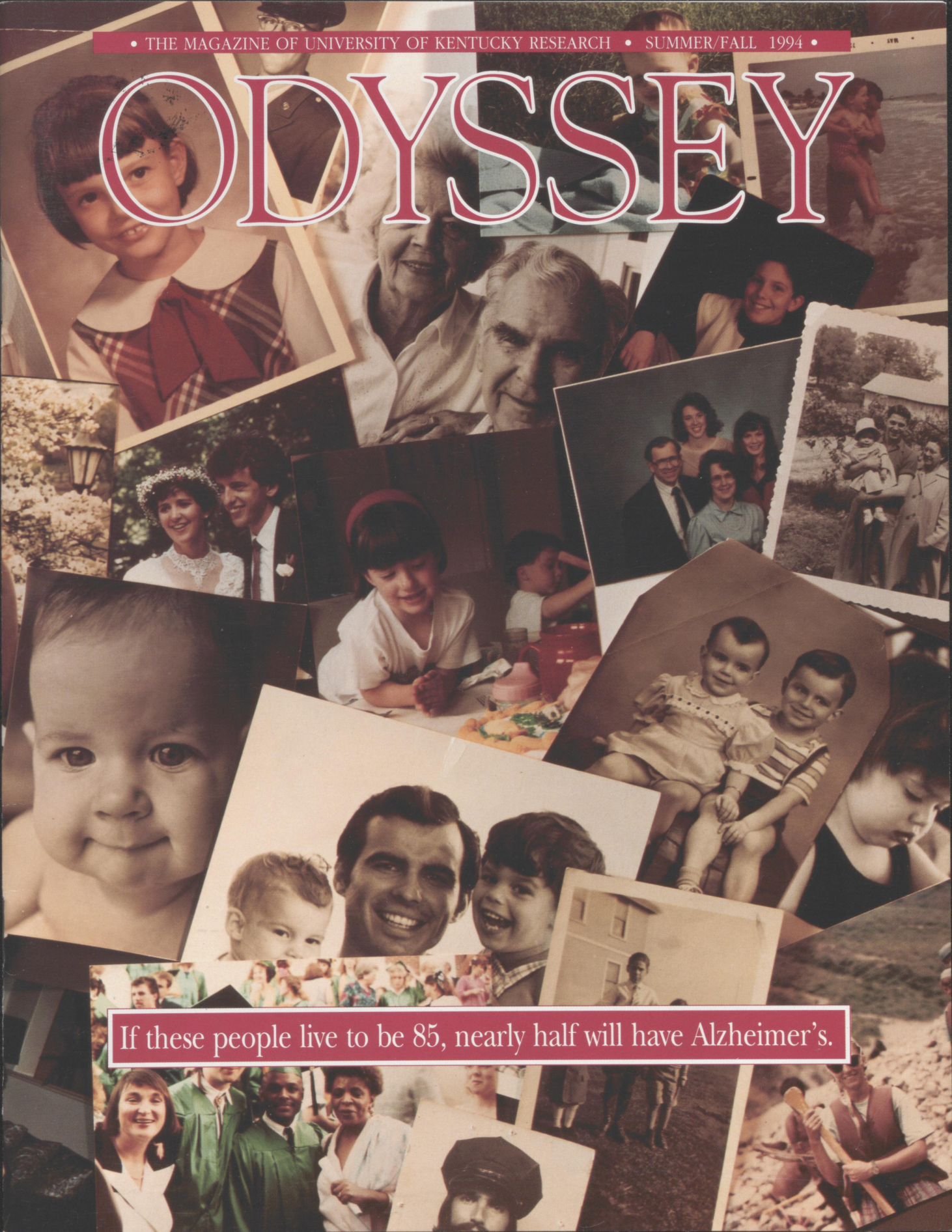


• THE MAGAZINE OF UNIVERSITY OF KENTUCKY RESEARCH • SUMMER/FALL 1994 •

ODYSSEY



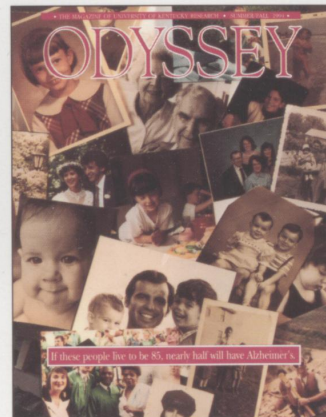
If these people live to be 85, nearly half will have Alzheimer's.



Cover Illustration

Once again we feature the topic of Alzheimer's disease in *Odyssey*. It is a natural area for us to cover, since we have one of the premier centers in the nation for the study of aging. The Alzheimer's research featured in this issue may be among the most significant work on this disease in recent years. A multidisciplinary team of UK researchers will take you through some of the complex processes that led to a significant new discovery that focuses on cell death in Alzheimer's. The bottom line of this research, though, is people—that this deadly disease can and will affect many of us. That is what our cover, full of people like you and me, indicates.

This disease makes us all vulnerable.



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, one goal of the university is to conduct programs of basic and applied research which support graduate and professional education, provide for the advancement of knowledge, and seek solutions for the acute problems of society.

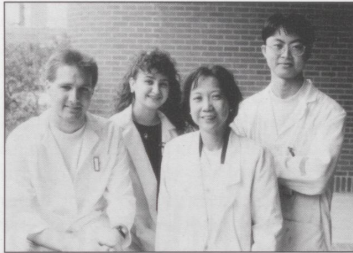
The university's research mission also acts as a magnet for attracting top graduate students who want to participate in nationally competitive research projects. This research experience can offer them a significant advantage in their education while laying the foundation for future research and development. *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.

ODYSSEY



Bug Love?
see *Kiosk*, p. 27



Science Boom, p. 8



*Working toward a Future
with Memory*, p. 2

Volume XII, No. 1

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.

Editor: Susan Hodgetts Stempel
Assoc. Editor: Jeff Worley
Designer: Shear & Shear
Publications Asst.: Lisa D. Lizer
Staff Writer: Graham Shelby
Contributing Writers: Sharon Reynolds, Ruthie Maslin, Kathy Larkin, Barbara Greider
Photography: Alix Roughen, Lee Thomas
Printing: Merrick Printing, Inc.
Cover Photo by Lee Thomas
©1994 University of Kentucky.
All rights reserved.

Contents

Alzheimer's Breakthrough: Working toward a Future with Memory	2
Science Boom	8
College Degree and Flexibility Keys to American Job Future	12
Launching Capsules into Inner Space	14
Honorable Mention	20
Kiosk: Bug Love?, Defining Mental Disorder, Improving Farm Safety and Health, and More...	27
Update: Snuffing Out Tobacco Use among Adolescents	35

University Archives
Margaret I. King Library - North
University of Kentucky
Lexington, Kentucky 40506

Alzheimer's Breakthrough: Working toward a Future with Memory

by Jeff Worley

UK Researchers Develop "Shrapnel Model" to Explain Plaque Formation and Cell Death in Alzheimer's Disease

Scientific Breakthrough.

This phrase is almost surely guaranteed to make a scientist cringe under its weightiness, its unequivocal claim. And Allan Butterfield, a professor of chemistry and head of the Center for Membrane Sciences at the University of Kentucky, knows this isn't a phrase to be tossed off lightly.

"A group of us here in the last few months have made some very exciting discoveries about how brain cells

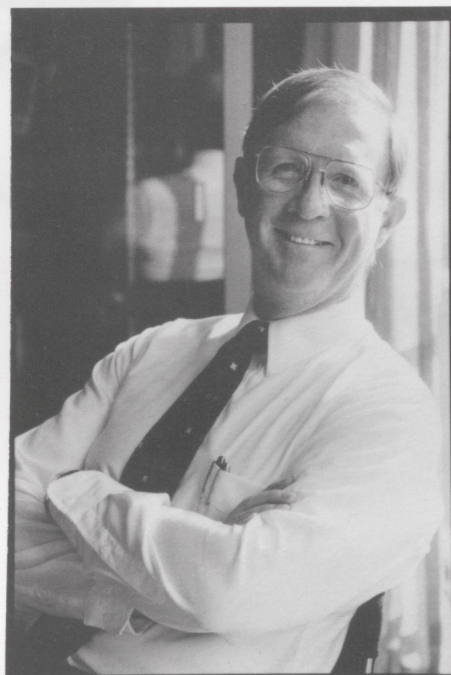
"This dehumanizing disorder [Alzheimer's disease] is by far the most threatening epidemic we have in our nation."

NIH Director T. Franklin Williams

are killed in the process of Alzheimer's disease," says Butterfield. "This is a breakthrough in the understanding of this disease." This dehumanizing disorder is, according to NIH Director T. Franklin Williams, "by far the most threatening epidemic we have

in our nation."

The result of a team effort at UK, the "molecular shrapnel model" of brain cell

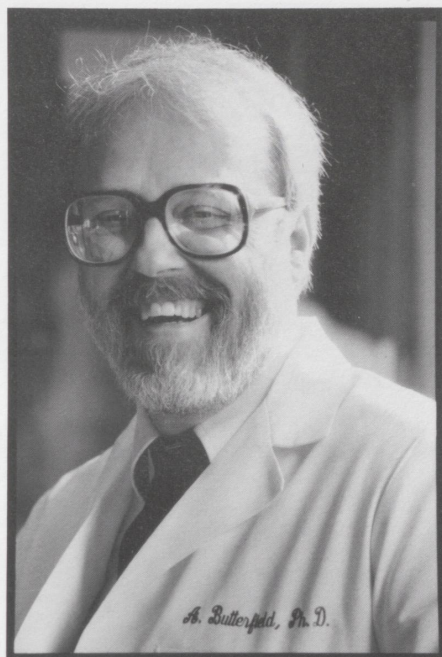


John Carney, pharmacology, has been working for 15 years to discover how oxidative radicals damage neurons.

death in Alzheimer's disease will for the first time, Butterfield says, permit a rational approach to therapy in this disorder. This model, he emphasizes, was developed through a multidisciplinary approach. The UK researchers involved include John Carney, an associate professor of pharmacology, Mark Mattson, a neurobiologist and associate professor at the Sanders-Brown Center on Aging, and two graduate students whose Ph.D. dissertations are focused on this research—Kenneth Hensley and Marni Harris.

The Challenges of Alzheimer's

The UK group's findings, which were published last April in the *Proceedings of the National Academy of Sciences*, hold significance for the millions of Americans projected to be stricken with Alzheimer's in the decades to come. By the turn of the century, it is estimated that five million Americans will be diagnosed with the disease; by the year 2050, the number of older Americans with Alzheimer's is expected to be between 7.5 million and 14.3 million, depending on the rate of population growth. There are now approximately four million Americans with the disorder. Alzheimer's is the nation's fourth leading cause of death, accounting for some 100,000 deaths annually. Only heart disease,



Alix Roughen

Allan Butterfield, director of UK's Center of Membrane Sciences, says that the therapeutic implications of the group's discovery are potentially significant: "If you can interfere with this free radical damage, or prevent it, you could, in principle, modulate this disease tremendously."

cancer and stroke claim more lives.

Although the cause, or, more likely, causes of Alzheimer's haven't yet been pinpointed, the disease has two unique physical features, always found together—abnormalities in the brain called plaques (clumps of beta-amyloid protein outside brain cells) and neurofibrillary tangles (shriveled strands resembling bundles of straw inside damaged neurons). These two features have constituted a nagging mystery that has impeded the search for what triggers Alzheimer's, because researchers haven't been able to determine whether the plaques and tangles cause the disease or are simply its byproducts. In recent years, Butterfield says, much Alzheimer's research has focused on the beta-amyloid protein, a peptide (a series of amino acids) that is the core block of the plaques.

"The odd thing about this peptide," says Butterfield in explaining his thinking process that led to the group's shrapnel model, "is that no matter what you try to do to dissolve it, you can't do it. As a chemist and a membrane scientist, I asked myself, 'How can you account for this?' The only answer I could come up with is that the peptide was forming covalent bonds—very strong chemical asso-

ciations. 'And how are covalent bonds formed?' I asked. The answer that occurred to me is by peptide free radical reactions."

Free radicals, Butterfield explains, are molecules with one or more unpaired electrons, an imbalance that causes them to be extremely unstable. "Nature abhors having unpaired electrons," says Butterfield. "So free radicals are very reactive because they are always trying to either give up or accept an electron."

Butterfield made this intellectual connection while walking one day from the chemistry building to his "third or fourth" meeting of the day. "I couldn't wait to talk with John [Carney] and to Mark [Mattson]," Butterfield says. "And to Kenneth Hensley, a grad student from Ashland who ended up contributing a lot to the project."

"I was immediately excited about this," Carney says. "We were over in the chemistry lab the next day to see if the beta peptide formed a free radical, and we found that it did." Carney explains that free radicals can be determined in solution by use of electron paramagnetic resonance spectroscopy, or EPR, equipment purchased a few years ago as a result of the state's \$20 million bond issue. Though you can't literally see free radicals, they do give off signals that can be read like a fingerprint. Each free radical can be seen as a unique graphic representation, so Butterfield and Carney knew, after checking their library of "fingerprints," that what they were detecting had to come from the beta peptide.

"It turned out," Mattson says, after the three researchers did more control experiments, "that other peptides also form free radicals. But they don't damage cell proteins the way the beta amyloid peptide does. Only amino acids in the sequence of the beta peptide damaged enzymes and inactivated them. I've never seen Allan quite so exuberant, and at this point, I got pretty excited too."

For Mattson, who has spent the past seven years studying the mechanisms involved in the death of nerve cells in the brain, the fragmentation of the beta peptide into free radicals was a missing piece of the neurotoxic puzzle he had put together. In a paper authored by Mattson and several co-researchers which appeared in *Trends in Neurosciences* last Oc-

continued on page 4

Alzheimer's is the nation's fourth leading cause of death, accounting for some 100,000 deaths annually. Only heart disease, cancer and stroke claim more lives.

"Call it brain rust. In many ways the process of protein aging involves iron inside the cell promoting oxidation. So the iron is actually rusting the protein."

John Carney,
UK Department of
Pharmacology

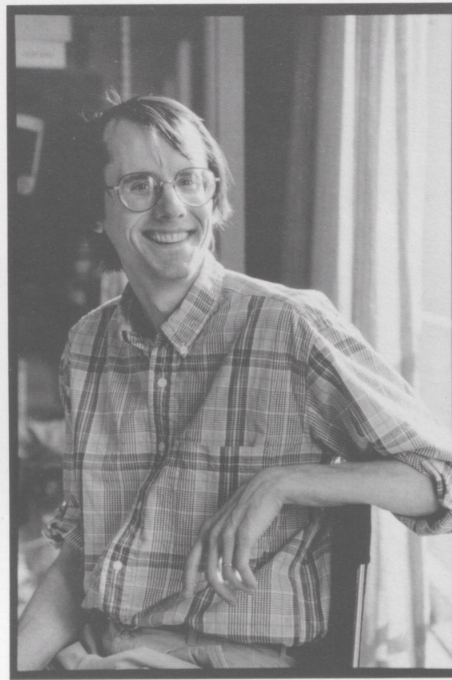
tober, he shows how the amyloid beta peptides break off from the larger protein, collect outside the cell, and stick together. This "aggregate" of the peptide is extremely toxic to nerve cells. His research shows that it then attaches to the cell, which needs relatively little calcium to function, damaging proteins that are involved in keeping calcium out. The barrage of calcium into the cell kills it.

"The new thing we found," says Mattson, "is that this peptide—after it breaks off—fragments into smaller reactive pieces, or free radicals. Because the nature of these radicals is to pair up, we think now that they specifically attack the cell membranes, substantially damaging them." Butterfield's discovery of free radical formation and the ability of these radicals to damage the cell membrane, thereby allowing calcium to leak in, explains how the beta peptide works to kill cells. This discovery was the missing piece of the puzzle.

