

PERSPECTIVES

RESEARCH, SCHOLARSHIP, AND CREATIVE ACTIVITY AT OHIO UNIVERSITY



AUTUMN ▲ WINTER 2002
VOLUME VI ▲ NUMBER II

A HIGHER LEARNING

LETTER FROM THE PRESIDENT AND VICE PRESIDENT



ON THE COVER Inspired by the topic and Americana art of Indiana-born artist Barbara Jeffords, Christina Ullman created this digital illustration entitled *Not in My Town: Facing AIDS in Rural America* as part of her personal collection.

DIGITAL ILLUSTRATION:
Courtesy of Christina Ullman

UNDERGRADUATE STUDENTS today demand more from higher education. Rising tuition costs, a tougher job market, and a more competitive race for graduate school have led many to seek hands-on learning opportunities through research and scholarly activity. We're happy to report that Ohio University is meeting this demand. At this very moment, hundreds of students are working alongside faculty in a variety of disciplines, creating new works of art and uncovering new knowledge in science, the humanities, and social sciences.

▲ The reasons undergraduates engage in research are many. More than half get paid, but there are easier ways to make money. Many want to get a taste of what it is like to work in their discipline long before they enter a graduate program. Will they like what they do? Is it intellectually stimulating? Undergraduate research offers students a unique opportunity to reach into the future and do the things they will encounter later in their professional lives. Along the way, they learn valuable technical and problem-solving skills and develop self confidence. They stand before an audience of scientists at professional meetings and present their findings, show their creative works in juried competitions, and publish their research in peer-reviewed journals. ▲ The advantages of these activities are enjoyed not only by students, but by their faculty research and creative advisers as well. Although carving out the time to mentor an undergraduate is challenging, we find that faculty members remember their own undergraduate experiences and their eagerness to get started on their careers. They want to attract good students to their field and find student involvement in research to be a helpful teaching tool. And professors often draw a lot of strength from undergraduates who are enthusiastic about their research. It's a mutually beneficial relationship. ▲ One of the hallmarks of an American education is instruction that helps students solve their own problems. It is not enough simply to learn facts or to read, write, and do math. These skills have to be integrated into a discipline. When they leave Ohio University, our students will enter a world in which the frontiers of knowledge are constantly being pushed forward. Engaging in undergraduate research and creative activity helps our students go the distance. ▲



ROBERT GLIDDEN
President,
Ohio University



JOHN A. BANTLE
Vice President
for Research,
Ohio University

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Comments and queries regarding editorial content should be addressed to Editor, *Perspectives*, 114 Research and Technology Center, Athens, OH 45701-2979; Phone: (740) 593-0946, E-mail: research.news@ohio.edu. Visit *Perspectives* online at www.ohio.edu/perspectives.

EDITOR
Kelli Whitlock

ASSISTANT EDITOR
Andrea Gibson

**SENIOR DESIGNER
AND ILLUSTRATOR**
Christina Ullman

INTERNS
Robin Burfield
Teresa Keyser
Nick Kowalczyk
Alison Stevens

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BY KELLI WHITLOCK

Most people who live in the country are attracted to the isolation from the noise and chaos of large cities. They enjoy the close nature of small communities and find comfort in what often is a neighborly environment. But for people with HIV and AIDS who have made their homes in rural America, some of the very qualities they love about country life are now causing them physical and mental anguish.

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BY ANDREA GIBSON

For the past 16 years, "Turtleman" Willem Roosenburg has patrolled the Patuxent River, documenting the population of the diamondback terrapin, the prized official state animal of the biologist's home state of Maryland. His research is prompting the state to explore ways to make the environment safer to these docile critters.

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If it's a print you seek, forget about those mass-reproduced posters for sale at the mall. The creation of a true print requires attention to detail, a lot of patience, and a little bit of obsession.

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In 1984, vice-presidential candidate Geraldine Ferraro offered a glimmer of hope to women wondering when someone of their gender would make it to the White House. They're still waiting. For now.

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BY KELLI WHITLOCK

With 25 volcanoes dotting its landscape, El Salvador is a geological hot spot on the Belt of Fire, a circle of volcanoes and fault zones that surround the Pacific Ocean.



IN THE COUNTRY The life of a dairy farmer is, at the very least, a challenge. Add an HIV diagnosis, and it becomes a far greater struggle.

PHOTO: Bill Petrie

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FIRST PERSON

WHAT IVORY TOWER?

ELITE INTELLECTUALS poring over dusty books, white-coated scientists toiling with Bunsen burners and test tubes, engineers at drafting tables with slide rules — these are stereotypes that have long outlived their usefulness, if they ever had any usefulness at all. Faculty in higher education indulge their curiosities, probe the unknown, all with a goal of learning something they didn't know before and sharing that new knowledge with others. Who knows where that knowledge could lead?

In some cases, the direction of such work is clear. The war against polio was waged with a vaccine developed at the University of Pittsburgh. Research by scientists at Florida State University led to the development of the cancer drug Taxol, which has helped thousands of people with cancer keep the disease in check. Scientists at Ohio State University developed vaccines to prevent the two most common diseases in cats, feline infectious peritonitis and feline leukemia. Television viewers around the globe scanned the surface of Mars through an imager designed by optical scientists at the University of Arizona. Scientists hoping to uncover the genetic causes of everything from Alzheimer's disease to high blood pressure welcomed technology invented at Ohio University that allowed the creation of transgenic mice and animal models for the study of human disease.

