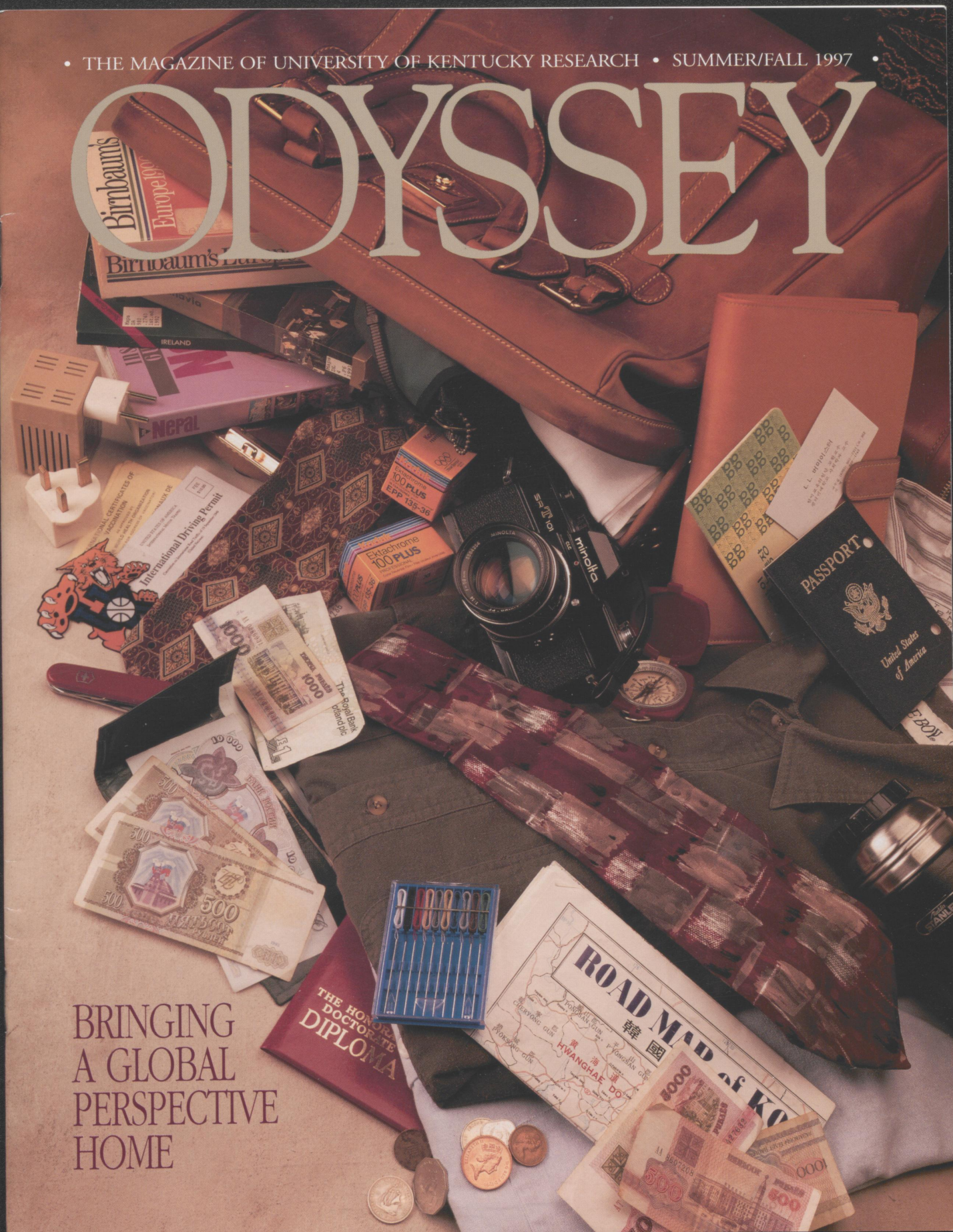


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ODYSSEY

BRINGING
A GLOBAL
PERSPECTIVE
HOME



ODYSSEY

*The University of Kentucky's premier publication
on research and graduate studies*

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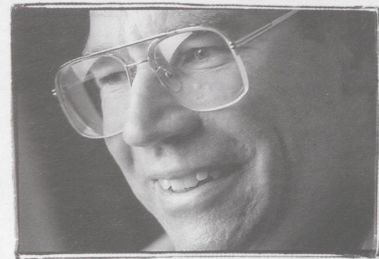
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W R I T T E N B Y
J E F F W O R L E Y

Most of the hundreds of research projects under way at the University of Kentucky are being carried out right here at home. But because of their research interests and areas of expertise, a growing number of UK faculty travel to countries all over the world to get firsthand knowledge of other cultures. The following are only a few of the many research activities taking place beyond U.S. borders.

BRINGING A GLOBAL PERSPECTIVE HOME



Connecting with Central Asia

Roger Anderson, director of UK's Kazakh-American Studies Center, enjoys his work here with faculty who opt to make the 5,000-mile trip to Central Asia, and he loves the 25-acre farm 10 miles south of Lexington that he shares with his wife and daughter. Life for him in central Kentucky is good. But he also admits to "an extreme fondness" for his home-away-from-home — Kazakhstan, a former republic of the U.S.S.R.

"I went to Kazakhstan for the first time in 1963," says Anderson, a professor of Russian and Eastern Studies. "I returned in '87 and went back again with my family on a Fulbright in 1990, at a turning point in Soviet history." He explains that because of its "geopolitical place" between Russia and China and its rich natural resource base (Kazakhstan has greater oil reserves than the entire Middle East), Kazakhstan has become politically pivotal. "This is one of the important reasons I became so interested in this region," Anderson explains. His focus, which led to his founding of the Kazakh Center, has resulted in nearly \$400,000 worth of grants awarded to the center since 1994 and several successful related extramurally funded activities at UK — by the College of Business and Economics, the Martin School of Public Policy and Administration and the College of Law.

Anderson's primary goal through all of this work has been to internationalize the campus in academic and "real-world" ways. "I see a great deal of benefit for UK through the broad range of faculty who have gone to Kazakhstan. In the past four years, we've sent faculty from anthropology, political science, history, film history, ESL [English as a Second Language], social geography, law, business and economics and education." To date, 15 UK faculty have taught for one to two months in one of three Kazakhstan universities or in a neighboring republic.

Stan Brunn, a UK professor of geography, is packing his bags this week for his second trip to Kazakhstan. "I'll be teaching at the same university as last time, Almaty, where I taught in the spring of 1996," Brunn says. He believes that flexibility is the most important single characteristic for an American professor who finds himself or herself in the Russian university system. On his last trip, Brunn was asked beforehand to teach three courses, and he came prepared to do so. "The problem — or I should say challenge — was, when I got to Almaty the administration wanted me to teach three completely different courses," Brunn says. "Yeah, flexibility — that's the key."

To begin to gain insight into the minds of the Kazakh people, Anderson says, Westerners must be aware of the distinctive attitude of Soviet people toward authority. And Anderson believes this psychological stance hasn't changed greatly since the destruction of the Iron Curtain.

"There's a legacy in the Soviet Union of viewing with suspicion personal originality on the job or entrepreneurship. History still inhibits many people from taking the kind of personal responsibility and long-term private planning which is so commonly accepted in the West," Anderson says.

Another major cultural and political difference, he says, has to do with loyalty within "highly personal networks." He says that in contrast to the ideals of an American meritocracy — advancing because of professional merit — post-Soviet citizens still tend to rely on very personal networks in the workplace. "In Kazakhstan the Soviet attitude of distributing goods and favors from the 'top down' still exists. When you are in a position of authority — great or small — you take care of your own," Anderson says. "It's very clannish and personal, and makes getting ahead on your own very difficult."

This is not to say that the many nationalities that comprise Kazakhstan's population (Kazakhs, Russians, Uigurs, Koreans) aren't industrious. Anderson says that it's

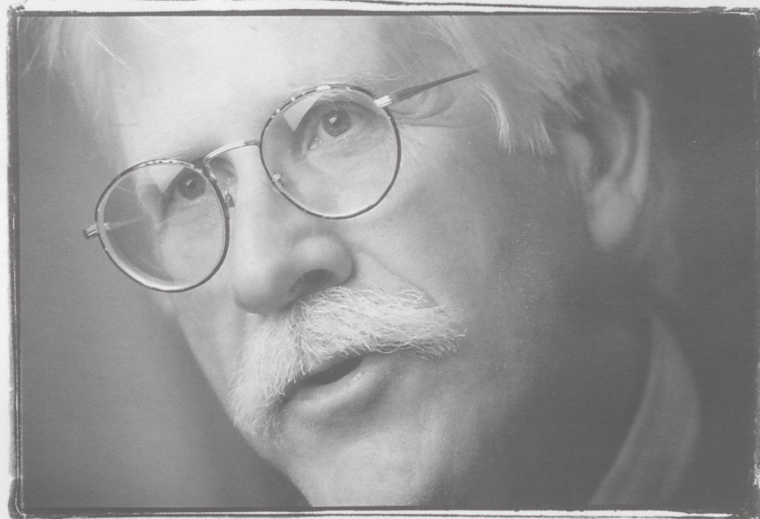


Photo by Lee Thomas

ROGER ANDERSON, DIRECTOR OF THE KAZAKH-AMERICAN STUDIES CENTER, SAYS THAT IT'S NOT UNUSUAL FOR PEOPLE IN KAZAKHSTAN TO HAVE THREE OR FOUR JOBS JUST TO MAKE ENDS MEET.

not unusual for people to have three or four jobs just to make ends meet so that their families can survive in a world that's been transformed under their feet.

"Not too many of these people have easy lives," says Alan DeYoung, a UK professor of educational policy. "Living in Uzbekistan isn't for the faint-hearted." DeYoung, who has worked in the Republics of Kazakhstan, Uzbekistan and Kyrgyzstan as part of the UK program, admits that living and teaching in this part of the world is a rugged venture. The local topography is basically rocky and stark, and in the summer months "rivals the Arizona desert as far as environmental hospitality goes," he says.

DeYoung stresses the partnership aspect of this program and believes that Americans clearly have some things to learn from the Central Asians. "On weekends, families flock to the cities — the cities in this area are desirable places to be," he says. "Villagers from outlying areas can take busses at low cost, and it's mostly a family thing — 10,000 people some weekends gathering in

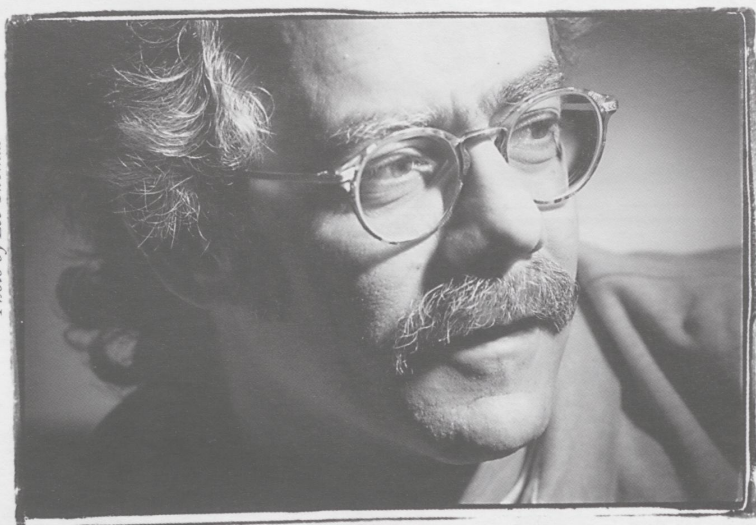
public parks and so forth." DeYoung points out the obvious contrast with some larger U.S. inner cities, which have been allowed to decay and have been all but abandoned.

Greg Waller, an associate professor of English at UK, traveled to Almaty, Kazakhstan's capital, in May of 1995 and spent a month screening and introducing a series of classic American movies. "I did this through a translator," Waller points out. "The films were shown in English without subtitles at what used to be the Communist Party film theater." He says that showing the series of seven films was a rousing success. The films included "The Gold Rush," "The Godfather," "The Deer Hunter," "Mr. Smith Goes to Washington," "Casablanca," "The Searchers" and "The Maltese Falcon."

While in Almaty, Waller spent several days at the Kazakhfilm Studios, interviewing filmmakers and watching a broad selection of Kazakh feature films and shorts. "It was an extraordinary situation being able

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Photo by Lee Thomas



UK ENGLISH PROFESSOR GREG WALLER BROUGHT SEVEN CLASSIC AMERICAN FILMS TO THE FORMER COMMUNIST PARTY THEATER IN KAZAKHSTAN.

to visit for a month, see so many films, meet people in the industry, and become familiar with that part of the world," Waller says.

When UK scholars and researchers return to Kentucky, they bring with them fresh knowledge about a people and culture that for decades was nearly inaccessible to Westerners. "One clear benefit for UK fac-

from halfway around the world may be standard operating procedure for a geologist, but why did Brunn, a geographer, do it?

"I think of these rocks as mementos, not for myself but for my students," he explains. "Whoever does best on an exam gets a rock." Asked whether this reward system makes students study harder, Brunn says,

"There's a legacy in the Soviet Union of viewing with suspicion personal originality on the job or entrepreneurship." — Roger Anderson

ulty members who make the trip is that, whatever their discipline, they return with a comparatist view," says Anderson. "Stan in geography or Jim Freeman in B&E and law, Don Gross in political science or Greg in film history have all worked with their counterparts in Kazakhstan. They bring back a fresh sense of what's happening there in their fields of study, different points of view, and this invariably filters back through their course material." In this way, Anderson says, both UK faculty and students clearly benefit.

Brunn, on his previous trip, brought back something even more tangible: Kazakh rocks. Lugging back a suitcase full of rocks

"It seems to work."

Anderson adds that another benefit of the Kazakh-UK exchange is that a number of UK students have been able to sample another culture and that their work in Kazakhstan boosts their career options. Several UK students, he says, have landed jobs because of their activities in Central Asia as undergraduates or graduate students.

Anderson underscores the point that this exchange is mutually beneficial. "It's been good for Kazakhstan in a number of ways," he explains. "We've trained many of the republic's future leaders in university administration and academic disciplines, hosted Kazakhstani Fulbright scholars, and

offered English-language training to Kazakhstan's faculty and students.

In considering the University of Kentucky's educational role in the exchange, Anderson says that UK is clearly the educational leader of all American universities in Kazakhstan. Thinking back to the genesis of the exchange, Anderson says he's glad the administration here recognized and took advantage of the "historical moment."

"The door opened at the right time, and I decided to go through it," says Anderson. "I didn't realize then there would be all these opportunities opening up. It's been the right thing to do."



In a land where rice is king

For Korean farmers, the sight of UK's Larry Burmeister making his way through a rice paddy is surely something to behold. For one thing, Burmeister, an associate professor of agricultural rural sociology, is a lean 6' 4" tall. Burmeister also looks, well, unmistakably *Western*.

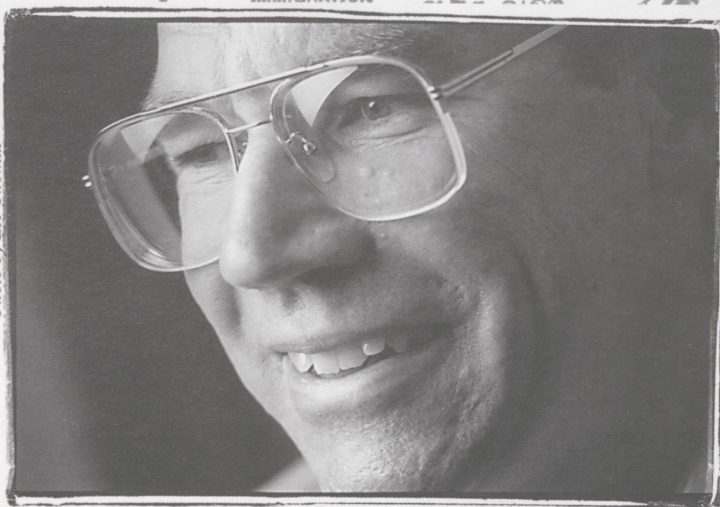
"Early on, it was important for me to get out into the fields and see the different varieties being produced since my research was focused on technical change in rice production," Burmeister explains. "So I needed to examine the physical characteristics of rice paddy production and of the plants."