Combining Years of Expertise

This leap forward in understanding how brain cells are undermined was possible because of a lot of preliminary groundwork and the combined expertise of the researchers. "What coalesced at UK," says Carney, "is a synergy of expertise. We're lucky to have people here in different but related disciplines, people with a lot of experience under their belts to help enlarge findings from another area."

Butterfield's experience includes the use of EPR to study membrane abnormalities in degenerative neurological disorders, including Alzheimer's disease. Carney has been examining protein oxidation in stroke for many years. "We knew from previous studies of Alzheimer's brains that there was an age-related increase in protein oxidation and loss of critical enzymes," Carney explains. "The central question was, How did the cell become oxidized?" Mattson has been working for the past seven years—sometimes in collaboration with Carney—on how brain proteins protect nerve cells against stroke in animal models. "What we've learned from this research," Mattson says, "is that certain proteins prevent elevation in calcium levels by sort of scavenging up free radicals. The



Alex Roughen

Mark Mattson, who works at UK's Sanders-Brown Center on Aging, was one of three researchers in the U.S. to receive the 1992 Metropolitan Life Foundation Research Award, and the \$100,000 grant that goes along with it.

proteins are able to do this by increasing production of anti-oxidant enzymes."

"Anti-oxidants," Butterfield explains, are molecules that can destroy these damaging free radicals. "How do you explain why an old person gets Alzheimer's and young people don't?" Butterfield asks. "The answer is, in all likelihood, that as young people we have a tremendous amount of anti-oxidant strength within our system. But as we get older our genetic machinery winds down—the ability to reproduce these beneficial chemicals weakens and free radicals more easily subvert the brain's cells."

The analogy of the brain as a machine that wears down seems to be a recurring analogy in their talk. Hensley, whose Ph.D. dissertation deals in part with the role of oxygen radicals, explains the importance of the body's ability to control oxygen levels. "For a good many years," Hensley says, "there has been a hypothesis that aging and Alzheimer's disease have one commonality—the body loses its ability to defend against oxidated stress. We obviously need oxygen to live, but the reactions that oxygen undergoes in the body have to be carefully controlled or

else your body begins to produce oxygen radicals which escape and can then damage cells."

"Call it brain rust," says Carney. "If the brain gets too much oxygen that's essentially what happens." Carney adds that this comparison is particularly apt because rust is iron oxide, or oxidized metal. "In many ways the process of protein aging involves iron inside the cell promoting oxidation," Carney says. "So the iron is actually rusting the protein."

What Causes Alzheimer's?

Researchers investigating possible causes for Alzheimer's have from the beginning looked for common traits in the various explanations of why people get the disease, even while acknowledging that Alzheimer's is almost surely multicausal. Perhaps the most important result of the UK group's research, Butterfield says, is that their work for the first time puts Alzheimer's disease into a single theoretical framework, accounting for what other scientists have observed in making various suppositions about what causes the disease.

Some researchers believe, for example, that at least some cases of Alzheimer's disease may result from an inherited defect in mitochondria, the oxygen-dependent energy factories in cells. Other scientists have put forth the idea that membrane defects may be the main cause of Alzheimer's (in fact, the first researchers to do so [in 1980] were Butterfield and William Markesbery, director of the Sanders-Brown Center on Aging at UK). Still other researchers point an accusing finger at disorders of the immune system or at trace metals such as aluminum or mercury—found by some scientists in high concentrations in amyloid plaques during autopsy of Alzheimer's victims.

One other leading theory has been that Alzheimer's is genetic. Allen D. Roses, a neurology professor at Duke University, believes that late-onset Alzheimer's is of genetic origin. His research indicates that the gene responsible is located on chromosome 19, and that it is some sort of "housekeeping gene that is supposed to keep cells tidy and opera-

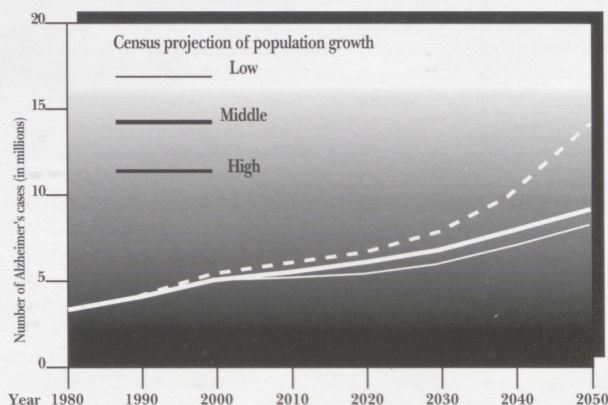
tional but burns out with age." Roses adds that, "We could all potentially develop the disease by 120 years of age," but that "since none of us live that long what we see is the beginning of the curve—patients who begin to display symptoms in their 60s, 70s and 80s."

Roses, in a study reported last November, showed that a rare form of a gene called apoE2 appears to protect people from developing Alzheimer's disease. But people with another form of the gene, apoE4, were at substantially greater risk of developing the disease. This discovery, for the first time, offers the possibility of developing a drug that would copy the natural protective action against Alzheimer's that may be provided by the apoE2 gene. The Duke research, which has been verified by others, shows that people with two copies of the E4 gene had 11 to 17 times greater risk of developing Alzheimer's.

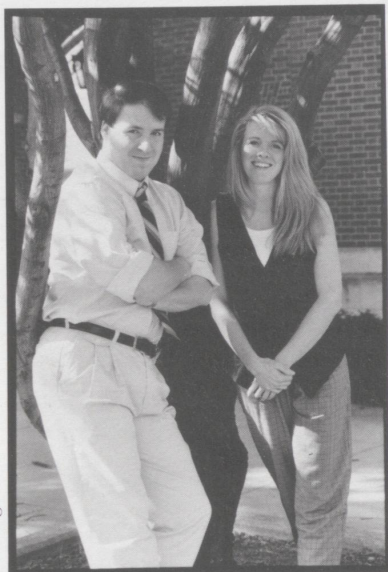
"I hope it doesn't sound too grandiose to say this," states Butterfield, "but a real strength of our shrapnel model is that it accounts for various abnormalities of Alzheimer's disease

Incidence Expected to Increase

The estimated number of persons 65 and older in the United States with Alzheimer's disease (AD) was 2.88 million in 1980. The number had risen to about 4 million by 1990. By the year 2050, the number of older Americans with AD is expected to be between 7.5 million and 14.3 million, depending on the rate of population growth.



(Source: Denis A. Evans et al., "Estimated Prevalence of Alzheimer's Disease in the United States," *The Milbank Quarterly*, Vol. 68, No. 2, 1990.)



Kenneth Hensley, from Ashland, Kentucky, plans to complete his Ph.D. work in chemistry in the fall of 1995. Marni Harris, from Irvine, California, hopes to receive her doctorate in pharmacology next spring. Both were instrumental in helping to develop the group's molecular shrapnel model of cell death associated with Alzheimer's disease.

that have been observed for years in the literature. Everything fits. It accounts for various enzymes that have been reported to be abnormal, various transport processes that have been seen to be aberrant, particular proteins that have been compromised because of attack by a free radical peptide . . . Our model puts all of these observances under a solid umbrella."

Defensive Strategies and Implications for the Future

If the shrapnel model proves to be accurate, then what? What can people do to protect themselves against the onslaught of Alzheimer's?

"The therapeutic implications of our research are that if one could interfere with this free radical damage, if you could prevent it, then you could significantly modulate the disorder," Butterfield says. "Eventually, it might be possible to give people anti-oxidant pills that protect them—that may not be all that far in the future," Hensley adds. "In fact right now, there are a number of people who believe taking lots of vitamin C and vitamin E can help protect brain cell membranes." Hensley goes on to say that in separate studies done at UK it was shown that vitamin E protects cell membranes by inserting itself into the membrane and preventing damaging over-oxidation.

"I think of it as a preventative measure," says Mattson. "Vitamins E and A absorb free radicals and prevent them from damaging cells. We've found that vitamin E in nerve cell cultures, for example, can protect against amyloid beta peptide toxicity." Butterfield, Hensley, and an undergraduate chemistry major, Beverly Howard, have found that vitamin E protects brain membranes from the damaging effects of beta peptide free radicals. Hensley, Mattson and Butterfield admit to

"I am absolutely convinced that within 10 years we will have a pill that prevents Alzheimer's disease."

Allen D. Roses,
Duke University

taking "more than the normal recommended daily dosage" of vitamin E. "There's absolutely no evidence that these vitamins are bad for you, and there's some strong evidence that they're good for you," says Mattson.

Now that the researchers have gotten this far, what's next?

"We've recently filed patents on several compounds that we find, at least in cultured nerve cells, can protect against beta peptide toxicity," Mattson says. "On one hand, we're trying to understand more and more about how the free radical kills cells, and we're also trying to identify compounds that interfere in this process. So that's the strategy now."

"How significant is this research?" Earl Stadtman asks rhetorically from his office at the National Heart, Blood and Lung Institute. Stadtman, the chief of the laboratory of chemistry in Bethesda, pauses only briefly. "This work is highly significant. It's becoming increasingly apparent that free radical damage to proteins is important in a number of disease processes. The University of Kentucky group has shown that the beta peptide is converted into a form which has the ability to spontaneously generate free radicals. They've taken a very novel approach to understanding the part free radicals play," he continues. "I know that John Carney, in collaboration with Robert Floyd in the Oklahoma Medical Research Foundation, has been looking directly for such an event for some time. This is unquestionably a breakthrough in the understanding of the pathology of Alzheimer's disease."

For the millions of Americans who will develop Alzheimer's disease in the next few years, any major discovery that may lead to the control or cure of the disease is welcomed. And indications that the Alzheimer's puzzle may be solved and effective therapies developed have never been stronger. "I am absolutely convinced that within 10 years we will have a pill that prevents Alzheimer's disease," says Roses of Duke.

"Within the next five years," says UK's Markesbery, "we're probably going to have a drug that will enhance memory. There are too many drug companies working on this and too many ingenious pharmacologists for this not to happen." ♦

Studies Show Mental Activity Helps Ward Off Alzheimer's Disease

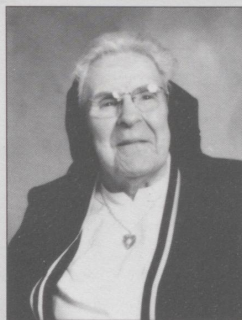
The Friedrich Nietzsche 500-page workout?

It may be more beneficial than you think. In addition to satisfying the intellect, mental aerobics just might help to keep you from developing Alzheimer's disease.

A recent study in Shanghai, one of seven such inquiries being conducted worldwide, has shown that levels of education have a profound effect on the ravages of Alzheimer's disease and other forms of dementia that chiefly affect older people, *The Chicago Tribune* reported. After studying more than 5,000 Shanghai residents ages 55 to 75, researchers found that, all other factors being equal, the uneducated subjects of the study had twice the risk of dementia as those with elementary or middle-school education.

Robert Katzman of the University of California at San Diego wrote in the journal *Neurology* that the findings of this and other such studies have profound social, biological, and medical implications. Harvard neuropsychologist Marilyn Albert, who conducted a study of elderly Bostonians, says "having more education means not only that you develop your brain when you're young, but that you use it more through your life, and that produces some sort of protective mechanism that helps keep the brain from developing Alzheimer's disease."

A unique study by University of Kentucky researcher David Snowdon is also focusing on the connection between early education and later-life mental functioning. For the past seven years, Snowdon has been studying the School Sisters of Notre Dame congregation, comparing disease and death rates of the more educated sisters to those of the less educated. [See "Aging with Grace: The School Sisters of Notre Dame Study," in the



Sisters Columbine Kumba and Godfrey Huber, both former teachers now in their mid-90s, are participating in an ongoing UK aging study being conducted by David Snowdon.

Winter/Spring 1993 *Odyssey*.]

Initial studies focused on sisters of similar age who represented a broad range of function and health—from those who were confused and bedridden to those still holding full-time jobs in the community. The more highly educated sisters lived approximately four years longer, with a good level of mental and physical functioning, than those who had less than a bachelor's degree. At every age, between 20 and 95, the less-educated sisters had twice the mortality rates of the more educated.

"One explanation for this might be that higher cognitive function is due in part to higher-educated people having jobs—as well as recreational activities—that keep them mentally alive," says Snowdon, who is working with a team of other scientists at UK's Sanders-Brown Center on this study. "Another line of evidence is that people who have a rich vocabulary early in life end up having high mental function later in life." These results have been determined, Snowdon explains, from examining words used in autobiographies written at age 21 and mental function assessed 60 years later.

"We also looked at what the sisters were writing at age 21, then looked

again at what they were writing 25 years later, at age 46," says Snowdon. "Those sisters who improved their vocabulary between ages 21 and 46 had better mental function at age 80.

"My suspicion is," he says, "that education has nothing to do with the pathology of Alzheimer's. It isn't that lower-educated people have more plaques and tangles; rather, it may be that more highly educated people have better connected brain cells." Snowdon goes on to say that one explanation for these stronger connections in the brain is that more highly educated people might exercise their brains more and thus end up with an agile brain in old age.

Snowdon cites evidence for this theory from a study by Katzman, who discovered in his work that the brains of more highly educated people are literally better connected than those of less-educated people. "Katzman found that the synapses in the brains of higher-educated people were much denser," Snowdon says. According to Katzman, higher-educated people develop "brain reserves," which become useful if the person develops the lesions of Alzheimer's or has a small stroke. "If other parts of the brain are well connected," Snowdon says, "the healthy parts of the brain may have a better chance of taking over the functions of the parts of the brain damaged by Alzheimer's."

In discussing the nature of brain cells and the ongoing Nun Study, Snowdon says there is no reason to believe that brain cells are any different than muscle cells. "There's a lot of good evidence to back up the idea of 'use it or lose it,'" he says. "The women in our study keep very intellectually active, whether it's reading, playing scrabble or watching Wheel of Fortune. They refuse to resign themselves to downward mental decline. One sister told me, 'There's only one time we retire—at night.'"

Science Boom



Biology professor Grace Jones, third from left, says that undergraduates play an important role in her lab. Paul Taylor, from Springfield, Kentucky, Mona Saidi, originally from Iran and now living in Houston, and Enrique Tze Leuk Pang, from Hong Kong, are currently working on research projects with Jones.

Student Interest in Science Classes Increasing

by Graham Shelby

Call it a major migration.

Over the last five years, undergraduates have been swarming to the sciences at the University of Kentucky. Since 1989, enrollment in chemistry classes has increased by 61 percent. Biology is up 75 percent. The College of Allied Health has experienced a student population explosion of 120 percent.

Many students, faculty and administrators say the decision by undergraduates to select science as their field of study results from a combination of genuine interest and basic, pragmatic concerns. Students want jobs, good jobs, and they're willing to work hard to get them.

Bill Korn, a spokesman for the Higher Education Research Institute in Los Angeles, says the trend at UK is part of a national phenomenon. In terms of the stated academic preferences of students, he says, "There's been a substantial increase over the last seven or eight years in the biological sciences." The institute compiles surveys taken of 200,000 entering freshmen.

From 1987 to 1993, the number of students nationwide reporting an interest in pursuing biological sciences (defined as biology, biochemistry and microbiology) increased from 3.8 to 5.6 percent. The institute's research found that during this time period substantially more freshmen became health professions majors. That classification, which includes pre-medical, nursing, pre-pharmacy and physical therapy, leapt from 7.2 percent in 1987 to 15.8 percent in 1993.

Rhonda Smith, a UK pre-pharmacy senior from St. Louis, says students' reasons for shifting to science are largely pragmatic. That doesn't mean, she says, that everyone can succeed in science courses. "You have to have a general interest in science, first of all," she says. If so, she adds, a student can follow a path that hopefully will lead to job and economic security. "The outlook in science fields is very good financially," she says. "If you have a science degree, there's always

Alex Roughen

"I see more people being interested in science because of the job market; they don't want to get a degree they can't go out and find a job for."

Mona Saidi, UK junior biology major

something you can do." The money and stability many students believe awaits them once they've finished school is enough of an incentive to lure them into sometimes difficult and lengthy degree programs. "It is expensive, there's no doubt about it," Smith says. "I figure after it's all over, I'll be happy."

