

• THE MAGAZINE OF UNIVERSITY OF KENTUCKY RESEARCH • WINTER/SPRING 1995 •

ODYSSEY

STAR SEARCH

UK Astronomer Talks about the Hubble, Time Travel,
Quasars, the Demise of the Dinosaurs and Our Future on Mars

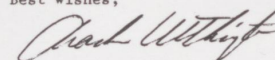
Dear UK Graduate Program Alumni and Friends,

With this issue of *Odyssey*, we are welcoming the alumni of University of Kentucky graduate programs to our readership. For those who have read *Odyssey* over the years and are familiar with the section titled "Honorable Mention" which features some of our graduates in every issue, it is evident that alumni of our graduate programs are both accomplished and diverse. These are individuals who, in their academic careers and many in their post-graduate activities, have demonstrated a keen interest in the type of research and academic endeavors regularly featured in *Odyssey*.

We are delighted to be able to send our graduate alumni University of Kentucky's research magazine and to keep you informed of some of the exciting developments underway in our research programs at the University. I hope you enjoy reading *Odyssey* and hope, too, that you will let us hear from you. We are pleased to be in touch with the graduate alumni again.

For our regular subscribers, your interest in our magazine over the years has been most appreciated. Thank you for your good comments and your support of the University of Kentucky.

Best wishes,



Charles T. Wethington, Jr.
President



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Charles T. Wethington, Jr.

The University of Kentucky, the commonwealth's graduate education and research institution, exists to provide opportunities for the education, personal growth and development of individuals and to contribute to the improvement of society.

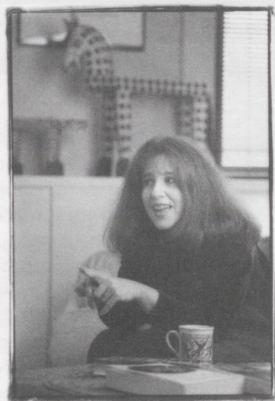
With this mission as its premise, the university conducts programs of basic and applied research which support graduate and professional education, provide for the advancement of knowledge, and seek solutions for the acute problems of society.

The university's research mission also acts as a magnet for attracting top graduate students who want to participate in nationally competitive research projects. This research experience can offer them a significant advantage in their education while laying the foundation for future research and development. *ODYSSEY*, through articles about various research projects and graduate education programs, reflects the breadth of the university's search for new knowledge and the myriad of research endeavors underway. The progress that the university has made toward achieving its research mission and securing the extramural funds required to support these types of endeavors would have been impossible without the talents and dedication of our researchers.

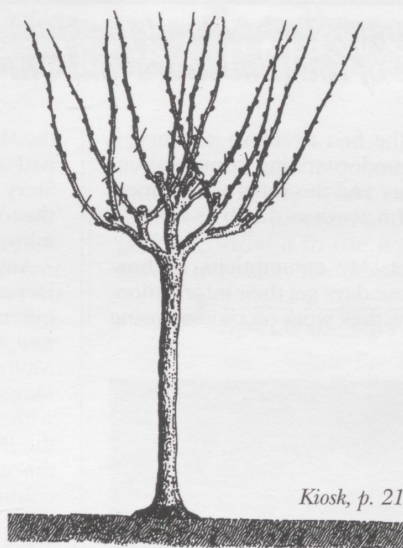
The goal of *ODYSSEY* is to offer the reader the opportunity to share in some of the excitement, curiosity and creativity evident in the research underway at the University of Kentucky.

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ODYSSEY



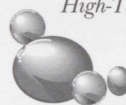
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Volume XII, No. 2

ODYSSEY is published by the Office of the Vice President for Research and Graduate Studies. Each issue of ODYSSEY describes only a few of the many University of Kentucky research projects underway in a variety of areas.

Requests for permission to reprint material and readers' comments regarding ODYSSEY are welcome and should be sent to the Editor, Communications and Advancement, University of Kentucky, Lexington 40506-0057 (phone 606/257-8297).

The publication of ODYSSEY is not financed by the State General Fund.

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Printing: Merrick Printing, Inc.

Illustrations: Cover by Teresa

Shear; pp. 8 and 9 by Professor

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STAR SEARCH

by Jeff Worley

UK Astronomer Talks about the Hubble, Time Travel, Quasars, the Demise of the Dinosaurs and Our Future on Mars

OK, I'll be the first to admit it. When it comes to understanding some current space technology and the ways astronomers do their work, I'm about as dumb as a box of moonrocks.

Case in point: My assumptions of how astronomers these days get their information, in particular how they work on projects using

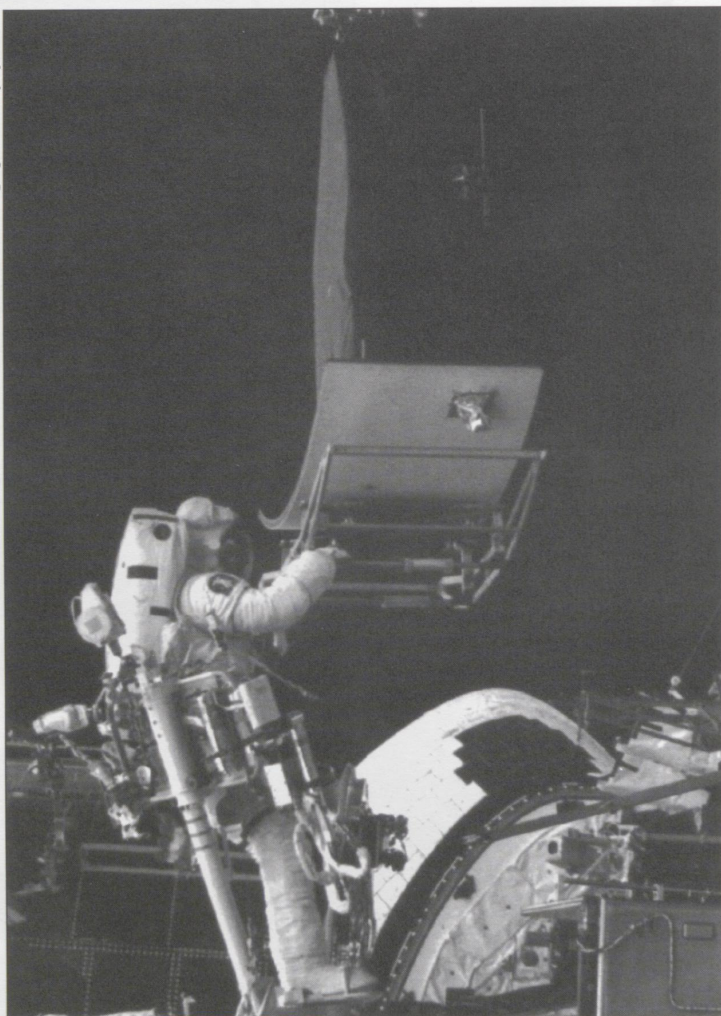
the Hubble Space Telescope, which has now had corrective lens surgery (UK graduate Story Musgrave leading the team of space doctors that repaired the 2.4-meter primary mirror) and is working just fine.

Anyway, I knew that Gary Ferland in UK's Department of Physics and Astronomy was an internationally known astronomer with current funding of around \$350,000 from the National Science Foundation and from NASA. I knew his research was somehow connected with the Hubble Space Telescope (deemed the HST by those in the know). But beyond this what I imagined Ferland *did* is occasion enough for me to apologize, right here and now, to my high school astronomy teacher Mr. Fisher.

What I thought was that Ferland's work involved him actually looking through a telescope. Now I knew he wasn't in orbit with the HST, in free fall with his eye to the telescope's eyepiece, but I did imagine that there must be some kind of telescope on Earth that somehow simulated what the HST was seeing, that Ferland would be in some way vicariously eavesdropping on galaxies a few hundred million miles away or so. Maybe one of the HST astronauts was taking direction from Ferland and operating the telescope according to his wishes?

Ferland broke the news to me gently that I was badly mistaken. "No mere mortal can get *near* the control system of the Hubble," he says. "Because if you point it at the sun, for example, you'd have a \$2 billion disaster. Just the slightest mistake could destroy everything." So after he assured me that it would be easier for a man with his suitpockets crammed full of handguns to board a TWA flight than for anyone to come close to the

Photograph courtesy of NASA



Astronaut Jeff Hoffman: First Servicing Mission of the Hubble Space Telescope

"In astronomy, we can't do an experiment as you can in physics. All we can do is observe what comes to us," says Ferland.



HST controls, I asked him about the connection between the space telescope and his current research.

"It starts with a proposal to use the telescope. It's horribly oversubscribed and costs \$100,000 an hour to use it. So it's a very competitive thing." Ferland is in the 10 percent of researchers who are granted time on the Hubble and given the funding that goes along with the time allocation.

"The telescope is totally controlled by computer," he explains. Many of the observations have to do with spectroscopy, a way of separating electromagnetic radiation according to wavelengths, and this is the type of data Ferland is interested in. "The data is downlinked, eventually to the Space Telescope Science Institute in Baltimore and from there to the individual researchers." Usually within two months of an HST observation, Ferland says, the data arrive in his office in the chemistry-physics building on the UK campus.

Ferland then analyzes the data received, which involves numerically simulating what goes on in a quasar, a small, intense celestial source of radiation characterized by large changes in wavelength. In his study of quasars, a research focus in the last 15 years, Ferland admits the fundamental challenge of doing such work. "In astronomy, we can't do an experiment as you can in physics. All we can do is observe what comes to us," he says. "There's an old saying in the field: 'Those who can, do; those who can't, simulate.' So what we do is simulate with a computer what goes on inside a quasar."

Ferland, in fact, has spent an enormous amount of time designing and refining an immense computer program that allows astronomers to simulate the conditions in "just about any" astrophysical environment and then predict what kind of light would be seen on Earth. This data program is in widespread use. And because Ferland's

data bank is used so often by astronomers, Ferland is the most frequently acknowledged astronomer in the world. "Because of the nature of this program and its availability, people borrow it to use it in their work. I always hope they find it valuable."

Spectroscopy 101

In the 19th century the development of spectroscopy allowed astronomers to analyze, for the first time, the chemical composition of stars. Spectroscopy is based on the fact that the colors emitted by an atom amount to an atomic fingerprint because the electron orbits of each element are different. The fact that each atom emits and absorbs a different set of colors allows scientists to identify the presence of that atom in small samples of material.

Ferland explains that a tremendous amount of information about celestial objects is ob-

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For the past 15 years, Gary Ferland has focused his research on quasars, small, intense sources of radiation characterized by large changes in wavelength.

