

ODYSSEY

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OF UNIVERSITY
OF KENTUCKY
RESEARCH
FALL 1984



High Blood Pressure in Rural Kentucky p.8

Another Major Earthquake for Kentucky? p.4

A child's interpretation of someone with a lifestyle which is harmful to their heart. (High Blood Pressure in Rural Kentucky, p.8)

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ODYSSEY

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Odyssey is a magazine published twice yearly by the University of Kentucky Research Foundation under the auspices of the Vice Chancellor for Research and the Dean of the Graduate School. Each issue of *Odyssey* describes only a few of the many University of Kentucky research projects underway in a variety of areas.

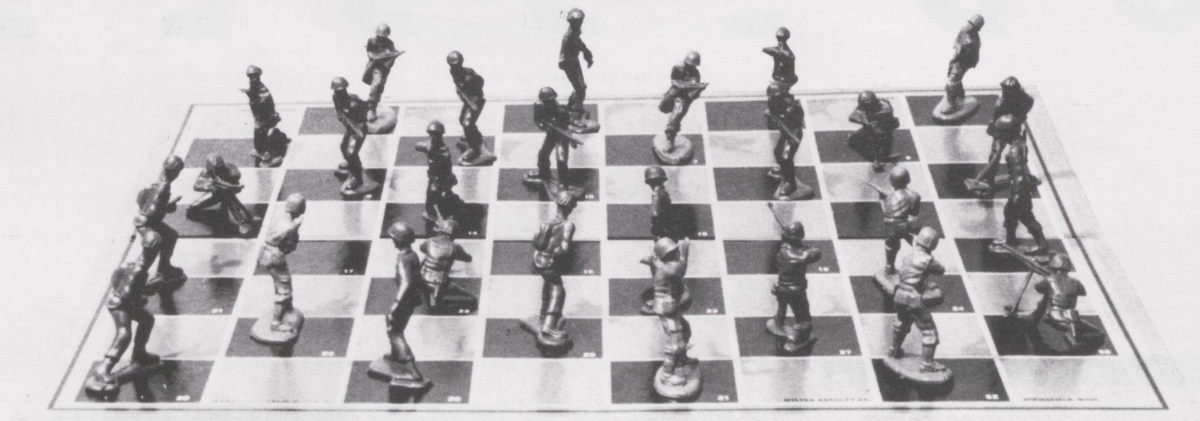
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WAR GAMES



The Kentucky-Harvard Seminars on Reorganizing U.S. Defense

Five generals came. So did an admiral. The head of the House Armed Services Committee was there. So were two former U.S. secretaries of defense and several former Defense Department officials. Top military personnel from Britain, Canada, and Israel were also on hand.

They were among nearly 60 civilians and top military officers who participated in a conference at the University of Kentucky Patterson School of Diplomacy and International Commerce. The meeting was aimed at examining the way that U.S. national security policy is made and implemented.

As one of the participants joked, "A war better not start while all of us are in Lexington, because this group represents the entire high command of the U.S. defense establishment."

Not only did the tiny Patterson School host such a world-class event, but its director, Vincent Davis, persuaded his colleagues at Harvard University to co-sponsor the conference, splitting it into two sessions, one at Cambridge, Mass., and one at Lexington.

That in itself may be another first. "To my knowledge, it is the first time Harvard and UK have been paired on

By Maria Braden

a project of this kind," Davis said.

The conference had its origins in a speech made by U.S. Air Force Gen. David Jones, then chairman of the Joint Chiefs of Staff, in early 1982. Jones proposed a major shakeup of the JCS, the nation's top uniformed military body. He said the country's top military officers need to spend more time developing joint strategies and fighting capabilities, and he proposed strengthening the chairman's authority.

"Unless the basic long-term shortcomings of the system are corrected, the severity of their consequences will continue to increase as the national security environment becomes more complex," Jones said.

"We need to spend more time on our war fighting capabilities and less on an intramural scramble for resources."

Air Force General David Jones

"We need to spend more time on our war fighting capabilities and less on an intramural scramble for resources."

"The speech triggered an avalanche of discontent," recalled Davis, who was in Washington doing consulting work for Defense Secretary Caspar Weinberger and the Joint Chiefs. Members of Congress, authorities in the Defense Department and elsewhere began to criticize the organization of the JCS and of the office of secretary of defense. House and Senate committees began holding formal hearings.

It had been more than 25 years since the last major reorganization, and during that time, changes had been piecemeal. No one had taken a comprehensive look at the operation of the whole system. So Davis asked the Ford Foundation for a grant to

"help discover the strengths and weaknesses of various reform proposals as well as the degree of consensus behind specific ideas . . ."

"Once Davey Jones blew the top off with his volcano-like speech, various people got involved in various study groups," Davis said. "We were by no means the only game in town, but we felt in a good position to get important people."

Davis invited two friends and colleagues to join him in the project: Professor Robert J. Art, dean of the Graduate School at Brandeis University, and Professor Samuel P. Huntington, director of the Center for International Affairs at Harvard.

"I didn't know how much money we would get from Ford . . . and I knew Sam (Huntington) had more money than we've got. I asked if Harvard would pay for the first conference," Davis said. As it turned out, the foundation came through with enough money to finance both conferences.

Davis said Harvard and UK complemented each other. "Harvard is a famous old private university . . . we are a land grant university out in the middle of America. I wanted to get some people to come out here to see what's here," Davis said he also liked the idea of a change of location, saying it made the pair of conferences more stimulating. Davis had hoped

That conference focused on what the United States could learn from other countries. But Davis said there was little that could be applied from the experience of other countries, mainly because of the unique constitutional emphasis in the U.S. on the distinction between civilians and the military.

During the second conference at UK, academicians corrected the practitioners' tendency "to stay too close to the tree that they can't see the forest," Davis said. That meeting focused on such areas as chain of command issues, budget process and weapons process issues and strategy making. The summary paper was delivered by former Defense Secretary James Schlesinger, who put forward an agenda for reforming the system. Among Schlesinger's recommendations were that the hiring system be revamped, the structure of the Joint Chiefs of Staff changed, and the flexibility of the nation's military procurement process be increased.

And what was the end result? A consensus that the chairman of the Joint Chiefs needs to be stronger, and that defense planning mechanisms need to be fine-tuned.

Davis compared the chairman of JCS to the chairman of a university committee. "Professors are prima donnas; so are admirals and generals. You can't walk into a board room in academia or government and say 'this

impossible, but it happens at glacial speed."

Davis believes that the conferences are part of a new consensus favoring reorganization, and that they will "help prod it along."

One tangible result of the project is a book, scheduled for publication in December '84, which incorporates papers from the two conferences and other contributions. Entitled *Reorganizing American's Defenses: Leadership in War and Peace*, the volume is a key part of the project. Davis wants it to be the definitive book, one that "will stand up for the next five to ten years. I want it to be the baseline document . . . that all arguments will start with our book."

Whether the consensus produces concrete changes will probably be determined during the first half of 1985, Davis said. "I've said all along that defense reorganization was so inherently controversial that change was only possible in (a president's) honeymoon — and then only if the president wants to make it an issue."

Much depends on who is defense secretary, should Weinberger leave, Davis said. Then too, Reagan has not expressed an interest in tackling organizational issues — unless they are money savers. "These recommendations are not necessarily money savers, but they are a way to get more efficiency; a more rational

"Change [in the Defense structure] is not impossible, but it happens at glacial speed."

Professor Vincent Davis

for a maximum critical mass of 35-40 participants at both conferences. But 58 showed up for the second conference at UK, many of them VIPs who more or less invited themselves.

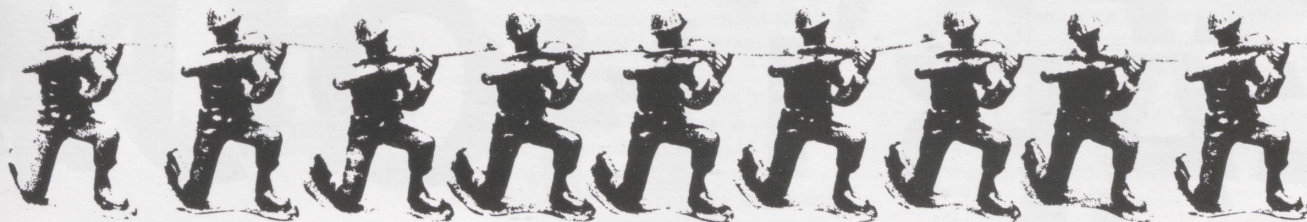
In the first conference, at Harvard, "academic-type people" like Davis talked to the practitioners, who "corrected the scholarly tendency to veer off into the abstract," he said.

is what we're going to do.' " There is an entrenched bureaucracy in government and in academia. And each of the branches of the military are wary of proposals that might jeopardize their autonomy.

"The task of trying to impose orderly centralization — synthesis — has always run up against basic neuroses," Davis said. "Change is not

policy," Davis said.

"It hinges largely on who their [the Reagan administration] key appointments are." Pleased at the success of his initial venture, Davis said he is hoping to persuade the Ford Foundation to finance another, similar project — this one on the linkage of the State Department and National Security Council.



Another Major Earthquake for Kentucky?

By Maria Braden

Most people, if told that their house and property might be destroyed or seriously damaged within the next 15 years, would want to find ways to avert the damage. Or, at the least, they would want to insure their property against loss.

Kentuckians are in just such a situation. Scientists are predicting a serious earthquake before the end of the century that would rock most of Kentucky and have a particularly devastating effect in Western Kentucky.

Pressure has been building in what is called the New Madrid earthquake zone for 170 years, since the great earthquake of 1811-12. Enough energy is stored in the ground to produce a catastrophic quake. "But it is pretty hard to get excited about something that happened in 1812," says John Kiefer with the Kentucky Geological Survey. "It's hard to convince people that there's a real danger there."

Kiefer, who was vice chairman of an earthquake hazards and safety task

into major opposition from some county judge executives in Western Kentucky. Dr. Kiefer explains the opposition because of the tendency of many people to look at any discussion of the earthquake problem as a hindrance to economic development.

"In California, they try to plan to make buildings as safe as possible," he said. "Here, the tendency is to say 'ignore it: maybe they won't find out about it.'"

Ron Street, a seismologist in UK's Geology Department, views it as a public relations problem. While he is pleased at the recent interest in earthquakes in the Central and Eastern United States, he fears the interest won't last. "I'm afraid it's going to be a passing fad," Street said. "We won't have an earthquake for 10 years and people will forget about it."

Vincent Drnevich in the College of Engineering, who has done extensive research on the effect of motion on soils and structures, echoed Kiefer's and Street's concerns. Despite the fact

"It's hard to convince people that there's a real danger"

Professor John Kiefer

Story after story has appeared in the media; scientists have frequently been interviewed and seem to be in agreement about the threat of an earthquake; a seven-state conference on earthquake preparedness was held at St. Louis last summer, and a new state panel has been formed to prepare citizens of the Commonwealth for such an event and to map out a response.

But the odd thing is that few seem to be listening.

force named by former Governor John Y. Brown, Jr., said he feels it is important to set up an earthquake education center. But the panel ran

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that Western Kentucky is a seismic-active area, "there is some indication that the public doesn't care," Drnevich said.

Drnevich, Street and Kiefer serve together on a 15-member advisory panel on earthquakes recently appointed by Governor Martha Layne

And the word "catastrophic" is not used lightly here. The earthquakes that began on December 16, 1811, and continued for a year have been called the greatest sequence of earthquakes ever to have occurred in the recorded history of North America. Research done by Street and his mentor, Dr.

for earthquake research. He notes that there are no major cities in the New Madrid Fault zone, and therefore no political power base.

Understanding earthquakes requires gathering instrumental data over a period of time, and is not the sort of problem that can be solved in two or

Twenty-five Western Kentucky counties are in what is considered the high risk portion of the New Madrid Fault.

Collins to take up where the Brown panel left off. The group is to analyze scientific and engineering data pertaining to an earthquake threat, and will make recommendations to the governor on actions needed to prepare for and to protect the public from the effects of a catastrophic earthquake.

At a national earthquake planning conference in St. Louis last summer, participants were told that such an earthquake along the New Madrid Fault could cost thousands of lives and millions of dollars in damage. Twenty-five Western Kentucky counties are in what is considered the high risk portion of that fault.

The fact that there haven't been any earthquakes in the area since 1812 leads scientists to believe that the next one will be very big. Drnevich compared it to "pent-up emotions" — the longer that energy stays bottled up, the bigger the explosion will be.

Otto Nuttli of St. Louis University, into contemporary accounts of the earthquake document the effects of these shocks over a wide area.

Witnesses described fish left out of water on land that had been lake and river bottoms; of large chasms and wide crevices; of buildings tilted, large trees uprooted, and extensive flooding. Relatively few deaths are believed to have occurred: one reason is that the area was sparsely populated. Today, however, damage would be considerably greater, both in terms of human life and property.

Street, who has been studying the New Madrid zone, said an earthquake there would mean serious structural damage; homes in some instances would have to be torn down or would collapse. Buildings not designed to withstand the horizontal motion of an earthquake might fall. Those most affected would be churches, auditoriums and supermarkets — all structures with few supporting walls.

The ground would rupture. Many towns in the Ohio River Valley are built on old river deposits — loosely consolidated material, not seated into a bed of hard rock. And this material would likely amplify the vibrations.

Street has been trying to measure and record seismic activity in Western Kentucky and elsewhere in the state, but has been hampered by lack of funds to upgrade his equipment. Ideally, he would like to have a set of seismographs set up across the state to learn more about attenuation effects, the way seismic waves attenuate as they diminish.

But these are wishes, and Street is a realist. He says Tennessee is the only state in the region that funds seismology studies, and that it is unlikely that the Kentucky Legislature would vote for any sizeable increase

three years, just by a substantial infusion of money. "I would rather see moderate funding over the long term than (see the Legislature) throw megabucks at it for the short-term," Street added.