Chuck Staben teaches Principles of Genetics, a 400-level class for biology majors. The School of Biological Sciences capped the enrollment at 75. Before Staben had prepared his first transparency, 50 names sat on the course's waiting list. He says more students asked to be admitted, but he stopped taking names at 50.

Asked why more students are now interested in pursuing careers in science, Staben says that while their interest may be genuine, most students aren't interested in becoming scientists. "It's not about science, it's about health professional careers," he says. "They're preparing for a profession." Of the students in his genetics class, Staben estimates that about 80 percent have some pre-health professional orientation. "They want to be a physician, a dentist, a physician's assistant," he says.

Staben adds that he understands the lure of health-care professions, particularly medical school. Even if students have to borrow \$20,000 a year for four years of med school, they can be drawing six-figure paychecks within 10 years of finishing their undergraduate work, he explains. "Anybody who doesn't see that as a cheap investment needs to go back to Business 101."

Mona Saidi, a junior biology major from Houston, says, "I see more people being interested in science because of the job market; they don't want to get a degree they can't go out and find a job for." Saidi, who plans to go on to medical school, says that students are attracted to science also because they see technology becoming an increasing part of every aspect of modern life. "A lot of our products now involve chemistry, involve biology, involve scientific research. We have use for science in every field—from cosmetic products to surgery, there is science involved."

Peter Berres, director of student services for the College of Allied Health Professions, says it isn't just future physicians like Saidi filling up science classes at UK. He says under-

graduates' academic and career decisions show they are aware of current data on job projections. "Most of the surveys that predict the future job market identify the health professions as a growing market," says Berres.

Allied Health's physical therapy and physician's assistant programs have experienced a heavy influx of students. Those two career tracks are expected to expand with the evolution of health care, Berres says. In terms of job growth, "Physical therapy ranks in the top three in any poll you read," he says, adding that the profession of physician's assistant is also predicted to grow.

One of the reasons for the expected surge is that many health-care reform plans call for an increase in mid-level practitioners—health-care professionals who are trained to handle minor or specific medical conditions that don't require the expertise of a physician. As a result, "We get more people who are pre-P.A. or pre-P.T.," Berres says. "Those numbers have just swollen." Enrollment figures aren't the only numbers worth noting. Berres says students can become certified as a physician's assistant or physical therapist in as little as two years (although it generally takes longer) and the starting salary for each is about \$40,000.

His analysis is backed up by data from the Bureau of Labor Statistics. The bureau reports that physical therapy is the third fastest growing job field, expected to see an 88 percent increase in jobs by the year 2005. Another Allied Health program, speech pathology, is also among the top 10. Significant job growth is also expected, according to the bureau, for physicians (35 percent), physician's assistants (34 percent) and pharmacists (29 percent).

Shaun Goulbourne is counting on that growth in physical therapy for a job. The physical therapy junior, who attended high school in Kentucky after growing up in England, says in his science classes he sees "mostly people going to med school, going to P.T., something in the allied health professions." He says students know what majors will lead them to employment. The availability of jobs, potentially high-paying jobs, attracts a lot of students to science. "That might be the initial turn-on," he says.

"We hate to admit that we're money hungry,

continued on page 10

Two rapidly growing fields are certified physician's assistants and physical therapy. Students can be certified in either field in as little as two years and the starting salary for each is about \$40,000.

but it plays a part." Not the only part, though. Goulbourne says science classes were the only "fun classes" he had growing up and that he loves the challenge of working in science.

He and other students are now getting to explore that challenge, thanks to UK's new Outreach Center for Science and Health Career Opportunities. Physiology professor Don Frazier helped organize the center, which is designed to coordinate all the science outreach programs the University sponsors for students, from pre-school to professional school. Frazier says outreach programs like the one Goulbourne participates in, which allows him to work in a sports medicine clinic, are part of a push by educators to stimulate students' interest in science.

A few years ago, Frazier says, there was a concern that American students were falling behind their international peer groups in science. Frazier, who is president of the Kentucky Science Teachers Association, says many people were worried that "We were not doing a very good job getting kids interested in science and math and the impact that would have on our economy."

UK has increased efforts to link the university with primary and secondary schools around the state, in the hopes of developing

students' interest in science at an early age. Frazier says something is obviously happening to these students to pull them toward science before they enter the university if they are filling up basic biology and chemistry classes. For whatever reason, he says, "These kids are coming into college willing to take these courses."

Frazier says that before they decide on their major and career path, students ask themselves, "If I do this, will there be a job at the other end?" He says, "Nothing will turn kids off as fast as thinking, 'I'm going to do all this studying, all this work and so what? There's no opportunity.'"

Still, there's more to the enrollment increases than job prospects, Frazier says. "People have begun to realize that it's important to have a grasp of science and math. The nation is dealing with important science-related issues, he says. "We're worried about our ozone layer, we're worried about people burning wood, burning coal." Young people, he believes, are beginning to realize they need science "to be an informed player in today's society."

Biology professor Grace Jones says today's students are very aware of scientific issues that garner considerable media attention, such as the environment, genetic engineering, and research into AIDS and cancer. She says she's glad to see more students looking into biology and other fields, even if she's not sure what their reasons are. "I really don't know [why they're here]," she says. "Could be we're doing a much better job." Whatever the reasons, she says, "I think we have better students going into biological sciences." And even if their reasons have a very pragmatic base, she says she can't blame them. "Nobody wants to graduate without a job."

Enrique Pang, a junior biology and pre-pharmacy major from Hong Kong, says he was drawn to science by the combination of both personal and pragmatic interests. He chose it over other subjects, because in science, "You have to think constantly," he says. "Everything is new and there are still lots of things that are unknown." He's also well aware of his career options. "You have a better future if you choose science," he says. "You have more jobs to choose from." ♦

Top 10 List of Growing Occupations

Top 10 occupations expected to expand the most between the years 1992-2005, with percentage of expected growth (from the Bureau of Labor Statistics)

1. Computer Engineer/Computer Scientist - **112%**
 2. Systems Analyst - **110%**
 3. Physical Therapist - **88%**
 4. Special Education Teacher - **74%**
 5. Operations Research Analyst - **71%**
 6. Occupational Therapist - **60%**
 7. Preschool and Kindergarten Teacher - **54%**
 8. Speech Pathologist/Audiologist - **48%**
 9. Psychologist - **48%**
 10. Construction Manager - **47%**
- Others: Physician - **35%**
Physician's Assistant - **34%**
Pharmacist - **29%**

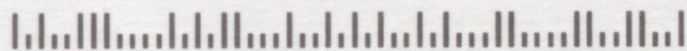
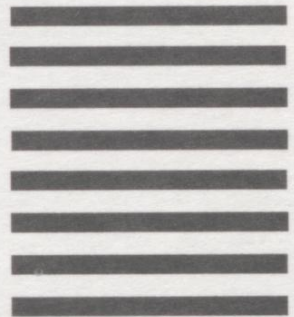


NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS MAIL PERMIT NO.18 LEXINGTON, KY
POSTAGE WILL BE PAID BY ADDRESSEE

UNIVERSITY OF KENTUCKY
ODYSSEY MAGAZINE
404 KINKEAD HALL-0057
500 S LIMESTONE
LEXINGTON KY 40508-9963



ODYSSEY

Yes, I would like to make a tax-deductible contribution to help keep Kentuckians informed about the importance of research and education to our state.

Please enroll me in *Odyssey* as a:

Business/Corporate Sponsor- ☐ \$500 ☐ \$400 ☐ \$250 ☐ Other \$ _____

Patron- ☐ \$200 ☐ \$150 ☐ \$75 ☐ Other \$ _____

Friend- ☐ \$50 ☐ \$40 ☐ \$25 ☐ Other \$ _____

Name: _____

(Please Print)

Donations will be acknowledged in *Odyssey* Magazine unless anonymity is requested.

Method of Payment:

☐ Check enclosed (Make payable to "University of KY-*Odyssey* Magazine")

☐ Charge my Visa ☐ , Mastercard ☐ Acct. # _____

Exp. Date _____

Signature: _____

☐ Yes, I would like a complimentary subscription to *Odyssey*.

My address is: _____

☐ I already receive *Odyssey*.

Science Hotline

Want to know how to find information on lung cancer in Kentucky? On the latest developments in superconductivity? The mating habits of gerbils?

Help is just a phone call away. A UK "800" Science Hotline has been made available to every science teacher and student in the state seeking answers to science-related questions and for locating source materials needed for school science activities.

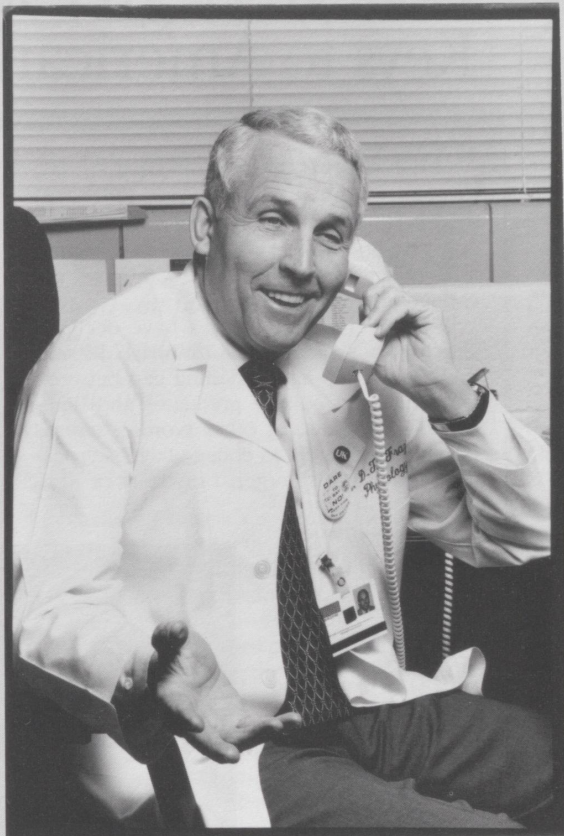
"In working with science teachers over the years, one thing that became obvious is that it would be nice for them to have a phone contact at UK," says Don Frazier, professor of physiology and biophysics. "There's a lot of expertise here at the university, but it's difficult to know who to call to tap into that expertise."

So in 1990, Frazier went to Emery Wilson, dean of the College of Medicine, and proposed that the college fund a science hotline. "The dean liked the idea right away," says Frazier, "of establishing a focal point for teachers and students to have access to some of the things going on at the university." The hotline was set up in January of 1991; over 900 calls have been handled since then.

Frazier says that the most common calls relate to questions about school science fairs. Teachers who are sometimes hard-pressed to come up with a different project idea for each student in their class call for project suggestions. Science fairs in Kentucky traditionally are held yearly at schools, in county-wide competitions, and then at regional or state competitions. Frazier emphasizes the fact that he is a "question facilitator," not Mr. Answer Man. "If the question is about chemistry, I contact a chemist to get an answer," Frazier says. "The point is to put the caller in touch with an expert."

What's the most unusual call Frazier has fielded?

"That's easy," says Frazier. "About a year ago I got a call from a student in southeastern Kentucky in the middle of the day. He asked me a very specific question about a chemistry problem—so specific I had a feeling it was a homework question. 'No,' the student responded when asked if the question related



Alex Roughen

Physiology professor Don Frazier says that UK began a Science Hotline in 1991 in order to help teachers and students in Kentucky find resource materials for school science activities. Over 900 calls have been handled since the Hotline's inception.

to his homework—it's an exam question.' It turned out that the student had gotten a pass to leave the class during the exam and used a pay phone (the hotline number is often posted on bulletin boards in school hallways) to call up to try to get a quick answer!"

Frazier emphasizes that the purpose of the hotline is to help teachers and students find resource materials, not to help students with their homework.

"This has been a useful and interesting project," Frazier says. "It's important for us to be a responsive institution."

The UK Science Hotline number is 800-955-9500.

Use send resumes and salary history to:

PACCAR Automotive, Inc.
Attn: RVP
1400 North 4th Street
Renton, Washington 98055
An Equal Opportunity Employer

PERSONNEL SERVICES

JOBS OVERSEAS

Employment Gazette publishes 14 listings every 2 weeks \$35.
C 1-800-882-9188 or send to: 1555A Wade Hampton, Greenville, SC 29609

POSITIONS AVAILABLE

ASSOCIATE POSITION

nell, Ramis, Crew, an & Bachrach, AV with 14 attys, seeking ate with min. 5 yrs any combination of d-tenant, transaction entation, debtor-cred- article 9, and bank- Resume & writing to:

Administrator
1727 NW Hoyt
Portland, OR 97209

CHANCELLOR

Carolina University ndidates for the pos- Chancellor. Candidates have a distinguished of academic achieve- successful administra- tance, and the ability e as an articulate rson and effective ad- for the university, and minorities encour- apply Position open un- Send letter of interest, resume, and a list of erences to P.O. Box lowhee, N.C. 28723.

LIC DEFENDER

/yr. Closes, 5/27/94, employees \$3.5 mil. Complete info appli- through, Spokane Human Resources, Mallon, Spokane, WA)456-5750. AA/EOE

COMMUNICATIONS

Regional Sales Manager with Long Distance Co. liv. to establish new dis- channels in the Mid- just have Sales Mgmt. er Interconnect Sales/ istance. Ext. travel.

POSITIONS

VICE PR GENERAL

Outstanding of a dynamic le- tain P&L resp a \$50-\$60 millic oratory operat the Western Ur To qualify, ye 5+ years P&L the clinical l, dustry and d ability to pro control direct background in For confident ation, please se

Cameron
Confident
Dept \\\
590 Lenn
Suite
Walnut Creel
EC

DIVISION CI

Norris Cylinde accepting appli division contri- cated in Long- plicants must h
• Degree in acc
• Five years at controller
• Strong manu- erations invo
• Will particip ly in operatio
• Strong in an- alysis/fore eting

The successful one who is on th ahead, not on saying where Mail resume a tory to Norris t pany, Human Dept., Re: Div ler, P.O. Box 74 TX 75607 E.O.E

VP of FI

Foot Three man

College Degree and Flexibility Keys to American Job Future

by Ruthie Maslin

They set out to research and rate the quality of the American work force. What they found is good news for college graduates.

While average U.S. wages have declined slowly but steadily over the past decade, there is a sharp and widening gap between the salaries of college graduates and high-school drop-outs. In other words, "returns from an investment in college have skyrocketed," says Mark Berger, University of Kentucky professor of economics and director of the Center for Business and Economic Research.

"It may sound self-serving to say this," adds Dan Black, also a professor of economics at UK, "but our products are doing much better out there in the marketplace."

Berger and Black have been conducting research over the past few years to look specifically at on-the-job training and its relationship to the quality of the U.S. labor force. Generally, the criteria they were using to rate the work force focused on how much training the worker receives after employment, the productivity of workers,

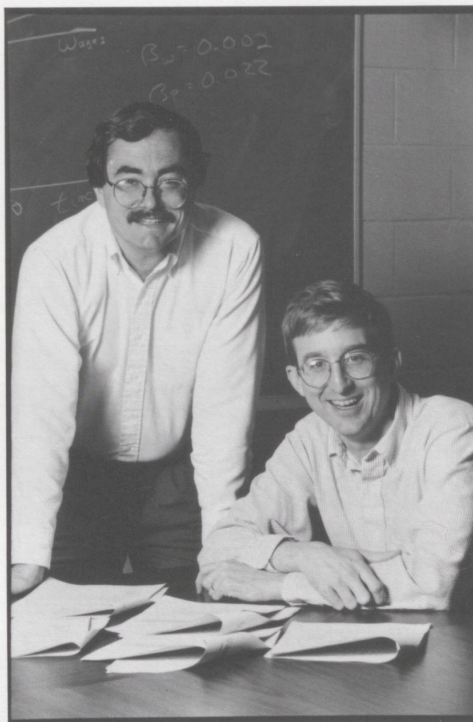
wages, and how intensively businesses search to fill certain positions.