Theories in mathematics and such social sciences as economics, sociology, and political science are used to predict economic trends, help nations formulate international policy, and better understand the societal impact of today's global marketplace. John Nash was a young faculty member at MIT when he began the work that eventually would earn him a share of the 1994 Nobel Prize for economics. His research on game theory impacted everything from the field of economics to military planning.

Film, theater, dance, art, and literature enrich human life, giving it color and sound and texture. Boston University's Robert Pinsky served an unprecedented three terms as Poet Laureate of the United States, a tenure marked by the development of the "Favorite Poem Project," which brought increased national attention to this literary form. These and



DIGITAL ILLUSTRATION: Christina Ullman

Everyone benefits from the work of college and university faculty. It is around you at this very moment.

other works in the arts and humanities add depth to what otherwise would be a flat existence, perception that makes the degrees of purple in a sunset meaningful to a scientist studying atmospheric conditions, and to a couple walking hand in hand along a rocky coastline.

More and more, funding agencies want to know who will benefit from research and creative activity. The public wants to know. Our readers want to know.

So, I ask, "*Who?*" The answer: Everyone.

The work of college and university faculty is not done in an ivory tower, nor does the fruit of those labors remain tucked away, hidden from view. It is around you at this very moment.

And chances are, you are better off for it.

KELLI WHITLOCK
Editor, *Perspectives*

contributors this issue

You'll notice the work of these contributors in these pages and, we hope, in future issues of *Perspectives*.

RICK FATICA

Rick Fatica is a photographer for University Communications and Marketing, part of University Advancement. His work has appeared in *Perspectives* since it was created in 1997, and can also be seen in *Ohio Today*, the university's alumni magazine.

ELLEN GERL

Ellen Gerl (Anthology) is a freelance writer in Athens, Ohio, and an instructor in the E.W. Scripps School of Journalism. She has been a frequent contributor to *Perspectives* since 1998.

SUSAN GREEN

Susan Green (Anthology), a media specialist for University Communications and Marketing, is a first-time contributor to *Perspectives*. Her writing also can be found in *Ohio Today*.

JO McCULTY

Jo McCulty is a freelance photographer in Columbus, Ohio. Her work has appeared in *Perspectives* since the magazine's second issue in 1997.

MEDICINE

A MARGIN OF CHANCE *Better drug therapy could lead to bigger organ donor pool*

Last year, 14,152 people in the United States received a donor kidney. But more than four times that number ended the year on the national organ transplant waiting list. And 2,861 more died hoping for a match that was never found.

As doctors search for options to improve these patients' chances, they increasingly are considering the use of "marginal" kidneys — organs that may be less than perfect due to the health of the donor or the length of time the donor kidney went without blood. Doctors turned away from kidneys such as these in the past due to presumed higher failure rates, but new studies suggest that the majority of these kidneys fare as well as any other transplanted organ.

But with so many people on the waiting list, improving the viability of all potential donor kidneys is a goal of researchers such as Sharon Inman, an assistant professor of biomedical sciences who studies ischemia-reperfusion injury, tissue damage that occurs when blood flow to an organ is stopped then started again after a period of time. The injury is common in all kidney transplants, but may be particularly severe in patients who receive marginal kidneys.

"People have been looking at drugs to preserve transplanted organs for about 40 years," says Inman, whose work suggests that altering post-transplant drug therapy may aid kidneys with severe ischemia-reperfusion injury.

The most often prescribed post-operative drug is cyclosporine, an immunosuppressant that helps prevent the body from rejecting the new organ. The drug must be administered very carefully: Too large a dose could cause a drop in the rate at which the kidney filters blood and decrease blood flow to the kidney. For donors who receive a marginal kidney, this problem may be particularly dangerous.

Inman is studying the effectiveness of a new immunosuppressant that she suspects may be a better alternative to cyclosporine. The drug, rapamycin, controls the immune system differently than its more widely used

counterpart and, according to Inman's preliminary findings from a study in rats, may do so without harming the new kidney.

"The kidneys treated with cyclosporine fared much worse than those treated with rapamycin," Inman says, noting that those organs suffered more restricted blood flow and poorer kidney filtration. Her study followed the rats for five to seven days; the next step in the project is to follow them for a longer period of time. Inman also is interested in studies that suggest certain cholesterol-lowering drugs may improve renal function, and is launching another project to see if cholesterol medication can counteract the negative effect cyclosporine can have on the kidneys.

"More hospitals are starting to use marginal kidneys more often," Inman says. "We want to see if we can make those kidneys exposed to ischemia-reperfusion injury work better so we can use them for transplant."