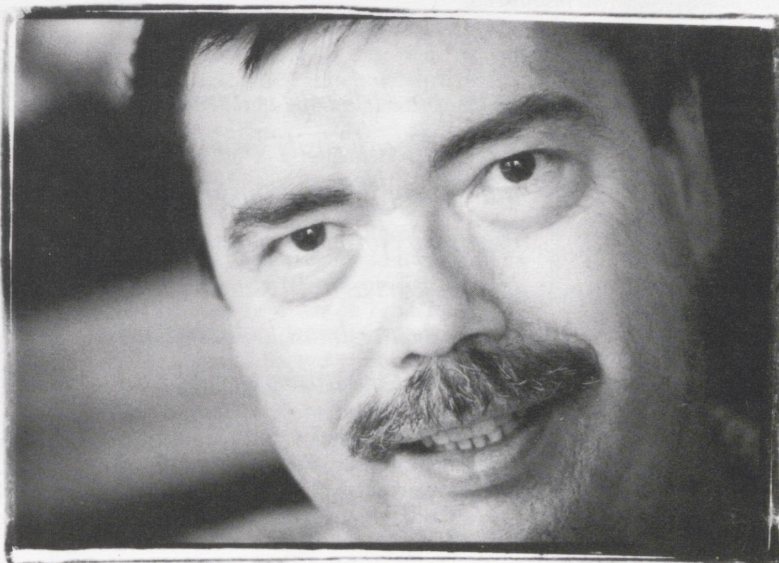
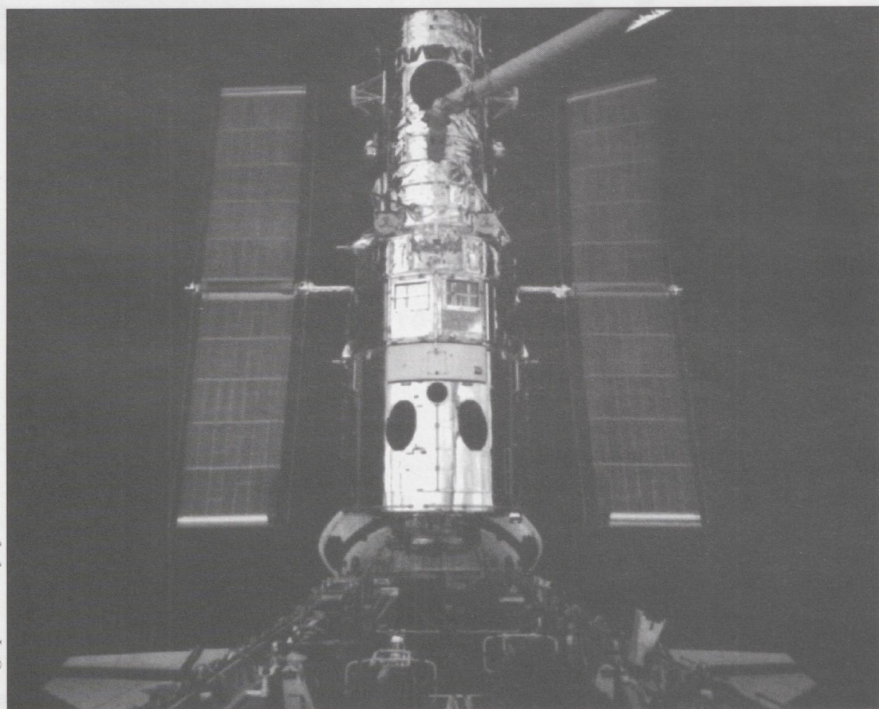


Photo by Lee Thomas

"Human beings consist mostly of elements that were formed inside generations of stars that died before the earth was born. If you were to trace back the history of atoms in your body, you'd find that the typical atom has been in a star a couple of times. We're all part of the cosmos."



Photograph courtesy of NASA

The Hubble Space Telescope, launched in 1990, developed a problem with its 2.4-meter primary mirror, which has now been repaired. The large flat objects are solar panels to power the instruments.

"The space telescope is a time machine. We can easily see galaxies that were around at the time the Earth was formed four and a half billion years ago. In studying quasars, we can almost look back to the creation of the universe itself."

tained from spectral analysis—the examination of light. To get such data, a spectrometer is connected to a telescope. This instrument uses a type of prism to separate light into its colors. A spectrometer also produces numerical data about the intensity of light at various wavelengths.

"All we can do is look at the light we receive from the stars," Ferland says. "The instruments on board the space telescope can disperse the light into a rainbow spectrum, and then we can look at characteristics of the spectrum to try to determine the composition of the material that emitted the light."

He says that this type of analysis, called remote sensing, is prevalent in chemistry and also in national defense work. Spy satellites are able to look at reflected light from below and determine the composition of the material that reflected the light.

"Colors have different intensities," Ferland says. "By just looking at how much red light, as opposed to blue light, comes off something, we can infer what kind of rocky surface it came from. And this, by itself, is what we use to determine the composition of asteroids across a solar system."



The Question of Quasars

Quasars, very distant galaxies, lurk at the edge of the observable universe, approximately 10 to 12 billion light years away. Because they're so far away, Ferland explains, the light that reaches us from them has been travelling a long time. Paradoxically, what the quasar astronomers see today may have no relation whatsoever to the object that exists at that point today.

"The idea of quasars is that after the Big Bang when the universe began its expansion, galaxies began taking shape," Ferland says. "The formation of galaxies was similar to the condensation of raindrops in a cloud; our



Milky Way Galaxy, for example, is a collection of a trillion stars all held together by their own gravity."

Ferland says that because of the HST the time has never been better to do the type of work that excites him the most—to study the first stages in the formation of what becomes a galaxy. "The space telescope is a time machine. We can easily see galaxies that were around at the time the Earth was formed four and a half billion years ago. In studying quasars, we can almost look back to the creation of the universe itself."

We Are Made of Space Stuff

So what have astronomers discovered about the composition of the material that has emitted light from the depths of space? The short answer is, the material is almost 100 percent hydrogen and helium. The long answer is more interesting.

"Ninety-nine percent of what's in the solar system is hydrogen and helium," Ferland says. "The things we're made of—carbon, nitrogen, calcium, iron, etc.—constitute less than one percent." The fact that we are "element heavy" gives us, Ferland says, a distorted sense of the cosmos. "We think of calcium and iron and so forth as making up most of what's around us, but if we look very far into the heavens we see that that's just not true." Even an object seemingly as massive as Jupiter, Ferland explains, consists of nothing but hydrogen (94 percent) and helium (six percent). A star, he continues, is gas all the way through.

"If you went in one side of a star, you'd pop out the other side in a few hours without hitting anything solid in between. A star is held up only by gas pressure." Ferland adds that the gas of a star is, however, very dense. "A cup full of the center of the sun would weigh about 500 pounds, but it's still a gas because it's so extraordinarily hot. It's 30 million degrees Fahrenheit at the center of the sun."

In fact, Ferland points out, we're made of star stuff ourselves. "Human beings consist mostly of elements that were formed inside generations of stars that died before the earth was born. If you were to trace back the history of atoms in your body, you'd find that the typical atom has been in a star a couple of times. We're all part of the cosmos."

Fireball over Jupiter

"It's only in the past 25 years or so," Ferland says, "that people have realized how fragile the Earth is." He makes this statement in the context of talking about the spectacular space show last July on Jupiter. Several comets plunged into the planet, causing a raging fireball which could be seen over the far edges of Jupiter. Because the planet rotates so quickly—once around about every 10 hours—astronomers could soon see the part of the planet that had been hit. "It looked like a huge tidal wave," Ferland says. "Jupiter is mostly liquid hydrogen, so when the comets hit, they created waves that swept out and across the planet. It was a very dramatic sight."

One result of the Jupiter collisions has been a renewed concern about our planet being suddenly bombarded with outer-space stuff. If Jupiter can be hit, surely planet Earth is a possible target too.

"The concern is a reasonable one," says Ferland, "and all you have to do if you want to worry a little is look at the moon. You can see all those craters on the moon. The hope has been that whatever made those craters won't happen to us." He points out that there are lots of asteroids whose orbits cross the Earth's orbit. "It's not so much that they are going to hit us as that we'll just hit each other as we're orbiting around the sun."

What can we do about this potential calamity? "There's been a tremendous effort to make very, very careful maps of the sky and try to detect everything that comes anywhere near the Earth's orbit," Ferland says. "By

"A star is gas all the way through. If you went in one side of a star, you'd pop out the other side in a few hours without hitting anything solid in between."

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"What probably happened to the dinosaurs is that their entire food chain collapsed. Any animals that had body weights over 40 or 50 pounds died. Only very small animals survived."

taking pictures from day to day and making calculations, you can figure out the motion of comets and asteroids, their speed. We knew two years in advance that there would be this collision with Jupiter; it wasn't a surprise."

But what good would it do us, the question could be asked, to know that in a couple of years a sizeable comet is going to smash into our planet? Enter Project Space Warn, which sounds like science fiction but is, Ferland says reassuringly, "rock-solid science."

"The purpose of Project Space Warn, which Congress has just given a tenfold budget increase, is to do something about a comet or large asteroid headed our way," Ferland says. "And we know enough now to stop it."

The idea, Ferland says, is to cause whatever is hurtling at us to veer off, if only slightly, from target Earth. "It's like a rifle bullet shot from 10 miles away," Ferland says. "If it's coming straight at us, all we have to do is get it to miss a little bit."

The scenario Ferland imagines involves a combination of American and Russian spacecraft, armed with nuclear weapons, which would be launched toward the intruding comet or asteroid. When the spacecraft are close enough to the object to affect its trajectory, they would self-detonate, causing the object to be thrown off its earthward

course. "You wouldn't actually destroy it—you'd just kind of elbow it to one side so it misses us."

To calm the nerves of anyone thinking that such drama in the cosmos is soon to occur, Ferland points out the fact that the odds of a good-sized asteroid hitting us anytime soon are heavily in our favor. "The Earth only gets hit about every 50 to 100 million years," he says.

The Death of the Dinosaurs

It was just such a direct hit, some 65 million years ago, however, that may have led to the extinction of dinosaurs along with other animal and plant species. In fact, Ferland says, this is now the leading theory to explain the relatively sudden disappearance of dinosaurs on Earth.

The theory goes that a giant meteorite—an asteroid—struck the Earth, exploded, and sent its debris high into the atmosphere, forming a dense cloud. The effect of this huge cloud of dust was that sunlight was blocked out and much vegetation died, as well as animal species that depended on this vegetation for food. Eventually, the cloud fell back to earth, settling debris that was primarily clay containing an abundance of iridium, platinum and osmium (a hard metallic element).

This theory was proposed after scientists discovered, in 1980, a number of sites around the Earth where layers of clay containing this unusual combination of elements—much more common in meteorites than in the crust of the Earth—were found. Geologists analyzed these clay deposits and found that they were about 65 million years old, remarkably close to the time of the mass extinction of the dinosaurs as shown by fossil records.

"What probably happened to the dinosaurs," says Ferland, "is that their entire food chain collapsed. Any animals that had body weights over 40 or 50 pounds died. Only very small animals survived." Small creatures such as rodents who could forage for seeds and nuts could live, however, and the fossil record shows that such creatures did survive.

Ferland says that this theory has been given more and more credence in the past 15 years. "And five years ago," he says, "the impact sight was discovered—just off the coast of the Yucatan Peninsula. There's a large crater about 50 miles across." He says that it's been known for 10 years that the asteroid hit water because the layered debris also offers evidence of tidal waves at the same time. "The collision sent off a huge tidal wave across a thousand miles of the earth. That in itself probably killed anything in its path."



The Death of the Sun and the Earth

Planets and stars, like animal and plant species, also become extinct. Our sun, astronomers say, will die a gentle death: It will gradually puff itself out into interstellar space. Because it is made only of gases, they say, it is using up its fuel and will continue to have a harder and harder time holding itself up. One result of the sun's accelerated effort will be that it will continue to get brighter (It's 10 percent brighter now than it was three or four billion years ago), so that long before the sun dies, Earth's oceans will boil. Limestone rocks will melt. Carbon dioxide will go back into the atmosphere producing a runaway greenhouse effect. And then the Earth will become as uninhabitable as our neighbor Venus.

"Venus today is a thousand degrees Fahrenheit on the surface," Ferland says. "The greenhouse effect on Venus has turned it into an inferno. The Earth will be like that in about two billion years."

Will We Be the First Martians?

Long before the oceans on Earth boil and the icecaps melt, Mars will be a very hospitable place, Ferland says. He believes Mars is the obvious choice for our new home after living on Earth becomes impossible.

When the first pictures of Mars were received from Viking I and Viking II in 1976, scientists reported that the planet had many topographical features similar to those on Earth. Mars has polar caps that are larger in winter and smaller in summer. There are canyons, the Valles Marineris, for example, which make the Grand Canyon look like a glorified pothole in comparison. And there are river beds as long as the Mississippi or the Nile.

"There used to be rivers on Mars," Ferland says. "There are regions with very large lakes or oceans. The question is, 'What happened to the water?'"

"The most favorable view, for us, of what happened to Mars is that it was very earthlike for a few billion years but is now locked in an Ice Age," Ferland says. This could have happened if the tilt of the planet changed enough over time so that the planet's atmosphere was literally frozen to the ground. "As soon as the atmosphere freezes and drops to the ground, then the greenhouse effect will totally disappear and you can't get it started again naturally," says Ferland.