To try to understand what makes Korean agriculture tick, a researcher needs to study the various facets of rice production,

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IMMIGRATION

Photo by Lee Thomas



LARRY BURMEISTER SAYS NEW LAWS HAVE OPENED KOREA'S AGRICULTURAL MARKETS TO CHEAPER IMPORTS, RESULTING NOT ONLY IN UNPRECEDENTED COMPETITION FOR FARMERS, BUT ALSO SPEEDING UP CHANGES IN KOREAN'S FOOD PREFERENCES.

Burmeister says. Rice is to Korean agriculture what tobacco is to Kentucky agriculture, only more so. Rice is cultivated by 85 percent of all Korean farm households. The income from rice production averages 49 percent of agricultural income and 28 percent of total income per farm household, according to agricultural researcher Myung-Hwan Kim.

"Rice is the staple food in Korea," says Burmeister. "It's really hard to analyze what's going on without focusing on rice."

But rice farming is now threatened, Burmeister explains, because of new laws which have opened Korea's agricultural markets to cheaper imports, resulting not only in unprecedented competition for farmers, but also speeding up changes in Koreans' food preferences. Per capita rice consumption has steadily declined since 1980 in both urban and farm households.

An organization called the Agricultural Cooperative has been dealing with this change, Burmeister explains, challenging import liberalization and exhorting Korean consumers to eat more traditional foods, particularly rice. The strategies and actions of this agricultural group are a major focus of Burmeister's current research.

With the new potential influx of lower-priced rice from other countries including the United States, Korean rice farmers are definitely feeling the pinch. And because land is a fixed commodity, it's not simply a matter of the farmers producing more rice to buffer their losses.

"You have to realize that the typical Korean farm is small," says Burmeister, "tiny by our standards — around three acres usually. So meeting the new challenge of competing with the imports is incredibly tough for a lot of farmers."

To come to their rescue, the cooperative initiated a promotional campaign to encourage the consumption of Korean-produced foods. This "formidable organization," as Burmeister characterizes it, launched its public relations campaign with solid backing: the organization has approximately 67,000 employees and a membership base of 90 to 95 percent of all Korean farm households.

The slogan "Love Our Agricultural Products" was adopted for the campaign. "The English translation is only approximate," Burmeister explains. "Because of the connotation of the Chinese characters in the slogan, it suggests not merely 'frequent use' but use linked to emotional attachment as well."

Ads using this slogan were displayed in various media billboards on freeways, on the Seoul subway, and were posted in bank offices. Related themes in the campaign emphasized the importance of agrarianism and what Burmeister calls "dietary monism" (the idea that distinctive patterns of food consumption have evolved as a unique and important cultural way to maintain Koreans' physical and psychic health). These themes were also developed in two comic books distributed by the cooperative to Korean elementary schools in 1990 and 1991.

"These comics were pretty amazing," says Burmeister. "In one episode, a primary school student is teased by his friends for taking a traditional lunch of rice and kimchi to school. His schoolmates, you see, have Western-style lunches. Then the student is transported supernaturally to the laboratory of a research scientist who teaches him about the nutritional advantages of the traditional Korean diet over Western food. The kid's classmates are found to be not

only forsaking Korea's cultural heritage but also endangering their health."

The stridency of the comic book messages, especially allegations about unsafe Western foods, enraged U.S. trade officials, and in response to complaints lodged through diplomatic channels, the cooperative stopped distributing the comics.

The overall success of such a campaign, Burmeister says, is very hard to measure, but recent statistics on the number of farm households in Korea suggest that the campaign has not been effective in reducing the exodus of Koreans from the farm. From 1990, when the campaign started, farm population fell from 6.61 million to 5.17 million; the number of farm households declined from 1.77 million to 1.56 million.

"These numbers pose a really interesting question for the future of agriculture in Korea," says Burmeister. "And from the conversations I've had with farmers and their families in the past few years, there seems to be an almost total lack of interest among the younger generation in continuing to farm." He adds that in talking to college professors in the country, he's found that very few agriculture students have any interest in going back to their home villages to work on the farm.

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A KOREAN
MARKET
BRIMS WITH
LOCALLY
GROWN PRODUCE.



"From the conversations I've had with farmers, there seems to be an almost total lack of interest among the younger generation in continuing to farm." — Larry Burmeister

"Lots and lots of young people see this as a bad economic venture; they just don't believe there's any future in it," Burmeister adds.

Burmeister contrasts the negative attitude of Korean young people toward farming with the situation in Kentucky. "I'd say around five to 10 percent of our agricultural college graduates at UK go back to production agriculture," he states. "It's an important kind of human capital reservoir for rural communities."

With nothing comparable to this kind of enthusiasm among its agriculture graduates in Korea, is rice farming headed for an inevitable collapse?

"Right now, the question is wide open," Burmeister says, "but it's certainly something I'm going to take an in-depth look at in the future." He adds that Korea, as well as some other East Asian countries whose young people feel a malaise about farming as a career, will definitely have to develop new ideas about what agriculture means if it is to survive as a viable sector. In this process of re-definition, the government might be wise, Burmeister says, to first of all appeal to tradition. "People still have ties to rural regions where their families originated. During the traditional Korean New Year's holiday, for example, it's customary for Korean city-dwellers to go back

and visit their home villages."

The indigenous physical beauty of the countryside will surely be touted in any future campaign to bolster the farming image, Burmeister believes, adding that the government will also surely need to step in to provide support. "Governments in the region might, for example, pay farmers a certain amount each year for preserving the landscape," he says. "That would be one approach. Some form of financial support, in any case, will have to be there." Burmeister's best guess is that agricultural products themselves will become less important than the sense of what agriculture means — to the environment, to the landscape, to rural tourism and to the culture in general.

Burmeister's various insights about Korean agriculture take on another dimension of importance when he returns to the Lexington campus. "I think it's important to talk to my colleagues in the field, my students, and Kentuckians," he says. "It's a global economy now. What's occurring over there has serious economic implications for our own agricultural situation."

He also believes we have a fair amount to learn from attempts by Korean policy makers to deal with the social by-products of agriculture, such as the landscape amenities agriculture provides. "We like our sur-

rounding countryside in Lexington, but it's continually being eaten away by developers; it's an embattled landscape. One of the justifications for someone from UK going over there to do research is to study how their agriculture is dealing with various development pressures."

Burmeister is clearly excited about — and grateful for — the time he's spent in Korea. "I figure since 1980 I've spent a total of four years of my life there," he says, "and it's been great. It's a privilege very few of us have — to try to understand the world views of people in another culture, to speak to them in their own language. It's no secret that the long Korean-American relationship hasn't been a completely happy one. But it's clear Koreans truly appreciate the American interest in their culture."



Unraveling the political complexities of Northern Ireland

The complex and entrenched political struggle in Northern Ireland wasn't what first led Cynthia Irvin there. She was drawn, instead, by something close to the hearts of many Kentuckians — horses.

"This was in the late '70s," says Irvin, an assistant professor of political science at UK. "I went to Dublin to work with horses; I was pretty far removed from any involvement in Irish politics."

A year later, though, Irvin went to France to lead a summer abroad program called The Experiment in International Living (now called World Learning). In Paris, and in her various travels, she met a number of political exiles which, she says, "gave me a feel for what was happening in their politically troubled countries."

When she coordinated a subsequent student abroad program in Ireland in 1983, she began to develop the intense interest in Irish politics that later led to her doctoral work and to the UK political science department. "The political situation being what it was, I was trying to arrange for the students to meet with representatives from

all the political parties," Irvin says. "And since I found it difficult to discuss Irish politics without discussing the IRA or its political wing, Sinnfein (pronounced Shin-fane), I decided to try to arrange a meeting for the students with these organizations."

Irvin adds that she wasn't exactly encouraged to do this. "Oh no, you don't want to do that," people would tell me. It was kind of a taboo to so actively acknowledge that these people existed," she says. But one day, she "just knock, knock, knocked on their door in Dublin. And from everything people had told me, I expected that I was either going to be immediately deported, or possibly shot."

Irvin didn't get deported — or shot. Instead, she says, she and the students had an interesting and productive meeting with several representatives of Sinnfein. And, in looking back at this incident, Irvin sees it as a defining moment in her academic life. "By stepping through that door, I began a journey that would lead me to graduate school and to the study of ethnic identity, historical memory, nationalism and conflict," she says.

Since at this time Irvin was living in a working-class Catholic neighborhood, she had a close-up look at the conflict between the Northern Irish and the British. "I came to understand perfectly why the IRA existed and why people would join the IRA. It was like living in a war zone. It was truly awful."

Irvin cites one example of a local family that the British soldiers "loved to harass" because one son was in prison for being in the IRA. The soldiers came into the house with a computerized print-out of every room — where the furniture was placed, the color of the walls, and so forth. The family had recently wallpapered the living room. The soldiers, perhaps suspecting that guns were now hidden behind the walls, tore through every wall in the room. "Worse," says Irvin, "is that the soldiers urinated and defecated in the husband and wife's bed. Their 10-year-old son witnessed this. It's no secret that an incident like this can make a kid angry enough to join the IRA when he grows a bit older."

"If you want to make the IRA go away, it's simple — just convince people on the street that they can achieve through politics what the IRA can achieve through guns."

— a leading member of Sinnfein

To balance this example a bit, Irvin points out that "it's surely horrible" to be a British soldier in Northern Ireland. From her experience, she says, the soldiers are totally ignored by the populace. "A soldier may come up to one of the locals and say, 'Nice day; it's not raining,' just trying to engage in normal conversation. And time after time he will be totally ignored. And the soldiers didn't ask for this duty — they were just sent there."

Supported by a \$42,000 grant from the U.S. Institute of Peace, Irvin will again travel to Northern Ireland this summer. The focus of her work this time will be to try to determine to what extent international economic assistance helps, if at all, to resolve conflict in Northern Ireland. The connection between economic well being and a lessening of conflict — the idea that with prosperity comes peace — is one that clearly intrigues Irvin.

The recent infusion of money from the United States and the European Union in



WHEN SHE KNOCKED ON THE IRA'S DOOR IN DUBLIN, CYNTHIA IRVIN BEGAN A JOURNEY TO EXPLORE ETHNIC IDENTITY, HISTORICAL MEMORY, NATIONALISM, AND CONFLICT.

this endeavor is starting to make a difference in the most disadvantaged communities, Irvin says. "Here's the idea: if you have two economically disadvantaged communities side by side — one Catholic and one Protestant, for example — the very condition of their existence leads, in part, to frustration and violence. With a heightened level of economic well being, the self-esteem of people in both communities tends to rise. Antagonism toward the 'other' lessens; then community representatives can begin to discuss problems with one another in a calmer, more rational way.

This, anyway, is the theory. But Irvin has her doubts about her research supporting the likelihood of this scenario. "I'll be surprised, frankly, if we find that this economic assistance is very effective," she says. "Take the kid who got caught and sent to jail for being in the IRA, for instance. True, if he'd had a job and had been on the job the day he got arrested, he clearly wouldn't have been jailed that day. But is having a job and being somewhat better off financially going to blot out from his memory years and years

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of built-up resentment? That doesn't seem very plausible to me."

Besides doing "a fair amount of library work" and interviews with various people, Irvin will analyze the results from a public opinion survey she designed to assess public attitudes about the effectiveness of economic development in building interethnic cooperation and resolving the conflict. In this work she will be collaborating with Sean Byrne, from the Department of Dispute Resolution at Nova Southeastern University in Ft. Lauderdale, Florida.

"There's a range of different groups that have received funding, so we'll be interviewing people who are in charge of the newly funded projects as well as those who are beginning to benefit from them," she explains. Irvin adds that the public opinion poll will be the first in Northern Ireland, to the researchers' knowledge, to address the topic of "peace through prosperity."

She has already seen some early indications that the economic assistance is beginning to reduce tensions in some areas, and she is encouraged by these signs. With a growth of self-esteem, she says, the people of Northern Ireland may begin to trust the political system more, rather than resort to violence to effect change. "As a leading member of Sinnfein told me, 'If you want to make the IRA go away, it's simple — just convince people on the street that they can achieve through politics what the IRA can achieve through guns.'"

When asked how her work in Northern Ireland is relevant to Kentucky and Kentuckians, Irvin says, "I can't wait to answer that question. In one rural community I know of in Northern Ireland — very underfunded in terms of education and health care — they've come up with the most amazing scheme. With this new availability of money, the community got some initial funding for five project directors who each trained five outreach people to make some local contacts in the community. The 25 outreach people have been going into the homes of single-parent families and simply asking what they need — child care, health care, educational opportunity and so forth — and pointing out that the funds do exist now to help them."



She adds that the outreach workers also screen for several problems in the home such as child abuse. This kind of grassroots "train-the-trainer" program could also work well, Irvin says, in rural areas of Kentucky.

"I have the feeling I'm going to come back to UK with something like '10 Great Ideas for Community Development,' which, with a little tinkering might be quite applicable to communities in our state."



Why do countries send peacekeeping troops?

Another member of the UK political science department, Karen Mingst, has also taken her research interests beyond U.S. borders. Mingst, currently chair of the department, is studying the reasons why countries decide to commit troops for United Nations peacekeeping efforts. Her research includes a wide range of countries — Sweden, Canada, Norway, Ireland, Nigeria, Ghana, Fiji, Nepal and India.

"The project focuses squarely on a crucial question in international relations — why states choose to cooperate," says Mingst. Since no one has done a comprehensive study of why countries choose to participate, Mingst — supported by a \$27,000 grant from the U.S. Institute of Peace — is breaking new ground with this work.

She has recently returned from working in Canada, where, Mingst says, this issue is causing the hottest debate among participating countries. Several ugly incidents involving the Canadian military recently have given rise to two best-selling books and a Canadian docudrama. And last summer trials of the military were televised nationwide.

The incident that fueled public outrage in Canada occurred when Canadian troops



UK POLITICAL SCIENTIST KAREN MINGST IS WORKING TO UNDERSTAND WHY COUNTRIES COMMIT TROOPS FOR UNITED NATIONS PEACEKEEPING EFFORTS.

were on a peacekeeping mission in Somalia in 1993. A Somali boy tried to enter the Canadian compound, and the soldiers reacted as if it were a break-in. Soldiers not only stopped the boy, they killed him. "There was clearly no restraint on the part of the troops," says Mingst, "and it was all captured on video (a camera crew happened to be on the premises)."

What was even worse, from a political perspective, is that no investigation into the incident took place for months. "The prime minister at the time was running for reelection, so people started to think this explained the time lag between the death of the kid and anything being done about it. In the interim there was clearly a cover-up going on. There was outright lying."

A focal point of the debate has to do with the regimental system in Canada, and whether this system promotes cover-ups and dishonesty. "When you join the military in Canada, you are assigned to a group and remain there for your whole military career," Mingst says. "So there's obviously an extreme loyalty to the group you're in, a strong desire to protect your buddies."

The investigation of this incident in the Canadian compound in Somalia is, Mingst says, Canada's version of a Watergate hearing. The proceedings, aired every day on television, have targeted the integrity of the military, its viability as a political institu-

tion, and the political cost of sending troops internationally.

Every country that agrees to send troops for peacekeeping efforts also considers the financial cost, Mingst says. "In the more developed countries, budgetary decisions are certainly part of it," she adds. "Certainly in the Scandinavian countries and in Canada that is an underlying dynamic." The question of regional influence is also important for many of the participating countries, she says, especially in Germany and Japan — whether it's appropriate to extend their country's influence in this way. As part of this project, Mingst traveled to Japan last fall to explore these debates.