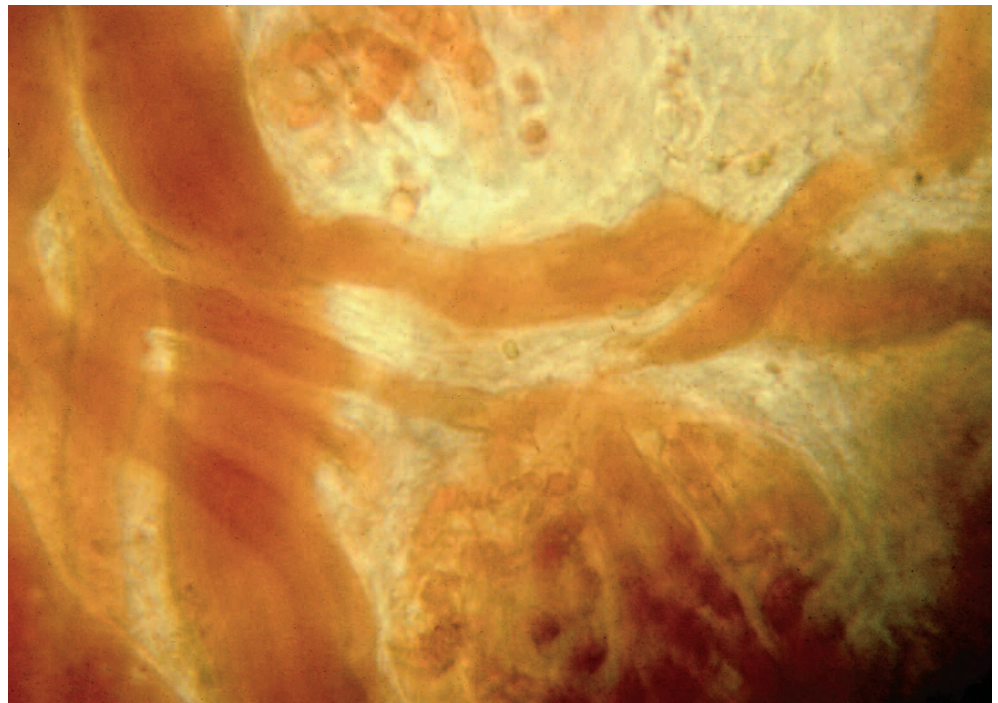
The use of marginal kidneys may be more common today, but they accounted for less than 2 percent of all organ transplants

in 1999, the most recent year for which the United Network for Organ Sharing has data. And the practice is not without controversy. Some of those kidneys come from non-heart beating donors — patients who, although they are not brain dead, could not survive without life-support equipment. Some claim this encourages the premature ending of the life of the donor. Others point to the two criteria used by many doctors for determining death: heart oriented and brain oriented. Scientists and physicians are now pushing for a uniform policy written by non-transplant specialists that would be instituted at all transplant centers.

"It's crucial that the public is aware and understands the endpoint of death," Inman says. "This is important since 'marginal' organs, such as those retrieved from non-heart beating donors, could expand the donor pool."

KELLI WHITLOCK

For more information about organ donation, visit the United Network for Organ Sharing at www.unos.org.



A LOOK INSIDE Scientists monitor increases or decreases in blood flow in blood vessels of the kidney, viewing the reactions in real-time through a microscope.

IMAGE: Courtesy of Sharon Inman

THEATER

RAZZLE DAZZLE

Canada's Cirque du Soleil redefines the notion of "circus"

Cirque du Soleil has dazzled audiences around the world with daredevil acrobatics, ethereal sets, and whimsical costumes. And for theater scholar Ame Wilson, the troupe has introduced something fresh and exciting to the theater world, redefining the notion of the circus at a time when traditional productions such as Ringling Bros. and Barnum & Bailey seem old hat.

"Cirque is a more elevated, 'art with a capital A' than that which has come before in the circus arts," says Wilson, an assistant professor of theater at Ohio University who has spent the past several years studying the close-knit theatrical troupe.

Canada's Cirque du Soleil includes five touring troupes that each perform different shows around North America and Europe, as well as two productions-in-residence in Las Vegas and one at Walt Disney World in Orlando, Florida. Cirque has featured 500 performers from 40 different countries, bringing acrobatics, drama, and exotica to almost 33 million people around the world since its creation in 1984 by a group of Canadian artists.

After Wilson attended and analyzed the individual shows, she contacted Cirque headquarters in Montreal, Canada, to continue her research. But when the tight-lipped organization declined an interview, Wilson got creative: She landed a job as a box office manager during the troupe's

Portland, Oregon, run to unravel its secrets.

After cautiously revealing her identity as a scholar, she interviewed her coworkers, who offered important behind-the-scenes details. Wilson learned that beneath all the acrobatics, there's a good dose of drama. The stories Cirque tells are based on the notion of the heroic journey. The shows introduce the hero or heroine (often a child), outline the journey she must take and the obstacles she faces, and then portray her overcoming these challenges and receiving recognition for the work.

The scholar also uncovered an interesting quirk of the troupe: While many of the performances, which are light on dialogue, appear to contain language that is Spanish, French, or Italian, the performers are actually speaking a gibberish they call "cirquish."

"None of the lyrics are real. They are all invented languages and they are invented for each specific show," says Wilson, who is possibly the sole Cirque scholar in the United States. She has presented her findings at several conferences in the United States and Canada, including the Mid-America Theater Conference and the Comparative Drama Conference.

Wilson will continue her research on the troupe by viewing and studying Cirque's newer productions, stunning affairs that use water, fire, and high-tech effects. She hopes the organization will open its doors to scholars in the near



UNDER THE BIG TOP Canada's Cirque du Soleil is more than a circus, Ame Wilson argues. It's theater.

PHOTO: Courtesy of Ame Wilson

future so she can conduct more interviews with the shows' creators and performers.

And she'd also like to make a case for Cirque du Soleil's place in the theater world.

"There's a lot of doubt among egghead groups that the circus is really theater," says Wilson, who hopes her work will change that reputation.

ANDREA GIBSON

For more information on Cirque du Soleil, visit the Web at www.cirquedusoleil.com.

ENGLISH

MUSICAL MUSE STUDIES REVEAL MUSICAL INFLUENCE IN JANE AUSTEN'S WORKS



NOTES AND LETTERS Jane Austen relied on music and literature in her writing.

PHOTO: Courtesy of Mimi Hart and the Jane Austen Memorial Trust

It's difficult to imagine a Jane Austen novel devoid of humor, charm, wit, conflicting pleasures, or music. In her day, proficiency in the arts was aligned with a woman's social status and her romantic availability. And although women were encouraged to attain a high level of proficiency in music, there was no public venue for them to perform.