Black says when they started their most recent study (supported by a \$60,000 grant from the UpJohn Foundation), they expected to see the same kind of relationship between training and wages as has been found between college education and wages. They didn't. Their findings do suggest, however, that on-the-job training is a good investment for employers. The national study of 300

newly hired workers and their employers over a three-month period showed that the productivity of workers rose sharply following a period of training.

Unfortunately for workers, the same was not found to be true of their earnings. Berger and Black found that on-the-job training increased productivity significantly more than it increased wages. Their research did show, however, that a college degree was beneficial in that college graduates tend to have more access to on-the-job training.

Because Black and Berger designed their research project to correspond closely with a 1981 U.S. De-



UK economics professors Mark Berger (left) and Dan Black have collaborated on several research projects over the past six years. Both admit to having occasional "cordial creative disagreements" in their work together, which, Berger says, is a positive thing: "It helps us focus in on the validity of our findings."

Ally Roughen

The researchers found that the labor force is more female, more technologically literate and more flexible.

partment of Labor study of the American work force, they have been able to compare their findings with the results of that study to determine trends in the American labor force over the past decade. The researchers say one difference is that employers are now looking at the job search and interview process much more closely, since they are more likely to have to give workers a good deal of training after they are hired, and employers want to make sure they'll get a good return on their investment of time and energy.

Berger and Black also found that the labor force is more female, more technologically literate and more flexible. Twenty years ago a young college graduate could get an entry-level position at a large company like IBM and expect to stay with the company, slowly climbing the corporate ladder until he retired, but that is no longer a common scenario, both economists note. Today's college grad is likely to work for at least three different companies before she retires, performing a wide variety of tasks utilizing ever-changing technology, especially in terms of computers. This means those who want to "make it" in the job market must be extremely flexible, something that "bodes well for higher education," according to Black.

"We're in the business of teaching people not only certain disciplines, but also how to think and how to learn," he explains. "An educated work force is one that will find it easier to make the changes that are requisite in business today," Black says.

Berger sees a connection between this need for flexibility and the trend that has been developing over the past five or six years, which shows that college students are moving away from specific fields such as business in favor of a liberal arts education. His advice to current and up-and-coming college students: Develop strong general writing and reasoning skills along with flexible computer knowledge.

Black advises college students to not underestimate the value of summer jobs and internships in their field. As U.S. firms become smaller and more specialized, it is becoming increasingly difficult to get initial jobs with a company, so internships, for

As U.S. firms become smaller and more specialized, it is becoming increasingly difficult to get initial jobs with a company, so internships allow students to get a foot in the door.

example, allow students to get a foot in the door.

Black and Berger's recent work is an outgrowth of a study they did for the Small Business Administration several years ago, surveying various businesses and their training activities. That survey focused on looking for differences in types of training in relationship to the size of the business and also centered on the results of training in different-sized businesses.

What they found in that study was that, typically, smaller businesses tend to conduct more informal on-the-job training (more one-on-one, hands-on work as opposed to highly structured seminars and classes conducted by consultants), and the return on the investment in training was higher for small businesses than for large ones.

As for the future, Black says they will continue their research along these lines. "Training is a hot field," he says, despite the common belief that the U.S. is undertraining its work force.

Black and Berger are currently working to summarize their data from the Upjohn study and publish the results in book form. They hope the book will be useful to business owners and managers. ♦

MARKETING EXECUTIVE
e, NC. Fast growing
ion + sales, public
y - in search of a
ng executive. Send
to:
82, Wall Street Journal
gton Ave, NY, NY 10170

ESS OPPORTUNITIES

e - Principals Only
blished lumber com-
distribution yards lo-
st of the Mississippi
re sales and seven fig-
s. Owner retiring. Pro-
ducer should have four
and able to obtain a
redit line. None other
y.
81, Wall Street Journal
Row, Dallas, TX 75247

ONE BILLION \$
SINESSES FOR SALE BY OWNERS
ufacturing to Small Retail Shops

No Brokerage Fees
To Buy or Sell
1-800-999-SALE

STERN BUSINESS SERVICES, INC.
ATIONWIDE

STRATEGIC

ependent, DataBase
ident, Client/Server
Reporting and Devel-
Tool company seeks
ic partner.

Please call:
(214) 580-1045

SINESS BUYERS
quisition Specialists:
ccess record acquir-
esses locally or nat'lly
ind corp. buyers, total
avail. plus our priv-
pool; over 90% of ac-
s were never listed for

TEN GROUP, INC.
800-487-7866

VEL AGENCY

wn travel agency. This is not a
s sell up travel agencies throughout
We provide a turnkey operation &
aining Call Travel Management
599 Ext. 13 M-F.

NESS FOR SALE

BY OWNERS
il - Wholesale - Mfg.
il Price Ranges
MAN & ASSOCIATES
P.O. BOX 15277
lanooga, TN 37415
1-800-796-5189
IX: (615) 842-1389

ST ONE PERSON
SS EVER. Hottest New
in U.S. P/T no selling
ous immediate & re-
income. Limited areas.
estment.
elebanc 1-800-805-0036

NG POOL CHEM SERV.
- No Exp. Necessary
in - Will Net \$75,000.
Full Amt. Required.
10-544-6004 Debbie

PMENT LEASING
OUR OWN BUSINESS
Training - Hi Income.
ost \$6,750. Mr. Parker
er Leasing Service
56-3234, 800-444-4930

COMMUNICATIONS
n TV. Rare opportunity
alized Mobile radio Li-
\$7000 required. More

Business Finan

Get the financing
the business you
base/directory p
hard-to-find fina-
business purchas-
and expansion lo-
FREE DEMO D

THE ULT MONEY MAKI

The ultimate fun-
creating hundred
nities with
incomes nationwi-

WE ARE S
We urgently need
cated people with
a lot of money.
FEDERAL MUSI
1-800-368-888

DAIRY

Established na-
portunity. Gr
Info. P.O. Box 1
Arkansas 75502

REAL ESTAT

SER
About
MOI

Complete Forec-
Auction Event
Line Computer
A SERIOUS
THE SERIOUS
1-800-90

REAL ESTAT

OCEANFRONT
COMPANY LIQ
Full price \$70,0
tion must sell 35
below market va-
800-230-7294/F

**Real
Bes**

R I
Issue
May

Source: ABC 301/92



Launching Capsules into Inner Space

UK Team Developing Dosage Forms for the Treatment of Drug Addiction

by Jeff Worley

If you've read some recent articles in Kentucky newspapers and national magazines about drug use, you might think victory in the War on Drugs is well on its way to being won. The use of illicit drugs among most segments of the population has declined in recent years, but the number of addicts remains stubbornly steady at nearly six million. Nationwide, according to the National Institute on Drug Abuse (NIDA), 55 percent of AIDS cases among children and 36 percent of hepatitis C cases are linked to intravenous drug use.

The human suffering behind these statistics is unfathomable, and there are other costs. The cost to the health-care system, for example, is only one of the ways society pays for substance abuse—2.3 million hospital days in 1991. Substance abuse is associated with 52 percent of rapes, 49 percent of murders, 62 percent of assaults and half of all spousal abuse cases and traffic fatalities, says NIDA.

While experts argue over which types of treatment are most effective—residential, outpatient group counseling, methadone or others—there is convincing evidence that treatment does work for many addicts. According to a recent article in *Common Cause*

Magazine, one survey that tracked 10,000 addicts over a five-year period found that 75 percent of those treated at outpatient programs and 56 percent of those in residential treatment had stopped using heroin and cocaine.

Successful treatment, of course, demands the use of a drug proven to counter the craving for addictive drugs and a drug-delivery system that is effective and convenient. For the past two and a half years at the University of Kentucky, a team of researchers in the College of Pharmacy have been using their expertise to develop dosage forms for exactly such treatment. Their work, currently focused on the development of tablets to be placed under the tongue, is being supported by a \$2 million grant from the National Institute on Drug Abuse. The contract includes the development of tablets, capsules, oral liquids and injectables.

"In 1991, NIDA published a Request for Proposals, and we were eager to put in our bid to do this work," says Ram Murty, director of pharmaceutical operations in UK's Center for Pharmaceutical Science and Technology, who is heading up this project. "Because of our expertise and facilities, we thought we had a pretty good shot at getting the contract."

The researchers involved in this five-year project are charged with developing, preparing and supplying a variety of stable, safe and effective dosage forms for the treatment of drug addiction.

Co-investigator Anwar Hussain says that the anti-addiction drugs themselves are being supplied by NIDA. "The drug we began working with in October of '91 to develop the sublingual tablets is called buprenorphine hydrochloride," says Hussain, a professor of pharmacy at UK. "It's already been shown to be effective for addiction, so our job is to put the drug in an acceptable form."

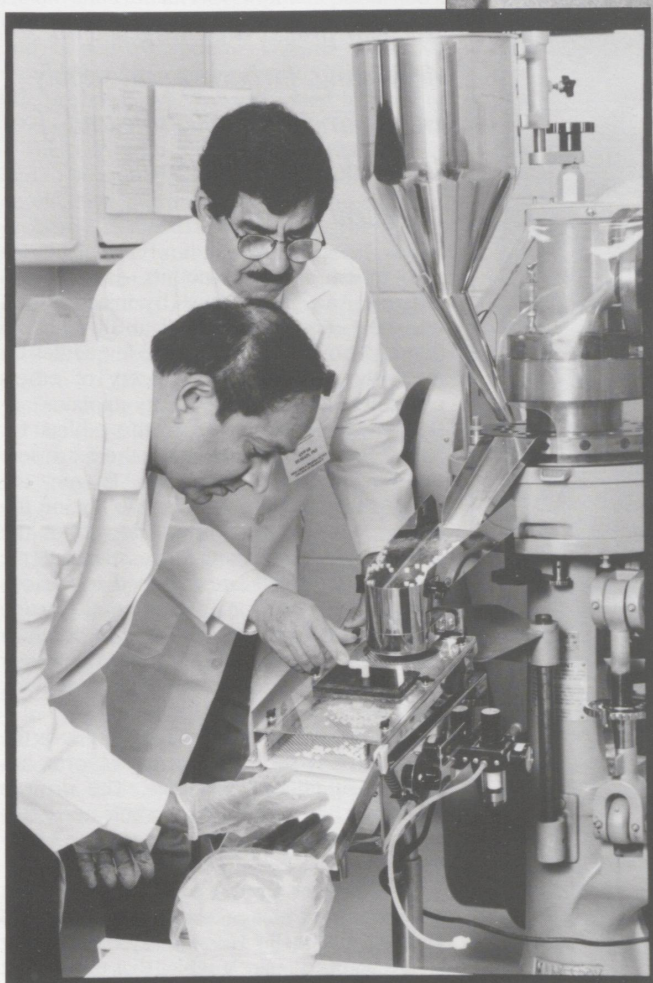
"Acceptable" means that the form of the drug must be convenient and effective. "The way this tablet works," Murty explains, "is that

There is convincing evidence that treatment does work for many addicts.

it dissolves under—the tongue so that the drug is absorbed into the blood-stream in less than a minute.

The drug then docks at different receptor sites known to be specific for the addictive drug—morphine, for instance." In this way, the harmless therapeutic drug tricks the body by imitating the addictive drug.

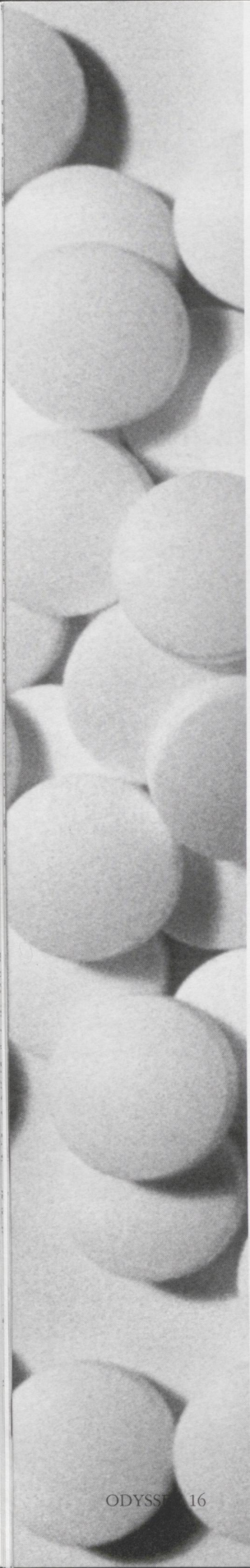
The sublingual form has some definite advantages over other forms of drug-delivery methods. Tablets that are swallowed may break down in the intestine and lose effectiveness before they can get into the blood-stream. Liquid forms have other drawbacks. The drug buprenorphine, for example, has traditionally been used in drug addiction treatment. Different milligram amounts of the drug have been put under the tongue with a dispenser or eye dropper, but quantity con-



Alix Roughen

Ram Murty (in foreground) and Anwar Hussain examine a batch of tablets which are being used in the treatment of drug addiction. This tablet press, located in the Center for Pharmaceutical Science and Technology lab, was purchased several years ago as part of the state's \$20 million bond issue.

continued on page 16



The researchers involved in this five-year project are charged with developing, preparing and supplying a variety of stable, safe and effective dosage forms for the treatment of drug addiction.

trol—measuring exact amounts—is sometimes difficult. And giving drugs by injection has, ironically, not worked well at all with patients. “Though drug addicts use needles on themselves, they are very leery of others using needles on them,” Murty explains.

In their development of the tablets for NIDA, Murty and Hussain say there are several “interesting challenges.” “To me, the most difficult thing is the stability of the dosage form,” Murty says. “How does the active ingredient change over time? If we assume the tablets are exposed to various temperature variations over time, the active ingredient may decompose or lose potency. That’s one of the things we’re paying very close attention to as we develop this delivery system.”

Hussain says the drug’s palatibility, as is the case with any sublingual or liquid form, has been a significant challenge. The drug is extremely bitter, so the researchers needed to add a “sweetening agent” to mask the bitterness.

“Nutra-sweet was an early candidate, but we ended up with a saccharin mix, which has worked very well,” Hussain says. “The point is, we want to make a tablet that the patient won’t resist: We want him to say, ‘Yes, I want to take it.’”

Another crucial consideration, according to the Pharmaceutical Center’s technical staff, is the process of mixing the drug. “When you’re mixing the active ingredient—in this case

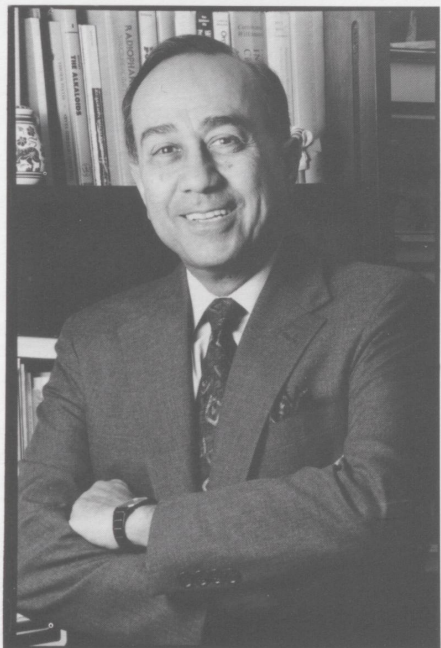
buprenorphine hydrochloride—with other powders that give the tablet its bulk, you want to be sure your active ingredient is evenly distributed,” says Rajinder Matharu, a post-doctoral research associate from Bombay, India. Various blenders and mixers are calibrated to do just that in the lab on the first floor of the pharmacy building. The batch of powder is then placed in a tablet press where the powder is compressed to form a tablet.

“Our facilities here include an automated checkweigher,” Matharu explains, “in order to ensure the uniformity of tablets.” The tablets are then placed in a counter and are bottled by hand. After being bottled, they are sent to various sites in the country for preclinical studies and clinical trials, following Food and Drug Administration guidelines.