Part of this favorable view is the very important assumption that there is still water on Mars; it is simply locked underground. "We think that the water is probably permafrost—five or 10 feet below the ground," Ferland says. "This would be extremely good news if it's true because it means that when the first people go to Mars they will have a fairly accessible water supply—they won't have to bring it along with them."

"The second thing is that we would have a very good chance of reversing the condition of the planet. There may already be primitive algae on Mars today; if not, we can bring them there and get them started. This would convert carbon dioxide, which is there today, back into oxygen. Then you could start trying to melt the permafrost and get the atmosphere back up—a process called terraforming."

When it's pointed out to Ferland that he said *when* people go to Mars, not *if*, he becomes even more effusive about that prospect. "People will go to Mars probably by the middle of the next century. There will probably be a permanent colonization of Mars within 200 years," he predicts.

By then, Ferland says, we will have increased our knowledge of the universe in wonderfully unimaginable ways. "The universe isn't stranger than we think," he says. "At this point in time, it's only stranger than we *can* think." ♦

"People will go to Mars probably by the middle of the next century. There will probably be a permanent colonization of Mars within 200 years."

Doing Some Body Work

by Angela Jones

Cultural Images of Men and Women

In current popular culture our identities are defined by the product on the auction block. Femininity and masculinity transmute overnight much to the whims of fad. But fads have an origin, and fashion designers who have revived the waif "Twiggy" look, for example, aren't playing guessing games.

"Designers invest a great deal of money in sniffing out cultural currents," says Susan Bordo, UK's new Otis A. Singletary Chair in the Humanities (William Freehling in the Department of History also holds the Singletary Chair). "They work with prevailing fantasies and anxieties to create images that don't simply imprint themselves on us, but reinforce powerful feelings that already exist."

Hence the popularity of supermodel Kate Moss, who is the '90s epitome of skinny at five feet seven inches tall, 105 pounds. She is child-like, wistful, vacant, and, to Bordo, represents the continuing power of ideals of female passivity. But to the young women who emulate her, says Bordo, Moss strikes a different chord. "To them, she represents not a backward-looking image of femininity but the epitome of contemporary 'cool,'" Bordo says. "Besieged by the pressures of modern life to be successful superwomen yet afraid of being seen as aggressive feminists, they are a torn and anxious generation of women. Kate Moss—or rather, the *illusion* of Kate Moss—seems unconscious of all that, above it all. She even claims to eat whatever she wants! But the reality is that the young women who worship her often suffer from eating disorders."

Conversely, men are barraged with images of hyper-masculine bodies, toned and bulked up, resurrected images of masculinity from the past. "The simultaneous appeal of waif-like females and powerful male bodies signifies that at least on the level of our bodies, traditional gender roles remain compelling. As much as our culture plays with androgyny, the majority of consumers still find comfort in clear gender difference," says Bordo, who taught a graduate course on masculinity last semester at UK.

Contemporary culture, however, sends mixed messages. Ads depict women bulking up, too. "Nobody knows anymore what it means to be a man or a woman," says Bordo. "The old maps don't work, and the new terrain is uncharted and confusing."

Bordo has authored two books and edited another, all of them dealing with the interrelationship of culture, body, and gender. *Unbearable Weight*, published in 1993, discusses how women have suffered from internalizing negative cultural attitudes to-



Drawing by John Tuska



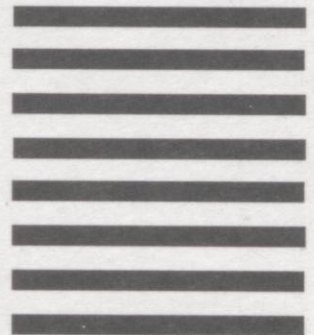
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"Nobody knows anymore what it means to be a man or a woman," says Bordo. "The old maps don't work, and the new terrain is uncharted and confusing."

ward the body, particularly women's bodies. Anorexia and bulimia are among the consequences of Western culture's discomfort with the "matter" of the body, and especially with female appetite and desire.

Outmoded Images

In her current research, Bordo is exploring gender and the body from the perspective of masculinity and the male body. In the past, men have been offered two main models—warrior and provider. But in a modern world where war is more a test of technological savvy than a battle of brawn, the old set of rules no longer applies. The "provider," as well, serves as a vestige of an outmoded world in which women were not yet a force in the public arena.

"Such models are physically harder on men, but psychologically clearer," Bordo says. "Manhood is tested and either confirmed or withheld from those who fail or from those who are excluded—as African-American men have been excluded throughout much of U.S. history—from the proving-ground of masculinity."

With the publication of Robert Bly's *Iron John* in 1990, the Men's Movement, a kind of reclamation of manhood attained through male camaraderie and seclusion, was first publicized. The movement spawned discussion among men who, like women 30 years ago, reexamined and began rejecting conventional ideas of what it means to be a man.

Although Bordo supports Bly's questioning the cultural construction of gender, she criticizes the movement's heavy reliance on classic myths that hark back to the days of knights and dragons. "Rekindling the fire of some mythical past is problematic. Pumping-up the muscles of the male imagination on old power-archetypes only serves to encourage further division between the sexes," she says. Much of the male bonding that Bly advocates, Bordo points out, is premised on "getting away from women and their demands" and has fostered "woman hating" and feminist-blaming. Bordo feels that these perceptions rest on a distorted idea of what feminism is about.

"I want to help shatter the assumption that feminism has nothing to offer men, or worse, that it is unsympathetic or only critical of them. Feminists have made us look at the consequences of gender, and men are 'gendered,' too," Bordo says.

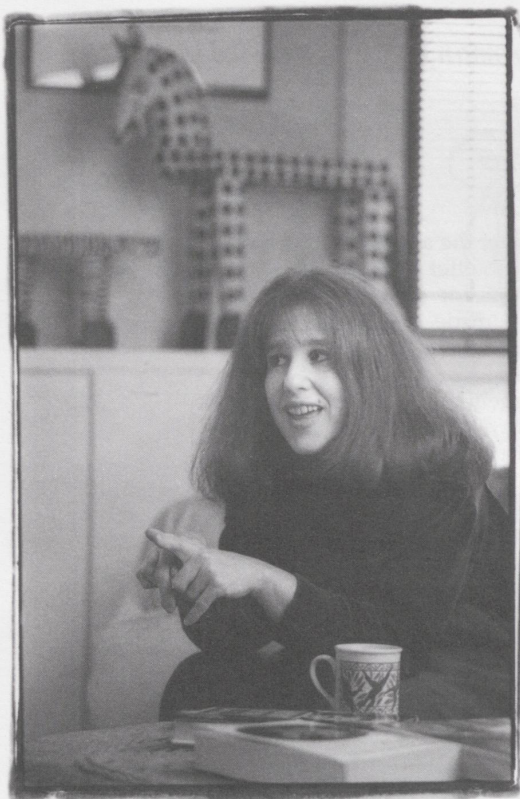
Her approach largely entails men and women exploring ways in which identities have been historically and socially constructed, and relating these concepts to their personal experiences and perspectives. "We need to talk about what cultural images and ideology teach us about ourselves," she says. "The messages sent have hurt and shamed men as well as women."

By investigating historical and contemporary accounts by men and about men from a wide

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Drawing by John Tuskia



Susan Bordo says she wants to help shatter the assumption that feminism has nothing to offer men or, worse, that it is unsympathetic or only critical of them.

"We need to talk about what cultural images and ideology teach us about ourselves. The messages sent have hurt and shamed men as well as women."

range of perspectives along lines of sexuality, race and ethnicity, Bordo expects to generate some interesting dialogue, void of academic jargon and rich with experience.

Unbearable Weight received accolades for successfully employing a hands-on approach to feminist theory. Critics called it

surprisingly readable and accessible to anyone concerned with feminism, gender discourse and postmodern theory.

Tired of academic "power language," Bordo, as a professor of philosophy and gender studies, realizes the limitations of scholarly jargon. "Real rigor is the ability to talk to others who don't share your background and to successfully communicate your ideas without a tribal language." As co-holder of the Singletary Chair, Bordo hopes to bridge the chasm between theory and practice and expand the discussion to the general public.

In the classroom, Bordo has begun. Rather than becoming mired in a mass of abstractions, her class discussions are geared toward the application of theory to culture, and to personal experience. Bordo's class on masculinity this semester began with theoretical models of gender, but quickly shifted to more concrete, historical study. "I will never let my students go on in endless abstractions. I want them to use theory responsibly, to keep it earthbound. Sometimes, they need to relearn to just *talk* to each other." By eliminating power-jargon from her own speech, she hopes students will learn by example.

Compared to the more traditional lectern

approach of teaching, Bordo's classroom conversations can make her job more difficult. Rather than rigidly following the course mapped by the syllabus, Bordo's class explores what some might consider tangents. "I think of it as continually taking the pulse of the course. Where we pick up each week depends on where the students are in relation to the material."

In seminars and small classes, Bordo uses student journals to develop a personal conversation that is often lost between professor and pupil, she says. "Responding privately to their journals, telling them about my life and ideas as they tell me about theirs, I'm not the impersonal teacher protected by the distance of my position." The journals are one method of using personal experiences to connect with the class material so the "personal and intellectual exploration are not divorced," she says.

In competing with other candidates for the Singletary Chair, Bordo stood out for her competitive scholarship and candor, says Richard Edwards, dean of Arts and Sciences. "She is someone rooted in scholarship who can bring a discussion of academicians to the public forum—a noble tradition in America," Edwards says.

Prior to her appointment, Bordo was J. C. Georg Professor of Philosophy at LeMoyne College, a small Jesuit college in Syracuse, New York. Her first book, *The Flight to Objectivity: Essays on Cartesianism and Culture*, was published in 1987 and established Bordo as a leading scholar on Descartes and the origins of modern science. *Unbearable Weight* received the 1994 Distinguished Publication Award from the Association for Women in Psychology, was nominated for a Pulitzer Prize, and was one of the *New York Times* "Notable Books of 1993." ♦

High-Tech Bubbles

UK Researcher Ready to Commercialize Novel Separation Process

by Jeff Worley

Thousands of tiny bubbles are hard at work in a basement lab at UK's Center for Applied Energy Research.

The bubbles rise slowly through a twenty-foot-tall hard plastic column full of water mixed with fine particles of dirt and coal. The bubbles collect the coal as they ascend. They bypass the dirt and other materials which sift downward in the column. By the time the bubbles reach the top of the column, they are black from piggybacking the coal. Then, like cars going through a car wash, the bubbles are cleaned of any residual mineral matter with a fine spray. They break in the collection tank at the top of the column, leaving behind a clean coal product.

Researcher B.K. Parekh, senior engineer and associate director at CAER, says that this separation process is based on the fact that coal loves air. "Coal is hydrophobic—it has a real affinity for air," he says. "So we use the bubbles as a collection system for the coal." The coal that is then collected, Parekh says, is about 90 to 95 percent pure.

As is the case with many such processes, though, it isn't quite as simple as it looks. Chemically active substances called "reagents" are added to the slurry (the watery mixture of coal, dirt, and other substances) so that the coal particle surfaces are better prepared to attach to the bubbles and so that the particles remain attached during their rising and rinsing steps. "One of the chemical reagents also lowers the surface tension of water to give the bubbles good stability," says Xiang-Huai Wang, an assistant research professor in mining engineering who has worked with Parekh on this project. Wang's expertise involves mixing various chemicals into a reagent that allows for the maximum recovery of coal particles.

The question might be asked at this point, Isn't this a lot of trouble to go through, just to

wind up with a bit of clean, burnable coal?

"There are two ways to answer that," says Parekh, who has worked at CAER for the past 10 years. "This system you see here," he says, pointing to the column which measures 12 inches in diameter, "is simply a model of what we can build. In actual practice we have made columns eight feet in diameter which can process two to eight tons of coal each hour. And over a period of weeks and months that's a significant amount."

Parekh adds that fine coal typically repre-

continued on page 12

Though the column in the basement laboratory at the Center for Applied Energy Research measures only 12 inches in diameter, columns eight feet in diameter are being used in the mining industry in western Virginia.