A musician herself, Austen understood this superficial fusion of women and music with 18th Century English culture. Many of her female characters were accomplished musicians and, as a satirist, Austen took great pleasure in skewing the cultural

appetite for feminine accomplishments, according to studies by Assistant Professor of English Mimi Hart.

It was in graduate school that Hart first became interested in Austen's work and the dichotomy between female amateur musicians and social conventions of the 18th Century woven throughout the author's novels.

"Although the 18th Century witnessed a remarkable demand for the new pianoforte and a proliferation of printed music, music history records little of the female musicians for whom these goods were intended and whose study and

FINE TUNING

Refining cochlear implants

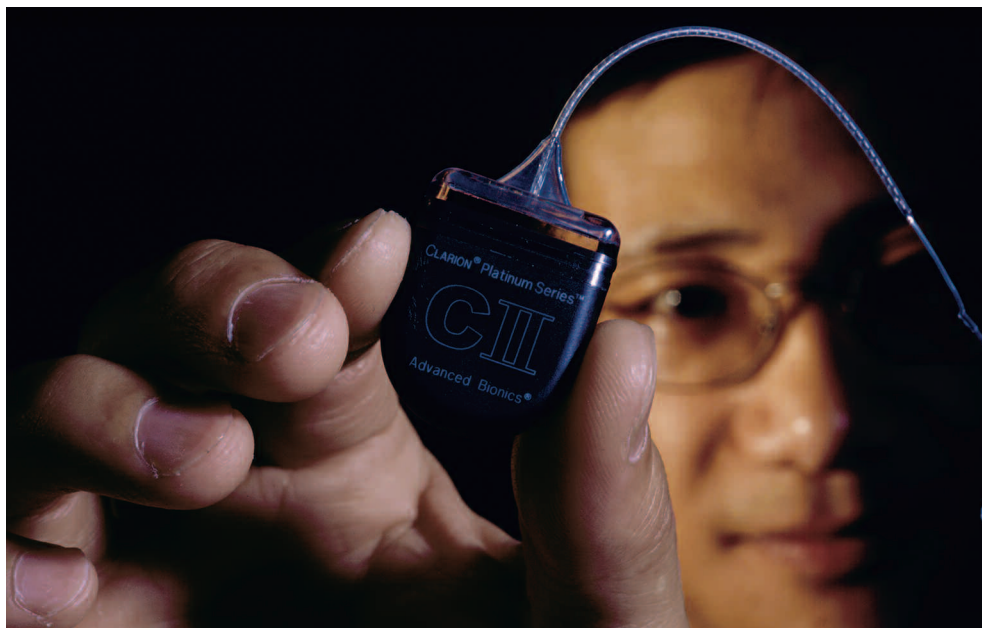
The syllable *ma* means one thing in English. But in Mandarin Chinese it conveys four different words when a speaker varies pitch. Pronounce the syllable flat and high to say *mother*. With a falling, then rising tone, it becomes *horse*.

For the quarter of the world's population who speak tonal languages, the ability to perceive pitch is key to communication. And for people everywhere, hearing different tones lets us appreciate music and sing.

Today, some 70,000 adults and children around the world who are deaf or suffer from major hearing loss have gained the ability to understand speech with cochlear implants, small electronic devices that surgeons insert under the skin behind the ear. But users have trouble perceiving tones, a drawback of the technology that scientist Li Xu and other researchers seek to remedy.

"Our next hurdle is to bring music to cochlear implant patients," says Xu, an assistant professor of hearing, speech, and language sciences whose research is funded by the National Institute of Deafness and Communicative Disorders, part of the National Institutes of Health.

His work focuses on improving implant design for speakers of tonal languages, research that one day may help others who are deaf hear melodies conventional implants don't allow them to hear. Xu's most recent study looked at the relative



DO YOU HEAR WHAT I HEAR? Today's cochlear implants have 22 channels. Li Xu's studies suggest they need 64 to allow users to perceive tones in music.

PHOTO: Rick Fatica

importance of two acoustic features — temporal envelope and fine structure — in perceiving tones.

He used the auditory-chimera technique, a method that mixes different acoustic features to create new speech sounds, to test a small group of Mandarin Chinese speakers with normal hearing to determine what tones they could hear.

The results, presented in August at the Collegium Oto-Rhino-Laryngologicum Amicitiae Sacrum conference in Amsterdam, suggest that implants need more auditory channels to carry temporal envelope information critical to perceiving pitch.

Today's models have up to 22 channels,

but 64 or more are needed, Xu says.

However, the research suggests that fewer channels might work if researchers can solve the problem of delivering fine structure information to a damaged cochlea, a topic that Xu plans to pursue next.

Xu next plans to study the language development in Mandarin-speaking children who are receiving implants as early as age 1 or 2. "What you speak is what you hear," Xu says. "It's like a new bionic speech being created due to the lack of tonal quality."

ELLEN GERL

For more information, visit the Web at oak.cats.ohiou.edu/~xul.

performance filled 18th Century middle- and upper-class homes," says Hart, who notes that much of the music during that time was written for women to perform at home for their families, which gave rise to amateurism. "Austen herself played the pianoforte every day for more than 30 years."

Hart's research led her to Austen's home in Chawton, England, where she found the author's hand-written and printed manuscripts in disrepair. Austen did not compose music. Rather, she painstakingly collected, copied, and bound hundreds of her favorite works.