When asked about the biggest challenge of this research project, Mingst says it has mostly to do with the very limiting reality that she hasn't figured out, yet, how to clone herself. "It would be great to be able to focus 100 percent on this project," she says. "But I have classes to teach, I have a tall stack of books from the library about Ireland I need to read, and I'm chair of the department right now. So it's impossible not to be fragmented, to lose my flow."

The most compelling challenge of the actual research, she says, is the sheer number of countries she's researching for this project — trying to pull together all the threads of each country's historical, psychological and cultural considerations that go into that country's decision to commit troops.

Mingst believes her work is clearly relevant to Kentuckians, especially to her students. "I teach classes in international organization and in international law, and I can talk about a lot of it from current firsthand experience."

In continuing to develop her international viewpoint, Mingst also gains in a personal way, she says. "When you go to other countries and get absorbed into their cultures, this expands your horizons as a human being. It makes you realize what a limited world you live in on a daily basis."

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PASSPORT

The Office of International Affairs: UK's Travel Agency

Talking with Mike Reed in his office on the second floor of Bradley Hall, you know you're in the presence of somebody who's done some world traveling. A brightly painted ostrich egg adorned with beads (from South Africa) sits on his desk. Behind Reed is a picture of a Kenyan Wildebeest made from dried banana leaves. A bronze wall hanging depicts the lively dance of a Ukrainian couple, and a large South African spear ornamented with more than 5,000 beads hangs, almost menacingly, from behind his desk.

Reed, who directs the Office of International Affairs (OIA), has brought back some of these objects from his travels; other souvenirs and artifacts were sent to him from his growing network of colleagues, former students, and friends. "I'd guess that I've traveled to around 26 countries at this point," Reed says, looking a bit surprised himself by this number. "Most of this travel has been on business — to talk with people to see which countries UK might best collaborate with in various research ventures."

The OIA, which started at UK in 1986, exists to help get international multidisciplinary projects up and running. The office provides extramural funds and works to coordinate the many logistical factors involved in organizing international research projects.

"Our main function," Reed says, "is to coordinate UK projects that are outside any one college or unit. If the project involves multiple units, then we can be a focal point to help with writing a proposal and contacting people around campus with similar international research interests." The OIA, he explains, works out various "logistical challenges" of international travel so that faculty can focus on their academic considerations.

The Kazakh-American Studies Program, which is now part of the OIA, is a good example, Reed says, of how the OIA works. "Two years ago, Roger Anderson was involved in activities with a wide variety of units on campus in connection with the program in Kazakhstan, and it simply didn't make sense for a professor of Russian to be spending so much time working on the logistics of travel with people in business and economics, education, public administration and so forth," Reed says. "This office is a mechanism to do just that so the professors here can focus on their teaching and research when they go overseas."

How does Reed feel about UK faculty traveling so far from the borders of their home state? And how is the work they do beneficial to Kentuckians?

"Most people in this state realize Kentucky is becoming increasingly linked to the rest of the world," Reed says. "So it's clearly beneficial for UK students to experience this, to get some feel for other parts of the world." Reed says that around 300 UK students each year are able to directly experience other cultures through the UK Study Abroad Program. But even those who can't take part in this program benefit indirectly from the international research being carried out by UK faculty. "Our faculty come back and can give firsthand observations of how other countries are dealing with various problems — agricultural, social, political and so forth," says Reed, a professor of agricultural economics. "We're simply not doing our duty as educators if we don't expose our students to international ideas and international thinking."

Reed says there's no doubt that all his travels have given him a broader and deeper perspective on world cultures. "This job allows me to travel extensively and to develop friendships all over the world," he says. "As a professor, I probably have 40 ex-students living and working in foreign countries as well as a whole network of university people around the world. I enjoy helping the university become involved in international collaborations. I really like being an advocate for internationalizing the campus."



A continent on the loose

Whatever the import/export balance between the United States and Argentina, one thing is certain: the biggest export has come from the United States.

About 525 million years ago, a piece of our continent broke off from what is now land along the Gulf Coast and drifted across several thousand miles of ocean before colliding with present-day South America. This block of land was 500 miles square — the size of Portugal and Spain — and took 70 to 80 million years to travel to South America, according to William Thomas, chair of UK's Department of Geological Sciences.

"For about 25 million years, as best we can tell, this island-microcontinent traveled at about four centimeters a year," says Thomas, "which is fairly typical of how slow these geological stories progress." Thomas made this discovery, working in collaboration with Ricardo Astini of the University of Cordoba in Argentina. The researchers' breakthrough follows a long list of scientific discoveries in which some fact or process comes to light almost accidentally.

For nearly 40 years, Thomas had been studying rock formations and components in the Appalachians, trying to figure out why they appear to stop suddenly in Alabama then appear again hundreds of miles to the west, in Arkansas, as the Ouachita Mountains. That gap is filled by the Mississippi Valley and, farther south, the Gulf of Mexico.

The pieces of this research puzzle started to fit, Thomas says, when he collaborated in 1991 with Chris Schmidt, a geologist at Western Michigan University, who was working on the mountain belt structure in western Montana. The two were comparing rock structures found in that region and in Appalachia.

"Chris and I talked about other projects we were working on, of course, and I mentioned the idea of a large chunk of North America breaking off and floating away millions of years ago," says Thomas. "I was certain it had drifted off but didn't know where it went." From years of study of the shape of the ancient continent we call North America, Thomas knew that around 550 million years ago, the continent had broken apart and that an ancient rift had formed along what we now know as the Appalachians and from Alabama southward.

Three years later, Schmidt had a Fulbright grant to study in Argentina and met Astini,

who told him the strange story of a huge area of unusual rocks there in the foothills of the Andes in Argentina, called the Precordillera, and the distinct layers containing fossils of trilobites and brachiopods of North American types. Thomas interjects: "And Chris said to Ricardo, 'I know exactly where it came from — Bill Thomas already told me.'"

Thomas then met Astini at a conference in San Juan, Argentina. "Geologists working in South America had realized for some time that the fossils and rock types they found in the Precordillera weren't at all typical of South America," Thomas says. These fossils were, in fact, very much like fossils of the same age in North America. "When Ricardo presented the Argentinian parts of the story and then I gave my talk, it became obvious that we were working on the same problem."

What has become a "very exciting collaboration," in Thomas's words, has already attracted international attention. The two published an article last August in *Science* magazine, and similar pieces have subsequently appeared in *Science News* and in *Discover*, which ran an eight-page article last September.

Thomas and Astini's explanation is largely acceptable to geologists, says Warren Huff of the University of Cincinnati's geology department. "The fossil evidence argues for it," he says, adding, "the length of the voyage, however, is still open to debate."

Thomas is looking forward to a sabbatical next year so that he can travel to Argentina to do field work with Astini. "And if we can get enough funding together," Thomas says, "Ricardo is going to come to the U.S. He and I plan to spend some time in Alabama and Texas looking at the rocks that would have been adjacent to the ones that left."

Specifically, this type of field work involves identifying the rocks, making comparisons, examining the succession of rocks — the rock layers. "We look at rock layers like you'd see in a road cut around Lexington," Thomas says. "This is important because each layer has been formed under different conditions, and each layer can be seen as a transition from the ones below and above it."

This is one way, he says, that geologists read history. "It's like reading pages in a history book," Thomas says, "except that some pages are missing, some of the pages have gotten wet, and on some the print is blurry. Our job is to assemble a complete and readable text."

In their work as geological matchmakers, Thomas and Astini also see themselves as "science detectives," Thomas says. "We're looking at the evidence and piecing together a sequence of events," he says. "It just so happens that our narrative extends over millions and hundreds of millions of years." ■



Photo by Lee Thomas

WILLIAM THOMAS SAYS READING ROCK LAYERS IS LIKE READING PAGES IN A HISTORY BOOK, "EXCEPT THAT SOME PAGES ARE MISSING, SOME OF THE PAGES HAVE GOTTEN WET, AND ON SOME THE PRINT IS BLURRY. OUR JOB IS TO ASSEMBLE A COMPLETE AND READABLE TEXT."

ODYSSEY

ODYSSEY

RESEARCH EXPERIENCES FOR UNDERGRADUATES PROGRAM THRIVING AT UK

WRITTEN BY HEIDI BRIGHT PARALES

PHOTOS BY LEE THOMAS

Stimulation is a key concept in both the research of a UK undergraduate and of the program that sponsors his work. Ed Stites, a UK mathematics student also interested in medicine, is exploring how computer modeling can serve as a basis to help people with stroke or spinal cord injuries stimulate their healthy muscles. He has recently been carrying out this work in the UK Research Experiences for Undergraduates (REU) program, which exists to stimulate the interest and curiosity of undergraduates in various research endeavors. Stites did his REU project with Jimmy Abbas, assistant professor of biomedical engineering, this past summer.

"I introduced Ed to the software tools he would be using and to mathematics skills he would need. Then I provided him with research papers on the topic to give him some perspective on spinal cord injuries, mathematical models of muscle, and functional neuromuscular stimulation (FNS).

FNS is a method of applying computer-controlled electrical impulses to muscles. Generally, with stroke or spinal cord injuries, part of the central nervous system cannot operate even though the muscles are still

healthy. With the right stimulation, muscles can be used to perform tasks for the person, such as picking up a cup of coffee or taking a step. The FNS control system is used to help determine how muscles should be electrically stimulated so a person who cannot voluntarily contract muscles can still perform a specific task.

The math/engineering REU program at UK, which began in 1995, provides undergraduates with short, focused research experiences working with faculty members. There are 20 other math and math-related REU sites in the United States, all funded

by the National Science Foundation. UK's site is unique, however, because it focuses on bringing together undergraduates from Appalachia and from highly competitive schools such as Duke.

The math/engineering program at UK is co-directed by Peter Perry, a professor of mathematics, and Suzanne Weaver Smith, an associate professor of engineering mechanics. This is the second year a project in biomedical engineering has been offered.

When these students meet for the summer, they begin comparing notes, says Smith. "UK students find out the programs are not much different at other universities, and this gives them a lot of confidence," she says.

"They discover they take the same classes and use the same textbooks. UK students feel they are getting a good education here, and are not as worried about being prepared to go to other graduate schools. And if the area they want to study has a researcher here they connect with, they might end up here for graduate school," Smith says.

Stites, a junior in math last summer when he joined this program under Abbas' tutelage, also had a strong interest in medicine. "I wasn't sure if I wanted to



MENTOR JIMMY ABBAS AND REU STUDENT ED STITES
USE COMPUTER MODELING TO CONTROL ELECTRICAL
MUSCLE STIMULATION.

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stick with math or medicine," he says. He discovered through the REU program that he could combine both, and it also gave him exposure to research.

His REU experience began with a three-day orientation, where he was joined by six other students. These students were selected because they typically had completed two to three years of college, including two years of calculus classes, says Perry. A background in physics and computer science is also preferred, because the research involves putting mathematical models on computers and then sometimes comparing them to experiments on real-world problems.

A strong math background still does not fully prepare the students for their research experience, because during three intense days of orientation, the students are shown mathematical processes they are most likely not familiar with, says Perry. Then, faculty members give presentations on the projects they are offering. Afterward, the students choose the projects they want to work on.

Smith says students usually get their first choices in projects. "With the flexibility of some and the focus of others, everyone usually gets something they want. There are always more mentors than students."

Stites selected Abbas' project in biomedical engineering because it was relevant to his experience, he says. Abbas met with Stites to guide him through his research, define the project, answer questions and fine-tune the process. "Ed was always good about asking questions and seeking out help when he needed it, so that made things very easy for me," Abbas says. "He worked hard and enjoyed it."

Currently there are devices available on the market for people with nerve damage, but the stimulation has to fit each person individually, Abbas says. "This makes widespread use very impractical and expensive."

The goal of Abbas' research is to automate the process of fitting the stimulation pattern to the user. The FNS control system for the stimulation is a set of equations; the usefulness of the system will depend on the characteristics of the equations. Stites

contributed to this research by building computer-simulated mathematical models of musculoskeletal systems and watching how they reacted to electrical stimulation. All research was done by computer modeling; no human subjects were used.

Stites says once his model was set up, his work involved changing values on specific parts of a mathematical formula and graphing the results, then repeating the process. "Each time I tried something different to see what worked best and why," he says.

"If the control system responded too quickly, a person using the system would fall," Stites says. "If it was too slow, the person would stumble. One area of our research was to find a speed that would work for a wide range of users."

"His results helped us to refine the set of equations so that FNS is more efficient — and hopefully more effective. As we move toward tests using human subjects, we now have a clearer understanding of how to select the control system parameters to achieve good performance. Ed's work was not just an educational exercise; it was a productive part of our overall effort."

Abbas describes Stites as bright, happy, enthusiastic and motivated — "and these are the kind of students that we would like to attract to careers in research and possibly in academics." The two were such a good fit that Stites now works part-time in Abbas' lab, where he can do research in both mathematics and medicine.

The REU program helped Stites shape his career goals. He plans to earn both an MD and a doctorate in mathematics. "The REU program gave me more familiarity with com-



SUZANNE WEAVER SMITH SAYS THAT WHEN REU STUDENTS FROM ACROSS THE UNITED STATES BEGIN COMPARING NOTES, "THEY DISCOVER THEY TAKE THE SAME CLASSES AND USE THE SAME TEXTBOOKS. UK STUDENTS FEEL THEY ARE GETTING A GOOD EDUCATION HERE."

puters and research methods," he says. "I realized I like research. I enjoy working out problems, I've always been good at math, and I've always wanted to go to medical school because it combines a lot of the sciences."

Abbas benefited as well from the experience. "The summer REU program gave me the opportunity to see how well Ed works and it gave him a chance to learn about what goes on in the lab. I am thrilled to have him here. I hope to work with another REU student this coming summer and I think that my experiences with Ed will benefit the next student coming through the lab."

Suzanne Smith also has had positive experiences working with REU students. In the spring of 1995, she talked with electrical engineering student Rodney Slone about a research project she was proposing for the REU program that summer. This would give Slone, who is from a small town in Eastern Kentucky, a chance to test the waters for graduate school. His project would be to determine the effect of wind vibration on high-voltage electrical wires suspended above the ground. His goal was to find out how the wires were vibrating, without actually contacting the wires, to predict when they had endured too much stress and needed to be replaced.

By measuring the electromagnetic field around a high-voltage power line, Slone knew he could reconstruct the position of the power line shaking in the wind. Even though he says Smith believed it would be difficult, if not impossible, he devised a mathematical way to measure the electromagnetic field of a transmission line by using only two rectangular wire loops on the ground running parallel to the power line. Then he measured the changing voltage on the loops to determine how much the power line was vibrating. He figured out how the ground wire loops had to be oriented, the number of loops needed and

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Shen Wins Centennial Research Fellowship

Flooding has caused millions of dollars in damage for Kentuckians during the past few years. Although weather forecasts for flooding have been reasonably dependable, they may become even more reliable thanks to the research of mathematicians such as Zhongwei Shen, who has been working to improve the basis of the models used in weather forecasting.

Shen, an assistant professor of mathematics at the University of Kentucky, is one of many researchers focusing on Navier-Stokes equations that model the flow of both liquids and gases. According to Shen, the current theory on the flow of fluid deals only with cases where the area occupied by a fluid has a smooth boundary. Shen wants to use partial differential equations to study a situation where the region occupied by a fluid has a rough boundary, and determine how those edges or corners affect the flow of the fluid.

He will have an opportunity to apply partial differential equations to another problem this fall, thanks to a fellowship he recently received from the American Mathematical Society (AMS). He was named a Centennial Research Fellow, a national honor that is given to only two to four non-tenured professors annually. When Shen heard that he had received the fellowship, he was "surprised and very delighted."