Richard Hawks, chief of the chemistry and pharmaceuticals branch of the medications development division of NIDA, is pleased with the partnership between the institute and the University of Kentucky. “College of Pharmacy researchers are making important contributions to the development of a clinically acceptable tablet that can be used in narcotic treatment,” Hawks says. “Kentucky is playing a key role.” Hawks adds that NIDA has only one contract for drug formulation development, and that is with UK.

Murty says that NIDA chose to award the contract to UK based on the expertise available here and the equipment in the Pharmaceutical Technology Unit, much of which was purchased several years ago as part of the state’s \$20 million instrumentation grant.

“This work fits in very well with the mission of our center,” says Thomas Foster, director of the Center for Pharmaceutical Science and Technology, “which is to link up with government and industry to develop new drugs.”



Alix Roughen

George Digenis, professor of medicinal chemistry and pharmaceuticals, estimates that, unfortunately, it will probably be four years before the contraceptive he's developed will be available in drug stores. The contraceptive, in addition to killing sperm, kills the HIV virus.

Digenis Developing Contraceptive That Also Kills AIDS

Another drug development project in the UK College of Pharmacy has been making headlines lately—the creation of a vaginal contraceptive that kills the AIDS virus. This research is being directed by George Digenis, professor of medicinal chemistry and pharmaceuticals and of nuclear medicine. And, as in the case of Murty's and Hussain's work, Digenis responded to a Request for Research Proposals made by a branch of the National Institutes for Health.

"In late 1991, the National Institute of Child Health and Human Development published a request dealing with the design of a substance and its delivery system," Digenis says. "We worked hard here to stage a successful scientific proposal, which was funded in April of 1993."

The request included four parameters that had to be met. The drug developed had to be an effective spermicide with strong anti-HIV properties, it had to establish rapidly effective spermicidal and anti-HIV vaginal levels within a few minutes and maintain these levels for at least six hours, to be non-irritable to vaginal membrane linings, and it had to be "cosmetically acceptable." The NIH has awarded \$1.2 million to UK for three years' research to perfect the contraceptive.

"The decision to work on products that would prevent heterosexual transmission of AIDS was dictated by the availability of funding in this particular area," Digenis explains. "And though homosexual transmission of AIDS is obviously a tremendous problem, our previous research experience here was more appropriately directed toward a vaginal, rather than a rectal, product. Our choice to take on this work doesn't mean we've forgotten the gay community."

In fact, the sharpest increase in reported AIDS cases in the past year, according to recent statistics, was among heterosexual women. The Centers for Disease Control and Prevention in Atlanta cites 9,288 cases last year in the U.S. of people becoming infected with AIDS as a result of heterosexual contact. For men, there was a 106 percent increase, but for women the incidents soared 145 percent to 6,056. Cases attributed to male homosexual or bisexual contact increased 87 percent, from 25,864 to 48,266.

The contraceptive Digenis has developed consists of two drugs: the spermicide nonoxynol-9 and a bacteria-killing agent he

continued on page 18



The sharpest increase in reported AIDS cases in the past year—a 145 percent increase—was among heterosexual women.

would “rather not identify right now” because a patent application is pending. “Nonoxynol-9 has been in wide use for years,” Digenis says. “The thing that got us working in this direction was the discovery in the mid-’80s that in addition to killing sperm, the chemical also kills HIV, the virus that allegedly causes AIDS.”

A recent study of prostitutes in countries where prostitution is legal suggested that excessive application of the drug may actually increase the risk of AIDS transmission by disrupting vaginal cells, creating membrane openings through which the virus could enter the circulatory system.

“As a result of this work, we knew two very important things,” says Digenis. “We knew that much smaller amounts of the drug would be needed to negate its negative effects.” Also, because research has shown that people—especially young people—resist using creams or jellies, the NIH wanted the drug in capsule or tablet form.

Working with Panayiotis Zavos, professor of animal sciences in UK’s College of Agriculture, post-doctoral students and graduate students, Digenis set out to make the capsule. To accomplish this task, the natural form of nonoxaline-9, a thick liquid with the viscosity of honey, had to be changed to a powder; so Digenis did what he terms “complexing” the drug.

“This means we mixed the liquid with a particular polymer, a string of repetitive molecules, that is known to have no pharmacologic activity. The polymer is solid and water soluble. The nonoxynol and the other agent we’re using attain the solid properties of the polymer, and we end up with a solid containing all three components.”

The next challenge was to design a delivery system to keep the drug effective over time. To do this, the researchers developed different “compartments” so that the capsule would be effective within three minutes after insertion and continue its effectiveness for six hours. “We worked hard at developing this,” Digenis says. “And we ended up with a rapidly releasing compartment as well as a compartment that releases pellets at a very slow rate, like cold time capsules.” The separate technology for doing this has existed for some time, he says, but no one had thought to combine the three

“The thing that got us working in this direction was the discovery in the mid-’80s that in addition to killing sperm, the chemical also kills HIV, the virus that allegedly causes AIDS.”

George Digenis

elements. Digenis says that the UK group has a patent pending for this formulation.

So far, the contraceptive’s effectiveness has been demonstrated only in the laboratory. Irritability tests are now being done using rabbits, and Digenis says if all goes well, the first human trials will begin by the end of this summer. Human volunteers won’t be exposed to the AIDS virus; instead vaginal secretions after intercourse will be extracted (“by painless aspirations,” Digenis is quick to point out) and will be separated into two units. One will be sent to Zavos who will test for spermicidal activity and the other will be sent to researchers at Duke University, where the anti-HIV properties will be evaluated.

Digenis says that there has been a fair amount public interest in this work since funding of this project was announced in several Kentucky newspapers last November. “We get a letter or call almost every day,” he says, “from women who want to know where they can get the tablets. Unfortunately, the drug won’t be on the market for a few years yet.” He adds that when it is on the market, it will likely be sold without a prescription and will be affordable—“probably for 25 cents to 50 cents a capsule.”

To achieve that timeline, Digenis and his group are working feverishly. “I hope that with government help we can get this on the market as soon as possible.” ♦

HIV Trials to Take Place in Kentucky

Investigational HIV drugs will soon be tested in Kentucky. This effort is the result of two Kentucky universities along with public and private health practices banding together into a consortium, the Kentucky Consortium for AIDS Research, so that the combined patient base in the state is large enough for the group to successfully compete for significant grants. This coalition includes 14 physicians—one oncologist and 13 infectious disease specialists—from UK, the University of Louisville, Lexington Clinic, Lexington's Central Baptist Hospital and private practices in Bowling Green and Louisville.

"By themselves, UK and U of L, even though they are university centers, do not have enough patients to attract large pharmaceutical grants," says Del Collins, UK acting vice president for Research and Graduate Studies. "However, as a group this coalition now represents about 75 percent of the HIV-positive population of Kentucky and will provide the numbers necessary to be awarded these types of grants." Collins says the consortium will seek grants from drug companies, the National Institutes of Health and AmFAR (American Foundation For AIDS Research), a private foundation.

Because investigational trials have traditionally been awarded to large urban centers such as New York City, Miami, Chicago and Los Angeles, HIV patients in Kentucky have had to travel out of state to receive experimental drug therapies. With no trials being offered in Kentucky, the closest site for Kentuckians wanting to participate in clinical research is the NIH-sponsored program at the University of Cincinnati.

Although UK will act as a data collection point for studies, patients will not be required to come to UK to participate when the project is fully funded. "Eventually we want everything to be run through the office of a physi-

cian who is participating in the coalition," says Richard Greenberg, UK associate professor of medicine. "UK support staff will collect data so that clinicians will be able to focus on the care of their patients and will not have to fill out forms and keep study records." He adds that because many patients are too ill to travel, the consortium members want to provide investigational drugs to patients in their own communities.

Figures collected in November of 1993 by the UK Division of Infectious Disease indicate there are more than 1,400 HIV-positive patients living in Kentucky. The new consortium hopes to be named to participate in a study of a new drug which researchers think may be as effective as AZT, currently the frontline treatment for HIV disease.

"We envision this drug being used with AZT as a double treatment or as a single treatment by patients who cannot tolerate the side effects associated with AZT. Right now it looks like the combination of AZT and the new drug will work together better than either one alone, but clinical trials are necessary to confirm this," says Greenberg. People who are HIV-positive, asymptomatic, age 18 or older, and have never taken AZT or have taken it for less than two years, will be eligible to volunteer for the trial.

Greenberg says the consortium welcomes participation by more physicians; interested physicians can contact him at his UK office. "This will be a statewide project," Greenberg says. "Its success will be linked to providing a workable arrangement for physicians who are the primary caregivers for HIV patients."

—Barbara Greider

HONORABLE MENTION

Impact and Achievements of UK Graduate Program Alumni

compiled and edited
by Susan Hodgetts Stempel

Robert Kendall Broadbent,

M.S., Animal Sciences, '62, owns and operates a 2500-acre farm in Princeton, Kentucky. He reports that he is presently growing over 100 acres of trees and shrubs for his business—Broadbent Farms and Nursery. As a graduate student at UK, Broadbent worked with Dr. Charles Barnhart on cattle and swine research.

Ann Truitt Hunsaker (formerly Ann Woodruff Truitt),

J.D., Law, '67, has been named to the *Best Lawyers in America* 1993-94, and to *Who's Who in Health Care*, and *Who's Who among Business Women* by the *Cincinnati Business Courier*. The Lexington native, who resides in



Ann Truitt Hunsaker, a Lexingtonian now living in Cincinnati, was chief counsel to the Health Care Financing Administration under President Reagan.

Cincinnati, served as chief counsel to the Health Care Financing Administration under President Reagan. Now associated with Graydon, Head and Ritchey in Cincinnati, Woodruff earned her undergraduate and graduate degrees at UK.

Barbara F. Haus,

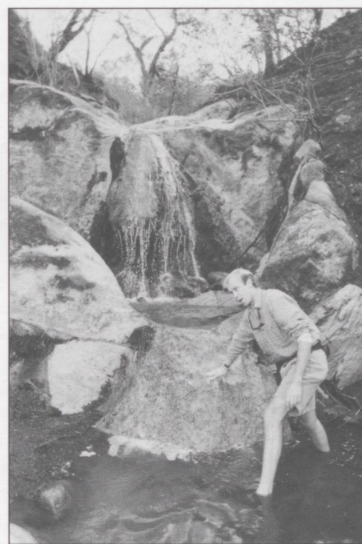
M.S.N., Nursing, '72, went on to earn an Ed.D. from Lehigh University. An associate professor of nursing at West Chester University in Pennsylvania, she served as chair of the Commission on Nursing Education between 1991 and 1993. Her activities include work with the American Cancer Society on its public education committee and with the American Heart Association as a CPR instructor.

Alvin Maurice Simmons,

M.S., '83, Ph.D., Agriculture, '87, is a research entomologist at the USDA-ARS, U.S. Vegetable Laboratory in Charleston, South Carolina. His research involves working to develop alternatives to traditional pesticides for managing insect pests of vegetable crops. Originally from New Bern, North Carolina, Simmons resides in Charleston, South Carolina.

Lee Kats,

Ph.D., Biology, '89, spends a lot of time standing, ankle-deep, in brisk, cold streams in the Santa Monica Mountains, studying the life of the California newt, a kind of salamander. "I get so into it I don't even think about the fact that my feet are cold," says Kat, a Pepperdine University natural sciences professor who has been studying amphibians at Cold Creek Canyon Preserve near Malibu for three years. Recently featured in the *Los Angeles Times*, Kats lives on the Pepperdine



Los Angeles Times photo by Alan Duignan

Lee Kats lists among his accomplishments his ability to mimic tree frogs so well that some frogs mistake him for a rival and charge.

HONORABLE MENTION

campus and is known for his ability to mimic tree frogs so well that tiny male tree frogs sometimes mistake him for a rival and charge. Understanding the creatures of the California landscape is important, Kats says, and he intends to stay in that area. This summer his students will be helping him as he heads back out to Cold Creek to check his research sites.

W. David Hager,

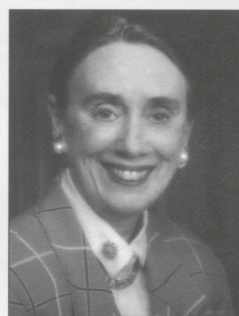
M.D., Medicine, '72, has a private obstetrics and gynecology practice in Lexington, Kentucky. Formerly president of the Kentucky OB-GYN Society, he is also chair of the Kentucky Medical Association CME Council. As a student at UK, Hager worked with Professors Steve Zwirik, John L. Durhing, and John van Nagell, all in the Department of Obstetrics and Gynecology. In addition to his many community and professional activities, Hager has published extensively, including authoring a textbook titled *Infection Protocols in Obstetrics and Gynecology*. He has also delivered over 3,500 infants. Hager, his wife Linda Carruth Hager, and their three children—Philip, Neal and Jonathan—reside in Lexington.

Deborah R. Turner,

Ph.D., Agriculture, '71, D.M.D., Dentistry, 1976, lives in Farmington Hills, Michigan, where she is a pediatric dentist at the Hawthorn Center. She is also affiliated with the School of Dentistry at the University of Detroit. The Indiana native had a doctoral-year fellowship while pursuing her Ph.D. at UK, working with Professor Richard Chapman in plant pathology.

Ann Stuart,

M.A., English, is managing a \$13 million budget, a 113-person faculty and 2,100 students in her role as president of the Hartford Graduate Center, a nonprofit center for adult education and professional development in Hartford, Connecticut. The center is a branch of the Rensselaer Polytechnic Institute in Troy, New York. Stuart, a native of Kentucky, was previously provost and vice president of academic affairs for Alma College in Alma, Michigan. She is the author of several books and manuals on specialty writing and from 1962 to 1989 was at the University of Evansville, where she was a tenured professor and served two terms as assistant dean of the College of Arts and Sciences. Early in her career she taught at Bourbon County High School in Paris, Kentucky, and at Henry Clay High School in Lexington. She and her husband are the parents of three grown children.



Ann Stuart, a Kentucky native, is a former college provost and vice president, and the author of several books on writing.

Orson Oliver,

J.D., Law, '68, is president of the Bank of Louisville. Oliver worked with the Department of Treasury in Washington, D.C. before taking his present position. His undergraduate degree is from Eastern Kentucky University.

Betty Rice Yung,

Ph.D., Spanish, '76, is a grants specialist and a clinical associate professor at the School of Professional Psychology at Wright State University in Dayton, Ohio. The Paintsville, Kentucky, native has had a great deal of success as a grants writer, bringing more than \$10.5 million into the Dayton community. She has also authored numerous scholarly publications, including an article on minority youth violence in the *American Psychologist*.

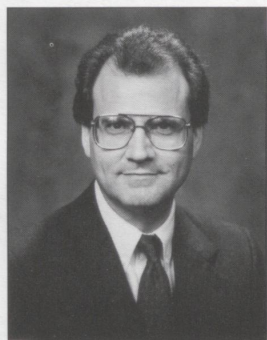
HONORABLE MENTION

Shirley C. Browning,

M.S., Agricultural Economics, '67, continued her education at the University of Connecticut, earning a Ph.D. in 1971. Originally from Wallingford, Kentucky, Browning is professor and chair of the Department of Economics at the University of North Carolina in Asheville.

Dan Jaco,

M.A., Communications, '71, is chief executive officer for the Missouri Patient Care Review Foundation in Jefferson City, Missouri. After receiving his master's degree at UK, he earned an M.S.P.H. at the University of Missouri-Columbia, where he was awarded an American Cancer Society Scholarship. After working for the Missouri Hospital Association, Jaco accepted a regional director position with the foundation, was later named deputy director, then director of operations, before becoming CEO in 1988.



Dan Jaco, while a graduate student at UK, worked on a project focused on communication and modernization in Appalachia.

As a student at UK he had an assistantship under Phil Palmgreen and Lewis Donohew, and worked on a project concerning communication and modernization in Appalachia.