Photo by Brian Baylor

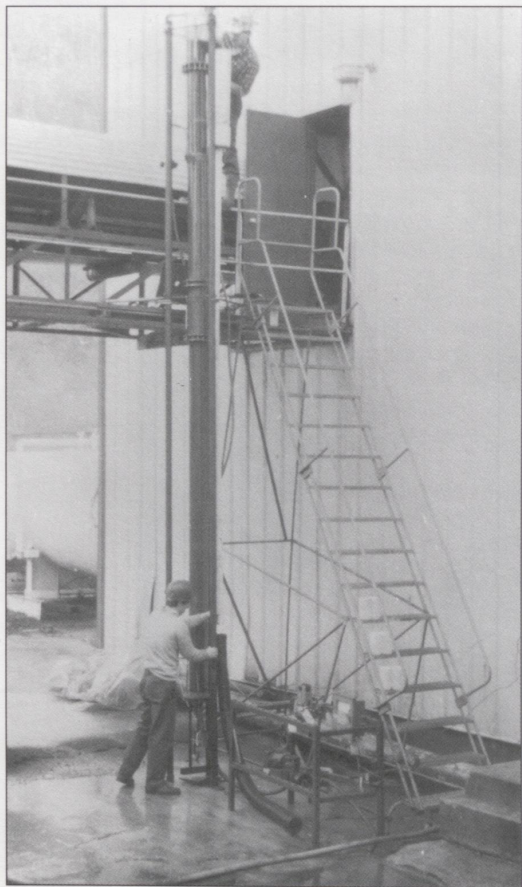
"Coal is hydrophobic—it has a real affinity for air."

sents about 20 percent of the total mined coal and traditionally hasn't been worth the trouble to recover. Most mining companies will simply discard it. "It may be a high-grade bituminous coal with pretty high BTU value, but they don't want to recover it because of the processing costs," Parekh says. In discarding the coal, there is not only a loss of potential value but also an environmental threat, since it is sometimes dumped in open heaps or in ponds.

In the column flotation process, trademarked as the "Ken-Flote" Column Flotation Cell, the slurry is fed into the column about six feet from the top. This gives the dirt enough space (14 feet) to fall and gives the bubbles enough time to seize the coal on the way up. The bubbles are created by forcing air at the

bottom of the column through a metal or rubber tube with lots of tiny holes in it.

Parekh and Jack Groppo, also a mining engineer at CAER, proved that this system is efficient and effective. But would a larger commercial version out in the real world earn its keep?



*The "Ken-Flote"
Column Flotation
Cell*

"A number of coal companies were willing to have us come and try it out on a larger scale," says Groppo, who has a doctorate in mining engineering from UK. "We did a number of pilot projects, and one of these was so successful that instead of setting up one column at the plant, the plant superintendent decided to have four units built, side by side, each eight feet in diameter and 22 feet high.

"B.K. and Jack [Groppo] showed us that this technology worked on a pilot scale—a six-inch column—so we decided to go ahead and build the units we have now," says Bill Peters of the AMVEST: Mineral Services Corporation in western Virginia. "We could see that this technology could be very worthwhile and practical to the industry." Peters personally researched and evaluated other columns that were available at the time before deciding to invest in the system devised at UK. "This was clearly the most economical of all the ones I saw," says Peters, manager of coal preparation services. "The low horsepower needed to run it makes it very attractive," he says, "and we were also able to build the columns out of used components. In all of our tests with this column we found that we had what we were after: a consistent combustible recovery rate."

In moving this technology from the lab to a processing plant, the biggest challenge, Groppo says, was that the columns had to be fine-tuned to be able to successfully process different constituents of coal. Several plants using similar technology process one or two types of coal, but Peters' company mines nine different types. "This was a significant challenge," Groppo says. "We had to look at each seam individually and test the critical parameters—feed rate, wash water addition, air-flow rate and retention time. And we had to determine an optimum range for each of these and figure out operating conditions that would work no matter which type of coal was being processed." Groppo adds that it was crucial to fine-tune the process so that it basically ran itself—no one would have to monitor the units.

Once a median range of conditions was found to handle all types of coal, the columns were immediately put into operation. "They've been using this technology since 1989," says Parekh, "and they've been happy with it." He points out that this has been a good example of successful technology transfer and that the process, in this case, went very quickly. "We went from laboratory study to pilot testing to large-scale commercial use in about three and a half years," Parekh says. "I credit Bill Peters, who took a sizable risk back then." The risk was worth taking: "In less than two years," Peters says, "we got back the \$300,000 we invested to build the four columns."

Parekh points out that column flotation technology has applications beyond coal recovery. In recent work at a Kentucky textile plant, the column has been tested to separate dye from waste water in the textile manufacturing process. At this plant, Fruit of the Loom in Campbellsville, the dye is part of the leftover solution from the thousands of pairs of colored briefs and t-shirts made there.

"Plant managers would obviously like a more efficient and environmentally safe way to dispose of the substance than through the

traditional chlorination process," says Parekh. "And using column flotation technology, we've been able to get most of the dye out of the water before it is discharged or recycled. We've shown it works, and the people at the plant are very excited about this technology."

The key, Parekh explains, is the reagent developed by Wang, who discovered "the right chemistry" to get the dye in the dye-water mixture into a more manageable form for disposal. There is a patent pending on this novel dye-removal process.

Parekh says that the process, similar to the coal recovery procedure, involves turning the dye into tiny particles that then attach themselves to the bubbles. The dye then rides the bubbles to the top of the column. The water, which can be released from the bottom of the column, is clean. "The water can be discharged or recycled back into the process," Parekh says. "Ideally, it would be continuously recycled so that it never has to be

"We went from laboratory study to pilot testing to large-scale commercial use in about three and a half years."



Jack Groppo, a CAER mining engineer, says that the biggest challenge in moving the column flotation technology from the lab to the processing plant was that the columns had to be fine-tuned to successfully process different constituents of coal.

Photo by Lee Thomas

discharged." The dye itself isn't destroyed, Parekh says, but it could be collected on a filter, which could then be disposed of.

Wang and Parekh have shown that this separation process can be a valuable tool for the textile industry, and they are currently working to commercialize the technology.

"This invention is extremely promising," says Mitchell Griffith, director of Kentucky Technology Incorporated in Lexington, a for-profit company that works directly with UK researchers to market ideas and inventions. "KTI has accepted the project for commercialization, and in partnership with CAER we're focusing on a strategy to form a company around the technology. The company would be involved in leasing the hardware to companies that want to remove colored dyes from waste water." Griffith adds that the new company would also sell as a consumer product the reagents used to remove the dyes.

"There are other pluses," says Griffith. "If the company decided to manufacture or to contract-manufacture the columns, that would bring jobs into the state, and the marketing and selling of the compounds would provide jobs. This technology would also aid in the clean-up of waste-water problems in the commonwealth."

"We're really pleased about the prospects that column flotation offers for solving industrial problems," says Frank Derbyshire, CAER director. "It's important to the center and to the university as a whole that we demonstrate, and continue to demonstrate, that universities can generate novel ideas that can be developed and translated into practical applications to benefit industrial growth and economic development."

"I've been to a number of textile plants in the U.S. and in other countries, and the problem is universal," Parekh says. "All the fabric and textile plants have the same challenges as far as how they dispose of potential pollutants. It would be terrific to take the lead in helping to solve this worldwide problem." ♦



Photo by Duane Headworth

B.K. Parekh, an associate director at the Center for Applied Energy Research

HONORABLE MENTION



Photo by Ken Gould

Dear Alumni and Friends:

The Graduate School is very pleased to have *Odyssey* as a new avenue of contact with its graduate alumni. Given the close ties between graduate education and research, it is appropriate that "the magazine of University of Kentucky research" be for graduate education, as well.

Graduate education at UK has grown significantly over the past decade in terms of new program development and student enrollment. In the Fall 1994 Semester, 5,200 graduate students were enrolled in 58 doctoral programs and more than 90 master's programs. One of the most exciting developments has been the expansion of extended-campus course and degree program offerings throughout the commonwealth via on-site instruction, satellite delivery, and interactive video transmittal.

We look forward to sharing information about these exciting developments, and we appreciate the opportunity to reestablish ties with you through the pages of *Odyssey*.

Cordially,

Dan R. Reedy, Dean
The Graduate School

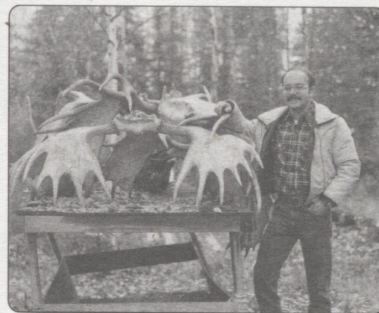
Impact and Achievements of UK Graduate Program Alumni

compiled and edited
by Susan Hodgetts Stempel

Thomas R. Klaene

D.M.D., Dentistry, '71, is chief dental officer for the Federal Correctional Institution in Texarkana, Arkansas, and holds the rank of captain in the Navy. Originally from Ft. Mitchell, Kentucky, Klaene has also served as a dental officer for the U.S. Navy and in Vietnam with the Marine Corps. He cites his experience as a dental officer for the Federal Bureau of Prisons in Barrow, Alaska, as one of his most significant career experiences, providing mobile dental services to isolated Alaskan native villages above the Arctic Circle. He reports this work required him to fly in and out of the villages in small planes in all types of weather. Klaene and his wife, Cathy, have a daughter, Erin, who is a senior in high school. The Klaenes plan to retire in a few years and return to Kentucky.

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Thomas Klaene says one of his most significant career experiences was as a dental officer for the Federal Bureau of Prisons in Barrow, Alaska. He is shown here on a "site visit" to Galena, Alaska.

HONORABLE MENTION

Neal Cravens

B.A., M.B.A., '76, has been appointed senior vice president for finance and chief financial officer for Tropicana Products, Inc., which is based in Bradenton, Florida. Cravens joined Joseph E. Seagram & Sons, Inc., which owns Tropicana, in 1979 as a senior financial analyst and steadily advanced to his most recent position of vice president of strategic planning and business development for Seagram.

Evelyn G. Coskey

M.S., Library Science, '63, is a librarian specialist at Holmes Correctional Institution in Bonifay, Florida. Coskey says that while "growing up, I was continually threatened with prison and now regard it as outrageously funny that I AM in prison (40 hours a week) and like it." One memorable event she recalls was the harrowing experience of being in charge of the library on the day an inmate was stabbed there. She reports that the inmate lived. Coskey is also a writer and has published two books, winning a Printing Industries of America award for 1973. As a graduate student at UK, Coskey was the recipient of a Kentucky Library Association scholarship.

Ronnie Sutton

M.A., Education, '63, has been named assistant vice provost for enrollment services at the University of Memphis. Sutton, a college administrator for 29 years, was previously an academic dean at Western Kentucky University for 15 years, most recently serving as dean of student development.

Sister Mary Evelyn Reinke

M.A., Education, '69, is an associate professor for education at Thomas More College in Crestview Hills, Kentucky. Reinke has served as chair of the college's education department for 13 years, and was an elementary school principal for six years. Reinke, origi-

nally from Covington, Kentucky, went on to earn a Ph.D. at Saint Louis University in 1989. She also serves as director of student teaching at Thomas More, as well as certification officer. Reinke recalls several professors that she enjoyed at UK, including Drs. Leslie Martin and Ray Wilke. Overall, she says what she recalls best about her time at UK was "the goodness of the people—students and faculty..." and the friendships that formed.

Douglas P. Blankenship

M.A., Education, '66, is president and chief executive officer of the Pacific Group, a \$400 million corporation that he developed in Los Angeles. The Pikeville, Kentucky, native worked as a graduate student at UK with Dr. J.R. Schwendeman in the Department of Geography. After graduating from UK, Blankenship went on to earn a Ph.D. at Ohio State University. His career accomplishments include creating one of the first Dial-A-Ride models, being named the fourth largest residential builder in the nation, and being named to Who's Who in The World, America, The West, Business and Finance and Industry. Blankenship has also been president of the UK Alumni Club for Southern California.