"It was shocking to see the sad condition of the collection," says Hart, who presented her research at the general meeting of the Jane Austen Society of North America in Toronto this fall. "It's ironic considering the loving attention Austen focused on her treasured music. Their condition clearly indicated an opinion that her musicianship continued to be viewed as unimportant to her development as a writer."

But Hart maintains Austen's continuous pairing of books and music in her letters and in her novels points to how thoroughly she relied on both art forms in her writing. Austen's letters also reveal how the author

used music to examine important issues of women's lives, Hart adds.

Determined to recover and preserve the manuscripts and songbooks, Hart formed a partnership with the Jane Austen Memorial Trust in Chawton, England, and possesses sole rights to their publication. She'd like to publish a Jane Austen songbook and is currently investigating possible publishers.

For now, Hart is in the process of digitizing the collection of Austen's papers. When the process is complete, she plans to donate it to Ohio University Libraries.

SUSAN GREEN

SOCIAL WORK

ANOTHER AMERICA *Revisiting the persistent poverty of Central Appalachia*

Michael Harrington's 1962 book *The Other America* helped spawn the War on Poverty by calling attention to impoverished regions in the country, including Appalachia. It also inspired Susan Sarnoff to enter the field of social work.

To help celebrate the 40th anniversary of the book's publication, the social worker revisited the author's observations about poverty in Appalachia. To her dismay, little has changed.

While poverty shrank in southern and northern sections of Appalachia, Sarnoff found the problem persists in the central region that encompasses West Virginia, southeast Ohio, and parts of Pennsylvania and Kentucky. Some Central Appalachian counties show poverty rates three times those of the nation's poorest counties and unemployment rates double the national average.

"It's a shame that it (the book) still rings true," says the Ohio University assistant professor of social work.

Sarnoff presented a paper on the subject in August at "Rediscovering the Other America: A National Forum on Poverty and Inequality." The work also will appear in a special commemorative issue of the *Journal of Poverty* to be published this fall or sometime next year.

The reasons for poverty in the region are numerous. Unlike Southern Appalachia, aided by federal money and attention during the Civil Rights movement, "Central Appalachians were never helped by the federal government," says Sarnoff, who chairs a graduate program focused on social work in rural environments. In addition, she says the region's geographic isolation has discouraged many businesses from locating here and kept it "invisible" to urban-oriented politicians.

"Policy makers often live in cities and they get away from the city to what they think of as a rural area — Vail or their summer home in Connecticut," she says. "They do not understand what it's like to live in a rural area lacking access to sewers, reliable phone service, clean water, or public transportation.

"There's also a certain attitude that if people want to help themselves economically, they can move to the city," Sarnoff adds.

That notion suggests there is a city nearby. Indeed, many Southern Appalachians found jobs in Atlanta; Tuscaloosa, Alabama; and

Macon, Georgia, cities that in return garnered financial aid. In contrast, she says Central Appalachia is "simply not a commutable area." And people in Central Appalachia want to stay.

"I don't know of a place in the world that residents love as much as people in the hills love the hills. That has to be respected," Sarnoff says.

Central Appalachians' rocky history with the coal industry also helps to explain their reluctance to leave.

"As long as you own your own piece of land, you can grow your own food. You don't have to work for 'the man,'" she says.

Still fresh in this generation's mind are stories of coal companies forcing family

members to give up their land and work for money, then stay at work at gunpoint until they'd paid off debts to the company store, Sarnoff explains.

However, Sarnoff's readings and personal observations offer hints of economic hope.

"We're on the cusp of something exciting," Sarnoff says as she describes consumers' increasing desire for homemade goods, organic foods, and the desire to "buy apples from an orchard you can visit," products and experiences that many Central Appalachian businesses market. But for now, she adds, Central Appalachia remains "very much the other America."

EG

HEALTH

THE PRESSURE IS ON

WHY ARE SOME PATIENTS UNABLE TO CONTROL THEIR BLOOD PRESSURE?

The war against high blood pressure has been fought with public awareness campaigns emphasizing the importance of taking prescribed medications, a healthy diet, and regular visits to the doctor. And the battlefield is thinning: According to the National Center for Health Statistics, the percentage of Americans age 20 to 74 with high blood pressure decreased from 40.4 percent during the first study period, 1976 to 1980, to 23.9 percent during the last study period, 1988 to 1994.

But studies also suggest that of the 24 percent with hypertension, just more than half take medication as their doctors prescribe. Why are some patients unable to follow doctors' orders?

For people in rural areas, the reason could be financial. The high cost of drugs and the time off from work for a doctor's visit may be more than some patients can afford, and their health pays the price, says Dr. Daniel Marazon, associate professor of family medicine and medical director of the Ohio University Osteopathic Medical Center.

Marazon and collaborators at Doctor's Hospital Family Practice Centers in Columbus, Ohio, analyzed the records of 127 patients over a nine-month period who were either receiving care at an inner-city clinic or a similar rural center. Their goal? To gain a better understanding of why some patients struggle to control their blood pressure.

A little less than half — 48.8 percent — of all participants had uncontrolled blood pressure.

Of that group, 38.5 percent were new patients and 39.1 percent missed scheduled office visits.

"Physicians typically see a newly diagnosed hypertension patient every week or two until they are stabilized, then they come back every three months. But we found out that doctor visits every three months is too far apart to maintain good control," Marazon says, adding that patients likely forgot about their appointments, had transportation problems, or were unable to take time off from work.

One way to address these problems would be to establish a patient call-back system, similar to what many dentists' offices have in place. Another would be to have a health professional call patients newly diagnosed with hypertension every week for several weeks. Such systems require additional personnel, but the benefit to the patients, Marazon suggests, could be significant.