Peter Hislop, chair of the mathematics department at UK, says, "These are among the most prestigious awards a young mathematician can receive."

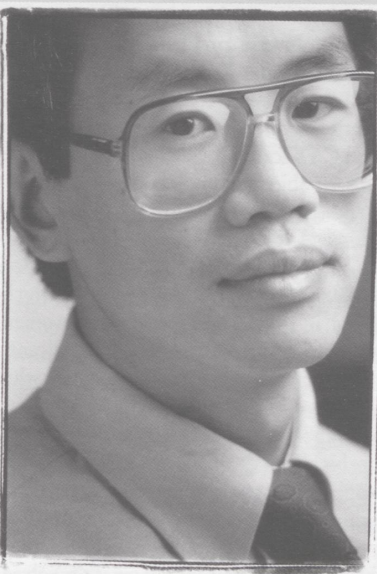
AMS is the main professional organization of mathematicians in the United States. Winners are selected by a national committee of distinguished mathematicians who look at the quality of the applicants' research and their potential for future development.

The winners can use their funds during a two-year period to support a reduced teaching load so they can concentrate on their research programs. Shen plans to conduct research this fall at the Mathematical Sciences Research Institute in Berkeley, California, because the institute will offer a special program and a series of workshops on partial differential equations. "This will be a great opportunity for me to interact with a group of leading experts in the field for new ideas, new approaches and new problems," he says.

His project involves using partial differential equations to study how energy levels of subatomic particles change when magnetic fields are present. The study of subatomic particles, called quantum mechanics, has applications to physical science fields such as biology or chemistry, and can be useful in areas which utilize computer chips and lasers.

Shen came from China in 1985 to study mathematics at the University of Chicago. After completing his doctorate, he earned a post-doctorate fellowship at Princeton University. Two years later he became an assistant professor at Purdue University.

In 1995, Shen came to UK because the mathematics department offered him the opportunity to work with a "strong group of people in the field of analysis," he says. He finds Lexington a nice location to live and work. "Its beautiful countryside, cultural activities, as well as convenience are things I like very much," he says.



ZHONGWEI SHEN WILL DO RESEARCH ON PARTIAL DIFFERENTIAL EQUATIONS IN CALIFORNIA THIS FALL, THANKS TO AN AMERICAN MATHEMATICAL SOCIETY FELLOWSHIP.

"Most students find the eight weeks a frustratingly short time, and we find in the end that students are much more interested in taking courses because they see how the math is used."

— Peter Perry

the equations he would be using. All of his work was done using computer modeling.

Smith says, "We could have come out with nothing, but Rodney found a way to formulate a stable mathematical problem so a solution was possible.

"Rodney is pretty exceptional," Smith adds. "He tested out of a semester on circuits by reading a textbook during Christmas break, and he earned his undergraduate degree in three years."

Slone says his computer modeling of the project worked out great on paper. He says it would never work in its current form in the real world, however, because the equations were extremely sensitive and could not take into account things like radio noise, which also would affect the results. "It sort of hurts, doesn't it?" he comments.

At some point down the road, however, his work might be useful to another researcher attempting to solve real-world problems. "With improvements in measurement technology, people in the future will, hopefully, be able to build on the results and do something feasible," he says.

Slone will finish his master's degree in electrical engineering this summer and is considering pursuing a doctorate in electrical engineering either at UK or the University of Illinois.

The future of the math/engineering REU site is not certain beyond this summer, but Smith and Perry are applying for another three-year grant. Perry says he feels the program has been successful. It started in 1994 as part of an inverse-problems re-



THE DIFFERENCE BETWEEN STUDY AND RESEARCH, PERRY SAYS, IS LIKE THE DIFFERENCE BETWEEN STUDYING GREAT BASKETBALL PLAYERS OF THE PAST AND ACTUALLY GETTING OUT ON THE COURT AND PLAYING THE GAME WELL YOURSELF.

search group with undergraduate participation. Inverse problems involve taking measurements of an object, such as the brain, and then recovering physical information about the object, much like X-rays and CAT scans provide information about unseen objects in one's body.

Based on the success of the pilot undergraduate research program, the National Science Foundation funded an expanded REU site directed by Perry and Smith which began in 1995. Three men and two women were selected from a pool of 29 applicants to participate. The hardest choice was who to pick, says Perry. "Most of the students who apply would work out very well. They are highly motivated, good achievers. Most applicants are thinking about graduate school and come here to get a taste of it.

"Once they go through the process, they have a much better idea of what's involved in a research project. The absolutely hard thing is to go from textbook learning, where the answer is in the back of the book, to

research where not only are there no answers in the back of the book, but there might not be a book," he says.

The difference between study and research is like the difference between studying great basketball players of the past and actually getting out on the court and playing the game well yourself, Perry says.

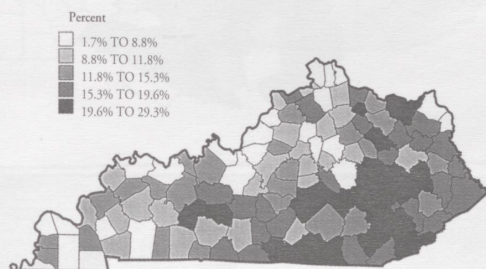
"Most students really feel sort of lost because there aren't the structures and guideposts they're used to in course work. They find the eight weeks a frustratingly short time, and we find in the end that students are much more interested in taking courses because they see how the math is used," Perry says.

This experience with real-world applications of textbook theories has the potential to be a defining experience for an undergraduate, says Abbas. It might serve to motivate some students to pursue careers in research, and other students might decide research is not for them. "In some respects, then, the REU experience may have a much greater impact on someone's career than any course we might teach," he says. ■

Come explore the REU
mathematics/engineering Web site
at <<http://www.ms.uky.edu/~reu>>.

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

Households without Telephone Service



MAPPING KENTUCKY'S PAST, PRESENT, AND FUTURE

The Appalachian Center's research director, Timothy Collins, puts the map on the table where I can see it. Printed on computer paper, it's not unlike many maps I've seen. Dark lines show boundaries, different shades of brown and red illustrate information from the key, and the title is centered in boldface at the top: People without Phone Service. In this particular Kentucky county, nearly 30 percent of the people are without telephone service. Looking at this graphical information fills me with awe and bewilderment. How is this possible? And why? Collins and the staff of the Appalachian Center are attempting to answer these questions with the help of innovative computer technology known as Geographic Information Systems (GIS).

The Appalachian Center has been doing "thematic" maps (such as the one mentioned above) using GIS software since 1994. "Thematic mapping allows us to look at how different themes, usually demographic or socioeconomic information, look on a map of Kentucky," Collins says. Seven years ago, Collins was writing out county-level data and coloring maps by hand. But with the advancement of

computer technology came greater mapping capabilities.

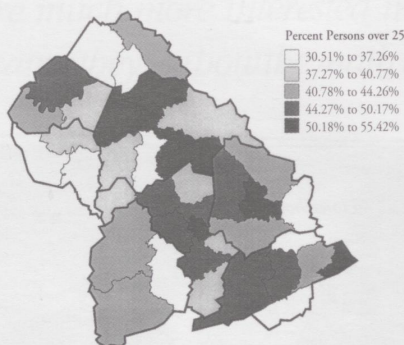
"With the advent of personal computers and the sophistication of computer programming, all of a sudden this thing of mapping and, the even deeper Geographic Information Systems, suddenly is at our fingertips," Collins says.

GIS uses hardware (often a personal computer), software (special mapping packages such as Atlas, ArcView and ArcInfo) and data sets (census information) to map spatial data in order to identify significant geographic trends or patterns.

Thematic mapping and GIS take cartography one step further. In thematic mapping, numbers are assigned to different variables, and then these numbers are mapped into some form of graphic interpretation. Collins says, "This might sound crazy, but if we want to map people by last name we could go through a directory and assign a number to Smith, and if we knew what county we could actually do a map that would show the density of Smiths in a particular area." According to Collins, this assignment of numbers to variables, known

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*People without high-school diplomas in
the Kentucky River Development District
by Census Tracts, 1990*



as digitizing, has greatly expanded the capabilities involved in mapping. Without digitizing, GIS would not be possible.

For Boyd Shearer Jr., GIS graduate research assistant for the Appalachian Center, the value of GIS lies in its ability to graphically display trends. "GIS is a tool we use to help construct an argument and to help verify results. It's excellent for mapping broad trends and doing sophisticated spatial analysis, and it allows us to make policy recommendations from that."

According to Shearer, the new GIS software has a querying capability which allows the user to set up "logical expressions or equations that could be significant or important." Collins hopes that asking the computer questions in this way will lead to informative answers, answers which reveal change: How have things changed historically? How have they stayed the same?

"There is tremendous potential over time to get new pictures of change, how things have changed. Government, economic and social policies are based on change — why things change, how fast things change, how we can bring about change. Because GIS

can reveal relationships between variables, a lot of what we do is historically focused," Collins says.

The Appalachian Center is mapping change within Kentucky by using GIS to investigate individual counties. Collins has been mapping all 120 counties in Kentucky in order to build a good basis for comparison.

"We are in the process of building a database, with everything from vital statistics, such as births and deaths, to income measures, to employment, population, education, anything you can think of that somebody has a number at the county

level," Collins says.

In 1996, the Appalachian Center completed a study on the Kentucky River Area Development District (KRADD). The study revealed an economic philosophy that did not work out as planned and strongly suggested that new solutions were needed. KRADD includes Breathitt, Knott, Lee, Leslie, Letcher, Owsley, Perry, and Wolfe counties. The center of KRADD is Hazard in Perry County.

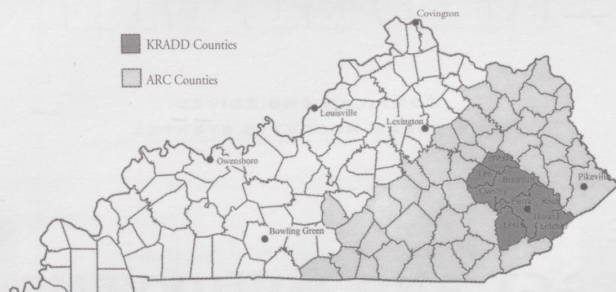
In the 1960s, planners in these counties followed a national trend, adopting a "growth center" or "growth pole" philosophy. They hoped that if government invested in a city such as Hazard, the "growth center," private business would follow, bringing jobs not only to that city, but also improving the economy in surrounding communities. The KRADD study showed Hazard was enjoying more jobs and higher incomes, but surrounding counties did not appear to benefit as much.

The KRADD study also revealed that educational levels are related to income levels and the ability to attract jobs. "After all these years of publicity about low levels of education in Kentucky, when we pre-



BOYD SHEARER JR. (LEFT) AND TIM COLLINS CREATE A PICTURE OF WHAT IT MEANS TO LIVE IN APPALACHIA BY USING GEOGRAPHIC INFORMATION SYSTEM (GIS) MAPPING TECHNOLOGY.

The Kentucky River Development District



sented these education maps to people, they said, "We knew we had an education problem, but we didn't know it was that bad," Collins says. In some census tracts (groups of 3,000 to 4,000 people), between 63 and 70 percent of adults 25 and older did not have a high-school diploma. "In the entire KRADD study area, almost half of the people did not have a high-school diploma according to the 1990 census," Collins says. "This situation clearly affects overall economic development."

According to Collins, the study raised the question: What needs to be done? "We need to work on upgrading worker skills, upgrading transportation, upgrading health care," Collins says. "The point that we make after looking at this economic and social data over the past 30 years is that we need to take a holistic approach to development. We can't just put all of our eggs in one basket; we really need a regional strategy."

The Appalachian Center plans to do more detailed mapping using ArcInfo, the newest mapping software that allows the integration of many different layers of data. "We will, I hope, before long, be using a lot of aerial photography and possibly satellite imagery."

From these aerial photographs and satellite images, the center will integrate GIS data in order to analyze the relationships of particular themes to actual landform and land use. Collins says, "One of the things you might want to look at is the relationship between natural resource depletion and poverty. We might see over a time span, as natural resources are depleted, an increase in poverty in an area." In addition, the imagery would be helpful in doing community studies, Collins says.

Using GIS to further the state's understand-

**"This might sound crazy,
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of Smiths in a
particular area."**

— Tim Collins

ing of itself follows the guidelines of the Appalachian Center's mission statement. Shearer explains, "We have kind of a mission statement to not only help, but educate people on the condition of Appalachia, and GIS mapping is helping to resolve the picture of what it means to live in Appalachia. If it means driving to work over 90 minutes has a relationship to poverty, then it's basically our mission to figure that out." Collins adds that the center works closely with individuals and organizations all over Appalachia in order to investigate the ultimate questions: Why

is our world the way it is, and what can we do to change it?

As Collins explains, the use of GIS has philosophical motivations as well as scientific. "We all find ourselves asking what is the relationship of humans to land? The different natural resources, geographic landforms . . . what we're looking at is how humans relate to nature and how we relate to ourselves within that space."

The center is spreading the word about trends in Appalachian communities through the studies and map on its Web page (<http://www.uky.edu/RGS/AppalCenter>). "The Web page is a use of GIS that is one of the most essential public services this research department does as a part of the Appalachian Center," says Collins.

Through the Web page, Collins says people from many different disciplines can access GIS results. "The Geographic Information Systems isn't just a geographic tool, a tool for geographers. I'm a sociologist. Political scientists, planners, historians and teachers use this tool."

Looking at the darker shaded region on the phone service map, I have to agree with Collins about the inter-connectedness of life. We all have to fit together on this map somehow, as the GIS data shows. Collins sums this thought up well: "As soon as you start drawing maps, one of the first things you learn is that you can look at nothing in isolation. You really begin to learn how interconnected local communities are within the region, and the region with the country, and the country with the rest of the world." ■

HONORABLE MENTION

COMPILED AND EDITED
BY SUSAN HODGETTS STEMPER

IMPACT AND ACHIEVEMENTS OF UK GRADUATE PROGRAM ALUMNI



FLANERY IS THE NEW COMMISSIONER FOR THE DEPARTMENT OF FINANCIAL INCENTIVES IN THE KENTUCKY CABINET FOR ECONOMIC DEVELOPMENT.

LORI H. FLANERY (FORMERLY HUDSON),

B.A., English, '87, J.D., Law, '90, is the new commissioner for the Department of Financial Incentives in the Kentucky Cabinet for Economic Development. Flanery, a native of Frankfort, Kentucky, received the Brown, Todd and Heyburn Scholarship while attending law school and as an undergraduate was a member of the Honors Program. As the first general counsel to the Executive Branch Ethics Commission, Flanery successfully prosecuted in the fall of 1995 a former Kentucky State treasurer for 11 ethics violations. Flanery and her husband, Kevin (J.D., UK law school, '90), have four children—three daughters (Kendall, Hayden, and Micah) and one son (Jared). Flanery's husband is the current deputy secretary for the Transportation Cabinet in Frankfort.

PATRICIA S. TERRELL,

Ph.D., Higher Education Administration, '88, has been named vice president for student services and dean of academic support services at Utah State University in Logan, Utah. Formerly the associate vice president for student affairs and dean of student life at Southern Methodist University in Dallas, Terrell began her new assignment on March 1 of this year.

PAMELA L. McCAFFERY SIGLER,

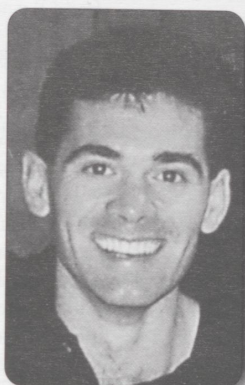
B.A., Vocational Home Economics Education, '75, M.S., Vocational Home Economics Education, '82, was selected as the 1996 Outstanding Family and Consumer Science Teacher by the Florida Vocational Association. The Fort Thomas, Kentucky, native was also honored as "Master Advisor" at the National Future Homemakers of America (FHA) Leadership Conference in July of 1996. She is married to J. David Sigler, has two children and lives in Spring Hill, Florida.