Meanwhile, Street has made some interesting observations. He is proudest of his work in spectral analysis, in which he measures the oscillations of various amplitudes. "My work has shown that here in the Eastern United States, earthquakes that we have are much more predictable than in the West . . . they have similar spectral characteristics." Given the magnitude of an earthquake, Street could predict the frequency. But he hasn't figured out why earthquakes in this region behave that way.

"Earthquakes are not simple little things," he notes. "Lots of people compare it to a rock in water that creates symmetric circles, but a host of other things will determine the kind of quake."

Street's research is important for design purposes, particularly of such sensitive structures as nuclear power plants or dams. With computer simulations now available, all the components can be entered, and "we can shake the thing, find the weak points, and determine which we should beef up," he said.

Drnevich's work and that of Richard Sergeant of the Kentucky Geological Survey also have direct practical application. Drnevich's research is sponsored by the U.S. Army Corps of Engineers, where he has done extensive work relating to soils and ground shaking. Studying the activity associated with the 1980 earthquake at Sharpsburg, about 50

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Jeff Hancock

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Another Major Earthquake for Kentucky? continued

miles northeast of Lexington, Drnevich wanted to know why so much damage occurred at Maysville, quite a distance away from the epicenter at Sharpsburg.

He and a student found very thick deposits of saturated sand near Maysville, which tended to amplify the bedrock motion, causing larger motions at the surface. The same

founded on soil or rock, the motion that a structure undergoes is directly related to the motion of the soil or rock beneath.

The discovery that soft soils act as an amplifier of bedrock motion has been known for some time. However, the problem becomes one of determining the amount of amplification and the magnitude of surface motion at a given site. Detailed information about both the soil profile at the site and the bedrock

would aid engineers in the design process, Drnevich said. They would either select alternate sites, design structures to withstand motion, or stiffen the soils beneath the structures.

Meanwhile, Sergeant and Roy Van Arsdale of Eastern Kentucky University have been trying to determine how recently earthquakes have occurred in the region, a basic point of information in the siting of sensitive structures such as nuclear power plants.

Under a Nuclear Regulatory Commission grant, Sergeant, Van Arsdale and several graduate students have been digging trenches in some central and east-central Kentucky counties to see whether terrace materials deposited by the Ancestral Kentucky River are disturbed in any way — an indication of possible earthquake activity. And they have found distortion of the ancient river beds, indicating that earthquake activity has probably occurred far more recently than had been believed.

Sergeant and Van Arsdale have been looking at two fault systems: the Lexington fault system, running north by northeast from Stanford up to Maysville; and the Kentucky River fault, out toward the east. "There's a good chance of recurrent movement in these areas," Sergeant said.

The bedrock in these areas is believed to be over 400 million years old, but the terrace materials formed by the Kentucky River are many times younger than the bedrock, perhaps only 10 to 20 million years old. If an analysis of the terrace material showed a disturbance or offset, it would be evidence of recurrent motion, i.e., probably an earthquake, in relatively recent geologic time.

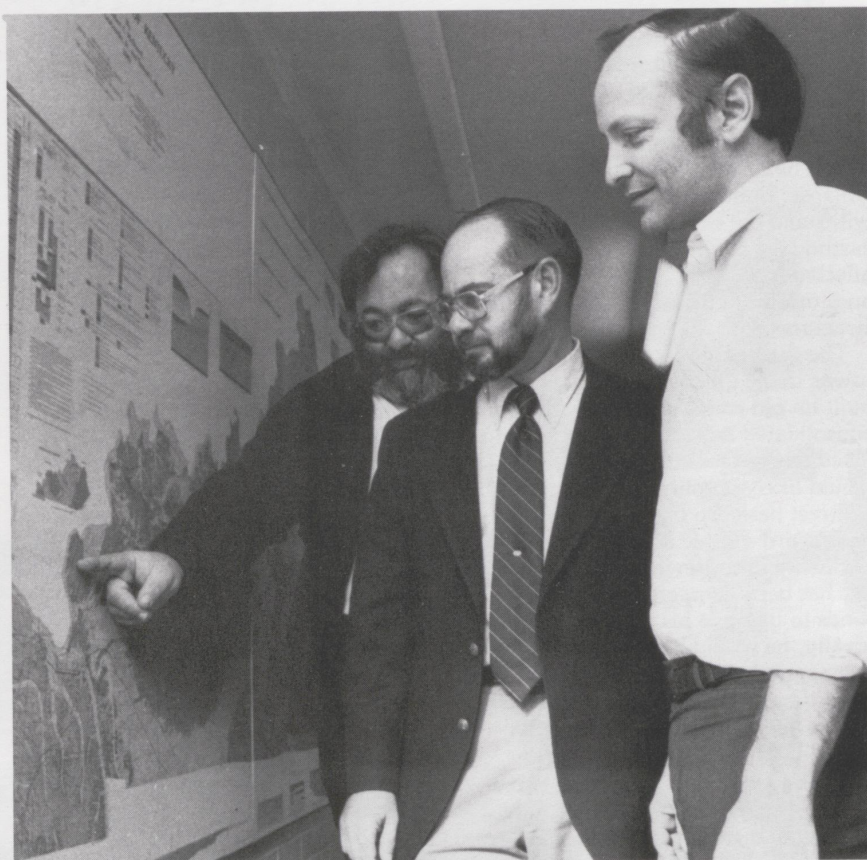
Sergeant said others have wanted to work on this sort of project, but previously there had been no funding available. "The Maysville earthquake changed the ballgame. It startled people," he said. "This area of Kentucky was supposed to be as solid as the Rock of Gibraltar."

So the Kentucky Geological survey sent off a proposal to NRC. At that time, in 1981, the Marble Hill and Zimmer nuclear power plants were still scheduled for completion, and in

Witnesses to Kentucky's quake in 1811 described fish left out of water on land that had been lakes and river bottoms; of large chasms and wide crevices; of buildings tilted and extensive flooding.

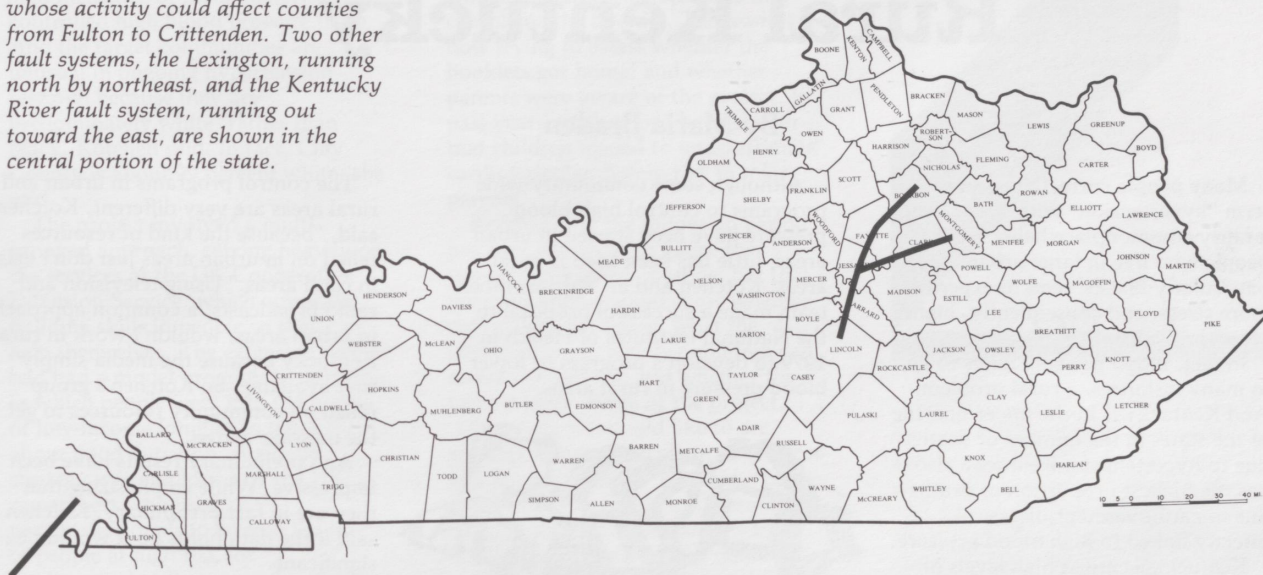
phenomenon probably exists at river towns like Paducah and Owensboro and along the entire Ohio River. Since nearly everything built has to be

motions is needed at each site. Even with this information, the problem is a very complicated one to solve. Knowledge of ground surface motions



John Kiefer, Ron Street and Richard Sergeant are studying the potential effects an earthquake would have on Kentucky.

Twenty-five counties in Western Kentucky are considered in the high risk portion of the New Madrid fault which is below the Southwestern tip of Kentucky but whose activity could affect counties from Fulton to Crittenden. Two other fault systems, the Lexington, running north by northeast, and the Kentucky River fault system, running out toward the east, are shown in the central portion of the state.



Van Arsdale and several graduate students have found evidence in ancient river beds that earthquake activity has probably occurred far more recently than had been believed.

close proximity to the faults in which Sergeant and Van Arsdale were interested. NRC was already funding a New Madrid fault research project, and approved the KGS proposal to develop field techniques in Central Kentucky, then apply them in Western Kentucky.

For the first two years, Sergeant's team used a truck-mounted auger and electrical resistance equipment to locate possible trenching sites. The last two summers, they have excavated eight trenches. Sergeant said the trenches have yielded "some pretty good indications of recurrent movement." In fact, he said, this summer's results were "really pretty spectacular."

If it can be conclusively demonstrated that earthquakes occurred in the area in the last one to 10 million years, it "would certainly change the way people build large structures, such as power plants, dams and bridges," Sergeant said. To the

NRC, responsible for issuing permits for such structures, a span of one to 10 million years is "like yesterday," he added.

"I don't think anything we've found could preclude any of that (construction)," he said, "but it gives you something to think about."

Two other UK researchers are working on a project related in a general way to earthquakes. David Shippy and Frank Rizzo in Engineering Mechanics have been working for several years on a mathematical-numerical approach for solving a wide range of problems.

"We want to extend this to the analysis of waves moving through solid, elastic media like earth," Shippy said. "We want to develop the capability for other people to examine the interaction of earthquake motions with building foundations and mines . . ." For example, they are applying their approach, known as the Boundary Integral Equation Method,

to some hypothetical earthquake problems already solved by some other technique, so they have something to check against. Now they are investigating the scattering of a particular kind of surface wave by a spherical cavity underground — such as a mine. They have also looked at vibrating footing problems, and they will be looking at the effect of certain kinds of waves impinging upon hemispheric cavities at the surface of the earth.

Shippy said they do not usually get into practical applications, but that probable uses of their technique might include the ability to predict the degree to which the earth's surface or a foundation might move during an earthquake. And it could be used on a structure to see whether it would withstand movements caused by an earthquake.

High Blood Pressure in Rural Kentucky

By Maria Braden

Many people correctly associate the term "hypertension" with stress. And a fairly commonplace belief is that people who live in large urban areas, particularly blacks, tend to experience more stress, and consequently, higher blood pressure.

In fact, blood pressure tends to be, in many instances, a rural problem. And Kentucky is in the upper quartile of the states in the number of deaths due to hypertension. Kentucky also has the highest proportion of deaths due to cardiovascular disease — directly linked to high blood pressure.

Kentuckians are at high levels of risk: "Kentucky men outsmoke the nation; (being) overweight is a problem; we consume a lot of salt as a state; (and) we have a lot of high blood pressure as a state," according to Dr. Jane Kotchen, a University of Kentucky professor whose research has focused on hypertension.

Although some community-wide programs to control high blood pressure have been started in urban areas, little has been tried in rural areas. Kotchen and an eight-member team made a successful proposal to the National Institutes of Health in 1979 to develop a program to lower blood pressure in rural areas.

The control programs in urban and rural areas are very different, Kotchen said, "because the kind of resources relied on in urban areas just don't exist in rural areas." Using television and radio broadcasts, a common approach in urban areas, wouldn't work in rural Kentucky because the media simply isn't available. So Kotchen's group relied on community resources to get the message across.

And preliminary results have been impressive. While emphasizing that they are in fact preliminary, Kotchen said if the data holds up it would be significant.



"Kentucky men outsmoke ,,
the nation . . .

Professor Jane Kotchen

The UK researchers chose as their target area Clay and Jackson counties, with Rockcastle serving as a control county. The counties were selected because an earlier study had shown a high incidence of inadequately controlled high blood pressure there. And the target communities are unusual in ongoing hypertension research because they are predominately white, rather than black, Kotchen said. In fact, Clay County is about 99 percent white, she said.

The project involved a multi-pronged approach, relying heavily on the services of the UK Cooperative Extension Service, which advocates building skills in people so they can help themselves. The extension service had had a model program in nutrition, in which people went into the homes of low-income families to teach them about good nutrition. A similar strategy was employed by the UK researchers who used paraprofessionals to go into the homes of people at high risk for cardiovascular disease, and to develop programs for them.

Children participating in the study were asked to draw pictures of what they thought people looked like who had high-risk and low-risk lifestyles.

Another extension service used was the 4-H program, which involved virtually all school-age children in the community through eighth grade, Kotchen said. First, a team leader program was developed to teach teenagers to work with fifth graders: they were taught to measure blood pressures and to conduct orientation activities for the younger students.

Then the fifth graders spent about an hour learning about high blood pressure, and were asked to evaluate their families — looking at factors such as exercise level; blood pressure levels; and some dietary concerns — whether they ate red meat or white, or used a lot of salt or sugar. Kotchen and the team developed a package aimed at capturing the children's attention — a "My Happy Heart Lifestyle Booklet" with use of stickers to indicate their perception of their family lifestyle. The children were

also asked to draw pictures of what they thought people looked like who had high-risk and low-risk lifestyles.