Changing blood pressure medication, depression, problems with substance abuse, and age also were listed as barriers to blood-pressure control in the study, published earlier this year in the *Journal of the American Osteopathic Association*.

There likely isn't one solution to this problem, Marazon notes, and what works for one health care center may not work for another. But identifying the risk factors, he adds, is the first step toward a prescription for care that works.

KW

SKY'S THE LIMIT

Research keeps satellite beams on target

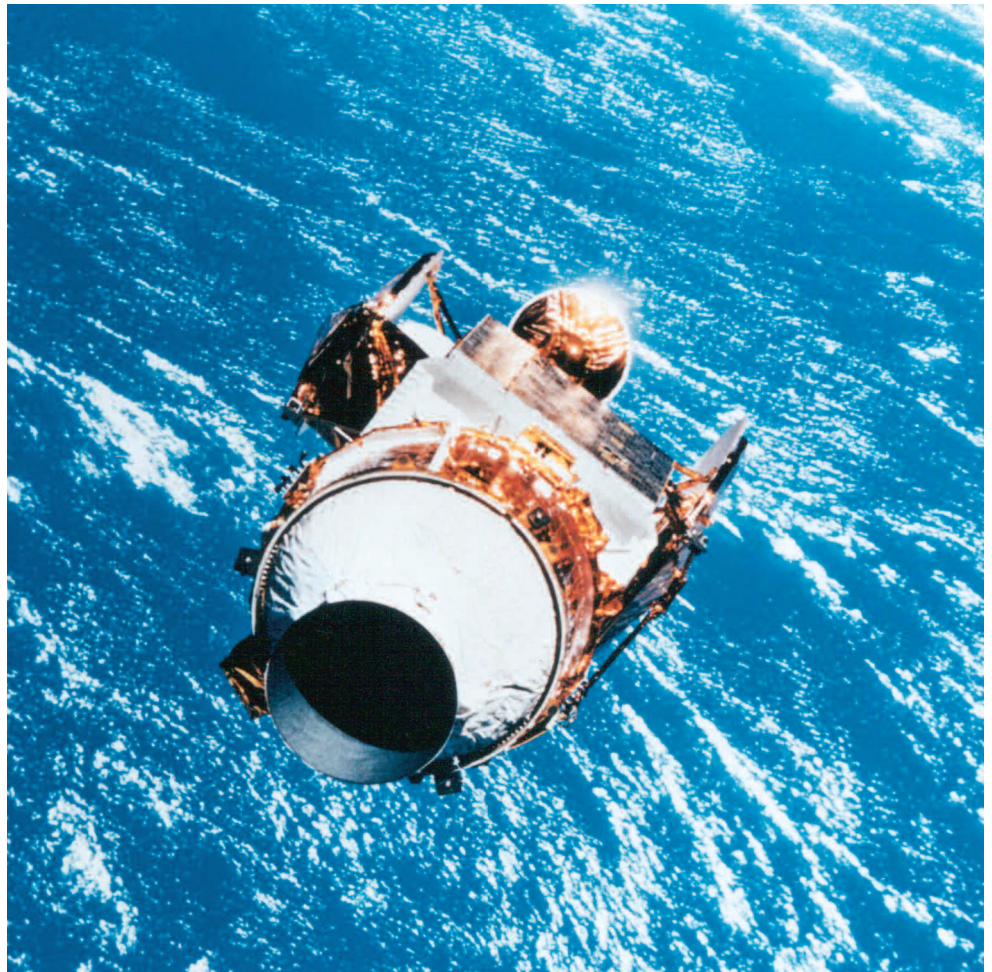
In 1993, NASA launched the Advanced Communications Technology Satellite — ACTS for short — to test new technologies for the next generation of communication satellites. Engineers originally designed the satellite for geostationary orbit: They parked it above the equator and set it to rotate in sync with the Earth's rotation. In this orbit, a satellite appears fixed in one spot.

But by the end of last year, ACTS was out of fuel and unable to maintain this position. The craft drifted into inclined orbit, causing the satellite's communication spot beams to miss their intended targets on Earth by as much as 50 miles. The misalignment reduced the strength of the satellite's signal and made it unusable for high-speed communication purposes. And for any satellite, beaming data to the wrong place signals doom.

That's a signal researchers at Ohio University didn't want to receive. The university began working with the satellite after NASA completed its experiments last summer. The space agency wanted to make ACTS available to universities and industry for education and research, and Ohio University was selected to lead a national consortium to make that happen.

But the researchers' interest in fixing the satellite's orbital dilemma was prompted by more than just the university's involvement with the consortium. Their motivation was scientific curiosity.

A research team that included engineering and communications students examined the problem and discovered there was too much movement along the satellite's yaw axis — a motion that jockeyed its tail back and forth. The onboard gyroscope and electromagnets effectively controlled the other axes, pitch and roll. But to measure and then correct its yaw angle, the satellite used a sun sensor hidden by Earth's shadow much of the day, according to Dennis Irwin, dean of the Russ College of Engineering and Technology. Irwin and collaborator Hans Kruse, an associate professor in the J. Warren McClure School of Communication Systems Management, headed up the research effort.



IN THE BLUE The Advanced Communications Technology Satellite pioneered new initiatives in communications satellite technology when it was launched by NASA in 1993. Now, it is a celestial laboratory for researchers and students at Ohio University.

IMAGE: Courtesy of NASA Glenn Research Center

"We needed to get the yaw movement down to one-tenth of what it would be with just the onboard spacecraft control system," Irwin says.