THOMAS S. LOGSDON,

M.S., Mathematics, '62, is a retired senior aerospace engineer with Rockwell International. As a graduate student at UK, he received an RCA Science Scholarship and a National Defense Fellowship. Logsdon reports that for nine years as an aerospace engineer, he worked as a trajectory specialist doing mathematical derivations used in shaping the trajectories for putting American astronauts on the moon. He has also written and published 28 non-fiction books and 40 technical papers and journal articles. Since retirement he heads Tom Logsdon and Associates in Seal Beach, California, and has taught over 200 short courses on American aerospace technology in 18 different countries on five continents. His e-mail address is <tslogsdon@aol.com>.

SUZANNE MARIE LENHART,

M.A., '76, Ph.D., Mathematics, '81, is a professor at the University of Tennessee in Knoxville. The Louisville, Kentucky, native received tenure in 1987 and was promoted to full professor in 1992. As a graduate student at UK, Lenhart worked with Professor Phil Crowley in the School of Biological Sciences on a computer simulation of the swimming motion of flagella. Now married with one child, Lenhart has received 10 years of grant funding from the National Science Foundation and has 54 research publications. She has also received research awards from the University of Tennessee chancellor and the Association for Women in Science.



AHMETAJ WENT FROM HOUSE ARREST TO NEGOTIATING FOR ECONOMIC ASSISTANCE IN HIS HOME COUNTRY, ALBANIA.

ARBEN AHMETAJ,

M.A., Diplomacy and International Commerce, '96, was UK's first Albanian student. When he returned to Albania, he worked for the president. Ahmetaj, however, quit the president's campaign in August, publicly denouncing it as corrupt. He left Albania and when he returned in early March was put under house arrest. After the mid-March riots and near-collapse of the Albanian government, he returned and was given a position in the new government as chief of staff to the minister of International Finance in the national government. Ahmetaj says, "In a few short months, I went from house arrest to negotiating with European Union representatives for an economic-assistance package to continue Albania economic reform and stabilization efforts."

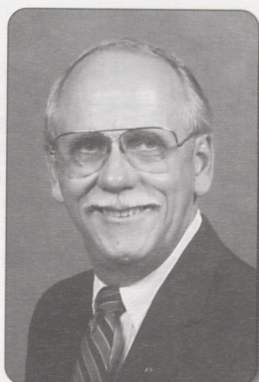
ANTHEA BOARMAN,

J.D., Law, '69, a London, England, native, recalls that when she arrived in the United States with her parents in the 1960s, "We felt this was a country based upon apartheid, that it was a frightening place." Now Boorman is the Metro Human Relations Commission director in Nashville. When she received her J.D. in law from UK, she was one of eight women graduates from the College of Law, the second largest law class of women in the country. She practiced law with a small firm in Lexington before being appointed the youngest sitting judge in the country as head of the Fayette County Juvenile Court. She later headed the Lexington Human Rights Commission and then went to Washington, D.C., as the director of the International Association of Official Human Rights Agencies. She then returned to Lexington and private practice to care for her parents before her most recent appointment in Nashville. Boorman and her husband have four biological chil-

dren and six adopted children, ranging in age from three to 27. She has also cared for 27 foster children.

VIRGINIA MARSH BELL,

M.S.W., Social Work, '82, is volunteer coordinator for the Alzheimer's Association in Lexington. Formerly a family counselor for the Sanders-Brown Center on Aging at UK, Bell co-authored, with David Troxel, *Best Friends Approach to Alzheimer's Care*, published by the Health Professions Press in 1996. A Kentucky native, Bell was primarily responsible for developing the Helping Hand, a day center for persons diagnosed with Alzheimer's disease. Bell reports that she received her M.S.W. from UK at age 60. She and her husband have been married 53 years and have five children, 12 grandchildren and now their first great grandson. After "retiring" from the Sanders-Brown Center at age 71, she became a full-time volunteer for the Alzheimer's Association. Her e-mail address is <VBellKy@aol.com>.



STEENSMA HAS PUBLISHED THREE BOOKS AND OVER 100 ARTICLES AND REVIEWS ON BRITISH AND AMERICAN LITERATURE, THE AMERICAN WEST, AND MILITARY AFFAIRS.

ROBERT C. STEENSMA,

Ph.D., English, '61, is a professor of English at the University of Utah in Salt Lake City. Originally from Sioux Falls, South Dakota, Steensma served with the U.S. Navy and Naval Reserve (1948-83), was awarded a Navy Commendation Medal and retired as a captain. During his career as a professor, he has served as a Fulbright lecturer in Finland, received a teaching award at the University of Utah, published three books and over 100 articles and reviews on British and American literature, the American West, and military affairs. Recently, he served as president of the South Central Society for 18th-Century Studies. He and his wife, Sharon, have five children and five grandchildren.

CONTINUED ON PAGE 20

H. PHILIP OREN,

B.S., Industrial Chemistry, '32, M.S., Chemistry, '34, is originally a native of Campbellsville, Kentucky, but now resides in Warm Springs, Virginia. The retired chemist was named to *Who's Who in Science and Engineering* 1996-97. In addition to a distinguished career as a chemist, he has written over 50 articles on black powder and ballistics for *The Priming Horn*, a publication of the National Muzzle Loading Rifle Association.



STEVEN R. DUNKIN,

M.S.W., Social Work, '76, is executive director of the Brown County Community Board of Alcohol, Drug Addiction, and Mental Health in Georgetown, Ohio. Dunkin was honored in 1996 with Ohio's Distinguished Rural Health Professional Award. He resides in Georgetown with his wife, Melinda, and three children: Cody, Jeremy and RaeLena.

SUE S. WALKER (FORMERLY SISK),

M.A., Education, '60, is executive director of James White's Fort, the first permanent structure in what is now Knoxville, Tennessee. She is currently president of the Alliance of the American Dental Association. Other honors include Civic Leader of the Year and the Service to Mankind Award. Past president of the YWCA, Walker has two daughters, Kandi and Kendra. Kandi is currently working on her Ph.D. and Kendra is in her last year of nursing school.

BERNADETTE RODAK,

M.S., Education, '80, is an associate professor of allied health and pathology and laboratory medicine at Indiana University in Indianapolis. As a UK graduate student, Rodak received a Kellogg Foundation Fel-

lowship and worked with Professor Norbert Tietz in pathology on the development of a clinical guide to laboratory tests. A native of Washington, D.C., Rodak has published a hematology textbook for W.B. Saunders, titled *Diagnostic Hematology*.

RANDALL A. MCCOY,

PharmD., Pharmacy, '91, is vice president for research and development for CareTrends Health, Education and Research Institute in Sioux Falls, South Dakota. As a graduate student at UK, McCoy worked with Professor Dennis Clifton on a research project funded by the American Heart Association, Kentucky Affiliate. He also was the recipient of a Genentech Cardiovascular Therapeutics fellowship. Prior to the establishment of CareTrends in South Dakota, McCoy says that virtually no research was being done in the northern plains. In addition to establishing CareTrends' research programs, McCoy has been instrumental in implementing "pharmacocentric" disease management programs in his home state. He is married and has a daughter, Kayla, and he and his wife Lisa are expecting another child. His e-mail address is <rmccoy@sunflower.usd.edu>.

BARBARA FURNISH RAGLAND SANDERS,

M.S., Ed. Psychology and Counseling, '76, continued her studies after leaving UK, earning a Ph.D. at the University of Texas in Austin. A native of Hebron, Kentucky, Sanders is now professor and chair of the Department of Physical Therapy at Southwest Texas State University in San Marcos, Texas. Her accomplishments include being president of the Texas Physical Therapy Association, the first person promoted to full professor of physical therapy at SWT and the first chair of the of the physical therapy department. She and her husband, Michael T. Sanders (M.S., College of Education, '78), live in Austin, Texas, with their 10-year-old daughter, Whitney. Her e-mail address is <BS5331@samson.health.swt.edu>.



SANDERS IS CURRENTLY CHAIR OF THE DEPARTMENT OF PHYSICAL THERAPY AT SOUTHWEST TEXAS STATE UNIVERSITY IN SAN MARCOS.

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Kenneth Foon, director of UK's Markey Cancer Center, met Malaya Chatterjee, professor in the university's Department of Internal Medicine, 10 years ago in upstate New York. He had recently come on board at Roswell Park Cancer Institute as the chief of clinical immunology.

"I met Malaya when I was interviewing for the position, and I thought she'd be a great person to work with — she was not only bright and congenial, but I could see in the work she was doing an adaptability to a clinical setting," explains Foon, who is also chief of the Division of Hematology and Oncology. And Chatterjee saw in Foon a dedicated clinician who would work tenaciously to test the products she developed. He refers to Chatterjee affectionately as a pit bull, because she is doggedly determined to figure things out. Chatterjee says that without Foon's dedication her vaccines would probably be sitting in a refrigerator somewhere.

The two are involved in immunotherapy, which focuses on treating disease by activating the body's immune system. Together, they have taken an idea from "bench to bedside" — from the point where it was a lab concept 10 years ago to the point where this new vaccine will soon be the subject of an international clinical trial. These "anti-idiotypic vaccines" are so called because they "mimic" tumor antigens (molecules on the surface of tumor cells) and stimulate the patient's immune system against these tumor antigens.

The vaccines are used after surgery to activate the patient's immune system against any residual tumor cells. Each vaccine is designed to mimic a specific antigen associated with a particular type of cancer. Together, Foon and Chatterjee have developed and received FDA approval on anti-idiotypic vaccines to aid in the treatment of colorectal, breast, melanoma and lung cancer. Of these vaccines, the colorectal vaccine is perhaps the most exciting to them because

FROM BENCH TO BEDSIDE: THE LONG JOURNEY OF A VACCINE

WRITTEN BY
LAURA LEE BROTHER

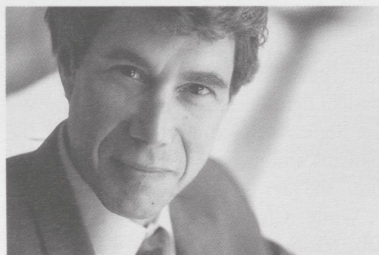


Photo by Lee Thomas

"THE BIGGEST THRILL OF MY CAREER AND LIFE WILL BE IF THIS VACCINE ACTUALLY CURES A SIGNIFICANT PERCENT OF THE PATIENTS WITH COLORECTAL CANCER," SAYS KENNETH FOON, DIRECTOR OF UK'S MARKEY CANCER CENTER.



Photo by Lee Thomas

AFTER THE TUMOR IS REMOVED AND THE PATIENT UNDERGOES CHEMOTHERAPY, MALAYA CHATTERJEE FEELS THERE IS A "WINDOW OF OPPORTUNITY" WHERE THE VACCINES SHE'S DEVELOPED CAN BE USED TO HELP THE PATIENT FIGHT RESIDUAL TUMOR CELLS.

it will be the subject of an international study this coming spring.

In the upcoming national and international trials with the National Surgical Adjuvant Breast and Bowel Project, half of the 1,000 patients with colorectal cancer who have undergone surgery will receive standard chemotherapy treatment, and the other half chemotherapy plus the vaccine. "We know the colorectal vaccine will activate the immune system; the goal for the phase-III trial is to improve survival rates," Foon says.

In addition to being the subject of an international trial, the vaccines have attracted the attention of a pharmaceutical company. Trilex pharmaceuticals licensed not only the colorectal vaccine, but also the vaccines for breast cancer, lung cancer and melanoma. In addition, the pharmaceutical company provided a \$1.75 million dollar grant to the university so that Foon and Chatterjee can continue working on the anti-idiotypic vaccines.

In her open, easy manner Chatterjee, who creates these vaccines in her lab, explains that early in her career, her specialty was the diagnosis of different cancers. Then about 10 years ago, when she first began working with Foon, she switched to cancer therapy, specifically immunotherapy.

The focus of this type of treatment is how to keep the tumor cells that are already present from spreading or recurring in the patient. Chatterjee explains, "One way of taking care of the tumor is to stimulate the patient's immune system in a specific way so that they can take care of the tumor themselves." One way to do this is to create a vaccine using the tumor antigen, which is a molecule on the tumor cell that elicits an immune system response. This antigen will then activate the immune system to rally against the tumor cells.

The problem with this approach in cancer patients, she explains, is twofold. First, a cancer patient's immune system is often suppressed due to the overall debilitation of

continued on page 24

the body, and, in some cases, from the effects of surgery, radiation and chemotherapy treatments. Second, tumor antigens are not very different from other tissue antigens normally found in the body, so the immune system does not recognize them as foreign, and thus tolerates these cancerous cells. And to further complicate matters, many times researchers are not able to isolate the tumor antigen in large enough quantities to give it back to the patient as a vaccine.

In order to counter these problems, Chatterjee is creating anti-idiotypic antibody vaccines that look foreign to the body, so the patient's system will respond when immunized, but also look like the tumor antigen, so the immune system response is directed against the cancerous cells.

Chatterjee sees many advantages to these anti-idiotypic vaccines. They can break the immune system's tolerance to tumor antigens; they are fairly easy to prepare and purify; there are few side-effects; and the vaccine is non-toxic to patients.

However, this process is not without difficulties. "Making the perfect tumor mimic is not that easy," Chatterjee says. "Isolating the right kind is very difficult." On top of that, there is a rigorous testing and regulatory approval process, which is very time consuming and requires meticulous record keeping.

While she concedes that the process does take a long time, Chatterjee is happy with the progress that's been made: "It's in the clinic now. We've treated more than 50 patients, and the good thing is that over 90 percent make active immunity against their own tumor antigens."

Chatterjee explains that their work is so important because cancer patients rarely die from the primary tumor. It is the secondary growth, or the recurrence of the cancer cells after surgery, chemotherapy, or radiation treatments that is so dangerous. In many cases, even though the patient may respond well to chemotherapy and radiation treatments, some residue of the cancer cells remains, and the cancer may not only



THE MARKEY CANCER CENTER

come back, but may resist therapy. After the tumor is removed and the patient undergoes chemotherapy, Chatterjee feels there is a "window of opportunity" where the colorectal vaccine and the other anti-idiotypic vaccines can be utilized to help the patient fight the residual tumor cells. "We are hoping to prolong the survival of the patients and give them a better quality of life," she says.

While Chatterjee spends hours in the lab, testing and retesting — trying to isolate the antibodies to make the perfect mimic of the human tumor antigen — Foon is busy in his office in the Roach building, writing the protocols for the clinical trials he wants to perform with the vaccines. These protocols outline the details of the therapy.

The clinical protocol that Foon puts together for the vaccines outlines the number of patients being treated, the dosage, the effects the researchers hope to see, and any known side-effects associated with the vaccine. This protocol is approved by UK's Scientific Advisory Board and the Institutional Review Board, and is then sent to the FDA, along with the IND (Investigational New Drug) application, which details from the beginning everything involved in the lab process. This, Foon says, is the "voluminous" document that is prepared by Chatterjee. Once the FDA approves the IND application and the clinical protocol, Foon actually begins using the vaccine on cancer patients.

The colorectal vaccine is currently being

used on patients as a part of their post-surgical therapy. First the patients are screened to ensure that their tumor is positive for carcino-embryonic antigen (CEA). Once they complete chemotherapy and radiation treatments, each patient in the study receives an injection of the vaccine every other week for a total of four injections. After the initial four injections, the patients are treated on a monthly basis. Foon said the immune system typically starts to activate after about the third or fourth injection, and it tends to peak around the sixth injection.

He emphasizes that he and Chatterjee won't really know if the vaccine is effective over the long run until the international trial is completed sometime after the turn of the century. But so far, the results look good: with the vaccine, patients' immune systems definitely activate and are able to recognize the cancer cells. "The biggest thrill of my career and my life," Foon says, "will be if this colorectal vaccine actually cures a significant percent of the patients with colorectal cancer." But he is quick to add that there are no guarantees at this point. In fact, he says one of his patient's cancer recurred after being on the vaccine for over three years. He notes that the patient was expected to have a recurrence within two years, but then adds quietly, "He is a friend, so it is very upsetting and disappointing."