One of the ideas behind this facet of the project was that the children would consult their parents as they completed the booklet. The team is now trying to assess whether the booklets got home, and whether parents were aware of the project. In past years, evaluations have shown that children tended to underestimate cardiovascular disease risk in their parents.

Kotchen said the follow-up period has been too short to gauge the project's impact on lifestyle, but that the evaluations would show whether the booklet got home, what the problems were, whether children can assess risk factors, and whether the parents were aware of the project. "Ultimately we would like to see whether information given to children will impact parents," she said, "but so far, we are just trying to determine whether these are mechanisms by which rural people can be reached."

One unexpected finding was that risk reduction programs in rural areas

The Role of Age in Hypertension

Several studies at the University are looking at hypertension as it relates to age. One of the studies examines youth and instances of hypertension, and the other study is directed toward the elderly. Both studies examine the disease's relationship to age in terms of prevention and treatment.

Research indicates that there are many factors possibly related to hypertension such as diet, personality, age, race, weight, and exercise, so research underway at the University is looking at the disease from many angles.

An example of one approach to understanding hypertension is a project conducted by Drs. Robert Straus and John F. Wilson. The researchers have reviewed studies of high blood pressure in the young, exploring the interconnections of behavioral factors with hypertension. They say behavioral factors play an important role in the complex system regulating blood pressure. Stress, personality, and coping ability are all significant factors, and they suggest that behavioral treatments for high blood pressure can effectively supplement drug treatment. In some cases, it can take its place.

Relaxation training, for example, has been shown to be effective, and behavioral modification of lifestyle in the area of nutrition, stress, and

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members. Kotchen believes that local volunteer participation is essential in a program of this sort because of the hostility that can be generated when a group of "outsiders" come in, run a program, and then leave, causing everything to stop.

"Our effort has been first of all to make the program work with some outside direction and some outside initiative. But basically, this has been a project done by people in the community, and that will now pass on to other organizations that are and have been in the community."

A fourth facet of the program was a two-week local radio blitz aimed at educating the community through the

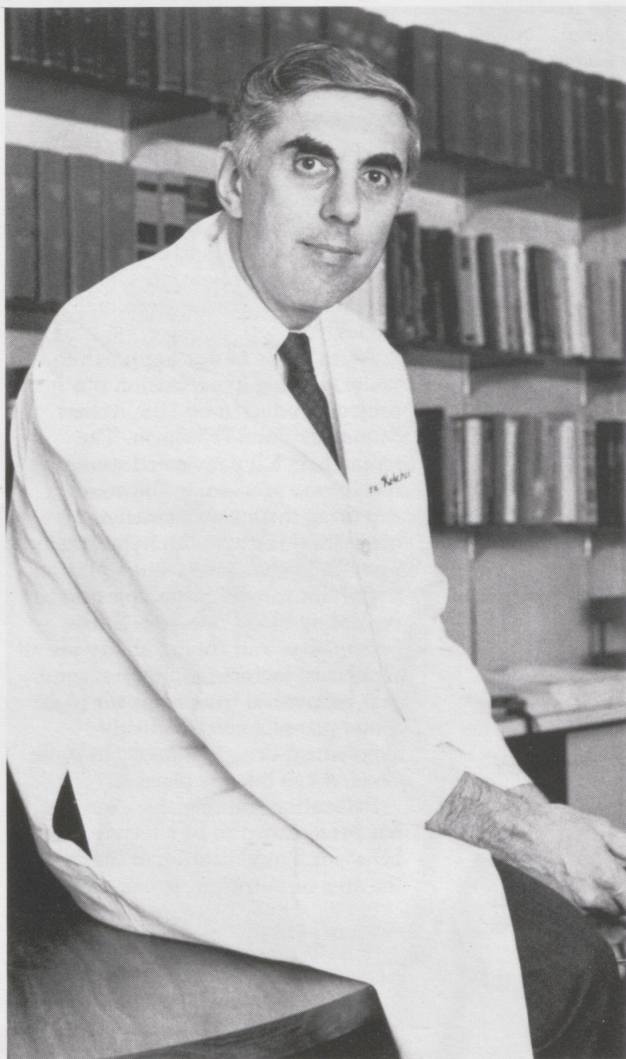
*K*entuckians are at high levels of risk for death due to hypertension.

use of public service announcements and talk shows. Kotchen said she was astounded at how many people called the radio station in response to the messages. To evaluate the number of calls, coupons were offered every sixth caller for a free bag of no-salt-added potato chips. All 100 available bags were given away, indicating that there were at least 600 callers, and probably many more listeners who didn't bother to call in, Kotchen said.

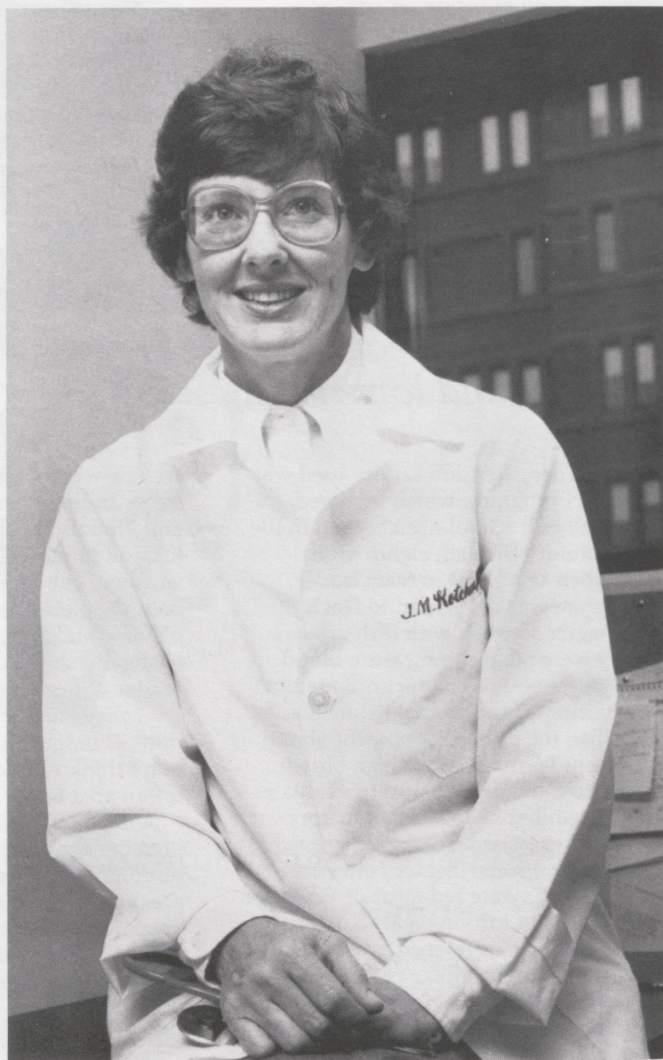
The final evaluation of the area involves examining evidence that there has been an impact on the community as a whole. Some of the programs

were initiated in response to needs perceived in an earlier baseline survey, done five years ago. Researchers are now looking at some 3,000 people questioned in the earlier survey, to detect any changes, and then compare the data with the control county.

Preliminary data, based on less than a quarter of the population surveyed, indicates that both diastolic and systolic blood pressure decreased over the five-year period in Clay and Jackson counties — despite the fact that the population had aged five years. In Rockcastle, the control county, blood pressure had increased.



Theodore Kotchen



Jane Kotchen

"There is a significant difference right now among males," Kotchen said, adding that females generally have a better record of blood pressure control. Preliminary data also indicate that fewer people in Clay and Jackson counties became hypertensive and more stayed normotensive (with normal blood pressure) than in Rockcastle.

"It's so preliminary, I'd hate to hang a hat on it, but if it holds up it's really going to be interesting," Kotchen said.

Another measure of the program's effectiveness is in mortality rates. The five-year program saw a 32 percent decrease in cardiovascular death rates in Clay County and a 27.4 percent decrease in Jackson, compared with a nine percent decrease in Rockcastle County. This compares with an 11.9 percent decrease nationwide.

"So it looks good," Kotchen said. She noted that mortality from cardiovascular disease is dropping in the nation as a whole, and that the eastern Kentucky counties have been slow to reflect this trend. "But that's really quite a drop."

Working closely with Kotchen on the Eastern Kentucky blood pressure control project is Dr. Robert Straus, professor of behavioral science, and Kotchen's husband, Dr. Theodore Kotchen, professor of medicine, among others.

The Role of Age in Hypertension continued

exercise is important in prevention, as well as treatment, of high blood pressure in the young. Wilson and Straus acknowledge that implementation of behavioral factors in treatment of the young will require additional time and energy on the part of health care providers. But they say the economic and social costs of hypertension suggest that they need to be included.

In another, related area of research, Drs. Theodore and Jane Kotchen and five colleagues in the UK College of Medicine have recently been awarded an NIH grant to study hypertension in the young. Their project is a longitudinal (dealing with the changes over a period of years) study of blood pressure among young adults first seen as 14 to 19-year-olds in 1973. The project will focus on Bourbon County in an effort to relate cardiovascular disease risk factors in adulthood to predisposing factors during childhood. Intervention to control high blood pressure could be an initial step in preventing cardiovascular disease.



Researchers will collect basic data on blood pressure, height and weight, and a wide range of other information, including smoking habits, exercise, ability to express hostility, and anxiety. They also will be studying blood flow, to see whether people with sustained high blood pressure exhibit an alteration in blood flow.

At the other end of the age spectrum, the Kotchens will coordinate a \$1.5 million NIH-funded study of hypertension in the elderly. Colleagues working with the Kotchens on the study include Drs. Markesbery and David Wekstein of the Sanders-Brown Research Center on Aging and Dr. Gordon Guthrie of the Department of Medicine.

The UK team is one of 17 that will try to determine whether treating high blood pressure in the elderly with drugs is the appropriate thing to do. Theodore Kotchen, the principal investigator, said volunteers would be recruited for the study: half would be given medication, the other half would receive a placebo. All volunteers would be closely supervised by physicians for several years, and the results should help determine the best method of treating the problem.

Kotchen has recently received approval of renewal of yet another grant relating to hypertension. This one is aimed ultimately at controlling hypertension in minorities, where it is prevalent. The NIH grant finances, over the next four years, a training program for faculty from minority institutions. Next summer the grant will pay for stipends for two faculty members from Kentucky State University and two from Norfolk State in Virginia to work at UK.

"The idea is for minorities to become more familiar with techniques in hypertension research, so they can compete (for grants) on their own," Kotchen said.

When the Rainfall Has a Low pH

by Marty Godbey

There's a battle underway — between nature and pollution. The winner has yet to be declared, but the struggle is being closely watched by University of Kentucky scientists.

Researchers in several departments throughout the University are examining the effects of acid rain and water pollution and developing methods by which future pollution may be gauged or regulated.

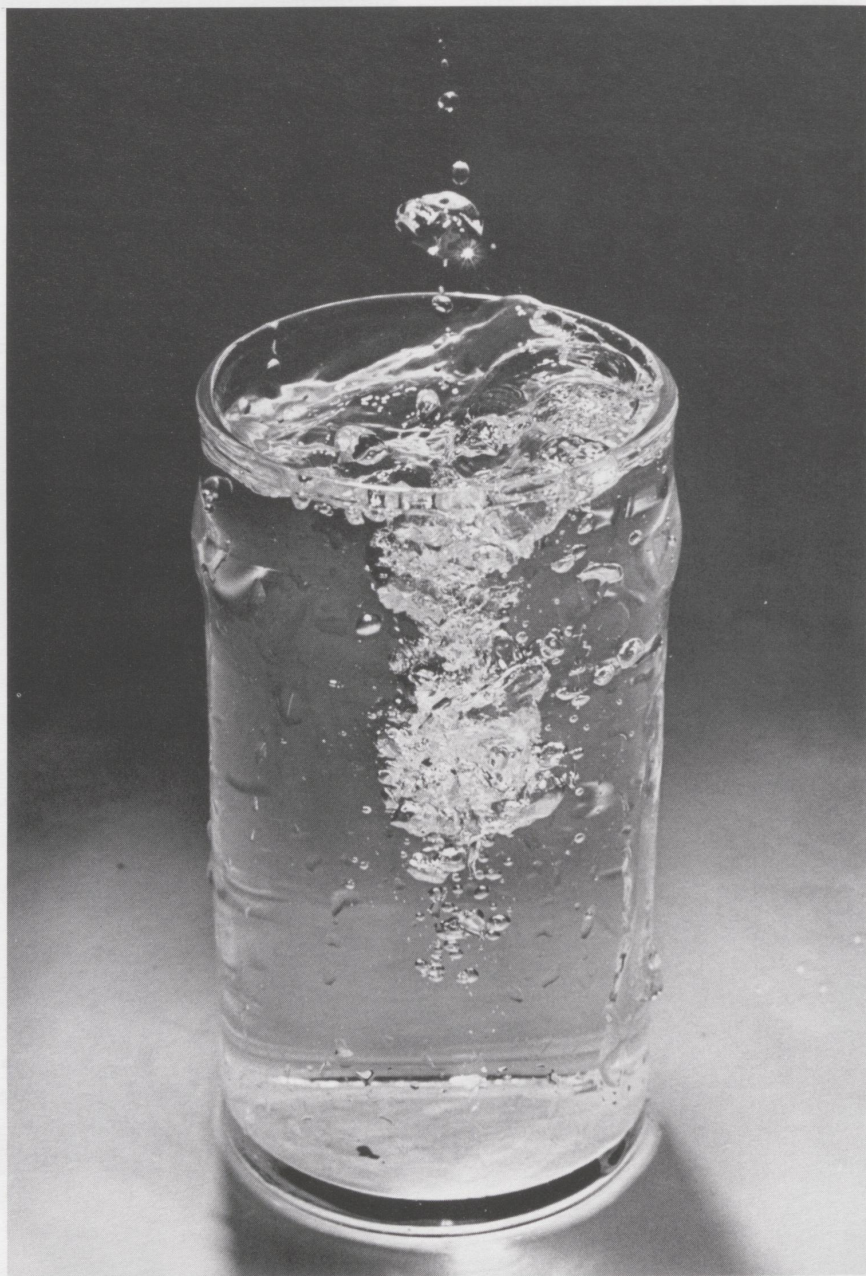
Acid rain is precipitation with a high level of acid, usually described in terms of the pH scale, a means of measuring the acidity or alkalinity of a substance. On this scale of zero to 14, 7 is neutral; above seven is basic, or alkaline, and below is acid. Rain is considered to be acid rain when the pH is lower than 5.6.