But how? Team members first calculated the position of the spacecraft from a beacon signal being transmitted to Cleveland. "For students, it was a chance to apply everything they've learned in classes about orbital mechanics and geometry," Kruse says.

Using data the onboard computer couldn't see and performing sophisticated calculations its memory couldn't hold, the students determined where the spacecraft should be. Next they fooled the onboard software with their inputs "to do what we wanted it to do," Kruse says.

It worked. The experimental satellite originally designed to function for four years continues in its ninth year of operation.

And on September 11, 2001, ACTS was called into national service. Students and

faculty worked through the night to reconfigure its antennas to interface with the Air Force Research Laboratory's ground terminal, which is mounted on a High Mobility Multi-Use Wheeled Vehicle.

"The idea was to provide a number of telephone lines through satellite in case additional ground telephone lines were damaged in subsequent attacks," Irwin says. Never deployed, the satellite "was ready if it had been needed."

The researchers say future ACTS projects will look at using new electronic components on the market to build ground stations that are smaller, faster, and cheaper than current ones and making the satellite's telemetry capabilities more widely available to other educational institutions via the Web.

EG

For more information, visit the Web at www.csm.ohiou.edu/ocact/.

TRAVEL

DESTINATION: APPALACHIA?

Scenic hill country. Log cabins with front porches. Herbs and handcrafted items for sale. It's a vision of Appalachia that tourism officials in southeast Ohio believe will attract visitors. But do tourists view this region as Appalachia?

That's what Matt Zuefle wanted to find out when he polled 118 people who took part in the Tour of the Scioto River Valley, an annual event in which thousands of people from around the state, nation, and world bicycle from the Ohio statehouse to the Ohio River at Portsmouth and back again. He shared results of the unfunded study with city officials this summer and plans to use its pilot data to spur future research.

"There are two archetypes of Appalachia: one is that of poverty and squalor, and the second is the romantic mountaineer living the simple life," says the assistant professor of recreation and sport sciences, who grew up in

STUDY EXAMINES PERCEPTIONS OF APPALACHIA AMONG TOURISTS

Zuefle Hollow in south-central Ohio's Scioto County. As more cities market the latter notion, Zuefle says, the cognitive map of Appalachia is expanding. "A cognitive map defines where people — especially cultural outsiders to the region — think something is," he explains.

Unlike geographic areas delineated by mountains or watersheds, or political or cultural boundaries, the cognitive map relies on perceptions, he explains. Two University of Kentucky researchers described Appalachia's cognitive core, or greatest area of recognition, as the area where West Virginia, Kentucky, and Virginia meet. Portsmouth and other southeast Ohio cities are well outside this circle, earning only 10 percent to 20 percent recognition as being part of Appalachia. But Zuefle's research suggests the circles may need to be redrawn.

"I wanted to look at one place on the edge of the Appalachia region and question both cultural

insiders versus cultural outsiders to see where they view the boundaries of Appalachia," Zuefle says. To his surprise, the results showed "many more people than I would have guessed consider this part of Appalachia."

Non-Appalachian residents of Ohio and Kentucky expressed a more favorable view of southeast Ohio than out-of-state tourists, which suggests that the area might be more marketable as a regional tourist attraction rather than a national one. The individuals polled also gave the Portsmouth area high ratings as a travel destination.

For officials banking on tourism to boost the river city's economy, that's good news indeed.

EG

For more information about Ohio tourism, visit the Web at www.ohiotourism.com and www.appalachiangateway.org.

BIOENGINEERING

MODEL KNEES *New implant could improve knee replacement surgery*

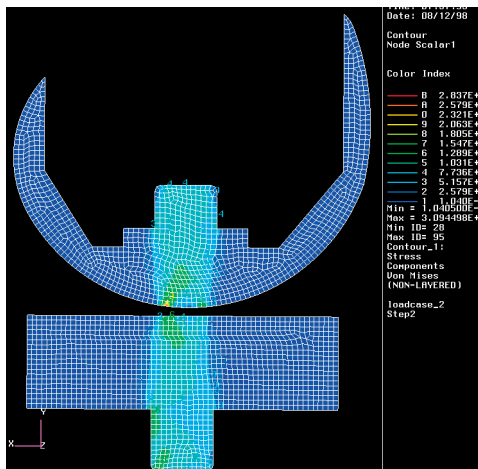
A Columbus surgeon recently invited biomechanical engineer Bhavin Mehta to watch a knee replacement surgery. The physician cut and drilled his patient's knee, then hammered the implant into place.

The implant "is mechanical in nature," says Mehta, an associate professor of mechanical engineering at Ohio University. "That gave us confidence." Mehta is designing a new knee implant that would offer greater durability and mobility, good news for patients who require implant surgery due to osteoarthritis, trauma, or athletic injuries.

Many conventional devices wear and loosen over time, making a repeat operation necessary every five to seven years. Each surgery results in some bone loss, so patients seldom can undergo more than three replacements. Surgeons disagree on what causes implants to fail. Mehta believes the reason may be the removal of two ligaments that crisscross the knee where the solid implant must fit. Two other ligaments remain intact.

"As engineers, we think that if you are holding something with four strings versus two strings, it is going to be more stable. And if it is more stable, it will loosen less," Mehta says.

Mehta's knee implant design features a hollow, concave surface that offers surgeons



TOTAL IMPACT Bhavin Mehta studies how weight-induced stress affects his knee implant design through computer simulation.

IMAGE: Courtesy of Bhavin Mehta

space to reconstruct the cruciate ligaments. "These ligaments are critical when you are running, jogging, or playing games," Mehta explains, adding that this is particularly helpful for active patients.