He explains that many people were dubious that the vaccine would work at all, and it is certainly gratifying that in a post-surgical setting in conjunction with other therapies, there is "absolutely 100 percent specific activation of the immune system."

What is it like to create a product and then essentially have to let it go? "What we get out of it," Foon says, "is that we get to see our product go on to the next level; the opportunity to see if it is actually going to play a major role in prolonging survival and curing people." ❖

MOUNTAIN SC-OUTS: PIONEERS IN CANCER OUTREACH

Not every cancer program at UK takes place in the lab or the clinic. The Cancer Control Division of the Markey Cancer Center, headed by Gilbert Friedell, is involved in many community-based programs designed to educate people about cancer and cancer prevention.

And in recognition of his dedication to cancer prevention programs, last fall Friedell was one of 10 people in the United States who received \$100,000 grants from the Avon Breast Cancer Leadership Awards. In awarding Friedell, Avon cited his work in creating informational materials and programs to promote early detection and treatment of cancer. "One of my particular concerns has been increasing screening and cancer control activities throughout the state, but particularly throughout Eastern Kentucky," Friedell says.

One of the community-based programs the Cancer Control Program has fostered is the Mountain SC-Outs (Mountain Surveillance and Counseling Outreach). This program was established because of the unusually high rate of cervical cancer and the relatively high incidence of late-stage breast cancer among women in 36 Eastern Kentucky counties. A pilot program was established in Clay, Jackson, and Whitley counties in 1991. The goal was to contact women over age 45 who had not had a Pap smear in three and a half years or more and who had never had a mammogram, and to get them to come to a medical clinic for a free Pap smear or mammogram.

The program was based on the philosophy of "peer contact." Angel Rubio, director of community-based research at Markey who helped establish the program, explains that part of the inspiration for this program came from a similar project conducted at Vanderbilt University. "Vanderbilt's work was based on the idea that peer-to-peer relationships were the best way to reach people — that a woman from a low-income background could walk into another woman's home and be more effective at communicating information than what a health official may do in a clinic setting," Rubio says.

Mountain SC-Outs (pronounced 'scouts') was born with help from a \$10,000 private foundation grant. The Cancer Control Program partnered with the Appalachian Communities for Children (ACC) and the Whitley County Communities for Children (WCCC) to design a community-based health-intervention program. The program aimed to improve low-income women's participation in local health department screening and early detection programs for breast and cervical cancer. Six women were selected from the two community groups and trained to educate women in their communities about breast and cervical cancer.

After its first year, the Mountain SC-Outs program received funding from the state Department of Public Health through local health departments to continue its outreach efforts. Currently, the program has been absorbed into Kentucky Homeplace, a program which also focuses on peer-to-peer contact. The role of women who

"By meeting people on their own level, they're more accepting of what you say because you're speaking their language."

were Mountain SC-Outs has expanded beyond cervical and breast cancer screening to include health assessments for entire families.

Marian Colette, who was the director of the WCCC at the program's inception, says it worked because the women recruited as Mountain SC-Outs were the same age and from the same community as the people they were contacting. "By meeting people on their own level, they're more accepting of what you say because you're speaking their language," Colette says.

Shirley Shelley and Mary West were both working with the WCCC when the Mountain SC-Outs program began. Shelley was in the first group of women trained to be Mountain SC-Outs, and West joined the group in 1993.

West and Shelley touched many people through their work. Shelley remembers one woman who approached her concerning her daughter who had cervical cancer and needed surgery. The woman came to Shelley because she knew she was a Mountain SC-Out and could help. Although the woman had no insurance, "We were able to contact Markey Cancer Center and get services for her there," Shelley says.

West worked with a woman whose mother had died from breast cancer when she was very young. Despite the history of breast cancer in her family, this woman had never had a Pap smear or breast exam and was resistant to West's encouraging efforts. West herself had an aunt who had never received preventive care, so she set up appointments so the two women, who were neighbors, could go together. "It made it much easier for them," West says. "This woman said later, 'You know I just hear tales about mammograms and Pap smears, and I thought after a certain age you just didn't need them.'"

West and Shelley agree that sometimes it was difficult to convince women these preventive services were necessary. West says many women weren't aware of the risks of cancer, and they, or their husbands, were uncomfortable with the whole idea of this sort of preventive care.

Despite some resistance, many women did utilize the free screenings. "In the first year, we contacted 500 women, and out of that, over half went for the services," Shelley said.

Although Mountain SC-Outs has now evolved into something much larger, the program is still lodged in the minds of many Whitley countians. "To this day, I still run across people who ask me about the program," Shelley says. In fact, last year she transported three women to Corbin, Kentucky, for mammograms because the women remembered the Mountain SC-Outs program and called her to ask for help with transportation.

"I believe we have made a big difference," West says.

KIOSK

IS FIDELITY FOR THE BIRDS?

You could call them love birds. They prepare a nest. He feeds her while she's incubating the eggs. It's a pretty cozy picture. But there's a much more complicated game going on between the sexes behind the scenes, says David Westneat, associate professor of biological sciences at the University of Kentucky.

Researchers have known for years that most birds are monogamous — 90 percent of males and females show strong social bonds with one mate. In North America, the male often defends territory, while the female nests and both male and female provide care for the offspring. "The system seemed fairly straight-forward," Westneat says. But some birds are a lot less faithful to their mate than Westneat and other scientists

thought. "New research is stimulating us to throw away our previous ideas on how mating systems work," Westneat says.

In his graduate work in the early '80s, Westneat noticed that male birds behaved very differently in the amount of care they gave their offspring. To see if paternity was a factor, he came up with a plan to use DNA testing to analyze blood samples from baby birds, their mothers, the mates and other males living nearby.

For this paternity testing, Westneat caught each bird and used a small needle to draw blood from the brachial vein. "It's very easy and doesn't harm the bird," Westneat says. He uses traps baited with cracked corn and

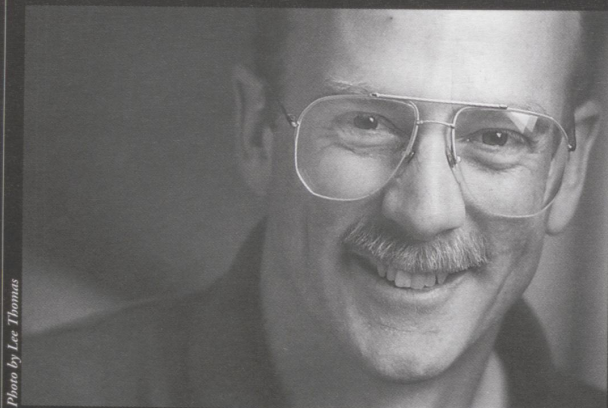
nets stretched across common flight paths or near nests to catch the birds. "We release them very quickly," says Westneat. "The mother often returns to feed her chicks within 30 minutes. Our testing doesn't seem to disturb them too much."

He found that startling percentages of one bird species, the indigo bunting, were nest-hopping. "In the indigo bunting, about 40 percent of the offspring are fathered by males other than the mate," Westneat says. In the fairy wren, up to 85 percent of all chicks are fathered by a male other than the mate. It happens about half the time in tree swallows.

In 1994, Westneat received a three-year, \$320,000 grant from the National Science Foundation to continue his paternity tests. Over the past three years, these tests have raised new questions for Westneat: Do females pursue multiple mates? Do males try to stop their females from mating with other males? The answers, say Westneat, de-

pend on the species and the environment. "Our research tries to integrate both ecological and evolutionary views in understanding behavior," Westneat says. "As we find differences between species, it's an opportunity to understand how ecological factors create evolutionary pressures and alter mating behavior."

In eastern populations of red-winged blackbirds, females don't openly pursue other males. Westneat observed that these females behave more subtly, resisting certain males more than others. He speculates they do this in order to keep the parental care their mates provide for the chicks. In western populations, males don't care for chicks, and females are much more obvious about mating with different males. "It's possible that in western populations environmental factors, like a better food supply, mean females can feed chicks with-



DAVID WESTNEAT IS STUDYING HOW ECOLOGICAL FACTORS ALTER BIRD MATING BEHAVIOR.

Photo by Lee Thomas

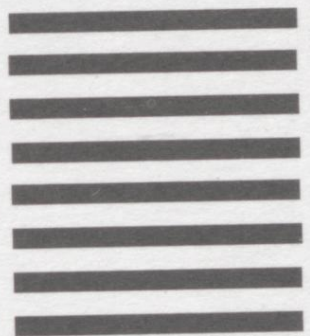


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NEW UK ENGINEER BOOSTS MACHINE SIGHT

out the male," Westneat says. "So females pursue matings with other males without worrying whether their mates will provide care because they don't anyway," says Westneat.

"I'm convinced that understanding why males and females interact in various ways from an ecological and evolutionary perspective can help us understand social behavior in general," Westneat says. Although his goal is not to explain human infidelity, Westneat says his studies of birds could help us understand some aspects of human behavior. "In all species, reproduction is a mix of cooperation and conflict," says Westneat. "Trying to understand why males and females are sometimes aggressive to each other, and sometimes not, could help us understand things like spouse and child abuse. It's a very, very long stretch at this point, but my work shows that often things are not what they seem."

"We hope by cataloging this diversity of behavior, we can further develop ideas about how ecology and evolution shape behavior." So far, the reproductive habits of only about 80 of the 9,000 species of birds have been studied.

— Alicia P. Gregory

"In the human body our eyes and our brains work together, and we call it a vision system," says Johné (JOHN-ay) Parker. Though she's not a neurologist, this University of Kentucky professor uses the information processing power of the human body as a model in her mechanical engineering theory.

"In manufacturing, a vision system is a camera or cameras linked to a computer or processor," Parker says. "The camera takes pictures, which are really a series of numbers, typically between zero and 255, that allow the computer to 'see' where something is." Parker explains that through these pictures the computer can determine if there's a defect in the manufacturing process, if something's the right size, or if a hole is in the right place. If adjustments need to be made, the computer translates the location of the object in the picture and signals the robotic arm to move to the location of the part in the real world.

Parker joined the College of Engineering as an assistant professor of mechanical engineering last fall with an expertise in vision systems — computerized systems designed to monitor product quality on an automated assembly line.

Her current work in the college's Center for Robotics and Manufacturing Systems



Photo by Lee Thomas

JOHNÉ PARKER MODELS COMPUTERIZED SYSTEMS DESIGNED TO MONITOR PRODUCT QUALITY ON AN AUTOMATED ASSEMBLY LINE.

involves fine-tuning a method that predicts what images will look like without setting up an actual vision system, complete with computer, cameras and wires.

The Alabama native began this research in her doctoral work at Georgia Tech. "My methodology uses a lot of equations that help me predict what the numbers that determine the image will be, and what a machine vision system will do," Parker says. Why is that useful? "Manufacturers usually spend a whole lot of money on a vision system that doesn't do exactly what they want or to the degree of accuracy they need," Parker says. Industry could cut this wasteful spending by working out the kinks through her model before a system is installed, Parker says.

Parker's model method can also explore the manufacturing process without a prototype of a new part. "Here you can just take a computer drawing and design the system to work with it," Parker says.

After her first visit to Kentucky, Parker says she was impressed by UK's facilities and faculty. "It's big enough to get things done in terms of an engineering department, without being so overwhelming that you're one of 60 faculty in the department," Parker says. "The College of Engineering is poised to grow, and I wanted to get in on that opportunity."

"Johné was hired because of her unique expertise in vision systems and her emphasis on

CONTINUED ON
PAGE 28

manufacturing research," says Kim Anderson, associate dean of Undergraduate Studies. "In addition, her enthusiasm for teaching was very evident during the interviewing process."

— **Alicia P. Gregory**

KENTUCKY'S FORESTS WORTH \$4 BILLION

Half of Kentucky's 25.4 million acres are forest, and trees mean big money. In fact, the University of Kentucky and Ag Project 2000 estimate that Kentucky's forest industry has the potential to contribute more than \$4 billion a year to the state's economy.

"That includes hardwood sales (oak, cherry, ash and walnut), wood for pulp and paper production, and softwood sales used in plywood and particle board," says Jeff Stringer, extension forestry specialist with UK's College of Agriculture.

Ag 2000, a comprehensive look at Kentucky's agricultural industries, was designed to sum up present and potential earnings as well as identify opportunities for economic development.

Kentucky gets revenue from its forests in more ways than wood sales, Stringer says. The state's



JEFF STRINGER SAYS, "PROPER LOGGING PRACTICES ARE THE BOTTOM LINE IN SUSTAINING FORESTS FOR THIS \$4 BILLION INDUSTRY."

tourism industry relies on forests for diverse wildlife and recreational opportunities. "Money from sales of equipment such as hunting and fishing gear, and taxes from hunting and fishing licenses are a significant part of both state and local economies," Stringer says.

"Forest product value is on par with Kentucky's traditional multi-billion dollar horse, tobacco and beef industries in terms of personal

income and job generation," says Jeff Hall, coordinator of Ag Project 2000.

"Our bottom-line goal is increasing farm income," Hall says. More than half of Kentucky's farms have forested plots, which provide supplies for building, shade for livestock, fuel, and timber revenue.

"The Ag 2000 project is working in economic development to raise the visibility of agriculture in

Kentucky so people recognize the contribution it makes to the economy and how much more it could make," Hall says.

"Proper logging practices are the bottom line in sustaining forests for this \$4 billion industry," Stringer says. In addition to conducting research on how logging affects the environment, Stringer organizes continuing education for loggers across the state through the Kentucky Master Logger Program. This program has trained 900 loggers since 1992 in areas such as Occupational Safety and Health Administration regulations, best-management practices for water quality protection, forest ecology, CPR, and chainsaw safety.

"By helping to educate loggers, we're able to transfer what we're learning through our research efforts into education programs to try to solve some of the problems," Stringer says. The Kentucky Master Logger Program won the Governor's Environmental Excellence Award and is ranked by the American Pulp Wood Association as the fourth best comprehensive logger education program in the United States.

— **Alicia P. Gregory**

TISSUE STUDIES COULD CONFINE TUMORS, AID FERTILITY

Solving infertility. Developing new contraceptives. Stopping cancer. University of Kentucky researchers have these long-term goals in mind as they explore the function of a little-understood system in ovulation.

This system, known as tissue remodeling, is responsible for breakdown of the ovarian follicle, the step that releases the mature egg from the ovary to be fertilized by the sperm. The follicle is made of layers of cells bound together by a "glue" called the matrix. The egg is released by the action of matrix metalloproteinases (MMPs), enzymes that chew through the matrix at the top of the follicle to let the egg out. The MMPs are policed by tissue inhibitors of metalloproteinase (TIMPs).

For every enzyme trying to break through the follicle, there is an overabundance of TIMPs. "You don't want the enzymes to run amok," says Tom Curry, head of an obstetrics/gynecology research lab at the UK Chandler Medical Center. "The vast number of inhibitors keep the enzymes from destroying the tissue by chewing up all of the cells."

Curry, who has studied these enzymes for eight years, is currently investigating how the MMPs target the top of the follicle and not the base. He says if he can find a way to control where the follicle breaks down, it could have applications for infertility, contraception and cancer.

In fertility cases, doctors could make it easier to release the egg. For contraceptive purposes, they could stop release of the egg, preventing pregnancy. For cancer, doctors may use Curry's research to confine

tumors. "Tumors that are benign stay within a confined area. Tumors that are malignant have the ability to get out and get into the blood vessels and travel to other places," Curry says. "In every tissue that's been studied, cancer's ability to get out of its benign home base involves MMPs and TIMPs." If Curry can find a way to keep the enzymes from chewing up the base of the follicle that leads to the blood vessels, he may find a way to keep cancer from spreading.