Carla J. Stoffle,

M.S.L.S., Library Science, '69, has been dean of libraries at the University of Arizona since 1991. The Colorado native was previously deputy director and associate director for public services at the University of Michigan Library in Ann Arbor. Shortly before coming to UK for graduate work, Stoffle was a Peace Corps volunteer in Barbados, where she developed a high-school library and helped to set up the World Health Organization Nursing School Library. During her academic career, she has received numerous awards and has served as president of the Association for College and Research Libraries; she was named ACRL Academic Librarian of the Year in 1992 and the ACRL Bibliographic Instruction Librarian of the Year in 1991.

Doak Schulte (Steven D. Schulte),

M.B.A., Business and Economics, '80, is president of Time Services in Cincinnati, Ohio. Schulte, originally from Bellevue, Kentucky, rose through the

ranks of computer marketing and now owns 50 percent of Time Services. As a UK graduate student, he worked with Dr. Clayton Paul in electrical engineering. Prior to settling into his current career, he served in the Peace Corps between 1981 and 1983 in the Philippines. Schulte reports that it was there he married the former Dolores A. Dasmariñas on Easter Sunday in 1983.

Tom Hammond,

M.S., Equine Genetics, '69, says he came to UK "with the intention of getting a bachelor's degree and working as someone's farm manager and starting my own breeding farm." Now a nationally known commentator for NBC on horse racing, football, basketball, figure skating, diving and track and field, Hammond got his start in the television industry when he took over "a lucrative \$35 a week job" doing a 15-minute nightly broadcast on local TV, reporting racing results from around the country. Hammond also owns a major share of Hammond Productions, Inc., a Lexington-based company which produces several weekly syndicated shows on horse racing.

Kristine K. Forney,

M.A., Music, 1974, Ph.D., Fine Arts, '78, is a professor of music at California State University in Long Beach. During her studies at UK, she was a graduate teaching assistant and an instructor. She was also the recipient of a UK Haggin Fellowship, a Summer Graduate Fellowship and a Dissertation-Year Fellowship, as well as a Belgian American Educational Foundation scholarship. As a graduate student, she worked with Professor Wesley K. Morgan on

HONORABLE MENTION

an anthology of music. In her academic career she has published numerous scholarly articles on Renaissance music, two editions of Renaissance music of two volumes each, and a leading textbook on music appreciation, titled *The Enjoyment of Music*. She is married to former UK faculty member William F. Prizer, who is a professor of music at the University of California, Santa Barbara.



Among Kristine K. Forney's many publications is a leading textbook on music appreciation titled *The Enjoyment of Music*.

George L. Whitmer,

M.S. Entomology, '68, and his partner launched a successful environmental engineering and consulting firm in 1991. The firm assists private industry, including major manufacturing industries, in obtaining permits and in meeting the environmental regulatory requirements of local, state and federal government. Having retired from the U.S. Army Reserve after 25 years as a colonel, he says his military career has taken him to 10 foreign countries on four continents. A North Carolina native, Whitmer currently resides in Jacksonville, Florida.

Charles W. Hartwig,

M.A., Ph.D., Patterson School of Diplomacy and International Commerce, '75, is chair and associate professor of the political science department at Arkansas State University in Jonesboro and is president of the Arkansas Political Science Association. He has also received a Fulbright grant which supported a lectureship in Liberia, West Africa, where, 20 years earlier, he had been a Peace Corps volunteer. The Fulbright experience was similar to Hartwig's experience as a child when he had gone to Germany at the age of 12 with his father, who had received a Fulbright. Following in their father's footsteps, Hartwig's 12-year-old daughter and nine-year-old son accompanied him to Liberia during his Fulbright year.

Veena Burry,

M.S.L.S., Library Science, '69, has had a busy, diverse career and life. Currently an adjunct professor at Fordham University and a teacher specialist in the New York Teacher Centers Consortium, for a number of years she juggled roles as an English teacher, the owner/designer in a hand-woven clothing business, a weaving teacher, and the mother of three children. In 1992 she was elected to *Who's Who among America's Teachers* and selected as the recipient of a National Endowment for the Humanities grant to study at the Bank Street College of Education in New York City.

William E. Seale,

M.S., Ph.D., Agricultural Economics, '75, is a professor and the chair of finance at George Washington University. Early in his career he was a legislative assistant to Senator Walter D. Huddleston, then a vice president of Commodity Exchange, Inc. in New York City and, for five years, he was a commissioner on the U.S. Commodity

Futures Trading Commission. Regarding his current position at G.W.U., Seale reports that the school has over 1,500 students in the M.B.A. program, 600 of whom concentrate in finance. The Lexington native makes his home in McLean, Virginia.

Paul G. Barash,

M.D., Medicine, '67, is chair of the Anesthesiology Department at Yale University Medical School. A prolific author, Barash has also served as associate dean for clinical affairs at Yale and was president of the Society of Cardiovascular Anesthesiologists from 1985 to 1987. Barash makes his home in Orange, Connecticut.

Mary Lynn Kays Bergsten,

M.A., Music, '68, is the organist and music associate for Fairhaven Church in Dayton, Ohio. The Lexington native

continued on page 24



Mary Lynn Kays Bergsten, a Lexington native, founded the Kettering Children's Choir, which performed at the Mozart Festival in Salzburg, Austria, in 1991.

HONORABLE MENTION

founded the Kettering Children's Choir in 1986 and serves as its co-director. The choir has performed in Salzburg, Austria, as part of the Mozart Festival in 1991 and gave a concert in 1993 at the National Cathedral in Washington, D.C. Bergsten reports that she and 53 members of the 82-member choir headed off to England in March of this year for a concert in Westminster followed by an Easter concert in Coventry. The choir members traveling with her, and 20 chaperones, ranged in age from 2 to 15. Bergsten also designed and supervised the construction and installation of a 55-rank, four-manual Zimmer pipe organ for the Fairhaven Church in 1988.

Jack W. Simpson,

M.S., Electrical Engineering, '66, has been appointed as group president of Scientific-Atlanta's Network Systems Group businesses and a senior vice president of the corporation. He reports to James F. McDonald, president and CEO and another graduate of the UK College of Engineering [see "Honorable Mention" in *ODYSSEY*, Vol. 11, No.2]. Simpson has more than 30 years' experience in the information and communications industries and is a member of the board of directors of Bank One of Dayton, Ohio.

Woody McGraw, Jr.,

M.S.C.E., Engineering, '66, is chief architect for the HUD office in Louisville, Kentucky. His current responsibilities include overseeing all multi-family and single-family design and construction in Kentucky for structures insured by the federal government. He has also been a dam designer for the U.S. Army Corps of Engineers.

Annie V. Saylor,

M.S., Ph.D., Mathematics, '79, is manager and co-owner for Simulation Technologies, Inc., a small research and development firm in Huntsville, Alabama. Originally from Harlan County, Kentucky, Saylor has also been an assistant professor of mathematics at the University of Alabama, Huntsville. She has been working as a modeling and analysis engineer for over 12 years. She says her company celebrated 10 years of doing business with the Department of Defense in 1993, and she is presently involved in research in simulation of radar environments. A prolific author, she has received numerous honors for her professional and her volunteer work. The Governor of Alabama named May 12, 1992, as "Dr. Annie Saylor Day."



Annie V. Saylor, originally from Harlan County, Kentucky, is manager and co-owner of Simulation Technologies, Inc., a small research and development firm in Huntsville, Alabama.

Alumni of any of UK's graduate programs are invited to complete the information form on page 25 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: _____

Address: _____

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?:
(include additional pages if needed) _____

Any other information you would like us to have: _____

Current Date: _____ Your Signature: _____

Would you like to be added to the *Odyssey* mailing list? ☐ Yes ☐ No

If you **do** want to be added to our mailing list, please indicate your mailing address:

Thanks for letting us know about you. Please mail or fax this form to:

Odyssey Magazine
404 Kinkead Hall
University of Kentucky
Lexington, KY 40506-0057
or
FAX to (606) 257-8298

ODYSSEY

ODYSSEY

KIOSK

Bug Love?

The title of Andrew Sih's National Science Foundation grant suggests that he's studying something perhaps only a scientist could love: "The Influence of Competing Demands on the Mating Dynamics of a Semi-aquatic Insect." Yet the University of Kentucky biology professor says he's really exploring a subject non-scientists will easily recognize.

The battle of the sexes.

Since 1990, Sih has been researching the sex lives, mating habits and survival skills of the waterstrider, a species of insect that inhabits streams and ponds. "Most people have seen them skating across the surface of the water," he says. He selected this particular insect as the focus of his study partly because it lives in a small self-contained environment and because male-female relationships among waterstriders are played out in very simple terms.

"Male waterstriders spend all their waking hours trying to mate with anything they see," he says. "Females almost always resist extremely heavily." Their reluctance is partly due to the fact that they feel the need to mate about once every three weeks, not nearly often enough for the average male. This results in life becoming a sexual gauntlet for the female waterstrider. "She'll get accosted and harassed by males once every minute or two."

The focus of Sih's research is discerning ways the insects adjust their behavior, particularly their mating behavior, with regard to changes in their environment, such as the presence of predators, male-female ratio and the availability of food. "We have found that their general behavior and in particular their mating behavior is very flexible," he says. For example, the struggles that en-

sue when the male wants to mate can attract the attention of predatory spiders and fish. The striders may be less likely to call such attention to themselves if they know a predator is nearby. "Even something as apparently simple as an insect shows very sophisticated changes in their behavior in response to the specific environmental situation," he says.

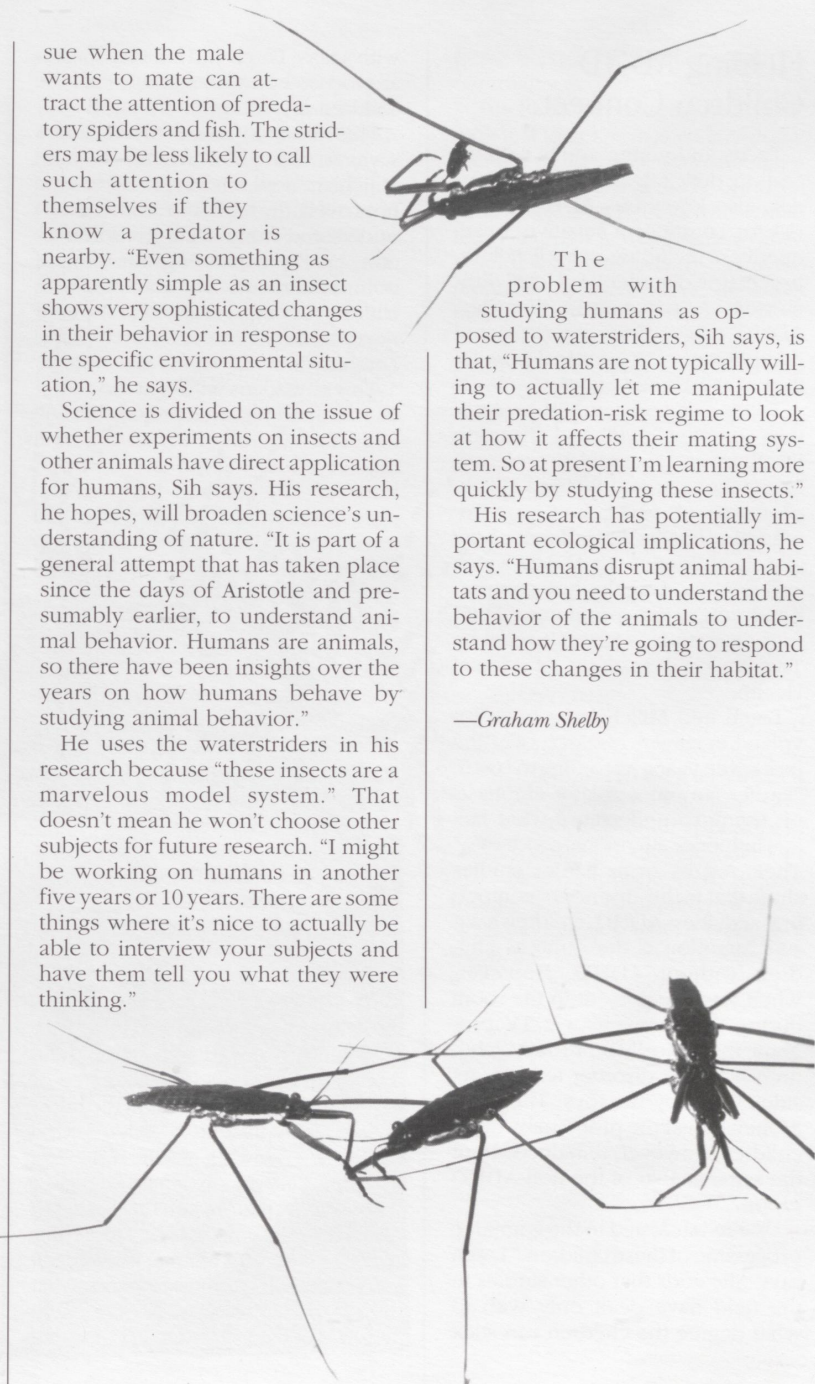
Science is divided on the issue of whether experiments on insects and other animals have direct application for humans, Sih says. His research, he hopes, will broaden science's understanding of nature. "It is part of a general attempt that has taken place since the days of Aristotle and presumably earlier, to understand animal behavior. Humans are animals, so there have been insights over the years on how humans behave by studying animal behavior."

He uses the waterstriders in his research because "these insects are a marvelous model system." That doesn't mean he won't choose other subjects for future research. "I might be working on humans in another five years or 10 years. There are some things where it's nice to actually be able to interview your subjects and have them tell you what they were thinking."

The problem with studying humans as opposed to waterstriders, Sih says, is that, "Humans are not typically willing to actually let me manipulate their predation-risk regime to look at how it affects their mating system. So at present I'm learning more quickly by studying these insects."

His research has potentially important ecological implications, he says. "Humans disrupt animal habitats and you need to understand the behavior of the animals to understand how they're going to respond to these changes in their habitat."

—Graham Shelby



Helping ADHD Children Connect

Teens and young adults with attention deficit hyperactivity disorder, also known as ADHD, are at risk for a number of negative consequences, including school failure, psychiatric disorders and legal difficulties. A psychiatric disorder, ADHD now affects an estimated five percent of the general population in the United States.

To try to understand more about this complex childhood disorder, Elizabeth Lorch, associate professor of psychology, and Richard Milich, professor of psychology, are researching factors that influence how closely children with ADHD watch and how thoroughly they comprehend television programs. Their four-year study is being funded by The National Institute of Mental Health.

Lorch and Milich have been involved in similar research over the past seven years. According to Lorch, "Earlier we put a greater emphasis on trying to understand what factors influence attentional processes." Their results from earlier studies show that in the absence of competing activities ADHD children's visual attention is the same as children without ADHD. However, when toys are present in the room during the showing of a TV program, the typically more active children with the disorder tend to get sidetracked by the toys. The comprehension of the program by these children, however, remained about the same as that of the non-ADHD group.

"We're interested in the cognitive processing of these children," Lorch says. She adds that other studies in the field have dealt only with to what degree the children can stick

with a task; Lorch and Milich's studies are focused on discovering what the children are comprehending.

This research has evolved, Lorch says, to the point where she and Milich are now working to determine how well the children with ADHD understand more complex information. "We're expanding our view of comprehension to also include children's comprehension of the connections between events in a story," Lorch says.

This new focus will be at the center of a two-part research project that will begin this summer. The first stage will involve observing the attention patterns of 120 children between the ages of seven and 12 in a controlled environment. Half of the children will not have the disorder, and half will have been diagnosed with ADHD. Each child will be asked to watch a 25-minute segment of a family-type situation comedy, *Growing Pains*, and will be told they will be asked questions about the story following the program. There will then be a short break. Afterwards, the child will watch a second 25-minute segment of the same program, but this time toys will be available while the program is running to present the child with an "attention option."

Research assistants will record each child's responses—when he or she looks at the TV screen as well as when the child looks away. In this way it can be determined—by later matching the child's answers about the program to his or her degree of attentiveness at the moment the information was presented—whether the child was viewing at the time the information was presented.