Sister Mary Evelyn Reinke is an associate professor of education at Thomas More College.



A Louisville native, Peggy Jane Pruitt has been a member of the Ohio University athletics staff since 1975.

Peggy Jane Pruitt

B.A., M.S., Education, '69, is the senior associate director of athletics at Ohio University in Athens, Ohio. Pruitt has also been an instructor and coach at Spalding College in Louisville, and was a coach and graduate student at the University of Illinois, where she earned a Ph.D. She joined the athletics staff at OU in 1975 but says she would like to eventually move back to Lexington and to UK athletics.

Jeanne Crouse

M.F.A., Art, '72, is the editor and general manager of Vieques Publications in Vieques, Puerto Rico. Crouse founded the company in 1992 to publish *Paseo*, a bilingual magazine and guide to the eastern end of Puerto Rico. Crouse says the publication concentrates on the ecological, environmental and historical features of the region—rain forest, bioluminescent bays, leatherback turtles, etc. Other career accomplishments include being the first female general contractor in Connecticut; she founded, owned and operated a commercial general construction company there from 1981 to 1990.

HONORABLE MENTION

Stephen L. Miller

B.A., J.D., Law, '78, has been named president of the Center for Energy and Economic Development (CEED) in Washington, D.C. CEED is a nonprofit organization dedicated to research and public understanding of the economic advantages and environmental benefits of modern coal technology, according to the center. Miller began his public affairs career in state government in Kentucky, serving as top aide to Gov. Brereton Jones, among other executive branch assignments. Miller, a Phi Beta Kappa graduate at UK, was previously in private law practice with the Lexington firm of Newberry, Hargrove & Rambicure.

Jeffrey L. Hill

Ph.D., Pharmacology, '78, has been appointed vice president for licensing and business development for Medco Research, Inc. Prior to entering the pharmaceutical industry, Hill was on the faculty at the University of North Carolina at Chapel Hill. More recently he founded and operated a public company engaged in biosensor technology, including cardiovascular applications. Medco is located in Research Triangle Park, North Carolina.

Patricia E. Houghton (formerly Patricia E. Franco)

M.M., Music, '68, is a private voice and piano teacher and choir director and organist at St. Theresa's Church in New Berlin, New York. Houghton is past executive director of the New Berlin Arts Council, and conductor and soprano of the county choral society.

James T. Thompson

M.S., Ph.D., Agriculture, '66, has been named president of Cogswell Polytechnical College in Sunnyvale, California. Thompson is former dean of the School of Agriculture and Allied Health Technology at the State Univer-

sity of New York College of Technology at Alfred, New York.

Virginia Marsh Bell

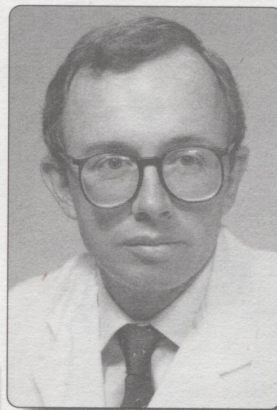
M.S.W., Social Work, '82, developed a nationally recognized model adult day center at UK and an in-home program for the care of persons with Alzheimer's disease. Bell's work was recognized in 1994 by the National Institute on Adult Day Care with its Ruth Von Behren award in special recognition of excellence, outstanding leadership and dedication to the growth and development of adult day care. Having retired as a family counselor at the UK Sanders-Brown Center on Aging in 1992, Bell continues full-time volunteer work for the Alzheimer's Association as the coordinator for over 150 volunteers who provide one-to-one companionship in the program. In October of 1994 Bell traveled to Tokyo, Japan, as a guest of the Research Foundation for Aged People's Health Science Conference, where she presented workshops on adult day care.



Virginia Bell (left) with Geri Greenway, a participant in UK's Helping Hand Program designed to provide respite for families and stimulating activities for people with memory loss. The program has been in operation for 10 years.

Ronald L. Seeling

Ph.D., Mathematics, '77, has been selected as chief actuary for the California Public Employees Retirement System board of administration. Seeling will be responsible for managing the actuarial function for the largest public pension fund in the nation with assets of nearly \$80 billion. Seeling assumed his new position in November. Previously, he was consulting actuary and managing consultant for William M. Mercer Inc. in Atlanta.



James Gallagher is a professor of anesthesiology and surgery at the University of Florida.

James Gallagher

B.A., M.D., Medicine, '70, is professor of anesthesiology and surgery and chief of critical care at the University of Florida in Gainesville. Originally from Lexington, Gallagher has served as chair of the Coalition for Critical Care Excellence, editor for 10 years of *Advances in Anesthesia*, and president of the Society of Critical Care Medicine and the Florida Society of Critical Care Medicine.

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HONORABLE MENTION

Glen G. Possley

Ph.D., Chemistry, '69, is senior vice president for Ramtron International Corporation in Colorado Springs, Colorado. As a graduate student at UK, Possley worked with Professor Hartley C. Eckstrom in chemistry under a grant funded by the Atomic Energy Commission. During his professional career, Possley has been affiliated with Texas Instruments, Motorola, and Philips Semiconductor. He cites his most important career achievement as the introduction of high-resolution photo lithography for high-speed semiconductor devices and epitaxy-fill techniques for semiconductors. Both processes are patented.



In addition to serving as executive director of the Kentucky Humanities Council, Virginia Grady Smith is a forensic sculptor for the Kentucky Medical Examiner Program.

Virginia Grady Smith

M.A., Ph.D., Anthropology, '88, is executive director of the Kentucky Humanities Council, an affiliate of the National Endowment for the Humanities for all 120 counties of Kentucky. The Lexington native is also a forensic sculptor for the Kentucky Medical Examiner Program. Forensic sculpting is a method of using scientific and

artistic techniques to reconstruct likenesses of unidentified homicide victims. Smith has two master's degrees from UK, one in art history and one in anthropology. As a graduate student at UK she worked on two National Science Foundation research projects.

James "Jack" Coleman Lyne, Jr.

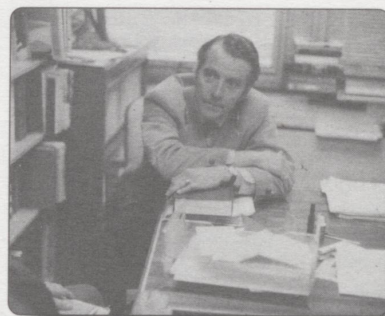
B.A., M.A., Communications, '70, is editor of *Site Selection*, published by Conway Data in Atlanta. Lyne has also served as director of school-community relations for the Louisville Public Schools, as news commentator for Kentucky Educational Television and for Cable News Network. In his current position he has done interviews and profiles of Robert McNamara, Trammel Crow and various CEOs. Lyne married Laura Jones-Kelley in 1991 in Dahlkeith, Scotland, and has two stepchildren, Adam and Piper. Lyne and his family reside in Norcross, Georgia.

Sarah Swinford Kinney

M.Ed., Education, M.A., English, '62, has been a high school teacher of English, journalism, speech, drama, government, and history almost continuously since 1959. The Cynthiana resident had a teaching fellowship while doing her graduate work at UK and also received a Haggin Fellowship. She says that the dean at the time, Lyman Ginger, also provided the funds for her to teach 20 hours a weekend and supervise the student newspaper, which she says was "a splendid opportunity." She has taught more than 3,000 young people during her career and says, "I still enjoy being with them and seeing them progress."

Frank Furlong Mathias

Ph.D., History, '66, is a retired history professor emeritus since 1987 at the University of Dayton in Dayton, Ohio. He was named "Professor of the Year in Scholarship" in 1974 and 1985, and



Among the many achievements of Frank Furlong Mathias is his biography of former UK President A.D. Kirwan.

is a fellow of Chicago's Newberry Library and author of numerous publications and books. As a UK graduate student he studied under then graduate dean A.D. Kirwan, who later became president of UK. As Kirwan's graduate assistant, Mathias assisted him in his biography of John J. Crittenden. Later, Mathias wrote a biography of Kirwan. While Mathias doesn't list one major achievement, he says he is happy to have taught some 8,000 students and to have produced three books and parts of five others. Other highlights include earning his doctorate, which he describes as "the greatest thing that ever happened to me" and serving for years the 100,000 Appalachian migrants in the Dayton area as a writer in their behalf. Mathias spoke at Boone Day in Frankfort, Kentucky, this year and has also had articles appear in the *Filson Club Quarterly* and the *Register of the Kentucky Historical Society*. He continues to serve as a referee reader of military manuscripts for the University Press of Kentucky.

Alumni of any of UK's graduate programs are invited to complete the information form on page 19 and send it to us. We will share as many of your responses as possible in future issues of *Odyssey*.

Information for *Odyssey* Magazine

Outstanding Accomplishments of our Graduate School Alumni

Please type or print

Your Name: _____

If your name was different at the time of your graduation, please indicate that name as well: _____

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Phone: [Office] _____ [Home] _____

Hometown: _____

Undergraduate Degree and Year Conferred: _____

Name of Institution Granting Your **Undergraduate** Degree: _____

Year Your UK **Graduate** Degree Awarded: _____

Degree: _____ UK College: _____

UK Department: _____

Additional Graduate Degrees

Degree: _____ Institution: _____

Year Awarded: _____

Degree: _____ Institution: _____

Year Awarded: _____

Professional Experience

Current Position: _____

Name of Company/Institution: _____

Location: _____

Career Highlights: _____

UK Background

Were you a fellowship or scholarship recipient while at UK? ☐ Yes ☐ No

If yes, please indicate the name of the fellowship or scholarship: _____

Were you involved in working on any faculty research projects during your graduate years at UK? ☐ Yes ☐ No

If yes, please complete the following:

Name of faculty member(s) with whom you worked: _____

Department: _____

Brief description of project: _____

Agency, if any, that funded the research: _____

(include additional pages if needed)

-over-

What do you consider your most significant career achievement to date?:
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KIOSK

Whose Woods Are These?

Diversity, the buzzword of the '90s, is not just about people. It's also about the struggle to balance the variety of life in the universe—the biological diversity.

The concept of biodiversity is quickly gaining a foothold among environmentalists and biologists around the country. A key figure in the movement is an extension wildlife specialist at the University of Kentucky, Thomas Barnes.

"Biodiversity is an extension of my own feeling toward the natural world," says Barnes, a wildlife biologist who grew up in South Dakota.

It encompasses every form of life—from bacteria to buzzards, fungi to flying squirrels, wildflowers to waterfowl—and their interactions with other forms, he says. In the web of life, humans are the caretakers of wildlife and plants, according to the tenant of biodiversity. But that is not necessarily to say that jobs must be sacrificed because of environmental concerns.

"If we try to manage the forests and grasslands so we reverse or halt the decline of a species, then we don't end up with controversies such as the one over the spotted owl in the northwest," says Barnes. "The ultimate intent of managing for biodiversity is to prevent situations in which a species is placed on the endangered list by the government."

To help educate public and private land managers, who in turn educate the general public, Barnes has launched an ambitious biodiversity program. Funded by a number of agencies, including the U.S. Fish and Wildlife Service and the Kentucky Division of Forestry, this effort includes the publication of two brochures, and video and training seminars.

The brochures, with photographs and text by

Barnes, are the first U.S. Extension Service publications on the subject. They have been very well received all

over the country, and requests continue to pour in for copies.

Until recently, Barnes says, managing natural resources has been reactive. Once a species is threatened, the government or environmental groups take action to protect it.

"That leads to what I call endangered species train wrecks, which open the way to all sorts of restrictions under the Endangered Species Act," he

says.