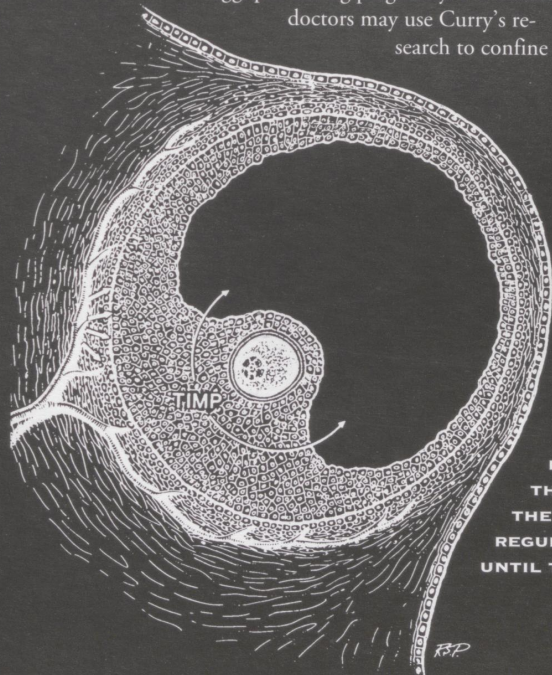
Curry and his colleagues use "knockout" mice to investigate how MMPs and TIMPs work. Researchers remove, or knock-out, certain proteins in the mice to find out what happens without those proteins. Using knockout mice, Warren Nothnick, a post-doctoral researcher in Curry's lab, won national recognition with the 1996 New Investigator Award from the Society for the Study of Reproduction. His innovative research beat abstracts from nationally ranked labs from the University of Michigan and NIH to win the \$600 award honoring outstanding research by scientists who are beginning their careers.

Nothnick, who is now at the University of Kansas Medical Center, focused on the role of one inhibitor called TIMP-1. He found that two other TIMPs were controlled by TIMP-1.

"The only downside of knockout mice is that in many systems there is compensation," Curry says. "Warren's project showed us this system is more complex than we thought. We assumed that without TIMP-1, ovulation would not take place, but it didn't quite turn out like that." Curry explains that there are 11 to 13 MMPs and four TIMPs, and it is possible that when you knock out one TIMP the others compensate. "The use of knockout mice has been extremely valuable in our research, but it also indicates that this is not the end-all, be-all for the ovulatory process," Curry says.

He adds that he is encouraged by new interest in MMPs by researchers from various fields. Curry is confident that understanding these keys to tissue breakdown will influence the way doctors treat disease in the future.

— Alicia P. Gregory



THE EGG, THE WHITE SPOT INSIDE THIS OVARIAN FOLLICLE, IS RELEASED WHEN THE MMPs CHEW THROUGH THE LAYER OF CELLS AT THE TOP OF THE FOLLICLE. TIMPs, THE REGULATORY ENZYMES, BLOCK THE MMPs UNTIL THE EGG IS MATURE.



A SWEETER-SMELLING PIG

You're driving through farm country enjoying the fresh air on a beautiful spring day. The scented breeze of dogwoods and fresh-mown grass floats through the open windows. Suddenly, an unpleasant odor adds itself to the mix. You scramble to roll up the windows as you detect the not-so-sweet odor of pigs. Researchers at the University of Kentucky are working to modify that unpleasant odor by changing what pigs eat.

"Over 200 different gases are responsible for the odor of swine manure," says Gary Cromwell, professor of animal science at the University of Kentucky. "We've made strides in reducing some of that odor by cutting in half

the amount of ammonia produced in swine waste."

Ammonia is made up of nitrogen, from undigested protein, and hydrogen. Less nitrogen in hog waste leads to less ammonia gas generated from the waste.

"Ammonia is not as offensive as some of the other odors, but if continuously breathed at sufficient concentrations, it can cause serious health effects," Cromwell says. Ammonia can trigger eye irritation, coughing, and shortness of breath in humans and lung damage and pneumonia in pigs.

In his research to reduce ammonia in pig waste, Cromwell fed one group of pigs a conventional protein

diet of corn and soybean meal. He fed a second group a low-protein diet, with four percent less protein. Cromwell made up the nutritional differences for this second group by fortifying the feed with amino acids, the building blocks of protein.

"We know just how much of each amino acid a pig needs to thrive," Cromwell says. "If we adjust the ratios of amino acids in the diet toward a more ideal blend, we can avoid feeding the pig so much protein, which reduces the amount of nitrogen it excretes."

Cromwell's colleague, Larry Turner, a UK agricultural engineer, measured

ammonia concentrations with sensors above manure storage pits for three weeks. Cromwell and Turner found that feeding pigs low-protein, amino acid-supplemented diets cut ammonia production by 67 percent.

"Now we are turning our attention to other components that make pig facilities smell, well, smelly," Cromwell says. "We're hopeful that we can reduce the amount of sulfur compounds in pig feeds. If we can do that, we can likely reduce the sulfur-containing gasses that smell like rotten eggs, that are the major contributors to offensive odors in livestock wastes," he says.

— Alicia P. Gregory

BUTTERFIELD WINS TWO AWARDS FOR RESEARCH AND GRADUATE EDUCATION

University of Kentucky chemistry professor Allan Butterfield has recently won two awards for his research and teaching — the 1996 Kentucky Academy of Science Distinguished University Scientist Award and the 1997 William B. Sturgill Award. The Kentucky Academy of Science Award was given to Butterfield for his research into the molecular basis of Alzheimer's disease and how to prevent it. This progressive neurological disorder is the fourth leading cause of death among the elderly.

"I feel honored beyond belief to have received this award," says Butterfield, who also directs the UK Center of Membrane Sciences. "There are a tremendous number of good scientists in Kentucky, so to be named a distinguished university scientist is really humbling."

The Sturgill Award was established in 1975 by William B. Sturgill, chairman of the UK Board of Trustees. The \$2,000 annual award recognizes the member of the graduate faculty who has made the most outstanding contributions to graduate

NEW WHEAT MEANS HIGH YIELD, MORE MONEY

education at the university.

"Presumably, this award was based on both the rather large number graduated and the subsequent placement of my graduate students," Butterfield says, "as well as the significance of our ongoing work on the molecular basis of neuronal cell death in Alzheimer's disease. I feel in many ways that this award is a testament to my outstanding graduate students, who have been so dedicated to research and so committed to excellence."

Jim Niewahner, a chemistry professor at Northern Kentucky University, nominated Butterfield for the Distinguished University Scientist Award because of his teaching success with both graduate and undergraduate students and his research. To date, Butterfield has published over 160 articles in research journals and two books on membrane research. "To me, this is cutting-edge research," Niewahner says, "that could possibly lead to a Nobel prize."

A new, high-yielding wheat developed at the University of Kentucky could mean extra dollars for Kentucky farmers next season. The new wheat variety called "Foster," developed by David Van Sanford, wheat breeding researcher in the UK agronomy department, produced an average 83 bushels per acre in test fields.

"That compares with the 1996 state average of 53 bushels per acre," says Van Sanford. While he can't guarantee 83 bushels for every farmer because of differing field conditions, Van Sanford says the potential boost for Kentucky wheat growers is significant. Last year 500,000 acres of wheat were harvested in Kentucky, with Kentucky Ag statistics reporting a 1996 average crop value of \$4.30 per bushel.

Van Sanford

crossed three advanced breeding lines to create the new wheat in research supported by the Kentucky Small Grain Growers Association and the Kentucky Small Grain Promotion Council.

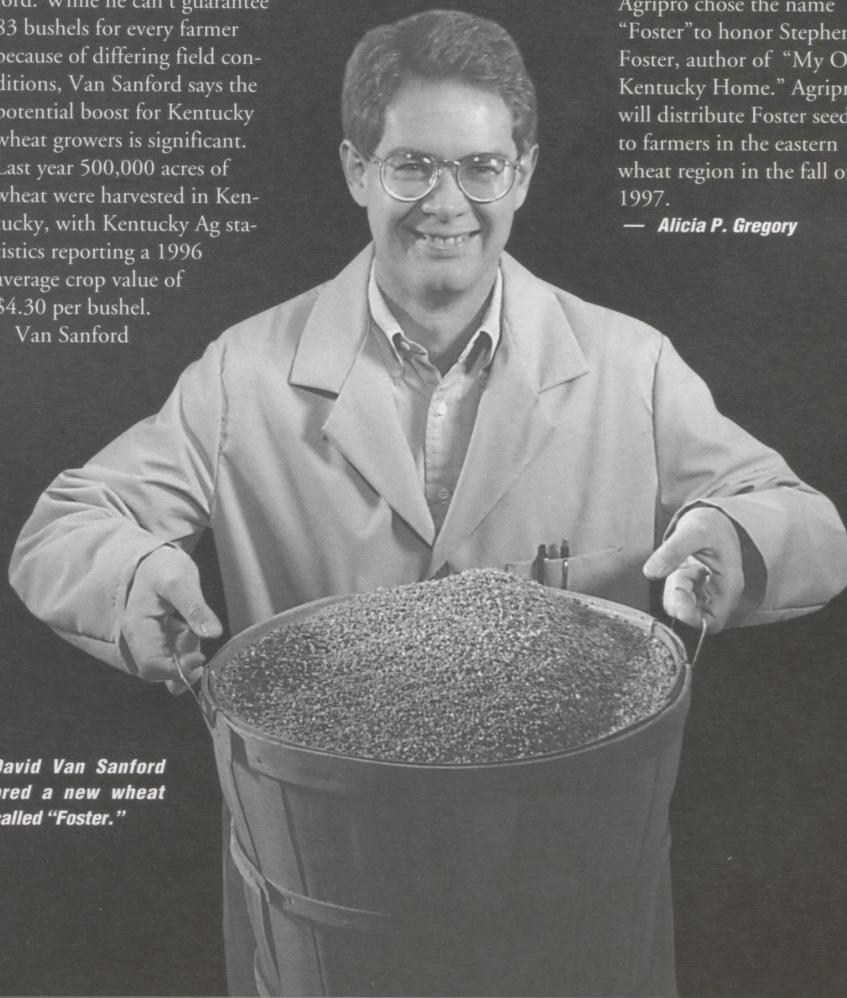
Beyond its high-yield potential, Foster seed has good stability. "It has good resistance to a lot of diseases, including powdery mildew

and leaf rust," Van Sanford says. It also has good standability (stays upright in high winds and heavy rains), he says. Van Sanford adds that Foster wheat also has outstanding milling and baking quality for cookies, crackers, biscuits, doughnuts and cakes.

The new variety was released exclusively to Agripro Seeds Inc., of Shawnee Mission, Kansas. Agripro chose the name "Foster" to honor Stephen Foster, author of "My Old Kentucky Home." Agripro will distribute Foster seed to farmers in the eastern wheat region in the fall of 1997.

— Alicia P. Gregory

**David Van Sanford
bred a new wheat
called "Foster."**



ASH RESEARCH CLEANS UP

Concrete can help save the environment. Well, maybe it can't clean the air or the water, but because of a separation process developed at the University of Kentucky it can use up the mountains of ash created by power plants.

In this process fly ash, the by-product of burning finely ground coal, is captured from exhaust gases, collected and processed to be used as a partial replacement for cement in concrete. Fly ash reacts when mixed with lime and water to form cement-like minerals but has several advantages over cement. "Cement has fine, irregular-shaped particles," says Jack Groppo, mining engineer at the Center for Applied Energy Research (CAER). Fly ash is a very fine, spherical, glassy material. "It's like tiny billiard balls," Groppo says. "It spreads and settles better, lasts longer and resists weather damage better than cement." And it's cheaper. "Cement can cost from \$70 to \$90 a ton," says Groppo. "Our separation process can produce fly ash for \$5 to \$7 a ton."

But fly ash doesn't come out of electric plants in a useable form. "It's a sloppy, quicksand-like material filled with coarse carbon grains," Groppo says. The 1990 Clean Air Act, which mandated lower levels of nitrous oxide emission for coal-burning power plants, led engineers to develop low nitrogen-oxide burners. These burners operate at lower temperatures and use fuel-rich combustion, but they leave such high levels of carbon in the fly ash it can't be used in concrete.

"The carbon creates a problem because it absorbs the chemicals used to make concrete expand and contract through freeze/thaw cycles," says Thomas Robl, associate director of the Waste Management Program at CAER. To make this new high-carbon ash useable, Groppo and Robl developed a carbon separation process.

In 1994 these UK researchers began to refine froth flotation, a wet separation process first patented in the 1920s, to float the carbon away from the fly ash. In this process, fly ash travels through a series of 10-foot-square tanks with agitators that churn water. Chemicals are added to make billions of tiny bubbles that carry the carbon and form a froth, like the foam at the top of a mug of root beer, at the top of the tanks. The oil-based chemical Groppo and Robl developed to make the carbon stick to the bubbles was patented in 1995. "The oil adsorbs into the carbon particles, making them hydrophobic — they repel water and attach to the air bubbles," Groppo says.

UK's separation process recovers not only useable fly ash

for concrete, but also captures carbon. "Our technology recovers the carbon in a form you can burn," Robl says. "There are several competing technologies out there, but ours is simple and very reliable. It also provides a very clean separation. The carbon is quite pure, as is the fly ash."

CAER has licensed this process to Advanced Pozzolan Technologies (APT) in Atlanta. "I think it's important that people know of research that has been done, and commercialized," says Charles J. McCormick, owner and president of APT. "At CAER they want to do something, do it well and turn it loose." APT is funding pilot plant research at CAER. The pilot plant processes 200 pounds of fly ash per hour.

Armed with this new separation technology, APT and UK are reaching out to industry in Kentucky and beyond. Groppo and Robl are currently working with two of APT's clients, East Kentucky Power Cooperative of Winchester, Kentucky, and Santee Cooper, the state-owned utility company in Georgetown, South Carolina. Both use millions of tons of Kentucky coal annually. "We're interested in making sure that they're getting the full value out of Kentucky coal and avoiding any problems with handling its waste," Robl says. Santee Cooper is currently budgeting for a froth flotation plant that would process 250,000 tons of ash per year.

"The amount of money spent in waste handling by the coal-burning utility industry is in the hundreds of millions of dollars," Robl says. "Although our work (waste research) is not flashy compared to a lot of research the university does, we are dealing with millions of tons of material and any gains we make are highly significant."

— *Alicia P. Gregory*

UK CHEMIST WINS \$75,000 NSF GRANT

University of Kentucky chemist Arthur Cammers-Goodwin won the National Science Foundation's Career award, totaling \$300,000 over four years for research and teaching. The NSF grant will fund his work to design shape and functions in organic molecules dissolved in water.

"Water is the solvent of life," says Cammers-Goodwin. As a solvent, water dissolves organic, carbon-based molecules, like sugar, to form a solution in which each organic molecule is surrounded by water molecules. "The human body is 70 percent water," Cammers-Goodwin says. "Carbon-based material in the body functions in water."

Many organic molecules do not dissolve in water, but scientists can change the molecular properties by adding charged atoms to increase interaction between organic and water molecules. Water molecules have positive and negative charged ends which attract each other and squeeze organic molecules out of solution. Cammers-Goodwin is modeling novel molecules that will take on certain shapes in water to perform specific tasks such as binding to charged particles and crossing biological membranes, like the blood-brain barrier.

Cammers-Goodwin starts

designing molecules by building a plastic model, with different colored plastic pieces representing different elements. With physical model in hand, he enters his atomic coordinates into a computer program to test whether it will work.

The NSF award will fund a class at UK, taught by

Cammers-Goodwin, that will use computers to simulate molecules in order to solve problems such as building neurological drugs to fit protein sites in the brain. "For example, if you want to stop an out-of-control enzyme, you'd design a drug to fit into the enzyme-active site to block it and shut it

down. Creating interlocking molecular shapes is the molecular basis of drug design," Cammers-Goodwin says. Students will model new drugs using biorganic and biochemical information from databases on the Internet.