Most acid rain is traceable to pollution in the air, primarily from the burning of coal and other fossil fuels. Sulphur dioxide and various nitrogen oxides in the fossil fuels are transformed into sulfuric and nitric acids and may show up in the atmosphere either nearby or in distant locations, depending on weather conditions.

Recent studies show Kentucky to be among the five to eight states leading in the pollutants that make up acid rain, following Ohio, Pennsylvania, Indiana, and Illinois.

"Kentucky's average rain pH of 4.2 is well into the acid range," said Dr. Wesley J. Birge, an environmental toxicologist in UK's School of Biological Sciences. Some of Birge's studies have dealt with the effects of acid rain on water quality and aquatic ecosystems. "Aquatic organisms are quite sensitive to pH," he said. "Any time you see the pH of water drop below 6.5 for a prolonged period, aquatic ecosystems may suffer significant damage."

"You start to see a reduction in the diversity and density of aquatic organisms after months of exposure; below 5.5 the impact is accelerated. If the pH is adjusted back into the



-photo by Gary Landers

Studies show Kentucky to be among the five to eight states leading in the pollutants that make up acid rain.

tolerable range by adding carbonate sources such as limestone or by curtailing pollution, one usually can expect recovery approaching natural conditions."

Natural conditions vary considerably from one body of water to another, as does tolerance to acid rain, industrial wastes, and other pollutants. Drs. Paul Bertsch and Vasilios Evangelou, of UK's Department of Agronomy, have recently completed a study of the acid sensitivity of seven Kentucky lakes.

"We wanted representative lakes with large use by the public," Dr.

compared to the aluminum-storing capacities of the expanding clays."

Sensitivity of lakes may change drastically, however, if aluminum is introduced from industrial sources. When the clays in the water become saturated with aluminum, "At some point," Evangelou said, "these clays may start releasing aluminum back into the water. It would be a very small amount but could be at toxic levels."

In the area of water pollution an interesting finding was that surface mine runoff might be bringing more alkalinity into lakes, making them

of the accumulated sediments is a costly process."

The research Evangelou and Bertsch have done resulted from questions raised at an IMMR acid rain symposium in May, 1983. "There were two conclusions," Bertsch said. "Very little environmental impact research has been done in the state, and Kentucky can't be blamed for sending acid rain very far out of state. Most of it stays here, and we should be doing more environmental impact research."

Acid rain alone impacts water quality, soils, and vegetation; in combination with other kinds of pollution, its effects are multiplied.

Dr. George Coltharp, of UK's Department of Forestry, is evaluating the impact of forest harvesting on pollution in streams, utilizing wooded areas drained by a stream (watersheds), in UK-owned Robinson Forest in Eastern Kentucky, and in the Land Between the Lakes in Western Kentucky. Both projects are funded by the Kentucky Division of Water, in the Natural Resources and Environmental Protection Cabinet.

One aim of the studies is to evaluate the effectiveness of "Best Management Practices" (BMP's), a predetermined

Six of the Kentucky lakes studied show that they are able to tolerate the input of large amounts of acid before showing acidity.

Evangelou said, "and some of the Eastern Kentucky lakes were near surface mine areas." Working under grants from the Institute for Mining and Minerals Research (IMMR) and the Kentucky Center for Energy Research, he and Bertsch studied Fishtrap, Dewey, and Cave Run Lakes in Eastern Kentucky, and Rough River, Nolin River, Malone and Beshear Lakes in Western Kentucky.

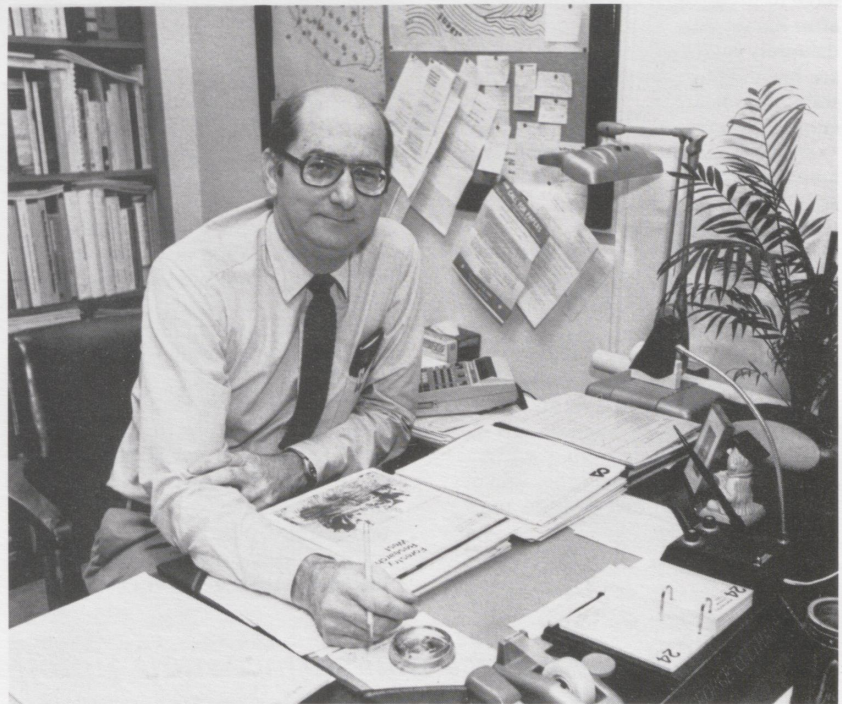
Examining the amount of acidity each lake could tolerate before the entire lake began to show acidity symptoms, Bertsch and Evangelou found that Fishtrap, Dewey, Rough River, Lake Beshear, and Nolin River Lakes have a total alkalinity greater than predicted from soil maps. Lake Malone had the high alkalinity predicted. These six lakes are considered "acid insensitive" lakes; that is, they are able to tolerate the input of large amounts of acid before showing acidity.

Bertsch and Evangelou investigated the suspended solids in Kentucky lakes — what Evangelou describes as "the soil particles in suspension, making the water appear muddy" — and their ability to release aluminum into water or remove aluminum from water.

"The solids in water," Evangelou explained, "behave as an expanding aluminum-storing mechanism. A large quantity of aluminum can be "stored" in these expanding clays. The amount of aluminum that can be introduced into a lake by acid rain is considered insignificant when

more acid insensitive. "We're not positive," Evangelou said. "The total disturbance is bringing in sediments with relatively high alkalinity, but altering the geometry of the lake by making it more shallow." This results in a trade-off: acidity is reduced, but at the expense of a shrinking lake. "You don't want to decrease the capacity of the lake because removal

CONTINUED PAGE 14



George Coltharp

When the Rainfall Has a Low pH
continued

list of forestry practices believed to have the least impact on water quality.

Using "clearcutting," the generally accepted harvesting method for this area, in which all trees in a given area are cut, Coltharp set aside three watersheds, 25 to 40 acres of mixed hardwoods, in each area. One is used for a control, the second is clearcut, implementing BMP's, and the third is clearcut using "logger's choice" practices, which emphasize convenience rather than conservation.

Streamflow was monitored for 18 months prior to treatment, while harvesting, and during post-treatment. "There's a fairly large array of chemical water-quality parameters," Coltharp said. "pH, amount of nitrate, nitrogen, sulfates, and six or eight more chemical values, conductivity, and rates of flow and yield. We're also investigating soil/water quality, i.e. water stored and in transit in the soil."

The Robinson Forest study began in 1981, the one in the Land Between the Lakes in mid-1983. "Watershed studies tend to take longer than some other types of studies," Dr. Coltharp said. "We should start getting data we can analyse about spring of 1985; we have to go through a growing season after harvesting. The streamflow has definitely increased, and other things are beginning to appear, but from a statistical standpoint, there's not enough to analyse."

Dr. Coltharp is also measuring the amount and quality of precipitation received on the experimental watersheds. "Based on our measurements of precipitation quality since 1975, we know that we are in an area of acid deposition," Coltharp explained. "The mean pH of precipitation at Robinson Forest during this 10-year period was 4.2, and has ranged from 3.2 to 6.7."

"The acid deposition question is of real concern, not only from a water quality standpoint but also because of its possible effects on vegetation and soils."



Wesley Birge

One current UK research project may speed up the process of investigation by using computer technology. Dr. John Chu, a bioorganic chemist in the College of Pharmacy, is building a computer model to describe water quality in major rivers in the United States under a project funded by the U.S. Army Corps of Engineers.

Working in the Corps' Waterways Experiment Station in Vicksburg, Mississippi, Chu is developing a very sophisticated computer model, which will provide a technique to predict changes in water quality following certain circumstances.

For example, Dr. Chu explained, "Discharge from a factory would affect fish life in a river. We'll be able to simulate what the content of the dissolved oxygen would be, as well as temperature, algae, ammonia, nitrate, nitrite, phosphorous content, etc. If the temperature of the water becomes

higher, oxygen content in the river would be dramatically reduced."

The model is currently being tested, using field data from the Susquehanna River in Pennsylvania, and is expected to be completed by 1985, when a users' manual will be made available to the public.

"If the model is valid," Chu said, "it can apply to whatever the river is, presumably most rivers in the U.S. We'll try to simulate all the necessary water qualities in a river when something has happened upstream; if we can predict, we might be able to prevent disasters downstream."

Although each of these UK researchers is investigating a different aspect of pollution, their contribution to the understanding of this serious and intricate problem may well echo Dr. Chu: "If we can predict, we might be able to prevent disasters downstream."

There is evidence that surface mine runoff might be bringing more alkalinity into lakes, making them more acid insensitive.

Four Perspectives on Alzheimer's Disease

By Tawny R. Acker



The Researchers

Alzheimer's disease, a dementing, fatal illness, affects about seventy percent of the two million Americans suffering from dementing diseases.

There is no known cause or cure for Alzheimer's, and it can be positively diagnosed only by autopsy.

The disease was first described by a German doctor, Alois Alzheimer, in 1907. He documented the case of a woman in her fifties, and called the condition, "presenile dementia." Now, both presenile dementia and senile

dementia are often referred to as Alzheimer's Disease.

"Alzheimer's is the major medical problem in aging," said Dr. William Markesbery, director of the Multidisciplinary Center of Gerontology at the Sanders-Brown Research Center at the University. "About ten years to 15 years ago, you never heard of Alzheimer's. It was around, but it was called different names, such as hardening of the arteries or it was just accepted that older people became senile as a matter or course. If the victims were younger, they were thought to be mentally ill. There was so little known about it by the public and the

general medical profession, it was rarely suggested as a diagnosis."

Educating the public and the medical profession is not such a problem today, Markesbery said. But there is still little hard data available about the disease itself.

"It is suspected that Alzheimer's is caused by a variety of factors," Markesbery said. "Research here is being directed toward many areas, such as the phenomenon of how injured nerve cells affect the function of other closely situated nerve cells and the possibility of an accumulation of a trace element, such as aluminum,

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being responsible for the onset of the disease."

The first indicator of Alzheimer's is a consistent loss of recent memory — forgetting family names, for example. Other symptoms include the repetition of words, phrases or sentences; not being able to remember the appropriate words to express oneself; and an uncharacteristic lack of personal neatness. This period may also be marked by emotional or behavioral changes in the patient. He or she may cry more, laugh inappropriately, or become angry or frustrated for no apparent reason.

These indicators occur during the first stage of the disease.

The second stage is characterized by a more encompassing memory loss, including the long-term, as well as the recent memory. The patient also has periods of disorientation and his or her speech may become markedly different. During this phase the patient also may experience extreme outbursts of anger and hostility.

The final stage of the disease reduces the patient to a vegetative level. The patient does not recognize family, becomes totally withdrawn, and does not respond to his or her environment. They become incontinent and many become immobile or bedridden. Because many of the patients in the final stage are elderly, they develop other medical

complications which may hasten or cause their death.

There is no way to predict how long an individual will stay in a particular stage, said Dr. Markesbery. Some people plateau in the first stage, others in the second. However, he said, it appears that people who develop Alzheimer's in their fifties or early sixties have a more rapid decline, while those who develop the disease in their late sixties or early seventies may have a slower course of decline. All Alzheimer's patients show a very gradual, often imperceptible transition from one stage to another.

"Until we learn more about Alzheimer's there is nothing we can really do for the patient, other than provide the medical attention they need and see that their basic needs are taken care of," Markesbery said. "And then we have to look at the toll the disease takes on the caretaker or family members providing care for the patient and see what we can do to make life easier for them."

But Markesbery is optimistic about the future for Alzheimer's patients. "There is a great deal more research activity being directed toward finding the cause for Alzheimer's than there

was ten years ago," he said. "People are just becoming aware of what an international health problem it is, and as that happens more funds will be allocated to research. And in this case, there are a lot of different aspects to examine. It will take time, but it is the only way we can learn."

Markesbery and his colleagues at the Center are involved in a variety of research projects which will help in deciphering the mysteries of Alzheimer's.