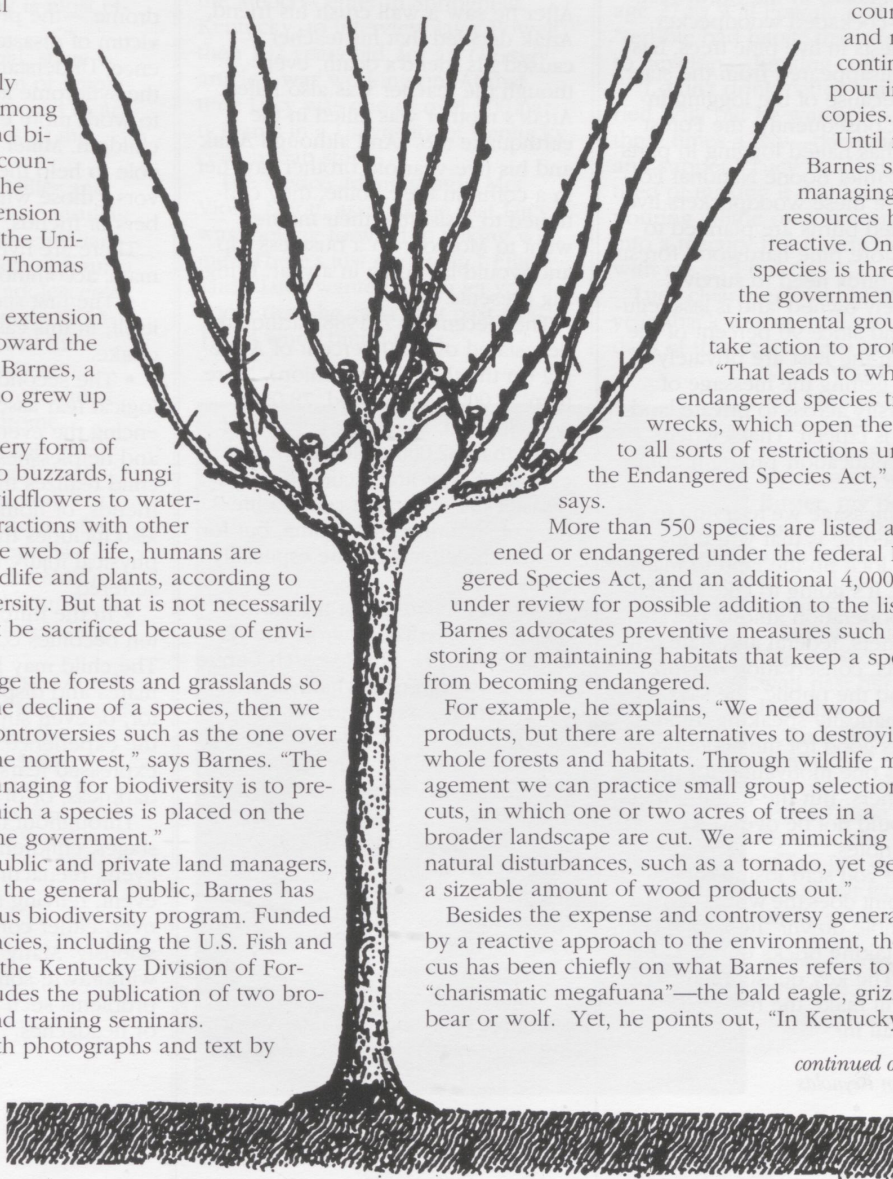
More than 550 species are listed as threatened or endangered under the federal Endangered Species Act, and an additional 4,000 are under review for possible addition to the list.

Barnes advocates preventive measures such as restoring or maintaining habitats that keep a species from becoming endangered.

For example, he explains, "We need wood products, but there are alternatives to destroying whole forests and habitats. Through wildlife management we can practice small group selection cuts, in which one or two acres of trees in a broader landscape are cut. We are mimicking natural disturbances, such as a tornado, yet getting a sizeable amount of wood products out."

Besides the expense and controversy generated by a reactive approach to the environment, the focus has been chiefly on what Barnes refers to as "charismatic megafauna"—the bald eagle, grizzly bear or wolf. Yet, he points out, "In Kentucky,

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most of our endangered species are freshwater clams or mussels."

Kentucky has also had its own version of the spotted owl controversy that pitted loggers against environmentalists in the northwest. The red-cockaded woodpecker, which nests in live pine trees, has all but disappeared from the state, partly because of the logging industry. Consequently, the Forest Service has halted logging in parts of the Daniel Boone National Forest where these woodpeckers live. Controlled burns are planned to help restore pine hardwood forests that the birds need to survive.

Privately owned land is less regulated; and since 90 percent of the forests in the East are privately owned, getting the message of biodiversity across to private landowners is crucial. That's where Barnes' education program comes in.

"The message we're trying to get out to people is that you don't have to lock up the land to manage wildlife. It's going to take tremendous cooperation among private landowners, federal and state governments, conservation organizations and the public," he says.

Pragmatically speaking, biodiversity is good for the economy, which is one motivation for private landowners. But the moral imperative should not be overlooked, Barnes notes.

"Once you start losing species, at what point does the whole ecosystem tumble down?" he asks. "Think of it as taking bricks out of a house. The key question is, what brick will make the rest of the house fall in?"

—Sharon Reynolds

Treating Earthquake Trauma

Six-year-old Artak was in kindergarten when the earthquake struck. After he saw a wall crush his friend, Artak decided that his teacher caused his friend's death, even though the teacher was also killed. Artak's mother was killed in the earthquake too. And although Artak and his five-year-old brother saw her in a coffin in their home, they continued to insist that their mother went to Moscow on a business trip and would be home in a year, bringing presents.

The December 7, 1988 earthquake devastated over 40 percent of Armenia (in the then Soviet Union). More than 25,000 people died, 78,000 were injured, 2,000 lost limbs, and more than 32,000 children were evacuated. For any victim of such a disaster the event can cause a lifetime of suffering and trauma, but for a child the effects can be especially cruel.

"When I heard about the earthquake, I immediately wrote the National Mental Health Research Centre in Moscow, offering whatever assistance I could," says Thomas W. Miller, professor of psychiatry at UK and chief of psychology service at the Veteran's Administration Hospital.

The Centre responded, saying, "We were touched greatly that you'd taken to your heart the news about the earthquake..." and Miller was invited to visit the outreach centre in Yerevan, Armenia.

Miller and Robert F. Kraus of UK spent six weeks in Armenia. Working with Adel Tatevosyan and Peter

Kamenchenko of the Academy of Medical Sciences' National Mental Health Research Centre, they helped educate the Centre's therapists in what Miller and Kraus call "trauma accommodation syndrome"—the predictable stages a victim of disaster is likely to experience. Understanding the stages of the syndrome allowed the therapists to work more effectively with the children. Miller and Kraus were also able to help the "secondary survivors," those who lost family members of friends.

There are five stages of post-traumatic accommodation syndrome:

- The first stage is the experience itself; in this case, the actual earthquake.

- The second stage is the psychological fear associated with experiencing the event, a sense of horror and helplessness and guilt as the child realizes the loss of parents, friends, or home. This second stage also includes the realization of any physical injury the child might have suffered.

- In the third stage the child often becomes confused and anxious. The child may have recurring nightmares and display agitated behavior, or even suppress memory of the experience. Children frequently expressed fears of vibrations, fear of darkness, or of being alone.

Throughout the second and third stages, children tend to revisit the event, reenacting scenes from the event, reliving the event over and over, either consciously or unconsciously. Many children become withdrawn; some report physical problems such as dizziness, nausea, or headaches.

- The fourth stage of post-traumatic accommodation syndrome is one of reevaluation and reasoning. In this stage the child begins to view the event from a more safe mental distance. It is in this stage that therapy is most effective.

- The fifth, and final, stage is that of accommodation or resolution. The child has learned to accept the consequences of the traumatic event.

While in Armenia, Miller and Kraus provided clinical consultations and worked with clinicians who studied the effects of trauma on 839 children and adolescents, ranging in age from eight to 15 or 16, who had survived the earthquake. Their study confirmed the five stages of trauma accommodation syndrome.

"Trauma accommodation syndrome isn't something that can be cured," Miller says, "but we can reduce the depression often associated with it." Approximately two-thirds of the children who participated in this study are showing satisfactory levels of adaptation.

Miller and Kraus' trip to Armenia was funded by a grant from the International Research and Exchanges Board, by the A.W. Mellon Foundation, National Endowment for the Humanities, and the U.S. Department of State.

—Marguerite Floyd

In Memoriam: Lucy Powell (1887-1994)

In November of 1989, I had the pleasant experience of traveling to the Medco Center in Springfield, Kentucky, to interview Lucy Powell, then 102 years old, for an *Odyssey* article I was working on. At that time Lucy was one of over 500 participants in a University of Kentucky centenarian study.

The Medco administrator, Mrs. Violet Elliott, assured me that Lucy was looking forward to talking with me. "There's just one thing," Elliott said. "Lucy wanted me to let you know that she can't chat past 4:00. That's when bingo starts."

Lucy was bright-eyed and alert and very talkative that day. She told me about her girlhood on a family farm near Mackville, Kentucky, her years as a student in the old White Oak Schoolhouse, her marriage at age 27 to Will Powell, and her one "terrible bad habit" that she began to develop—drinking coffee.

"I didn't drink coffee when I married Will, but he wanted his coffee three times a day—breakfast, dinner and supper," Lucy recalled. "I got tired of making it that long. I got to pouring a little on a saucer and then into a teacup. But it didn't agree with me so I quit."

Lucy clearly enjoyed rolling the years back to that time, the early days of this century just before

World War I. "We had big times, good times," she said. "And we had lots of pets. My favorite was Buster, my pet pig. I could hold him in my arms at first, but then he got big—over 300 pounds."

Lucy remained active at Medco until well past her 104th birthday.

"Lucy was always very verbal," recalls the current Medco director Laurie Dillard. "Even at the very end of her life she wasn't shy about letting us know what she

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Photo by Mark Zerof

Lucy Powell

needed, what she thought about things." Lucy Powell died in May of this year at age 106. "She was quite a special lady," Dillard adds.

In fact, she was literally one in a million. "One person out of a million lives to be 105 years old," says David Wekstein, associate director of UK's Sanders-Brown Center. "Getting to be that old is an accomplishment in itself."

After the interview that day, Lucy agreed to have her photo taken (it ended up to be our cover photo), but not before she pinned on the corsage she had received two years earlier, on her 100th birthday. "On my 100th birthday, I was made a Kentucky Colonel," she told me. "I got over 230 cards and letters. That was a good, good day."

—Jeff Worley

Checking the Bottom Line in Division 1A Sports

The average Division I college athletic department is profitable, but isn't exactly a money-making machine, according to a recent NCAA report. In fact, most departments have to rely on institutional support to stay out of the red. The report was based on a voluntary survey sent to 492 schools, including 85 of the 107 schools in Division 1A.

The study, conducted by University of Kentucky accounting professor Dan Fulks, determined that the average Division 1A athletic program made a profit of \$660,000 in 1993. But when institutional

support is subtracted, the average program lost \$174,000. In 1993, the UK athletic department reported a profit of \$577,189.

There was a 55 percent response rate, says Fulks. "In general, average revenues for each of the divisions have increased since 1989," Fulks says. "Expenses have also gone up, but not as much. In general, net results are improving."

The survey found that men's programs get 54 percent of the budget, women's programs get 14 percent and 32 percent is eaten up by administrative costs. "At UK in 1993, 57 percent of the budget was earmarked for men's programs, 11 percent for women's programs, and the remaining 32 percent went for administrative costs and auxiliary program costs," says Larry Ivy, senior associate athletic director at UK.

Nationwide, men's programs generate 69 percent of the revenue, and women's programs bring in four percent. The remaining 27 percent of revenue was classified "non-gender." UK men's athletic programs accounted for 74 percent of total income, while women's programs generated about half of one percent, Ivy says. The remaining nearly 26 percent of revenue came from non-gender programs and auxiliary programs.

The average basketball profit rose from \$1.2 million in 1989 to \$1.6 million in 1993, while the average football profit was \$3.9 million, up from an average profit of \$2.8 million in 1989. At UK, basketball and football were both profitable, the basketball program earning \$2,703,000 and the football program making \$2,272,605.