Cammers-Goodwin says he hopes his research will develop better methods for molecular recognition. "Molecular recognition means that at least two molecules have an attraction for one another," he says. "Molecular recognition may enable doctors to monitor a patient's blood-chemical levels at her bedside, and aid environmental chemists in the study of the effects of pollution on the environment."

Cammers-Goodwin, who earned his Ph.D. from the University of Wisconsin, came to UK in 1995 from post-doctoral work at the Massachusetts Institute of Technology. "I was ecstatic when I found out I won this grant," Cammers-Goodwin says. He adds that he feels honored to receive this recognition from the scientific community.

— Alicia P. Gregory



ARTHUR CAMMERS-GOODWIN

Photo by Lee Thomas

UK HISTORY PROFESSORS WIN GUGGENHEIMS

"I was flabbergasted." This was the unrestrained response from UK history professor Thomas Cogswell, upon finding out that he had been awarded a Guggenheim Fellowship for the 1997-1998 academic year. Guggenheim Fellowships, explains Cogswell in a calmer moment, are very difficult to get and are among the most prestigious grants awarded annually to scholars in the humanities. Only 17 of the 164 fellowships granted across the United States and Canada this year went to historians.

And this year the UK history department can feel doubly proud, since Cogswell was joined by his colleague George Herring, another Guggenheim recipient. These two professors are the only scholars from a Kentucky college or university to receive Guggenheim Fellowships in this year's competition. Both Cogswell and Herring will spend time away from their regular faculty duties to concentrate on two important projects.

"It is a wonderful thing for the department," says History Chair Jeremy Popkin, a 1991 Guggenheim Fellow. "It reinforces the sense that this is as good a department as you'll find at any comparable university."

Cogswell will spend his year's fellowship in England, researching at the British and Bodleian libraries. The archives there contain seldom-studied underground publications from the 17th century that may shed new light on the Great Rebellion of 1642.

Herring has spent his 28-year career at UK researching and teaching the history of American foreign relations and is considered an expert on the Vietnam War. He will spend most of his fellowship in Kentucky, writing a 700-page book on U.S. foreign relations from the American Revolution to the end of this century. The book will be part of the Oxford University

Press multi-volume "History of the United States" series.

The John Simon Guggenheim Memorial Foundation is the only major granting agency for humanists outside of the federal government. It was established in 1924 to provide financial support to established scholars and artists for their research and creative work.

— **Dana B. Cox**, *special assistant to the dean, College of Arts and Sciences*



GEORGE HERRING (LEFT) AND THOMAS COGSWELL

Photo by Lee Thomas

BEATING BACK THE APHID ATTACK

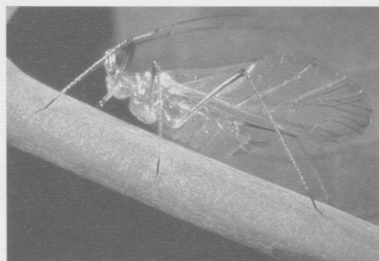
When asked about aphids and how they transmit plant viruses, Thomas Pirone leans back in his office in Ag Science Center North and looks through his window at the pale blue April sky, as if searching for the answer. He's spent quite a number of years closing in on the answer to that question, and he's happy to share his findings.

Pirone, a professor in the University of Kentucky's Department of Plant Pathology, is investigating the intriguing relationship between aphids, plants, and proteins called "helper components." It's a complex interaction that is necessary for aphids to spread viruses from plant to plant. It's also a potentially harmful situation for Kentucky farmers, since the state's major cash crops — tobacco, soybeans and corn — can be targets of these aphid-borne viruses.

The storyline goes something like this: aphids — tiny, soft-bodied insects that feed on the sap of plants — are the only insects that carry a certain group of viruses to various plants, which become infected. The viruses then use the infected plants to produce the helper component, a protein necessary for the transmission of the virus. What makes matters worse, Pirone points out, is that the virus spreads very quickly; infection can take place in seconds. The result is that an entire field of plants may be infected before the aphid infestation can be detected and stopped. It is this extraordinary dynamic between insect, plant, and protein that first interested Pirone and which remains his research focus today.

In 1983, when *ODYSSEY* first reported on Pirone and his research, plant virology and other similar disciplines were just entering the age of genetic engineering. When techniques of molecular biology became available in the mid-'80s, Pirone and his fellow researchers were able to create mutations of the viruses for their own experimental use. According to Pirone, he has been "making rapid progress — but slowly" ever since.

Pirone characterizes his research



APHIDS, SOFT-BODIED INSECTS THAT FEED ON PLANT SAP, SPREAD VIRUSES TO KENTUCKY'S TOBACCO, SOYBEAN AND CORN CROPS.

on the transmission of viruses as the uncovering of "more and more complex levels of understanding." For starters, Pirone and his colleagues established that aphids require the helper component to transmit viruses (although the why of such an arrangement remains a tantalizing puzzle). Through other experiments they have also made the preliminary determination that different species of aphids seem to interact with different kinds of helper components in the transmission of the viruses. More recently, experiments have been done in Pirone's lab that suggest that some plants may contain a substance that interferes with virus transmission.

One recent discovery Pirone's research group has made concerns the actual location of the virus within the mouth parts of the

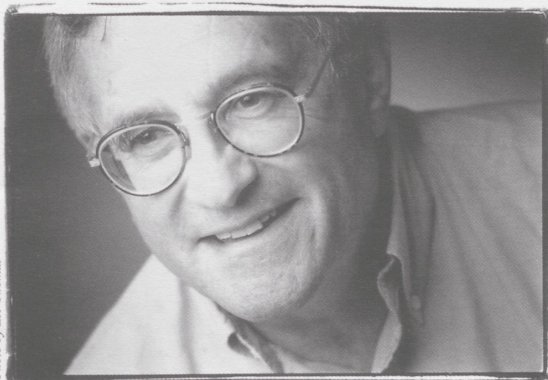
aphid. They have noticed a strong tendency for the virus to be retained near the tip of the aphid's stylets (feeding apparatus). This observation has allowed his lab to focus on this particular area in investigating the transmission process.

Over the years Pirone's research goals may have remained constant, but his methods have changed to fit his needs and to take advantage of the latest technologies. His lab has used genetic engineering and electron microscopy, a process in which a beam of electrons is focused through a lens to produce an enlarged image. They have starved aphids and allowed them to feast on artificial diets. They have even tethered the creatures to a device using ultra-thin wire to record their feeding habits.

Since Pirone joined a fledgling Department of Plant Pathology in 1967, he has enjoyed his life's work immensely. He considers himself most fortunate to have always worked with talented and enthusiastic people, not only from UK but from around the world. The department he joined 30 years ago now numbers 10 research faculty (three of whom are plant virologists) and four extension faculty, who do much of the department's field research. Pirone is also pleased that the university has become "a stronger research institution across the board," an indication of its commitment to scientific inquiry.

Pirone's own commitment has not gone unnoticed. David Smith, the chairman of plant pathology, describes Pirone as "quite simply, a wonderful asset to the department and a great mentor to younger scientists. As chairman for the better part of 10 years, Pirone maintained a high level of research and seems as excited about his work today as he was 30 years ago."

Pirone acknowledges that his investigations generate their share of additional questions. He is confident, however, that his answers may one day help to control the viruses that threaten many of the state's most important crops. ■



THOMAS PIRONE USES INNOVATIVE RESEARCH METHODS LIKE TETHERING APHIDS WITH ULTRA-THIN WIRE TO A DEVICE THAT RECORDS THEIR FEEDING HABITS.

ODYSSEY

RESEARCH OUTREACH

The University of Kentucky's research goal is to conduct programs of basic and applied research which support graduate and professional education, provide for the advancement of knowledge, and seek solutions for the acute problems of society.

The university's research mission also acts as a magnet for attracting top graduate students who want to participate in nationally competitive research projects. *ODYSSEY*, through articles about various research projects and graduate research programs, reflects the breadth of the university's search for new knowledge and the myriad of research endeavors under way.

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ODYSSEY is not just a magazine — it is a resource which serves as the basis for some very important outreach activities. The articles appearing in *ODYSSEY* are rewritten — in a briefer format — for a newspaper column titled "UK Science & You." This column is sent to every newspaper in Kentucky and is a regular feature of many of the weekly papers. Through these columns we reach a potential audience of 1.4 million readers—letting them know how UK research impacts their daily lives.

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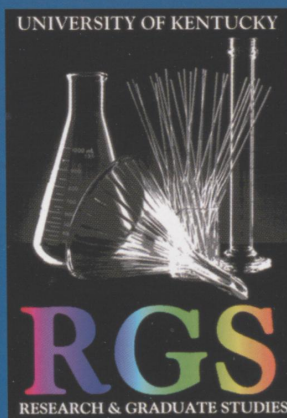
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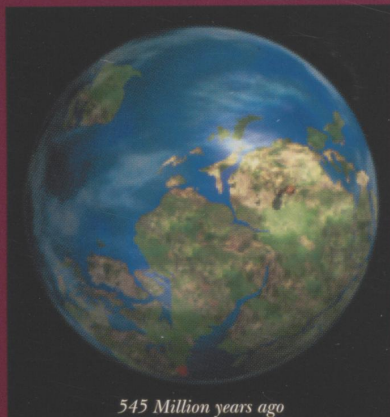
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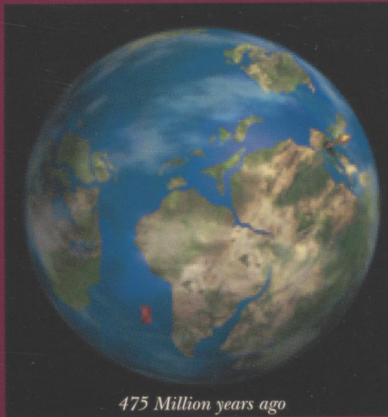
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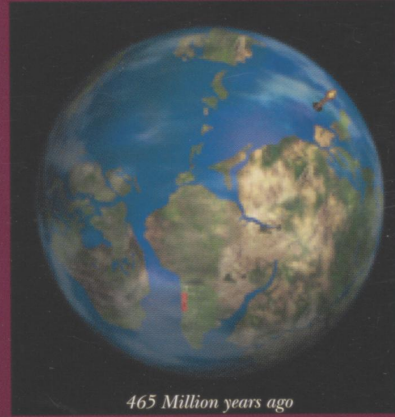
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545 Million years ago



475 Million years ago



465 Million years ago

A fragmenting supercontinent (red land mass) breaks free and travels north (middle globe), crossing the Iapetus Ocean until rejoining South America (far right). See article titled "A Continent on the Loose," p. 10.

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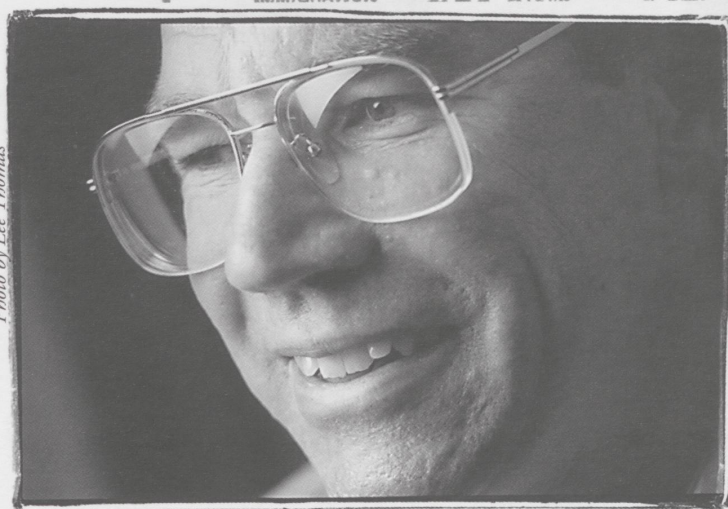


Artwork by Aze + Kuan, Inc.

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IMMIGRATION

Photo by Lee Thomas



LARRY BURMEISTER SAYS NEW LAWS HAVE OPENED KOREA'S AGRICULTURAL MARKETS TO CHEAPER IMPORTS, RESULTING NOT ONLY IN UNPRECEDENTED COMPETITION FOR FARMERS, BUT ALSO SPEEDING UP CHANGES IN KOREAN'S FOOD PREFERENCES.

Burmeister says. Rice is to Korean agriculture what tobacco is to Kentucky agriculture, only more so. Rice is cultivated by 85 percent of all Korean farm households. The income from rice production averages 49 percent of agricultural income and 28 percent of total income per farm household, according to agricultural researcher Myung-Hwan Kim.

"Rice is *the* staple food in Korea," says Burmeister. "It's really hard to analyze what's going on without focusing on rice."

But rice farming is now threatened, Burmeister explains, because of new laws which have opened Korea's agricultural markets to cheaper imports, resulting not only in unprecedented competition for farmers, but also speeding up changes in Koreans' food preferences. Per capita rice consumption has steadily declined since 1980 in both urban and farm households.

An organization called the Agricultural Cooperative has been dealing with this change, Burmeister explains, challenging import liberalization and exhorting Korean consumers to eat more traditional foods, particularly rice. The strategies and actions of this agricultural group are a major focus of Burmeister's current research.

With the new potential influx of lower-priced rice from other countries including the United States, Korean rice farmers are definitely feeling the pinch. And because land is a fixed commodity, it's not simply a matter of the farmers producing more rice to buffer their losses.

"You have to realize that the typical Korean farm is small," says Burmeister, "tiny by our standards — around three acres usually. So meeting the new challenge of competing with the imports is incredibly tough for a lot of farmers."

To come to their rescue, the cooperative initiated a promotional campaign to encourage the consumption of Korean-produced foods. This "formidable organization," as Burmeister characterizes it, launched its public relations campaign with solid backing: the organization has approximately 67,000 employees and a membership base of 90 to 95 percent of all Korean farm households.

The slogan "Love Our Agricultural Products" was adopted for the campaign. "The English translation is only approximate," Burmeister explains. "Because of the connotation of the Chinese characters in the slogan, it suggests not merely 'frequent use' but use linked to emotional attachment as well."

Ads using this slogan were displayed in various media billboards on freeways, on the Seoul subway, and were posted in bank offices. Related themes in the campaign emphasized the importance of agrarianism and what Burmeister calls "dietary monism" (the idea that distinctive patterns of food consumption have evolved as a unique and important cultural way to maintain Koreans' physical and psychic health). These themes were also developed in two comic books distributed by the cooperative to Korean elementary schools in 1990 and 1991.

"These comics were pretty amazing," says Burmeister. "In one episode, a primary school student is teased by his friends for taking a traditional lunch of rice and kimchi to school. His schoolmates, you see, have Western-style lunches. Then the student is transported supernaturally to the laboratory of a research scientist who teaches him about the nutritional advantages of the traditional Korean diet over Western food. The kid's classmates are found to be not

only forsaking Korea's cultural heritage but also endangering their health."

The stridency of the comic book messages, especially allegations about unsafe Western foods, enraged U.S. trade officials, and in response to complaints lodged through diplomatic channels, the cooperative stopped distributing the comics.

The overall success of such a campaign, Burmeister says, is very hard to measure, but recent statistics on the number of farm households in Korea suggest that the campaign has not been effective in reducing the exodus of Koreans from the farm. From 1990, when the campaign started, farm population fell from 6.61 million to 5.17 million; the number of farm households declined from 1.77 million to 1.56 million.

"These numbers pose a really interesting question for the future of agriculture in Korea," says Burmeister. "And from the conversations I've had with farmers and their families in the past few years, there seems to be an almost total lack of interest among the younger generation in continuing to farm." He adds that in talking to college professors in the country, he's found that very few agriculture students have any interest in going back to their home villages to work on the farm.

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