Researchers at the Center are optimistic about a grant they have applied for which would support about six different research projects related to Alzheimer's. The core of the proposed project involves biochemical and morphological studies and includes following an already established group of aging Alzheimer patients and continuing to collect and evaluate blood, hair, fingernail and postmortem brain specimens for the other studies.

One study which would use the samples will primarily involve Dr. S. T. Dekosky, UK assistant professor of neurology. He will examine biochemical factors which keep neurons or nerve cells functioning properly in the brain. It has been

"Alzheimer's is the major medical problem in aging."

Professor William Markesbery

hypothesized that in Alzheimer's Disease certain damaged nerve cells do not repair themselves. By examining material extracted from human brain tissue, he will try to get a better understanding of what allows the cells to live or die.

Drs. J. T. Slevin and D. L. Sparks, UK professors of neurology, are interested in exploring and measuring neurochemical transmitters in an area deep within the brain called the basal ganglia. Neurochemical transmitters are the agents which allow nerve cells to communicate with each other. One of the major transmitters is a chemical called acetylcholine, primarily supplied by the basal ganglia.

In Alzheimer's patients' brains, the neurotransmitters fail to communicate properly, and autopsies show a major





loss of acetylcholine. Slevins and Sparks's research primarily is aimed at defining what happens in the basal ganglia of the brain that is responsible for the loss of acetylcholine.

Markesbery and William Ehmann, UK professor of chemistry, will closely examine the role of trace element toxicity and/or imbalances in Alzheimer's. Trace elements are substances, such as zinc, aluminum, cobalt, calcium, and mercury which appear in the body. Some trace elements are important in the body's metabolic processes, while others are nonessential and occur in the body as a result of the person's environment. Depending on the element's toxicity, an imbalance can result in health problems or death.

One hypothesis is that an excessive amount of aluminum is present in Alzheimer's patient's brains. However, their current research does not appear to support that finding, said Markesbery. "But," he said, "we did find that it accumulates with age. We have found large concentrations of bromine and mercury, although we don't know what it means yet."

"Since we don't know the cause, it is important to examine everything," Markesbery said. "It has been shown that aluminum and calcium are found in increased measures in the brains of Alzheimer's patients. Maybe it is not necessarily the amount, but rather where that amount is located."

A sophisticated form of analysis, Instrumental Neutron Activation Analysis, allows the researchers to observe and measure different trace elements in the brain at the same time. The process is able to differentiate between the types of elements.

Another approach, using a high-powered electromicroprobe, enables the researchers to see where each trace element is located in individual brain cells.

"The trace element study gives us an opportunity to very carefully follow Alzheimer's patients throughout the stages of the disease by taking hair, fingernail, and blood samples," Markesbery said. "Using these we can look for and record the trace elements and then compare with what the autopsy shows."

Another aspect of following Alzheimer's patients in this study is the addition of 20 sets of twins of which one of each pair has Alzheimer's. "Dr. Ehmann came up with this idea," Markesbery said. "Since apparently ten to 20 percent of the cases of Alzheimer's appear to be inherited, using twins, because their genetic information is so similar, could provide some interesting information."

Dr. D. A. Butterfield, UK chemistry professor, will examine the potential abnormalities in the cell membrane of Alzheimer's patients' brains. His previous studies have shown an alteration of protein in the red blood cell membrane in Alzheimer's. To determine further how the membrane functions, he will measure how specific substances are altered when they enter and leave the red blood cell membrane.

A decline in protein synthesis in the brain is evident in Alzheimer's Disease. UK Professor of Biochemistry R. E. Rhoads, will try to determine the mechanism of decline in the brains of Alzheimer's patients and to see if it is a factor in the chain of causality of the disease.

"The combined research represents a major undertaking," Markesbery said, "because it cuts across departmental barriers to allow us to work effectively toward a common goal."

The Family

He was told his mother had Alzheimer's Disease, a dementing, fatal illness, which has no known cause or cure. The diagnosis indicated she was in the second stage of the disease which is characterized by loss of long and short-term memory, personality changes, and behavioral problems such as outbursts of anger or hostility for no apparent reason, and a loss of reasoning skills.

He faced the dilemma of what to do. She seemed to recognize him and she was physically healthy. He could not, with a clear conscience, place her in a nursing home. During the week of the

CONTINUED PAGE 18



The Family continued

doctor's evaluation of her, she had been living with his family and it was apparent she was having difficulty adjusting to the change in environment. What would she do in a new and strange environment, like a nursing home, without even one familiar face? For him, there was no choice. Although the doctor had recommended that he explore the possibilities of a nursing home facility, he felt he must make a place for her in his home.

He was acutely aware of the hardships it would place on his own family after reading a book titled, *The Thirty-Six Hour Day*, written by some physicians at John Hopkins. Each chapter clearly emphasized the strains in caring for an Alzheimer's patient.

Adjusting to a new family member was not an easy process. Especially one who could not, or, at times it seemed, would not, perform the simplest task. It was as if a new five-year-old with a cantankerous personality had moved in. This was certainly the case with his mother who had to be reminded to eat, and then she

sponded to questions with monosyllables, if at all, and she seemed so distrustful of everyone. He often came home from work to find her packing her suitcase and saying, "Help me, Help me."

His mother's behavior distressed him terribly at first. He questioned his wife and the children about their treatment of her—was it something they were doing to make her so unhappy? He consulted the doctor about the best way to make her feel content. The doctor explained that it was nothing they were doing, she was simply responding to situations which existed only in her mind. But he suggested, instead of becoming involved in an argument with her of whether or not she was supposed to do something, re-

sponded to questions with monosyllables, if at all, and she seemed so distrustful of everyone. He often came home from work to find her packing her suitcase and saying, "Help me, Help me."

He tried the doctor's suggestions and sometimes they helped. But he was unsure how to ease the tension her presence was creating within his family. His wife was worn out every day from watching her and trying to take care of the children as well. His youngest son, 9, seemed to be able to cope with it better than his daughter, 12, or his eldest son, 16. He had seen his younger son watching cartoons with his mother, which was more than the older children did. They avoided her. If

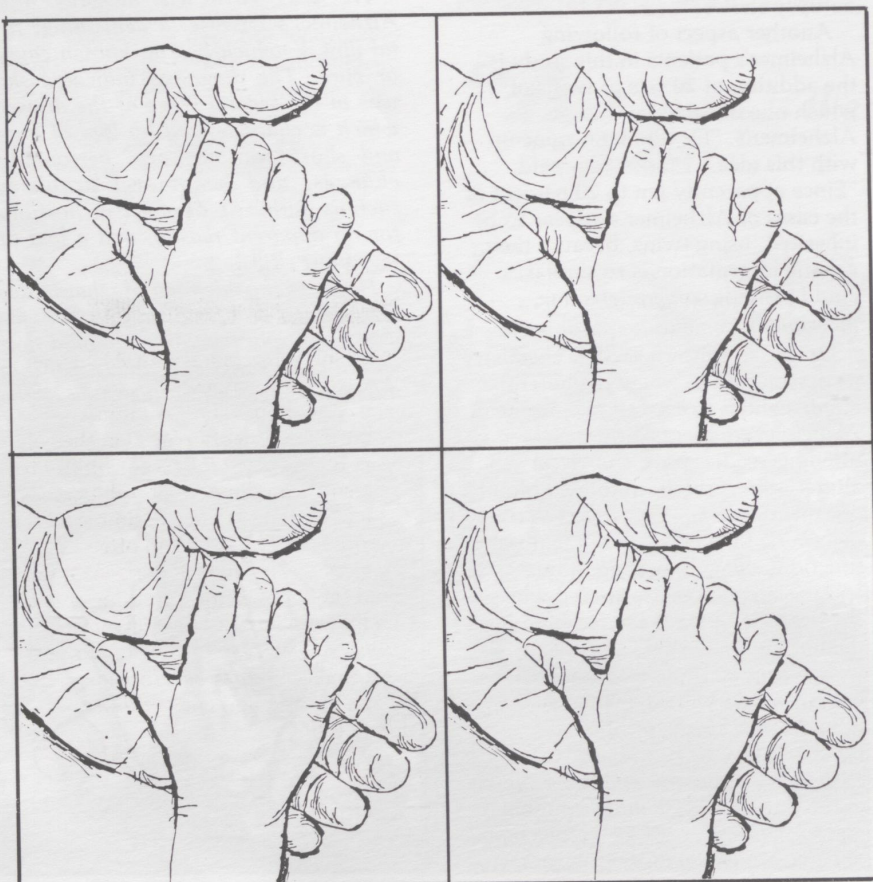
It was as if a five-year-old with a cantankerous personality had moved in.

spond by telling her the next step of pushed her plate away with disgust, regardless of what was on it. She re-

she came into a room, they left. They had stopped inviting friends over — now they were always going to their friends' houses. His daughter could barely hide her dismay at his mother's lack of table manners and when he had told his youngest son to chew with his mouth closed, the child had responded, "Tell Grandma. If she doesn't have to, why should I?" He had answered, "Your Grandmother is sick, she can't help it. When she was well she had wonderful table manners. Don't you remember Christmas dinners?" All of the children had responded with a blank look. He knew then that they really couldn't remember the sweet, gentle grandmother. All they could see was a cranky, old woman who drooled and complained. But he felt that with time, patience and his memories of her, he could pass to them his own good feelings about her.

He was also aware that the children might need counseling to help with their feelings of frustration and fright. His daughter had asked him several times if this was going to happen to him. He had tried to reassure her, but how could he when he wondered the same thing? Would his life end like his mother's? Would he be faced with the fear of losing his mental faculties and his physical capabilities from Alzheimer's Disease?

Until researchers discover the cause and then treatment or a cure, they all would wonder.



The Victim

Calling her children by the wrong names was something she had been doing for years. So why were they all making such a fuss about it now? After all, with five children who could keep up, and not to mention all of the grandchildren.

She had begun to dread holidays because all of them would come to her house and it was difficult for her to remember who was married to whom—and to whom each child belonged—and why they were even all there.

And then there was all that clamor about her burning up the coffee pot. With all the people there and all of the confusion, who could remember everything they had on the stove? But they scolded her—as though she were a five-year-old. They made remarks about her not being able to continue living alone. What nonsense! After all, she had lived alone since her husband died. One of the children mentioned he had been dead now almost three years—she thought it had been nearly ten. But she hid her confusion; she was getting to be good at that.

And then there was the misplaced purse. She hadn't wanted to go to the grocery with her daughters but they insisted. And they weren't content until she took her purse, but she couldn't remember where it was. Oh, it was around somewhere but she just couldn't recall exactly where or when she had last seen it. One of the girls finally located it but then they started all over again about her forgetfulness until she angrily reminded them that she was a sixty-year old woman and entitled to forget a few things.

What she didn't tell them was that she had been misplacing items regularly for about two years. But it really didn't bother her much anymore. Oh, it made her feel stupid and mad at herself when it first started happening, but she had learned to live with it. In fact, she didn't even think about it until they came and made her feel old and incompetent.

But what scared her was that now she often forgot where she was, as well as what she was doing there. Suddenly she would look around and couldn't remember what room she was in or whose house. She wasn't so sure that was an accepted sign of aging—like forgetting where you put things. For-



getting where you put yourself was another matter entirely and she didn't know what to do about it. One thing for sure, she wasn't going to tell the children. They would undoubtedly start with the "What are we going to do with Mother" routine and try to make her give up her house and move in with them or, maybe, even put her in one of those nursing homes.

So, when after Christmas dinner, she had walked downstairs and saw a room full of strange people talking and waving to her to join them, she simply smiled and sat down. No one noticed. She had made it through another visit.

Several months later though, a man and woman came to her door—claiming they were her son, Roger, and his wife. When they finally convinced her to let them in, they kept going from room to room talking about the dust and dirty dishes and they even said she looked untidy—a dirty housedress and hair that had not been brushed for days.

After a while, she realized the man was her son, but who was the woman? She didn't like the way she kept looking at her and going from room to room. She warned Roger that the woman might be trying to steal something but he kept saying she was his wife.

Not long after, her children told her she had to leave her home and go to live with her son. She hadn't wanted to go but it all happened so quickly.

One minute they were packing her suitcase and the next she was here, in this strange house.

No one looked familiar, except for Roger. She hated it when they started trying to make her eat this or wear that. Why didn't they leave her alone? She was being held against her will—if only she could escape. Why wouldn't her son help?

The Support Group

Caring for persons with Alzheimer's Disease has been described as a "thirty-six hour day." A family member is suddenly placed in the role of assuming constant responsibility for a person who may be, or will become, unable to understand the simplest instruction. The situation often requires a role reversal with the adult child taking over the parenting role of the afflicted parent. As Alzheimer's progresses, the victim's behavior and care resembles that of a three or four-year-old child and ends with an infancy-like state.

CONTINUED PAGE 20

The Support Group continued

"People who have not been in a constant-care situation with patients who gradually become incapable of expressing their needs and unable to interact with their environment, cannot imagine the problems the situation creates, especially when there is no treatment or cure as is the case with Alzheimer's," said Dr. David Wekstein, associate director of biomedical sciences at the University of Kentucky and co-founder of the Bluegrass Alzheimer Society.

Wekstein and Dr. William Markesbery, director of the Sanders-Brown Research Center on Aging and professor of neurology and pathology at UK, founded the group in 1981.

"Dr. Markesbery and I decided that there were a lot of people who felt very isolated while taking care of Alzheimer's patients," Wekstein explained. "After determining the need, we asked Ralph Carpenter, (director of chaplain services at the UK Medical Center) to coordinate and moderate the group. Then we contacted two family members (who were providing care to Alzheimer's patients), Bob Pate and Clare McFarlen, to get their suggestions as to what kinds of information would be particularly helpful to the families. Public service announcements were next . . . About 20 people came to the first meeting. And we have been holding a monthly meeting since that first one in March 1981."