Equine Research Foundation Celebrates 10 Years

Little did Maxwell and Muriel Gluck know, 11 years ago, that their \$3 million challenge gift to the University of Kentucky would have such far-reaching results. This money would fund not only the construction of an equine research center, but would also serve as the catalyst to help unify horse industry and university leaders, resulting in the establishment of the University of Kentucky Equine Research Foundation in 1984.

This year the foundation celebrates its first decade. And during the past 10 years the foundation has continued to fulfill its two-fold mission: to facilitate the exchange of information between the university and the horse industry and to assist in securing funding for equine research at UK.

Some of the foundation's notable accomplishments in the past decade include surpassing the \$3-million challenge and raising \$4.2 million in gifts and pledges, ensuring the commonwealth's \$3-million pledge in state economic development bonds, and helping to secure development bonds for renovation and an addition to the Livestock Disease Diagnostic Laboratory.

The foundation was also sup-

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ported by three important gifts: an anonymous \$5 million for the endowment fund, John "Trader" Clark's donation of his entire farm, valued at nearly \$900,000, to the university to benefit equine research, and Edna Morris' \$200,000 gift to endow the Gluck Center library and memorialize her husband, John A. Morris.

"Globalization of the industry has brought about the increased need for protection from disease," says Albert Clay, chair of the research foundation. "Now, more than ever, the horse industry needs to turn its attention and full support to the health and well-being of the horse."

—from the *Equine Research & Service Report*, 1994

Three Faculty Members Named Research Professors

The three faculty members selected as the 1994-95 University Research Professors are Kathleen M. Blee, sociology; Joseph W. Brill, physics and astronomy; and Sam J. Turco, biochemistry.

The professorships were established in 1977 to recognize outstanding research achievement and to enhance and encourage further scholarly research productivity. The recipients are excused from teaching duties for one year so they may devote themselves to full-time research activities.

Blee has been in the sociology department at UK since 1981, after receiving degrees from Indiana University and the University of Wisconsin-Madison. At UK she has served as associate dean of the College of Arts and Sciences and as director of the Women's Studies Program.

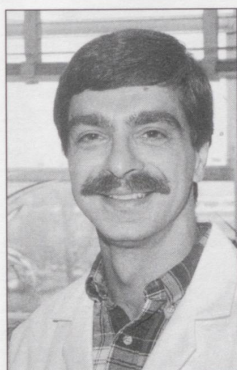
In 1991, Blee published the book

Women of the Klan: Racism and Gender in the 1920s, which was nominated for a Pulitzer Prize and selected as an Outstanding Book by the Gustavus Myers Center for the Study of Human Rights. The book helped propel Blee to national prominence as an authority on the participation of women in organized hate groups. In the upcoming year, she plans to conduct research into the increasingly visible role of women and girls in contemporary hate-based movements such as neo-Nazi groups.

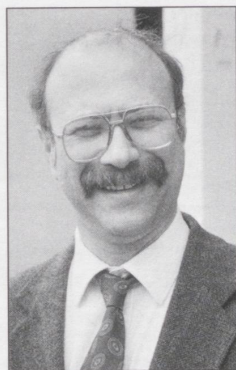
Brill, a professor of physics and astronomy, has been a UK faculty member since 1979. He received his bachelor's degree from Columbia University and master's and doctoral degrees from Stanford University.

Brill's research has focused on the properties of materials with unusual structures and the development of techniques to measure properties of very small crystals. Recent projects have involved the study of C60 fullerenes and layered superconductors. His current research emphasis is on quasi-one-dimensional metals which exhibit "charge-density-wave" states (a condition where the electron density is not constant). Brill says these are among the most unusual materials known, with electrical and mechanical properties very different from those of normal metals.

Turco joined the UK biochemistry faculty in 1978 after completing postdoctoral study at the Massachusetts Institute of Technology. He received his bachelor's degree from Indiana University of Pennsylvania, and doctorate from the Uni-



Sam Turco



Joseph Brill



Kathy Blee

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versity of Pittsburgh School of Medicine.

Turco has given lectures around the world on his research into parasitic infectious disease. In 1993, his research was cited in *Parasitology Today* as one of the 100 historical milestones of parasitological research. Turco has spent more than a decade studying the leishmania parasite, which is transmitted by sandflies and claims thousands of lives each year, primarily in third-world countries. His work with leishmania has as its goal the eventual total eradication of the disease.

—Steve Baron
UK Public Relations

A Marijuana Lookalike

Hey! What's that strange looking plant growing on University of Kentucky's experimental agricultural land at Spindletop near Lexington. Doesn't it look an awfully lot like marijuana?

Well—yes, it does from a distance.

But it's not. Marijuana has five separate leaves and this plant has a single one with seven leaf-like fingers spreading outward. Another variety has a single palmate type leaf. It's not even from the same family as the illegal weed, but rather is a distant cousin of cotton and okra.

"It's a new plant we're experimenting with this year for the first time," says Morris Bitzer, extension agronomist with UK's College of Agriculture. "It's called kenaf and while it's new for us, it has been grown for centuries in

Africa and the Indian subcontinent, used mostly for bagging and rope."

Bitzer's interest in the plant has nothing to do with bagging or rope though. It has to do with paper. The fiber from kenaf offers a promising source for pulpwood to use for paper.

"It grows extremely fast," Bitzer says. "We planted our plot at Spindletop on May 20th and one at our Quicksand Research Center on June 2nd. Six months later now the plants are already about 12 feet tall."

Does that mean the plant is really potentially a rival for pine trees now used mostly for paper pulpwood?

"Yes," says Bitzer. "Kenaf produces about 10 tons of fiber per acre each year—that's three to four times as much as pine."

He adds, "Kenaf is a biodegradable, 100 percent environmentally friendly crop that can replace trees in almost every way and fossil fuels in a lot of uses."

There are other potential markets for kenaf, he says. Some research has shown that it can be made into a wood that is bug proof, fireproof and rot proof. Other research has shown it can be an exceptionally high-protein animal feed. It can be fed to chickens and by-products can be used to collect poultry litter. Pelletized kenaf can be burned like coal and it emits no sulfur. It can provide bedding for horses and is an excellent absorbent.

But it is for use as paper that Bitzer finds especially interesting.

"It makes a superior newsprint," he says. "And its use as paper that

might produce a feasible alternative market to add significant extra dollars for AG Project 2000, Kentucky's plan to increase its annual agricultural worth to \$5 billion by the year 2000."

A company already is looking at putting a plant in central Kentucky to process kenaf exclusively by 1996 or 1997, he says. Just where can't be revealed right now. "A processing plant must be built for the market to be there," Bitzer says. "But if that one plant is established, it alone will handle 200,000 to 250,000 acres annually. And that would be just the beginning."

But will it grow well in Kentucky climate?

"This is just our first year of research," he says. "I'll be collecting yield data later this fall, but I feel that data will be very favorable."

He knows already that kenaf will grow in Kentucky in both dry and rainy seasons, and that Kentucky offers certain advantages over locations farther south that might be warmer and wetter. For example, Kentucky has fewer disease and pest problems in kenaf than some more southern states where research has been conducted.

"It will grow anywhere corn will grow," Bitzer says. "But after harvest season begins there isn't any storage costs before marketing. That's because after the first freeze, it can be left standing in the fields until it's actually needed at the plant."

—Jerry Robbins, College of Agriculture

African-American Heritage in Hall, Kentucky

The people here see it as just a normal community," says professor Kim McBride as she speaks of the African-American community of Hall, established 20 miles south of Lexington just after the Civil War. She and her husband Stephen are finding out through their research, however, that though the citizens of Hall see it as "normal," it has historically been far from a typical Kentucky community. The McBrides, who are employed by the Program for Cultural Resource Assessment in the Department of Anthropology, are currently conducting historical research on the community as well as collecting archaeological data.

The community of Hall was an outgrowth of the Camp Nelson Refugee Home, established by

Rev. John G. Fee of the American Missionary Association and Capt. Theron Hall in January 1865. The camp, called the "Home for Colored Refugees," provided a haven for families of African-American soldiers and also for those who were escaping slavery and pursuing their freedom. It was the third largest recruiting center for African-American soldiers in the U.S. at that time, smaller only than recruitment centers in Louisiana. Professors Kim and Stephen McBride find this area and the community of Hall unique because of the rare social and educational opportunities that it offered its citizens.

According to previous research, the area eventually contained 97 cottages, at least eight larger buildings used as hospitals, school rooms, offices, boarding halls, a dormitory for teachers, and additional tents and cabins

used as refugee housing. Hall (then called Ariel) was established by many African-American soldiers and their families who remained in the area after the closing of Camp Nelson in 1866. They created an unusually active community which was home to a 16-piece brass band, a string instrument group, the Camp Nelson (Ariel) Academy, and even a baseball team. Some descendants of the refugees, along with some newer residents, still inhabit the remaining 15 to 20 houses today.

The McBrides are also doing oral history research, funded by the Kentucky Oral History Commission. This work is about 90 percent

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Refugee camp at Camp Nelson, Jessamine County, Kentucky, circa 1865



complete, according to Kim McBride, and the archival work is about halfway done. "There is a lack of written documents," she says. "The oral history helps to fill in the gaps." The McBrides are obtaining information through conversations with 20 to 25 people in the area who have some connection to Hall. The researchers are just beginning their archaeological search, but expect the project to be complete by next September.

Kim McBride finds the work at Hall interesting because of its importance to African-American history and because of the uncommon social and educational opportunities offered there. She mentions that she especially enjoys the oral-history research. "I have met many generous and interesting people that have a uniquely strong sense of community," she says. She admires the commitment of Hall's descendants to keep their ties to the community, a task that is often difficult because of the scarcity of employment. She adds that she appreciates the ability of the original inhabitants to overcome the challenges they faced at the time Hall was established.

The research and planning are being administered by the Jessamine County Fiscal Court, and funded by a grant from the Kentucky Heritage Council. Jessamine County hopes to use the information, documents, and pictures discovered through this research in a proposed Camp Nelson park and museum. The museum is still in the planning stages, but if developed it will serve as an interpretive center to educate visitors on the African-American experience at Camp Nelson.

—Kimberly Neel

Medical Practice: Urban or Rural?

What causes one nurse or one physician to practice in a rural area while another health-care provider opts for the larger urban setting? It's a question that has been asked for years, and Raymond Olesinski and Cynthia Cole of UK's Center for Rural Health in Hazard, Kentucky, are asking it again but in a different way.

Olesinski and Cole are conducting interviews with health-care providers throughout Kentucky, gathering oral histories of doctors, nurses, and technologists. "We're looking at open-ended histories rather than making determinations in advance," says Olesinski.

"Most studies of this type are done by survey," Olesinski, assistant professor of clinical laboratory sciences, says, "with the categories already set out. Our feeling is that the reasons health-care providers practice in rural areas are too complex to be studied that way."

The interviews with various health-care providers include such questions as where training was received, why an individual selected rural Kentucky, what the benefits and problems of practice in rural Kentucky are, and the most memorable experiences (both positive and negative) of providing health care and of living in rural Kentucky.

Although this study, funded by the Kentucky Oral History Commission, isn't scheduled for completion until the end of May 1995, Olesinski and Cole are al-

ready getting a glimpse of the personal reasons someone chooses to practice and live in rural Kentucky.

"When deciding to move here," says Cole, assistant professor of medical behavior science and associate director of the Family Practice Residency Program, "they look for commonalities that are pleasant to them such as the natural beauty of the setting, an uncrowded environment, a place that is less regulated, and more opportunities for belonging to a community."