A unique feature for this research group is that girls will be studied as well as boys. This change is the result of a new NIH policy requiring that more females be included in research it funds. "The NIH doesn't say that

half the subjects studied must be girls," Lorch says, "only that girls must be studied. We think this is an exciting development. Since there are few previous studies to compare our work to, we'll be doing groundbreaking work." Boys have previously been the focus of such studies because ADHD is diagnosed four times more frequently in boys than in girls.

The results of their research, Lorch says, will have implications in terms of peer communication and school performance. "How many misunderstandings and inappropriate responses occur among children because of a child's inability to connect two events in time?" Milich asks. Both researchers also point out that their work, in its focus, is consistent with the principles behind KERA—an emphasis on the learning process rather than rote learning.

—Kathy Larkin

Defining Mental Disorder

When is a mental disorder not a mental disorder?

When the American Psychiatric Association says it's not.

The question of defining mental disorders is researched, reported on, and sometimes hotly debated by the APA every few years when it publishes the *Diagnostic and Statistical Manual of Mental Disorders*, or *DSM*. University of Kentucky psychology professor Thomas Widiger served on the task force for *DSM-IV* and found himself refereeing a bitter battle between different factions of the mental-health community.

Controversial issues arise with each publication as scientists clash

KIOSK

over what will be classified as a disorder. This time, the fight centered around Pre-Menstrual Dysphoric Disorder. Widiger describes PDD as a rare and very extreme version of Pre-Menstrual Syndrome; its symptoms include severe irritability, anxiety and mild forms of depression.

The dispute surrounding PDD focused on how it should be classified and the potential consequences of that classification to women. Whether or not the profession refers to this condition as a mental disorder is very important, Widiger says: "These decisions that are made in this book have tremendous social repercussions." The standards set in the *DSM* volumes, which are revised roughly every seven years, can influence court cases, public policy, insurance coverage and social attitudes.

Most psychiatrists will acknowledge the existence of PDD, Widiger says. And many felt that if the existence of the disorder is not widely disputed, it should be cited in *DSM-IV*. Others, including the American Psychiatric Council of Women, argued against its inclusion, partly because PDD is difficult to diagnose. Widiger says that at the clinical level, "It's very difficult to differentiate reliably from normal PMS. Therefore, if it was included in *DSM-IV* as a recognized mental disorder, it would probably be misdiagnosed and likely

overdiagnosed."

That result could have social implications for women. "We also know from a lot of research, that PMS is a major source of stigmatization of women. It would not be unusual for those who don't really understand anything about PMS or the menstrual cycle to attribute a woman's anger or irritability at some time as being due to PMS," Widiger says. "It would obviously add to any sort of stigmatization and social discrimination to

have a mental disorder which is an ex-

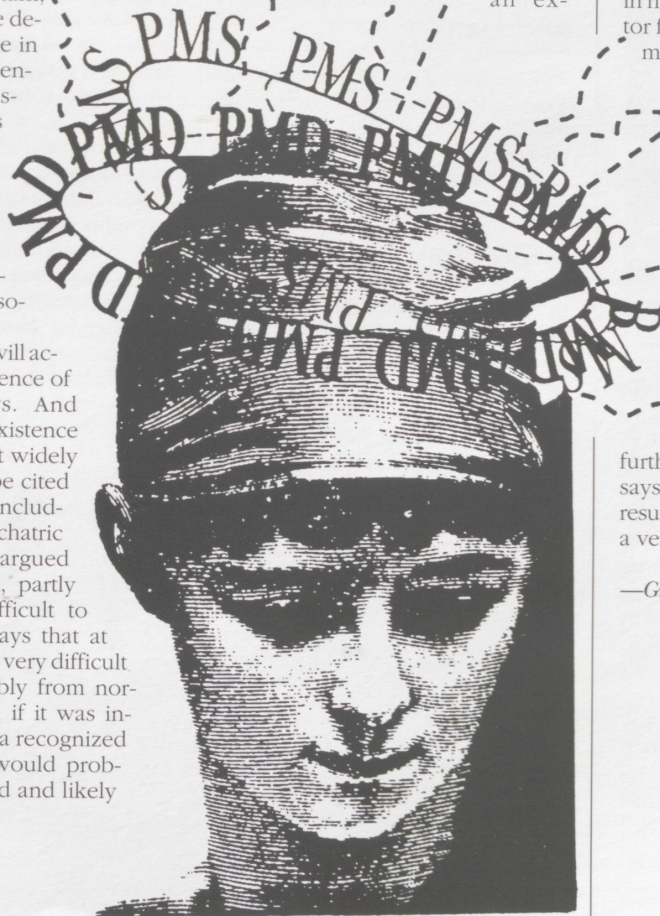
treme version of this that would be overdiagnosed."

The likely overdiagnosis of PDD, which Widiger says is widely documented in research, was one major reason women's groups opposed PDD's inclusion. He says what would likely happen is that many women would be told incorrectly they were mentally ill three days of every month.

Widiger says he understands both points of view and doesn't have a firm conviction on the issue. His neutrality perhaps served him well in his capacity as research coordinator for *DSM-IV*. He had to review all materials submitted for the edition and ensure that all claims were supported with empirical, scientific evidence. "My job as research coordinator was essentially to keep everybody honest and open," he says. "Very few scientists are really objective."

The APA finally decided to include PDD in the book, but not to list it as a mental disorder. Widiger says PDD is in an appendix to *DSM-IV*, one designed to list proposals that require further study. Ultimately, Widiger says, neither side lost or won. As a result, "No one's happy," he says. "It's a very difficult situation."

—Graham Shelby



NIH Awards UK \$5 Million Head Injury Grant

The University of Kentucky College of Medicine has received a program project grant from the National Institutes of Health (NIH) for almost \$5 million to study ways to improve recovery from severe brain trauma. Over the next five years, a multidisciplinary team of 20 researchers will investigate biological and physiological factors which can negatively affect survival rate and quality of life after severe head injury. They also will study whether the biochemical environment can be enhanced by growth factors to improve outcome.

Brain injury of all degrees of severity is estimated to affect more than 500,000 Americans each year. The long-term results of severe brain injury are tragic for both head injury patients and their families because head trauma often results in long-term substantial intellectual and physical impairment. The NIH grant will fund five individual projects including one clinical study involving the effect of a new therapy on head injury patients, two studies of mechanisms of brain injury and two studies of the mechanisms of systemic injury.

Byron Young, professor and chair of surgery in the UK College of Medicine, will direct the program project grant and a team of researchers from within the UK Colleges of Medicine and Pharmacy.

"Once the primary brain injury occurs, a cascade of secondary events takes place throughout the body," he says, "resulting in injuries to the intestines, liver and lungs. We

know that improvement occurs for a period of about one to one and a half years in patients who survive severe head injury. We want to arrive at treatments which will help more people to survive and to minimize initial trauma and secondary injury. Perhaps more importantly, we want to optimize their chances for maximum improvement."

—Barbara Greider

Improving Farm Safety and Health

"Farming Injuries Up First Half of Year." "Farmer Paralyzed in Fall from Barn." "Teen Killed When Tractor Overturns."

These headlines, which appear with depressing regularity in Kentucky newspapers, point to an increasing need to understand—and work to prevent—the hundreds of farm-related injuries and the 35 to 40 deaths that occur every year on Kentucky's 91,000 farms. Funded by nearly \$4 million in grants, the University of Kentucky has launched a major drive to bolster health awareness and reduce machinery-related farm injuries in Kentucky and seven other Southeastern states.

To many of us taking a leisurely drive through the country, the rolling farm fields and picturesque barns and outbuildings lead us to view the farm as a haven of peace and tranquility. Not so, says Robert McKnight: "Too often farms come to resemble combat zones, where farmers and their families lose limbs and sometimes their lives."

McKnight, a UK epidemiologist who is directing the five-year project, says work has been underway since the fall of 1992 to develop programs to make farm families more sensitive to farming risks. "Unlike mining, which has regulatory rules set by the Mine Health and Safety Administration, there are very few guidelines for occupational health and safety in agriculture," he says.

One result of having these stated guidelines may be that the number of deaths in mining has gone down considerably over the past 10 years, while deaths in agriculture have not statistically decreased nearly as much. In 1990, for example, 39 Kentucky farmers died in farm accidents. That is almost double the 20 miners killed in state mining accidents that year. Mine deaths in Kentucky went from 34 in 1984 to eight in 1992.

One part of this overall study, focus-



Alex Roughen

ing on farm women, is in its third year. "We feel that farm women are an untapped resource as a means to preventing disease and injury for the entire farm family," McKnight says. "Farm women tend to already have a lot of knowledge and power in terms of dealing with family nutrition, so we thought, 'Why not work to extend this into the related areas of health and safety?'" Beginning with a core group of 12 women who were trained to be advocates for health and safety on their farms, this part of the project is in full swing. "The idea is that these women become experts in specific health and injury problems, then teach other farm women," McKnight explains. "It's an informal networking system." Researchers from Western Kentucky University and UK are working together on this part of the project.

Another phase of this project has just gotten underway with a Kentucky farm health survey, which will give the researchers information on health conditions and injuries of Kentucky farm families. This survey will be conducted in 60 of Kentucky's 120 counties and will be targeted to four major groups: older farmers (over age 55), women on farms, children on farms, and farmers with off-the-farm jobs.

"There's no retirement age in farming," McKnight explains. "And the nature of the work means a lot of climbing up on machinery or in barns. We want to look at the condition of stairs and ladders, the type of footwear people have who do a lot of climbing. Some older farmers get up in some high places and may get dizzy, especially if they're taking drugs for medical problems. Among the over-80 age group, unfortunately, there's a high mortality rate for hip fractures."

McKnight says that two UK teams will be conducting this survey—a physical-exam team including a doctor and a medical assistant, and another team which will include an industrial hygienist and an agricultural engineer. The researchers will be "traversing the state" in a "self-contained" motor home, he says.

The project's cornerstone is a \$1.6 million grant from the federal Centers for Disease Control to establish a Southeast Center for Agricultural Health and Injury Prevention at UK. Researchers will focus on ways to reduce farm health and safety risks in Kentucky, Tennessee, Mississippi, Alabama, Florida, Georgia, and North and South Carolina. Overall, nearly 30 UK researchers will be involved in the project.

In all phases of this initiative, prevention is the key, McKnight says. "The challenge is to help people reduce risks. We need to get people talking to one another. We need to get more people involved."

Strawberry Fields Forever

You take one bite, and your mouth explodes with pleasure. RedChief, Quinalt, Tennessee Beauty... Whatever name it goes by, the strawberry is probably the best-loved fruit in the U.S.

In Kentucky, strawberries are relatively easy to grow and to maintain, according to UK horticulturist Doug Archbold, who has spent over 10 years studying numerous types of strawberry plants. "Though there aren't any widespread insect problems, we do see some occasional things. Tarnished plant bugs can feed on the fruit when it's first developing, and the strawberry clipper may damage developing flower buds, but none of these problems are wide-



spread," Archbold says.

Perhaps the most common enemy, he says, is not an insect but a spider—the mite. "We usually see these in the summer months," Archbold explains, "when it's very hot and dry. Mites feed on the leaves, which becomes a problem when the mite population is high." Mites are nearly invisible in two ways—they usually attack the underside of the leaf and they're tiny. A mite is about half the size of the period at the end of this sentence.

How best to fight the mite? "In some pest management programs, predator mites have been used successfully," says Archbold. He explains that these mighty mites don't attack the plant but do eat their smaller plant-eating cousins.

Two strawberry problems that

continued on page 32

KIOSK

are fairly common, says Archbold, are leaf spot and leaf scorch. When attacked by fungi, the leaves may turn yellowish or yellowish red. "A fungicide application a couple of times in the summer might be enough to control this," says Archbold, who adds that the best way to keep plants healthy and producing over the years is to add the right amount of nitrogen—and at the right times.

Archbold is currently doing research on exactly this problem. Funded by the North American Strawberry Growers Association, he has been working with U.S.D.A. agronomist Charles MacKown to try to find out how nitrogen can best be utilized by the strawberry plant. This work is of particular relevance to Kentucky agriculture, since strawberry production in the state is valued currently at \$2.5 to \$3 million per year.

"There isn't really much known about how the strawberry plant uses nutrients," Archbold says. "In part, because the strawberry is very shallow-rooted, a lot of the nitrogen fertilizer given to the plant is leached out of the root zone; the plant never gets it." "Leached out," Archbold explains, means that rainfall or irrigation water pulls the fertilizer below the root system. Not only is the fertilizer wasted, but there's also the agricultural concern about chemical contamination of ground water.

In research at South Farm, just south of Lexington, Archbold has been working to determine exactly how much nitrogen is reaching the strawberry plant. Using a chemically altered type of nitrogen which can be detected and tracked, Archbold was able to find out that individual plants were getting only five to 10

percent of the fertilizer placed alongside the plants. "This is a very poor rate," says Archbold, who adds that most of the nitrogen put down probably goes to feed the weed population.

Now Archbold and several UK graduate students are trying to find out the requirements of the plant for nitrogen. "Basically, we're trying to discover how nitrogen is handled by the plant. For example, does it use nitrogen equally at all times during the year, or are there times when it requires more fertilizer?" In this work, the researchers are comparing fruit-

ing versus non-fruiting plants and nitrogen-rich versus nitrogen-deprived plants.

Archbold's work may well lead to future recommendations concerning methods of nitrogen fertilization as well as new systems of timing for optimum use of nitrogen. "There's really very little known about the biochemical aspects of nitrogen use by the strawberry plant, so that's where we're headed with this work."

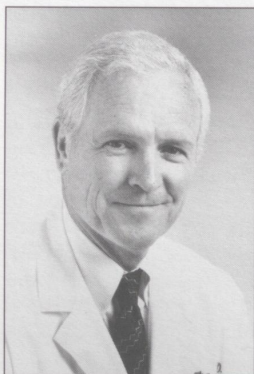
The results could be beneficial not only for the small-time backyard grower, but for Kentuckians who depend on the crop for a significant part of their annual income.

Kudos to Three UK Researchers

Three University of Kentucky professors have recently received recognition, in the form of awards and grants, for their work. David Wilson, professor of pediatrics and associate dean for academic affairs of UK's College of Medicine, was given the prestigious Education Achievement Award; chemistry professor Steven Yates received a \$290,000 grant from

the National Science Foundation; and Herbert Fertig, assistant professor of physics at UK, was awarded a \$30,000 Sloan Research Fellowship.

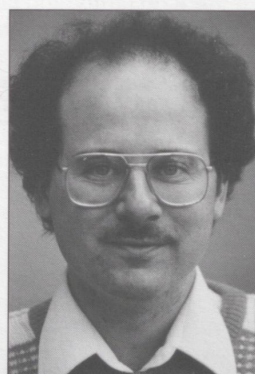
Wilson, who received the award from the Kentucky Medical Association, is project director for a \$2.5 million Robert Wood Johnson grant awarded to UK in 1992 to develop a new medical curriculum. The new



David Wilson



Steven Yates



Herbert Fertig

curriculum emphasizes early development of clinical skills and patient contact, integration of the basic and clinical sciences, and a new focus on self-directed learning and problem solving. Wilson has received numerous awards for his teaching, and is a recipient of the UK Alumni Association Great Teacher Award.

Yates is being funded by NSF to conduct research into the fundamental properties of atomic nuclei. The grant represents the first of three years of expected funding from the foundation, and enables Yates and his colleagues to continue a line of research they have been pursuing for more than a decade. "Basically what we do," says Yates, "is examine the shapes of atomic nuclei by scattering neutrons. If you can understand the shapes, then you can understand how the nucleus is put together."

Fertig, one of 100 Sloan Fellows this year, is involved in researching the physics of materials, such as semiconductors used in making computer chips. He has performed similar research under a grant from NSF and is now collaborating on a NATO research project in Spain. Fertig is only one of 11 UK faculty members who have received Sloan Awards, named for a former chairman of General Motors, since 1955.