Carpenter said the support group has several purposes: to offer person-to-person help from families in the same situation; to serve as a source of information for the families about the disease and related research activities; to help them locate needed services and agencies; and to promote advocacy in the form of educating the public and legislative bodies about the disease in hopes of garnering monetary and service-related support. As a part of its services, the group provides a newsletter to families of Alzheimer's victims.

The Center's Memory Disorder Clinic was also begun after a suggestion from the group. The clinic, sponsored in conjunction with the UK



-illustration by Jim Foose

"People who have not been in a constant-care situation with patients who gradually become incapable of expressing their needs and unable to interact with their environment, cannot imagine the problems the situation creates . . ."

Professor David Wekstein

Department of Neurology, provides extensive evaluations of patients suffering from memory loss.

Still another outgrowth of the group was the formation of a day-care center one afternoon a week for Alzheimer's patients. The facility is managed by Bell and staffed by trained volunteers, many of whom have had Alzheimer patients in their families. "This service is provided to give the caretaker time to clean house, run errands, or whatever," said Wekstein. "Any benefit to the patient is secondary." Families provide patient transportation to and from the day-care facility. Attendance is limited to

those Alzheimer's patients who are not bedridden, incontinent, or do not need to be medicated during the afternoon session.

The support group has recently applied for national membership and has incorporated, relieving UK of the organizational responsibilities. The group also is in the process of electing a board and officers to direct its activities.

More information about the support group or the day care facility is available from:
Sanders-Brown Research Center
Univ. of Kentucky (02301)
Lexington (606) 233-6049

ZERO GRAVITY

Its Effect on Body Fluids, Deconditioning and Fire

Astronaut Storey Musgrave slept with his head lower than his body for ten days before the launch of Challenger (April 4, 1983) to compensate for the shift in volume of body fluids which would occur during the first few days of space travel.

"You can feel the fluid shift toward the head [while in space]," Musgrave said in a phone interview from his home in Houston. "There is a fullness in the neck, and some edema (fluid retention) is evident in the face. The

By Tawny R. Acker

voice even changes. But, I compensated for this by sleeping with my head down and my body was already accustomed to it."

Although these minor symptoms usually last for only a few days, the cardiovascular changes which occur with the shift in blood fluid may have long-term side effects.

The same phenomenon affects

astronauts and high-performance aircraft pilots upon their reentry to the earth's atmosphere. The blood fluid volume rushes away from the head and into the extremities and may cause the astronauts to faint.

Although there are ways to combat this phenomenon, such as having the astronauts consume a great deal of salt water prior to reentry, it is necessary

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Scientist-Astronaut Storey Musgrave, an alumnus of UK, was a member of the 1983 space mission STS-6 and the 28th American to venture outside a craft into open space. Scheduled for an April 1985 mission Musgrave is shown here injecting nutrients into root systems of pine seedlings during a Spacelab simulation exercise. The majority of experiments which are done in space, according to Dr. Musgrave, come from universities.

Zero Gravity continued

to study and define the stress created by the body's rapid readjustments.

University of Kentucky Professor of Mechanical and Electrical Engineering Dr. P.K. Bhagat is conducting experiments designed to measure shifts in the body's fluid volume and the resulting effects on the cardiovascular system.

Gathering stress-related data requires creating controlled shifts in blood fluid volume and then accurately measuring the fluid shifts, while at the same time, monitoring the cardiovascular system. Bhagat, working on a grant from the National Aeronautics and Space Administration (NASA) in 1977-1982, developed a machine, called ultrasonic plethysmograph, which uses ultrasonic waves to measure shifts in the volume of blood fluid. The idea of using ultrasonics for these measurements was initially suggested by Professor J. L. Lafferty, director of UK's Wenner-Gren Research Laboratory.

"It had been hypothesized that in space, fluid shifts to [an individual's] extremities," Bhagat said. "So I tried an ultrasonic measurement in the calf of the leg." The experiment proved successful and was subsequently adopted by NASA as basic equipment for space research.

Bhagat is now studying fluid volume redistribution under hypergravity conditions, or those conditions that exist during take off and certain maneuvers executed by high-performance aircraft. The Office of Naval Research is sponsoring the lab-based research which is being done on a Navy-approved centrifuge.

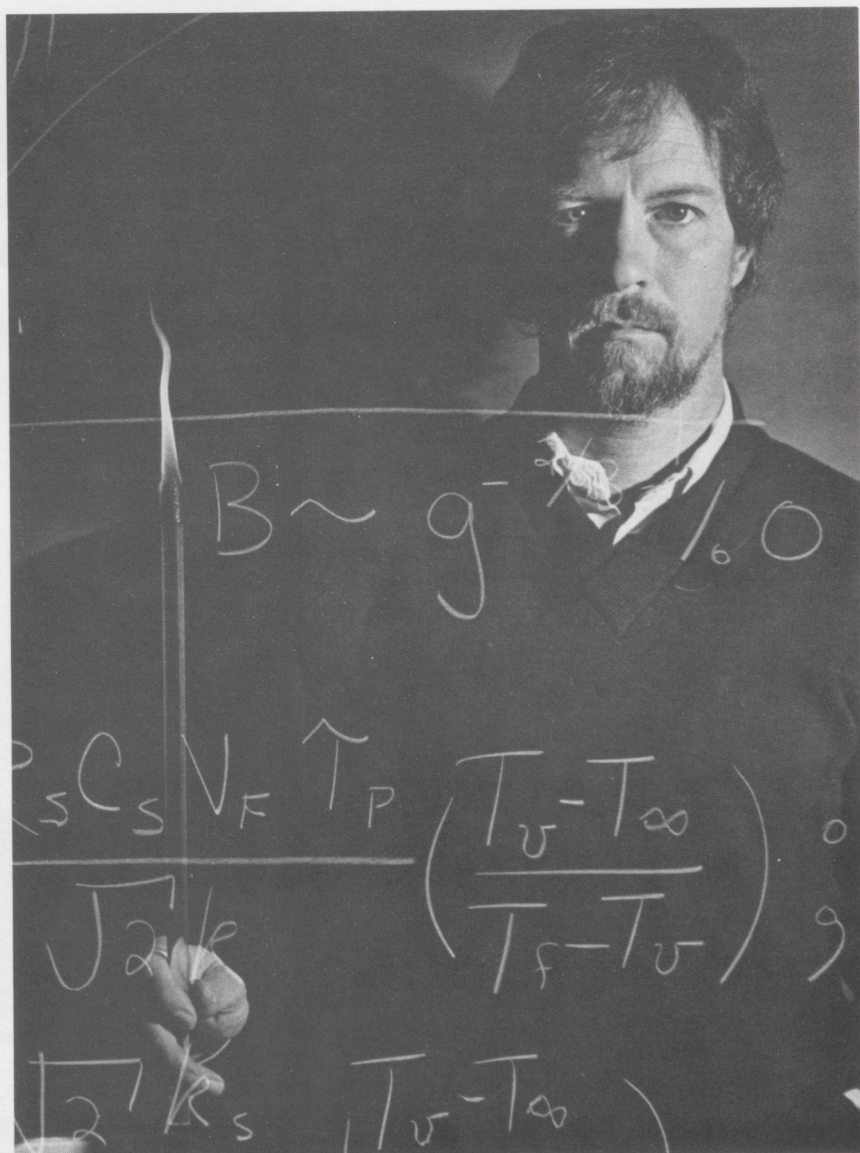
The potential of fire is an important consideration in the interior of a space ship with its high oxygen content and various combustible materials.

"We are making measurements at several sites on the body to define the changes in fluid volume that take place," he said. "Knowing what these changes are and when they occur will help provide a basis for protective mechanisms."

While Bhagat's study measures the changes or redistribution in the volume of body fluid, UK Professor of Mechanical Engineering Dr. Charles Knapp is examining how to change or redistribute the fluid.

The body operates as it does

because of the constant pull of gravity which dictates that a certain amount of force or energy be exchanged for each activity. If the gravitational conditions are even slightly altered, changes occur in the body's fluid distribution, as well as the cardiovascular system. For example, the phenomenon that occurs when a person shifts positions too rapidly — light-headedness — is similar to how a person feels who has become deconditioned. Knapp and his co-investigator, Dr. Amit Bhattacharya, former UK research associate, and Dr. R. G. Edwards, UK associate



A device to study the differences in flame spread in space and on earth was developed by Dr. Altenkirch of UK's mechanical engineering department.

-photo by Gary Landers

professor of mechanical engineering, were concerned with the deconditioning that occurs in space. Knapp said this deconditioning causes not only cardiovascular change for short flights, but changes in the skeletal system during long-term missions. For example, studies show that after about a month in a null gravity situation, there is a loss of calcium from the bones.

"We reasoned that if you could replace the majority of the earth-based forces lost by persons in space with 30-45 minutes of forces produced by a specially designed oscillating platform in the spacecraft, then astronauts could possibly function with little or no side effects for prolonged periods," Knapp said.

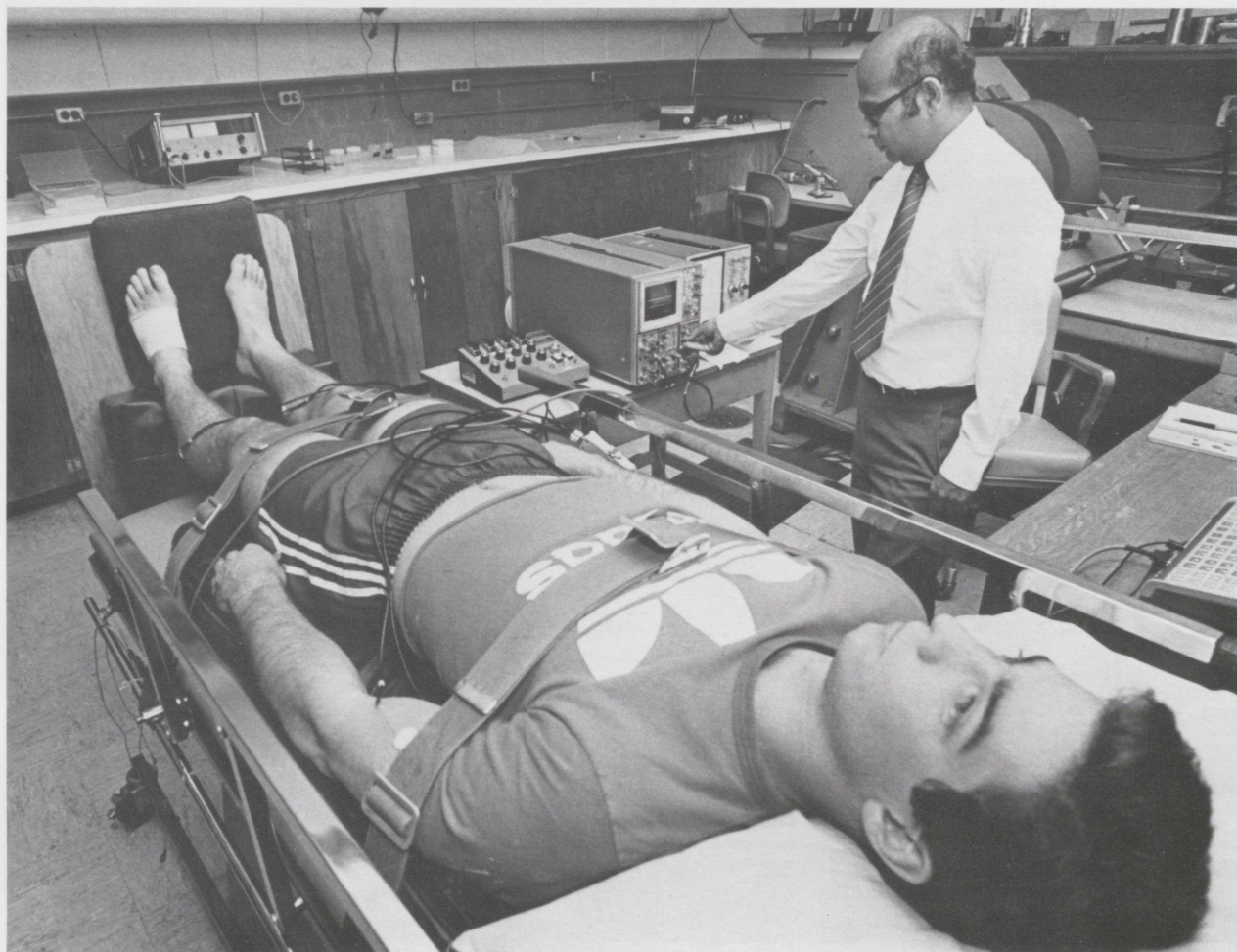
First we had to establish a daily force profile, Knapp said. We did this by using some equipment designed by

Ralph Mann, former UK associate professor of health, physical education and recreation, that showed the typical force of whatever exercise was being performed. For example, every time your foot strikes the ground when you take a step, it creates a certain force pattern. After we established the amount and types of force that would make up a safe daily force profile, we created an oscillating platform that would provide that amount and type of force. Then we designed an oscillating bed that an individual could lay on and, in about forty-five minutes, receive a daily force profile. The profile is not the equivalent of forty-five minutes of exercise because the machine is exerting the force and the person is simply receiving it without offering any resistance. So, although the profile provides the body with what

can be loosely described as exercise, it is not designed to offer weight loss or toning advantage. The profile exerts forces on the skeletal system and on the cardiovascular system to cause a redistribution of fluid volume, Knapp explained.

To simulate the cardiovascular deconditioning that occurs when people are in space, volunteers were asked to lay on a tilt table with their heads at a five degree angle lower than their bodies for a specified time, while others were put in water immersion tanks for varying times to decondition their cardiovascular systems. Knapp was able to examine the volunteers before and after they had undergone a treatment on what he fondly refers to as the "shake table" — the oscillating table.