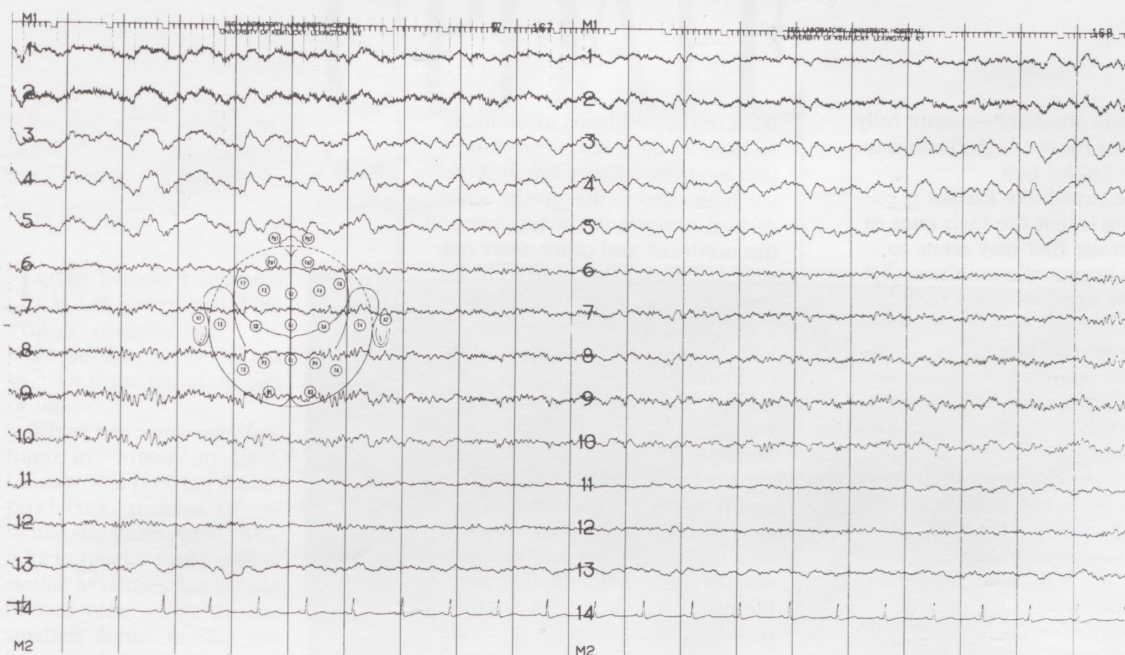
Cole and Olesinski also agree that an important factor is where someone gets his or her training. "When individuals train in a rural area," Olesinski says, "they are more likely to stay in a rural area."

Cole says the issue of choice is less effective when the practitioner is required to practice in a rural area. "Programs that require two or three years of practice in a rural area as a part of their grant acceptance aren't very successful," she says.

Once all the oral histories have been compiled, the researchers will be looking for clues that can help attract and keep more health providers in rural Kentucky.

—Marguerite Floyd

KIOSK



Tracking Stroke

Douglas Lanska is on the trail of a killer—stroke, the third leading cause of death in the United States. There are plenty of cases to study, particularly in Kentucky.

Lanska and other researchers have pinpointed the southeastern part of the country, which includes Kentucky, as the nation's so-called "Stroke Belt" because of the high mortality from the disease in this area. Although smoking and high blood pressure are among the suspected culprits, Lanska, a neurologist and an associate professor in the University of Kentucky College of Medicine, says scientists still do not understand why rates of deaths from stroke in some areas

of the southeast are twice the rates of some other areas of the country.

Why, despite a steady decline in stroke death rate since the mid 1920s, does this region continue to be overrepresented in stroke mortality rates? "This problem has received insufficient attention, given the magnitude of its public health importance," Lanska says. "There are such gigantic disparities in rates of stroke that if we understood why one area of the country has a lower frequency of stroke and apply that knowledge to areas of high frequency, we might make a tremendous difference in how much illness and unnecessary mortality the population has to suffer."

For the past five years, Lanska has been conducting a series of epidemiological studies into stroke trends and geographic distribution.

Thus far the studies, funded by the National Institute of Neurological Disease and Stroke and the Department of Veteran's Affairs, have revealed that different diagnostic and reporting practices of disease and death cannot account for either the decline in stroke mortality rates or the clustering of high rates in the southeast.

Statistical models developed by Lanska and colleagues show that factors in stroke occurrence are much more important in explaining the high rates in the southeast than are factors determining death once a stroke has occurred. Unfortunately, the known stroke risk factors—such as high blood pressure, diabetes, and

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cigarette smoking—cannot fully account for the high death rates in the Stroke Belt.

One possibility Lanska is exploring is that the high rates in the Stroke Belt may relate to some aspect of a Southern diet. Lanska notes that there are nutritional similarities between diets of those who live in the South and traditional Japanese diets, which have been linked to the extremely high rates of stroke in Japan.

Although interstate migration patterns do not account for the high mortality rates in the Stroke Belt, interstate migration has had some interesting effects on stroke patterns, Lanska found. For example, the stroke mortality rates for white residents of Florida have been dropping since post-World War II. Research suggests that these rates have been affected by large numbers of white senior citizens retiring to Florida from other parts of the country. Generally, these people are a healthier group and less prone to have strokes. Moving into the Stroke Belt apparently did not increase their risk of death from stroke, Lanska says.

Lanska also found that southeasterners leaving the Stroke Belt do not always leave their legacy behind. Among African-American residents moving to the north, a carryover effect from genetic makeup, environmental exposures and lifestyle factors apparently leaves this population at continued high risk for stroke. Efforts to maintain cultural identity, coupled with societal prejudices, may further preserve lifestyle factors and personal habits that make African-Americans

born in the southeast more likely to have strokes. Racial predisposition to stroke cannot account for the high rates in this group, since African-Americans already living in the northeast and other areas outside the Stroke Belt tend to have lower rates of stroke mortality.

The door has been opened, Lanska believes, for further study, particularly among targeted groups. He is currently trying to identify at what point in a person's life risk factors for stroke are operative and whether, when, and how the chances of dying from stroke can be positively or negatively influenced. "Migration studies show that early and late life factors can be important in a person's risk for this disease," he says. "We also know, for example, that we can lower stroke risk later in life through controlling hypertension and diabetes and stopping smoking. It's important to understand and appropriately modify lifestyle factors that influence our chances of having a stroke no matter where we live."

—Sharon Reynolds

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UPDATE

Inner Space Invaders

by Angela Jones

Judith Lesnaw's research has led her to reacclaim Pogo's observation, "We have met the enemy and it is us." Or more precisely, bits of us.

When her work was featured in *Odyssey* in 1987, Lesnaw was probing the reproduction process of vesicular stomatitis virus (VSV), which attacks cattle and is similar to viruses that invade human cells. Viruses, the smallest forms of life, are basically little pieces of genetic information wrapped in a protein package. Because they are so small, they can't produce the building blocks and energy they need, so they invade living cells and borrow the resources they need.

"When the invaded cells are the ones that make up our bodies, we get sick,"

says Lesnaw, a biology professor and the director of graduate studies for biological sciences. And because viruses commandeer the cell's machinery to do their work, viral infections can be tough to fight. "We cannot destroy the machines that make these viral particles because the machines are us," Lesnaw says. "This kind of cure would kill the patient."

The challenge for virologists like Lesnaw is to identify parts of the virus that are essential for its reproduction, and then to select those essential regions that are different from our own parts. These regions then become targets for antiviral drugs.

In her early studies Lesnaw helped identify a potential target for interfering with VSV replication—the L protein. This large viral protein is important because it is used to copy the virus's genetic blueprint. What Lesnaw and her research team at UK—senior research associate Elizabeth Marek,

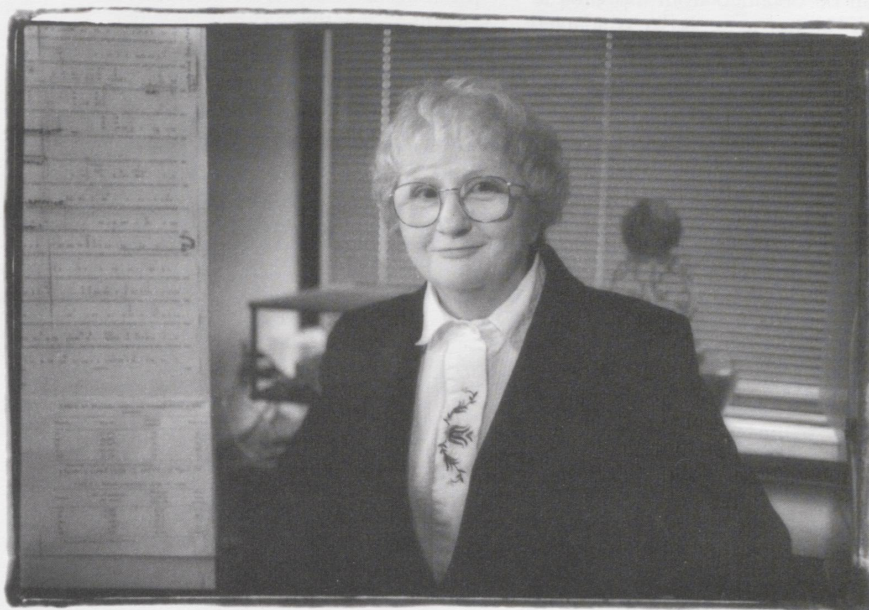


Photo by Lee Thomas

Judith Lesnaw stresses the point that viruses are "not altogether nasty. They hold a wisdom of their own and are a wonderful microcosm of the evolution of life."

technician Michael McGuinness, and Steven Enkemann, a former graduate student in biology now working at the NIH—have discovered is that the parts of this protein that carry out different tasks resemble parts of proteins that perform similar tasks in other living things, in humans, for example.

"The L protein is like an intricate patchwork quilt in which the various patches have been borrowed from our own proteins and reassembled in a different way," Lesnaw explains. "Not only do viruses use the cell's machines, but we now know that they pirate the working parts of the cell."

In order to design a drug to disable the L protein but not our proteins, the researchers need to understand how it works, what it looks like, and what parts of it look different from us. To solve this puzzle, the research

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team is dissecting the L protein with molecular, genetic and structural techniques.

"This work requires a large quantity of the L protein, much more than can be obtained from the virus itself," Lesnaw says. "So we've adapted techniques used in genetic engineering to trick the cells of an insect into manufacturing the protein for us." The insect is given another virus, called a baculovirus, which sends a much more powerful message to its host cell than does VSV. The result is that the insect cell produces the large quantity of L protein the researchers need.

The insect of choice is the cabbage looper. These light green caterpillars are common garden pests that feed primarily on broccoli, spinach, celery and tomatoes. They are reared in the lab in Styrofoam coffee cups and fed mashed mung beans. The process of maintaining these little L protein factories, Lesnaw points out, is very inexpensive.

The availability of large amounts of the L protein has sparked a collaboration between Lesnaw's group and University of Alabama scientists Gail Wertz, a virologist, and Ming Kuo, an X-ray crystallographer. Their goal is to determine the shape of the L protein. "Proteins are far too small to be seen with a light microscope or even an electron microscope," says Lesnaw. "But their structures can be deduced by a technique called X-ray diffraction analysis, which determines the position of every atom in the protein molecule."

The first step is to change the protein to crystal form, a complex process which requires a large

amount of the L protein. Next, a narrow beam of X-rays is directed at the crystal. Some of the X-rays are "scattered" by the atoms, and from the pattern of the scattered X-rays the positions of the atoms are determined. "We hope that the information generated will lead to the design of novel anti-viral drugs for a wide range of infections," Lesnaw says.

Although we tend to think about viruses in the context of the diseases they cause, Lesnaw reminds us that "viruses are not altogether nasty. They hold a wisdom of their own and are a wonderful microcosm of the evolution of life." ♦

On Becoming a Contributor to *Odyssey Magazine*

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Odyssey is published because the University feels that your support and understanding of the importance of UK research activities are critical—now perhaps more than ever.

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 can reach a potential audience of 1.4 million readers—letting them know of some of the advances that have been made through research, of career opportunities for their children in research and science, and of particular programs where UK research has made life better for them and their families.

In addition to sending the columns to newspapers throughout Kentucky, over 1,100 teachers in more than 100 counties subscribe to the columns which are sent free of charge. A recent survey of the teachers showed that 76 percent of these teachers—representing nearly 100,000 students—rated the columns from moderately important to very important in strengthening their students’ knowledge of careers and activities in research and science. And, as you know, keeping our students and teachers informed about research, science and technology is critically important to Kentucky’s goal of expanding the horizons of our young citizens and encouraging their pursuit of education.

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