UK Researcher Promoting Mod Squad Approach to Business

Paul Dupree wants to change the way 40,000 Kentuckians do business.

He says he knows how to revitalize Kentucky's textile and apparel industries, to make them produce better products faster, cheaper and more efficiently. The key, he says, is a concept called modular manufacturing.

Dupree, the apparel and textile program manager at the University of Kentucky Center for Robotics and Manufacturing Systems, says modular manufacturing is an idea borrowed from the Japanese, in which workers are assembled into teams of five to 15 people. Each group is called a module, or mod, and they produce one garment at a time. Every employee becomes experienced in operating two or three machines, and each mod produces a finished piece of clothing in minutes.

The textile and apparel industry employs over 40,000 Kentuckians, but Dupree says when he has examined individual manufacturing plants he's frequently found high turnover rates, low wages and low morale, debilitating mechanical setbacks and frequent health problems suffered by workers whose jobs require them to repeat the same motions all day, every day.

"If the industry stays the way it is, it will not survive and jobs will be fleeing the state," Dupree says. "To maintain jobs in the state, we're going to have to do business differently." He says the traditional method of placing 30 people along an assem-

bly line limits productivity. In old-style textile plants, each person works on one machine, performing the same task on perhaps hundreds of identical items in a day, often not seeing the final product. Also, Dupree says, "You're paid by the piece so you're not so much concerned with quality as quantity."

If Dupree is right, modular manufacturing could solve those problems. He advises rearranging the assembly line into horseshoe-shaped mods, training each employee to work different machines and assigning responsibility for production and quality to the entire team. Do this and you'll see production and worker morale increase, he says. With modular manufacturing, the worker's attitude "changes from ignore the person next to you to support and work with the person behind you," Dupree says. "You give them responsibility and they'll take pride in their work."

As for the growth potential, the projections can be astronomically high. "The numbers are so good, people immediately dismiss it," Dupree says. "We're not talking five percent gain, we're talking 200 or 500 percent gain." He referred to a recent simulation using traditional and modular manufacturing to produce light circuits. In the experiment, 17 people produced 11 circuits at a cost of \$148 per unit using traditional manufacturing methods. In the same amount of time, one five-person mod produced 35 units at \$7.54 per item.

Those kind of numbers are possible, Dupree says, if companies adequately train all their employees in the new method and gradually

continued on page 34

phase in the process. There will be a cost to purchase new equipment and retrain workers, but, "That's a single, one-time cost," he points out. "It literally pays for itself."

Dupree said although he's employed at the Center for Robotics and Manufacturing Systems, his work studying and promoting modular manufacturing is more psychology than technology. "We're not proposing any automation or robotics—we're trying to re-engineer the human side of the industry."

—Graham Shelby

Cancer in the Commonwealth

Thomas Tucker says science will probably never find a cure for cancer. He's not being pessimistic, he just means cancer isn't one disease with one cure.

"Cancer" refers to more than 120 different diseases," he says. "These diseases are classified together because they all share the common characteristic of abnormal cell growth." Tucker, the associate director of the Kentucky Cancer Registry, explains this point of definition as background to understanding the findings of the registry's 1992 Cancer Incidence Report, which includes information about the 25 most commonly occurring cancers in the state. The report is produced at the University of Kentucky's Markey Cancer Center.

Established by the state legislature in 1990 with money from the legislature, the Kentucky Cancer Registry documents cancer incidence rates and

tracks all newly diagnosed cases in the commonwealth. According to its 1992 report, more than 17,000 new cases of cancer are diagnosed annually in Kentucky, with lung, breast, and colorectal cancers the most frequently diagnosed forms of the disease. Tucker says Kentuckians experience lung and cervical cancer at much higher rates than the national average. "Our rates of lung cancer, especially among men, are unusually high," he says. The registry reports 111 lung cancer cases per 100,000 males in Kentucky, compared with the national rate, reported by the National Cancer Institute, of roughly 80 per 100,000. Unlike some other forms of cancer, there are currently no reliable methods for early detection of lung cancer. Tucker adds that "at the present time, we do not have very effective treatments for lung cancer."

Cervical cancer and breast cancer are different stories. Both of these forms of the disease can be detected early and if cancer is found it can be effectively treated. "If cervix cancer is found in its earliest stages, it's almost 100 percent curable," Tucker says. The chances of effective treatment are significantly diminished if the cancer has progressed.

Finding a low rate of cervical or breast cancer in an area doesn't necessarily mean the disease is less common there; it may mean it's just not being detected. "As you more aggressively look for cervical or breast cancer, you find more cases," Tucker says. "Sometimes incidence rates are higher in a population because it has been intensively screened."

Tucker explains that the registry divides the state into 15 sections, called Area Development Districts, and examines the cancer rates in each as well as in Kentucky's 120 counties. By looking at counties or districts that have high incidence of late-stage cancer, but low incidence of early-stage cancer, the registry determines where screening needs to be improved. That combination indicates the disease is present but is too often going undetected.

Tucker and Gilbert H. Friedell, director of the Kentucky Cancer Registry, have been working with other state registries and the Centers for Disease Control to establish a national cancer registry program. "The availability of high-quality data is essential for determining where to allocate limited breast and cervix cancer screening resources," says Tucker. He adds that health-care proposals at the national and local levels should include adequate funds for breast and cervical cancer screening because early-stage cancer is much less expensive to treat than late-stage cancer.

—Graham Shelby

UPDATE

Snuffing Out Tobacco Use among Adolescents

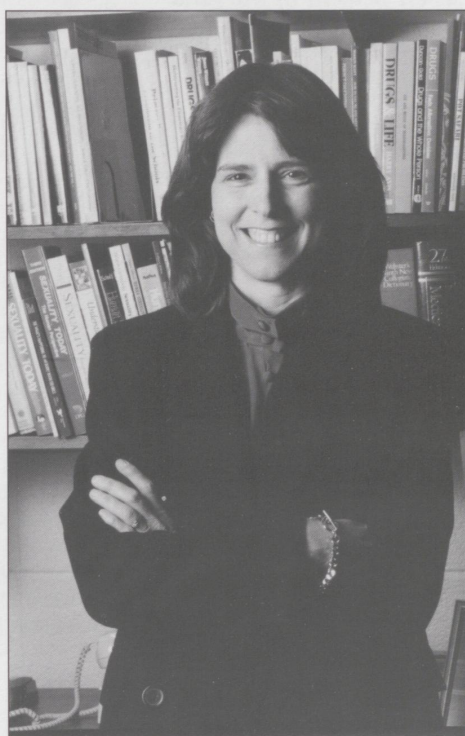
by Sharon Reynolds

Broad leaves of tobacco turning golden yellow in the late summer sun signal the beginning of a new school year in Kentucky. For some adolescents, it's also a time of transition from elementary to middle school—a time of excitement and experimentation.

By the time they are in the seventh grade, an unusually high number of children in the heart of Kentucky's tobacco-producing country will already be using the product that pays for their clothes and puts food on their tables. Getting them to stop smoking, chewing, sniffing or dipping tobacco becomes more difficult with each passing year. But researchers at the University of Kentucky think they may have found a way to slow this alarming trend with a reverse sort of peer pressure.

Since 1986, Melody Noland, a professor of health education at the University of Kentucky, has been researching tobacco use among these high-risk Kentucky youngsters and testing ways to curb it. When Noland's research was previously featured in the spring 1987 issue of *Odyssey*, her work focused on the use of smokeless tobacco—chewing tobacco and snuff. These forms of tobacco were enjoying a surge of popularity among young people, fueled by widespread misconceptions that they were harmless alternatives to smoking. Furthermore, most health education programs of the day were targeting cigarettes.

Since then, more people have become aware of health hazards such as oral cancer posed by smokeless tobacco. At the same time, evidence has shown that cigarette smoking is more of a problem among teenagers, particularly



Melody Noland's research on the effects of tobacco use among teenagers was previously featured in the Summer 1987 issue of Odyssey.

girls, than is chewing tobacco.

Noland's earlier study of 1200 middle- and high-school students in Fayette and Montgomery counties revealed that more students in Montgomery County, a tobacco-producing county, used smokeless tobacco than their urban counterparts. Armed with that data, she and her research team were able to obtain a \$530,000 grant from the National Cancer Institute (NCI) to test the Kentucky Tobacco Prevention Program, a set of classes that uses social influence to prevent tobacco use among adolescents.

"Other research studies have shown the program we are using to be effective in changing behaviors," says Noland. "We knew our project would be of interest to NCI because we were applying proven methods of tobacco-use prevention to a high-risk group."

In the 19 Central Kentucky middle schools where the latest studies are being conducted, Noland and her associates found high rates of tobacco usage. That didn't surprise them. The schools are located in counties whose

residents derive much of their income from tobacco: Anderson, Bourbon, Boyle, Clark, Fleming, Garrard, Grant, Jessamine, Mercer, Montgomery, Morgan and Woodford. NCI has placed children in tobacco-farming families in a high-risk group that also includes Native American youth, baseball players, rural residents and youth identified as problem-prone.

In the fall of 1992, Noland's team began surveying 3,851 seventh graders in the schools. Results showed that

continued on page 36

In Noland's survey of 3,851 seventh graders in several Kentucky counties, over half the students had smoked at some time in their lives. Nearly 10 percent of the boys and slightly more than seven percent of the girls had smoked within the last 24 hours—an indication that they were already regular smokers.

over half the students had smoked at some time in their lives. Nearly 10 percent of the boys and slightly more than seven percent of the girls had smoked within the last 24 hours—an indication that they were already regular smokers, says Noland. A carbon monoxide test used in conjunction with the questionnaire was administered to each student to verify tobacco use.

"The numbers were really high compared to national data," Noland says. "It was also high compared to the rest of Kentucky." About 40 percent of the students who smoked said one or both of their parents were smokers. "If they were raised in tobacco-producing families, the kids' use of tobacco was even greater," says Noland.

Apparently smokeless tobacco is less of a problem, according to the study. Nearly half the boys had tried it but fewer than eight percent were regular users. Almost none of the girls used smokeless tobacco regularly. Most of the students reported having tried cigarettes first, then smokeless tobacco.

Last spring, a social influences program designed to prevent the use of any form of tobacco was implemented in 10 of the schools surveyed. The remaining nine, where traditional health education programs were already in place, serve as a control group.

Peer educators—students picked by their classmates—assist teachers during the six 45-minute sessions of the program. Viki Ford, who helped set up the classes at the schools, says using students chosen by their classmates is more effective than relying solely on adults to get a non-smoking or chewing message across.

"The peer educators are students the others look up to and admire," she says. "As a former teacher, I've been very happy with the way the students have gotten involved and interacted during these sessions."

Techniques used include demonstrating immediate physical and social consequences of tobacco use, examining motives for using tobacco, revealing how classmates pressure others to smoke or chew, teaching assertiveness and refusal skills, developing resistance to persuasive advertising to smoke, and obtaining pledges from students not to use tobacco.

Rather than admonishing students to "just say 'no,'" the classes demonstrate, through videos and role playing, skills that come in handy in familiar situations. One scenario at a county fair shows there is safety in numbers. A small group of smokers, or chewers, try to get those in a larger group to use tobacco. Rather than argue, students simply say "no" and are backed up by their friends. The "broken record" method, repeating "I don't smoke" to an insistent person, is also played out in these sessions.

The students were surveyed again last fall and given a "booster" set of classes in the spring of 1994. Next year, when the students advance to the ninth grade, Noland's group will administer another questionnaire to measure behavior changes.

"We know that tobacco usage will go up," says Noland. "We're just hoping it doesn't go up as much in the experimental group as it does in the control group. Just from looking at other studies, we know that kids, as they get older, tend to try tobacco."

That's all the more reason a prevention program is needed in the middle school years, she says. "Most studies show that if kids get through high school without starting, they usually won't start afterwards. Generally, if they get through the peer pressure in high school, they can resist later."

Parents, school administrators and teachers have been very receptive to the program, says Noland. Despite the fact that many of the families are tobacco growers, most do not want their children to start smoking.

"We're promoting the health of seventh graders, and I don't think anybody can object to that," she says. "The message we are sending is more needed in these areas than anywhere else. ♦"

On Becoming a Contributor to *Odyssey Magazine*

Helping Keep Kentuckians Informed About Research and Science

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 opportunities for their children in research and science careers, 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 1100 teachers in more than 100 counties subscribe to the columns which they receive 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.

Please take a few minutes and complete the card in this magazine, indicating your support and interest in helping us to continue to get out the message of why and how research and graduate education is important to our state. Your support would be deeply appreciated as is the support of the following individuals, businesses and organizations that have become contributors to *Odyssey Magazine*.

Business/Corporate Sponsors

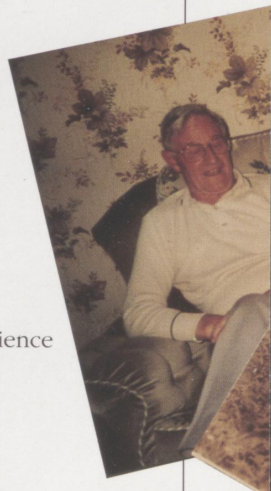
Ashland Oil Foundation, Inc.
Dennis G. Haack, ClinTrials, Inc.,
Lexington, Ky.
Shear and Shear Design, Inc.,
Lexington, Ky.

Patrons

Bruce K. Davis, Frankfort, Ky.
Kris Kimel, President, Kentucky Science
and Technology Council, Inc.,
Lexington, Ky.
Mr. and Mrs. Grover Shropshire,
Georgetown, Ky.
John D. Stempel, Lexington, Ky.

Friends

Kay S. Bell, Georgetown, Ky.
Margaret Brewer, Lexington, Ky.
George Street Boone, Elkton, Ky.
Dr. Richard Crutcher, Lexington, Ky.
Dr. and Mrs. Frank G. Dickey, Sr., Lexington, Ky.
Charles E. Eastin, II, Lexington, Ky.
Virginia G. Fox, Lexington Ky.
Jerry H. Glenn, Jr., Cincinnati, Oh.
Robert L. Hayes, Princeton, Ky.
Mr. and Mrs. Edward Hodgetts, Venice, Fla.
Ruth A. Kitchen, Lexington, Ky.
Patty Lyons, Ft. Wayne, In.
James D. Norvell, Corbin, Ky.
Mr. and Mrs. Douglas F. Pollard, Glyndon, Md.
Kathy Rubado, Prestonsburg, Ky.
J.J. Ryan, Jr., Lexington, Ky.
Judge William L. Shadoan, Wickliffe, Ky.
Albert P. and Martha Helen Smith,
Lexington, Ky.
Tom Roger Smith, Venice, Fla.
Barbara Kavanaugh Thompson,
Lexington, Ky.
Kay Treameer, Lawrenceburg, Ky.
Mr. and Mrs. David S. Weil, Lexington, Ky.
Friend of *Odyssey*/Anonymous



PATRONS

ODYSSEY

Communications and Advancement
Vice President for Research and Graduate Studies
Fourth Floor, Kinhead Hall
University of Kentucky
Lexington, Kentucky 40506-0057

ADDRESS CORRECTION REQUESTED

NONPROFIT ORGAN.
U. S. POSTAGE
PAID
Lexington, KY
PERMIT NO. 51

BIRDWHISTELL, TERRY L
SPECIAL COLLECTIONS-M I KING LIBR
112-KING LIBRARY ANNEX
2 (969) 0224

Gesetz Gottes:

1. Du sollst ein einziges Gott glauben
2. Du sollst den Namen Gottes nicht verächtlich machen
3. Du sollst den Tag des Herrn heiligen
4. Du sollst Vater und Mutter ehren
5. Du sollst nicht töten
6. Du sollst nicht ehebrechen
7. Du sollst nicht stehlen
8. Du sollst nicht falsch schwören
9. Du sollst nicht nach dem Bösen begehnen
10. Du sollst nicht nach dem Bösen begehnen

RECYCLED PAPER

PRINTED WITH
SOY INK