CONTINUED PAGE 24



Dr. Bhagat measures the changes or redistribution in the volume of body fluid under conditions that exist during take-off of high-performance aircraft.



This oscillating platform (also known as "the shake table") is used in research by Dr. Knapp for applications in the deconditioning of space travellers.

"The results were mixed," he said. "A group of people were helped and, some did not show an improvement. It may be that the answer lies in the deconditioning. People can respond very differently to the same deconditioning protocol. There needs to be more basic research with long-term deconditioning in order to study these types of counter measures."

Knapp said he also thinks that this type of study could provide help for quadriplegics or bedridden people who suffer from deconditioning, especially skeletal deconditioning. "I think we need to do more research in the area of skeletal deconditioning," he said.

The majority of experiments conducted in space have originated at universities.

At NASA's request, Knapp and Edwards redesigned the oscillating table and turned it in to a small oscillating platform with a metal spine and shoulder harness. The reduction in size and weight made it possible to fit easily into the space shuttle.

"When they [NASA] were asking us about placement in the craft, we kept suggesting corners, but they said, 'Remember this is space, there is no gravity — we could just as easily hang it from the ceiling.'"

However, NASA decided not to fly the platform, he said. Time permitting, though, Knapp does plan to expand upon the research.

NASA does tentatively plan to take the experiment designed by Dr. Robert Altenkirch, UK chairman of mechanical engineering, in one of the 1986 flights. Altenkirch designed a device to study the physical differences which occur in flame spreading in space and on the earth and what happens in the case of combustible materials in a zero-gravity environment.

"With NASA's guidance, we designed a mechanism that lets us photograph, from two different angles, the way a flame spreads in zero gravity as opposed to the way it spreads on earth," Altenkirch said. "The way a flame spreads on earth is affected by gravity," he explained. "If

you light a match and look at the flame and notice its shape, it is that way because gravity pushes the gases that generate the flame upward."

Without that gravitational pull, how will the flame be shaped and how will it spread? These become crucial questions when you consider the interior of a space ship. Not only is it a zero gravity environment, but it also contains a high oxygen content and combustible materials, which are a known fire hazard.

"If there were a fire aboard a space craft, with the information we gather, the astronauts will be better equipped to control it because they will be able to understand the way it will spread," Altenkirch said.

Bhagat's, Knapp's and Altenkirch's research projects, all sponsored by NASA, are indicative of the varied

studies funded by the agency. "We (NASA) are similar to a national astronomical facility or an accelerator lab which provides users, in this case universities, with the opportunity to do science," Musgrave said.

But the arrangement is also beneficial to NASA. The majority of experiments which are done in space come from universities; others come from industrial laboratories and in-house research. For example, Musgrave said, "The majority of experiments I'm flying on my April 17 [1985] mission are sponsored by, or the principal investigator is from, a university."

Southern Black Writers: *We Didn't Lose the War*

By Tawny R. Acker

After the Civil Rights movement began, there was a noticeable change in the subject matter and tone of fiction written by southern black writers, according to Charles Rowell, University of Kentucky professor of English. "Blacks developed a more positive attitude toward the South as home," he said. "Southern black writers began to use the experiences of the place as sources to discuss the nature of modern humanity rather than as the stuff of social and political protest."

Rowell is writing a book which historically and critically examines southern black fiction from the Civil Rights era to the present. "I selected fiction, because it, more than poetry or drama, best represents the black southern cultural ethos," Rowell said. "I always write about the South, because it is my home and I am an unabashed southern chauvinist. I chose black writers of the region for this book because their work has been ignored by scholars writing about southern literature."

Rowell examines seven authors' work: Ernest Gaines, Alice Walker, Albert Murray, James Alan McPherson, Gayl Jones, Hal Bennett, and Henry Dumas. He chose these authors because they are some of the more prolific and better known black southern writers. Two, Alice Walker and James Alan McPherson, have won the only Pulitzer Prizes awarded to black American fiction writers.

For the most part, all of the authors' stories are about southern characters, their relationships to the land and community, the function of Afro-American cultural traditions, and the role their Southern heritage plays in their lives. Most of the authors, Rowell said, are innovative in their experiments with language and form. Several of the authors have turned the novel into a form like story telling rather than drawing on the static tradition of the novel. For instance, *The Color Purple*, by Alice Walker, is an example of a novel being written in almost an oral form.

Rowell's book also compares the authors' work with that of their white contemporaries. There are some similarities in subject matter between black and white southern fiction from the same era, but there is a radically different approach to the material. "When southern whites speak of freedom, they usually limit it to freedom for white people only. But when southern black writers write of freedom, they argue for universal freedom, freedom for all people," Rowell said.

Both black and white authors write about family life, but the two groups of writers do not even share a common definition of the word, "family," Rowell explained. "When white authors write about family, they only mean the nuclear family and are concerned with tracing bloodlines back to colonels and generals or European noblemen. Family, to southern black authors, also includes the nuclear family, as well as the community. Then, too, southern white writers are always talking about how 'we' (apparently whites) lost the Civil War and suffer as a result of it. Southern black writers know that 'we' (obviously blacks) did not lose the War and that we are better off because the Union soldiers defeated the slave-holding society of the White South," Rowell added.

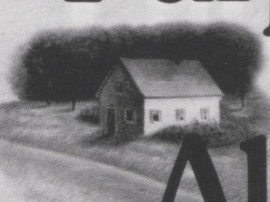
Rowell's book, which is one-third of the way completed, will have four chapters. The first, an introduction, offers a historical background of southern black fiction and explores changes in subject and style from pre-Civil War to the present. The second examines the southern black traditions

and the black aesthetic used by these authors. Rowell describes this aesthetic as recognizing the beauty of folk songs and the sense of beauty inherent in the quality of black traditions. Chapter three will focus on the authors' use of place, as in the South in general or as specific as a parish where all of writer Ernest Gaines' stories occur. The final chapter will explore the portrayal of family and community and how the authors treat black and white characters in their work.

Rowell's research for his book is currently being sponsored by the Carter G. Woodson Institute at the University of Virginia, where he is also a visiting scholar in the English Department. During the 1983-84 academic year, Rowell was awarded a Rockefeller Foundation Fellowship to begin his research.

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The
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Author of *Meridian*

Research Briefs



Healthy Cash Crops for Kentucky Farmers

By Marty Godbey

Health-conscious consumers provide a strong market for Kentucky fruit and vegetable crops, according to a recent study by members of the University of Kentucky Department of Agricultural Economics.

The research project, conducted by Andrew Jermolowicz and David Pendlum, research associates, with Drs. Harold G. Love and Milton Shuffett, project leaders, was sponsored by the Kentucky Council on Agriculture. Market size and potential were investigated for more than 35 fruits and vegetables, many of them not presently grown in quantity in the state.

Examining 11 major marketing centers within a day's drive of most of Kentucky's potential producers, they estimate Kentucky farmers may initially expect from five to ten percent of the market for such crops as potatoes, apples, tomatoes, watermelons, cantaloupes, cucumbers, sweet corn, bell peppers, and others. Initial gross annual income could feasibly be \$17.7 million to \$35 million, and once markets are established, there is a good chance for expansion.

As fresh fruits and vegetables form an increasing portion of the average consumer's diet, food retailers need dependable, nearby supplies of high-quality produce. Kentucky's farmers may produce crops earlier and for longer growing seasons than those farther north, and may extend the marketing period for crops grown to the south, while profiting from transportation savings over produce shipped from California, Florida, and Texas.

Additionally, if production and marketing practice guidelines provided by the study are followed, Kentucky growers may time crops to coincide with the most profitable market periods, or "market windows," in order to realize the greatest return on their investment.



One aspect of Shuffett's and Jermolowicz's research project includes developing methods of improving and increasing the variety of fruits and vegetables Kentucky farmers produce. Here they inspect apples at The Apple House, a Lexington market.

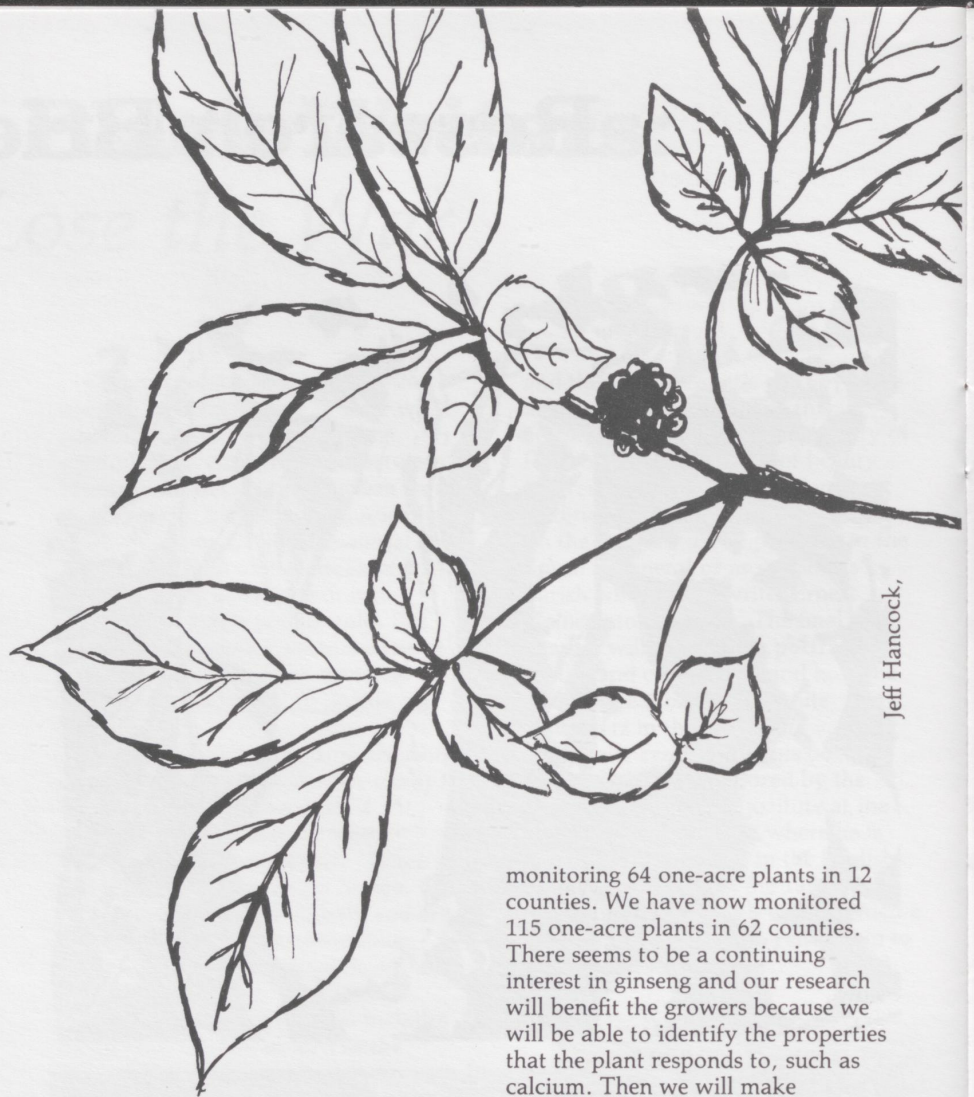
THE ROOT OF LOVE AND HEALTH

By Tawny R. Acker

Asians say the root of the ginseng plant has restorative powers and often use it as a nerve tonic. Shaped somewhat like a human body, the plant also has been lauded in American folklore for its medicinal value. Although science has yet to confirm whether, indeed, ginseng has all of the powers attributed to it, the herb is readily available at groceries and health food stores throughout the United States.

The U.S. Food and Drug Administration classifies ginseng as a food item, not a medicine, and most of the ginseng Americans purchase is imported from Korea. But, ironically, some of the ginseng purchased and used in Hong Kong and Singapore is grown in the mountains of Kentucky.

Ginseng is a cash crop for some Kentuckians and the perennial, herb-like plant is native to many of the state's hardwood forests. It has also been on the national threatened list of plants since 1979. And here is where University of Kentucky researchers



play a role. To insure its preservation, states where wild ginseng is being harvested are required by the U.S. Fish and Wildlife Service to meet certain requirements, including documenting the status of the wild populations, and conducting research that will help insure survival of this natural resource.

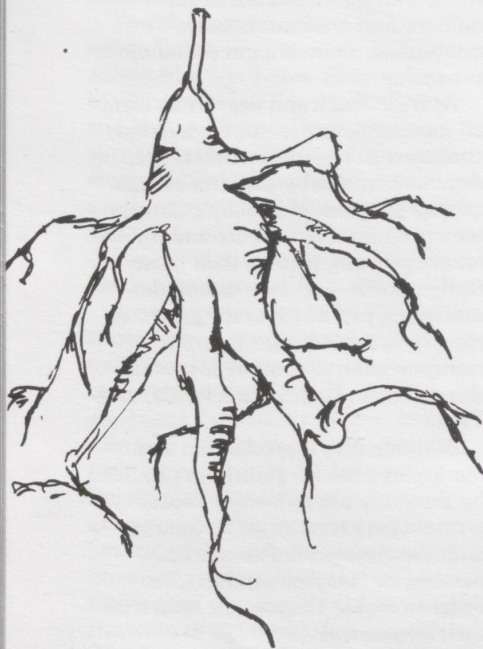
Researchers from UK's Horticulture Department have been collecting this data for the state for six years, while at the same time gathering additional information for research on the biology of the plant.

"When we monitor the plants, we are gathering material that will allow us to examine ginseng's growth and reproductive cycle," said Horticulturalist Clarence Roberts. He has been involved with the project since 1978. "When we began, we were

monitoring 64 one-acre plants in 12 counties. We have now monitored 115 one-acre plants in 62 counties. There seems to be a continuing interest in ginseng and our research will benefit the growers because we will be able to identify the properties that the plant responds to, such as calcium. Then we will make recommendations to help growers achieve a maximum yield by using a certain fertilizer compound.

"We also are interested in determining the reasons some ginseng roots lie dormant for several years before resuming growth," Dr. Roberts said.

Roberts indicated that studies also are currently underway at the University of Pennsylvania to determine ginseng's chemical makeup and its possible uses in the commercial marketplace. "Once all of the research is completed," Roberts said, "and if ginseng does have medicinal properties, it will certainly open up the American market."



Brain Malfunction May Affect Aging

By Marty Godbey

"Animals change throughout their lives by virtue of how they are created," said Dr. Richard Walker of the Department of Anatomy and Sanders-Brown Research Center on Aging. "Two cells become an adult animal in a continual state of reorganization."

Dr. Walker, an experimental gerontologist, believes an organizing unit in the brain may act as a pacemaker, or controller, of these changes, realizing its aim when the animal reaches reproductive maturity. With no evolutionary pressure to stop the developmental trend once maturity is achieved, the controller continues to promote change beyond the point of stability, producing the abnormal physiologic and behavioral patterns typical of aging.

This distortion in the temporal order causes susceptibility to disease and physiological weakening; Walker hopes ultimately to understand the mechanisms of time-dependent decline, so that the aging process may be slowed.

"It seems that with advancing age," Walker explained, "the patterns of change in neural communication give

rise to disturbances in biological time structure that are characteristic of aging. So, it is possible that the specific malfunctions of aging are the result of changes that occur first in the brain."

Walker's current research, funded by the National Institute of Health and the American Federation for Aging Research, focuses on the metabolism of specific neurotransmitters (molecules used by brain cells to communicate) in the suprachiasmatic nucleus (SCN), an area of the hypothalamus located above the optic nerves in most vertebrates. This area of the brain contains neurons regulating vegetative functions — feeding, thirst, sex, temperature control, rage, and fear — and the SCN has been identified as controlling temporal order.

Female rats of various ages are used in the study, due to the similarity of their reproductive systems to those of humans, and because the female reproductive system grows old and ceases function without the presence of disease. A specific marker, a hormone necessary for ovulation, indicates changes that occur with

aging. "With advancing age, secretion patterns of that hormone become defective," Walker said. "The defect resides in the brain, in part in the SCN."

Studying serotonin, a type of neurotransmitter, in the SCN, Walker has found it undergoes a rhythmic pattern of accumulation and depletion that seems to coincide with functions such as sleep, feeding, and endocrine secretion. By isolating the functions associated with various transmitters and examining the changes in the brain and in behavior that occur with advancing age, he may find other parallels that will lead to a better understanding of the aging process.

Not Part of a Loving Relationship

By Tawny R. Acker

"Spouse abuse is a human problem, rather than an economic one," according to Dr. Judith Worell, University of Kentucky educational psychology and counseling professor. "It cuts across socioeconomic barriers, although both social and economic factors affect or may trigger abuse."

Research indicates that an incidence of spouse abuse occurs in the United States every thirty seconds. Of all the reported incidences of spouse abuse, ninety-five percent of the victims are women. Fifty percent of these women return to the abusive relationship. Twenty to 25 percent were involved in abusive relationships with someone they were dating prior to marriage.

Worell and UK counseling psychology graduate student Victoria Witt, are conducting research designed to determine some common denominators in premarital and marital abuse. Their research will aid in identifying the factors that might be predictive of marital abuse at an earlier stage in interpersonal relationships.

The researchers have developed a survey which will be administered to UK undergraduate students and to



Rebecca Baylous

Not Part of a Loving Relationship
continued

currently married couples with known marital abuse, who have been suggested for participation in the study by regional mental health and spouse abuse centers. The questionnaires will ascertain demographic information and biographical data — including history of familial abuse, incidence and severity of abuse. There will also be a section gauging current contributing factors, including self-blame, feelings of helplessness, perceived alternatives, alcohol and/or substance abuse. Personality variables relating to either accepting or delivering abuse, including standardized scales for self-esteem, depression, sex-role orientation, and a measure of perceived personal power will also be incorporated in the survey.

For the purpose of this study, abuse was defined as slapping, hitting, punching or kicking, and clear threats of violence, such as "I'll get a gun and kill you tomorrow if you do that." Worell will be conducting another study which examines sexual abuse.

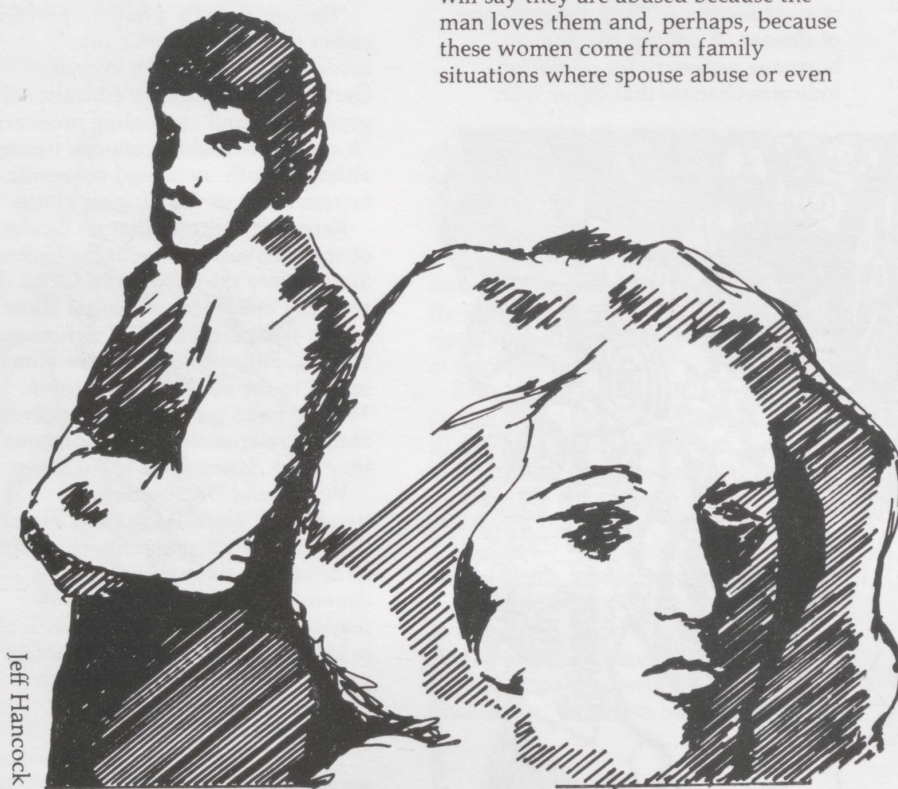
"Our concern is how do we help people understand what is happening to them (when they become involved in an abusive relationship) and then how to help them get out," Worell said. If they were aware of some of the factors that signal the onset of an abusive relationship then perhaps, Worell speculates, they would not become so involved. Or, if they could understand that abuse is not an integral part of a loving relationship, it might be easier for them to leave the relationship.

Worell expects that the research will show a higher incidence of premarital abuse than is suspected, and that the abused persons will show higher depression and lower self-esteem than other persons. She feels that the abused partner will stay in the relationship because of fear, emotional attachment, or because they believe they have no other alternative, often due to economic factors. Worell predicts that "sex-role socialization will be apparent in that the more traditional-type women, who accept men as the authority, will also be the majority of those in abusive relationships, and that what is known as a 'normalization of deviance' has taken place." For example, women will say they are abused because the man loves them and, perhaps, because these women come from family situations where spouse abuse or even

child abuse was a common occurrence, they accept it as a normal part of a relationship. Worell also expects the findings to show a high correlation between alcohol and substance abuse in incidences of abuse.

The study is also designed to allow follow-up projects with extensive personal interviews while the students are at the University to determine how many of the college students involved in abusive relationships continue them and why or why not.

The study is being financed under a grant from the National Institutes of Health's Biomedical Research Support Branch.



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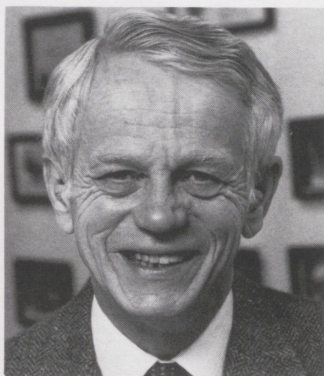
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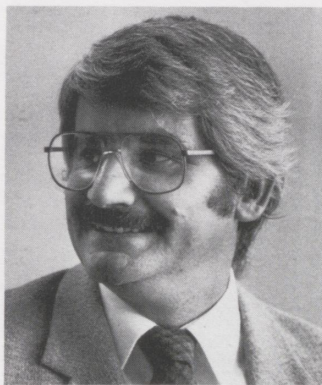


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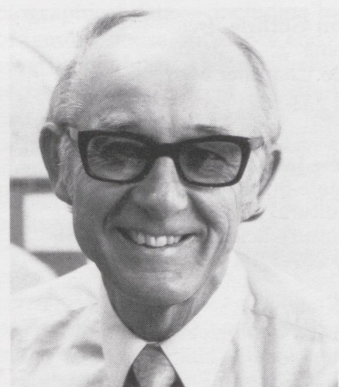


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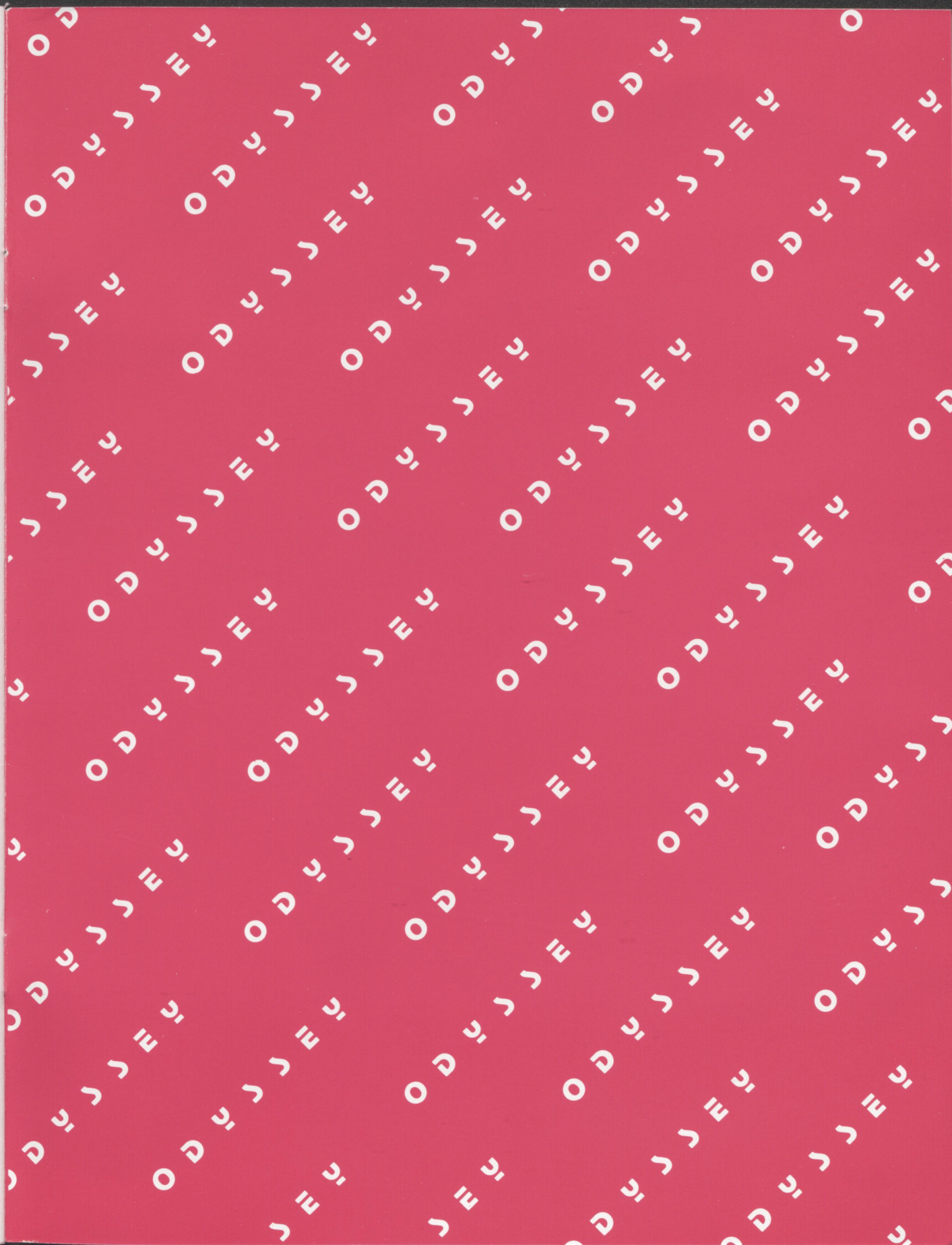
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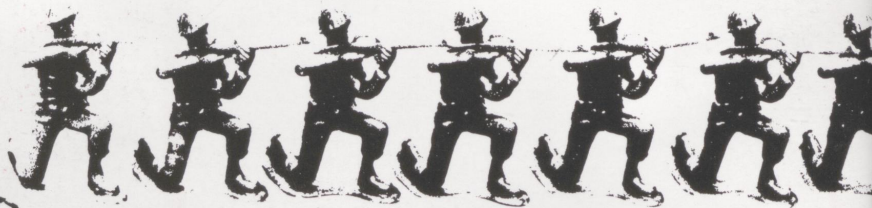
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