Computer analyses showed the lighter implant could handle the stresses placed on bones during walking or climbing activities as well as traditional designs.

Several steps precede a product prototype, however. Mehta and a team of graduate students first constructed an anatomically

correct model of a human knee — "not an easy task," he says. They created the 3-D computer model using hundreds of cross section images of an individual's knee captured by magnetic resonance imaging and computed tomography. With that information, students molded a plastic replica of the knee this summer.

While exploring the idea's patentability, Mehta says he hopes to convince surgeons that the new design has merit and interest the implant manufacturing industry in developing a prototype.

Mehta, who will present his findings in December at the International Congress on Biological and Medical Engineering in Singapore, is now researching the meniscus, a gasket-like structure that sits between the femur and tibia. Physicians currently replace the structure using the meniscus of a cadaver. A surgeon has encouraged Mehta to explore easier ways to perform the complicated procedure.

"Is there a composite material that would be better?" Mehta asks. "Is smaller better? Thick or thin?" Questions, he notes, that beg computer models.

EG

For more information, visit the Web at www.ent.ohiou.edu/~mehta.

KEEPING A JOURNAL *Publications offer outlets for writers and communication researchers*

Creative writers and researchers in telecommunications and popular culture studies are finding new outlets for their works in three new scholarly journals edited by Ohio University faculty.

Spring 2002 marked the debut of *The Online Journal of Space Communication*, a quarterly journal edited by telecommunications professor Don Flournoy. According to Flournoy, the electronic journal, a publication of the Society for Satellite Professionals International of New York, is designed to globally advance space communication as a profession and as an academic discipline.

The publication's goal is to become not only a record and repository for developments in satellite and space communication, but to generate critical analysis of those developments. The first three issues featured such topics as a database of worldwide academic institutions, research centers, and professional associations involved in the education of future professionals, and the legacy of NASA's Advanced Communications Technology Satellite (ACTS), which researchers at Ohio University have used for their studies. Applications in Satellite Remote Sensing,

including the American View program spearheaded by some of the university's faculty, also have been highlighted.

Avant garde writers and artists have another venue for their work in *Hotel Amerika*, a new literary magazine edited by Associate Professor of English David Lazar. Lazar says he hopes the publication, set to debut this fall, will respond to and include work in contemporary visual arts.

"Younger writers, international writers, and writers working in genres or forms that are more experimental will be featured in the magazine," he says. The cover of the inaugural issue will feature a photograph by renowned photographer and mixed media artist David Wojnarowicz, who died of AIDS in 1992.

Norma Pecora, an associate professor of telecommunications, will co-edit the third new journal, *Popular Communication*, with Sharon Mazarella of Ithaca College.

"Popular communication is a relatively new field and it differs from pop culture and American studies in that it looks at pop culture as it connects to the media," Pecora says.

Published by Lawrence Erlbaum Associates

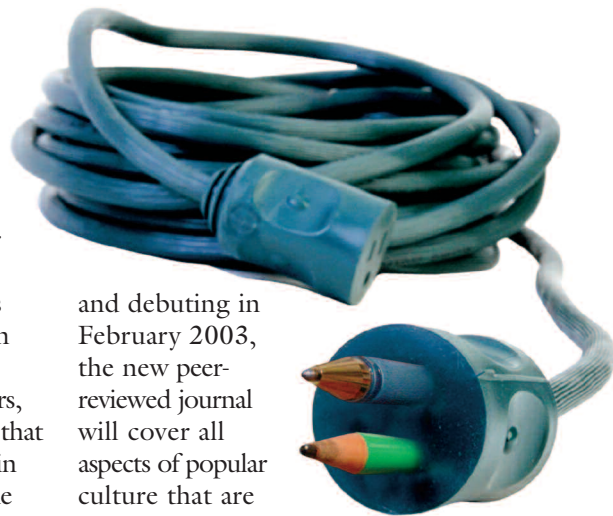


IMAGE: Christina Ullman

and debuting in February 2003, the new peer-reviewed journal will cover all aspects of popular culture that are mediated by or related to mass media, and includes feature articles on popular communication texts, artifacts, audiences, events, and practices. Content of the inaugural issue will focus on mapping the field of popular communication, Pecora notes, defining both what it is and where it's going.

SG

For more information, visit *The Online Journal of Space Communication* at www.spacejournal.org, *Popular Communication* at www.erlbaum.com/Journals/journals/PC/jpc.htm, and *Hotel Amerika* at www.hotelamerika.net.

a second look

AN UPDATE ON A PAST STORY

ENGINEERING AND TECHNOLOGY

PLUG AND PLAY SOCCER-PLAYING ROBOTS TAKE JAPAN

As Brazil conquered Britain and Germany in this summer's World Cup championship, a team of Ohio University soccer players also was testing its mettle in an international competition in Japan. These athletes weren't young men in mohawks, though, but a fleet of coffee can-sized robots.

In June, after three years of research and testing, Ohio University faculty and student engineers debuted a small team of soccer-playing robots dubbed the "RoBobcats" during RoboCup, a worldwide exhibition of robotics and artificial intelligence technology. ("Robots on the Run," *Perspectives*, Autumn/Winter 2000.)

The RoBobcats was the only team from Ohio and one of just a few around the nation to qualify for the soccer tournament, which aims to foster research in robotics and AI.

"RoboCup shows the best of what the world has to offer," says David Chelberg, project leader of the RoBobcats and an associate professor of electrical engineering and computer science.

For its first time in competition, the team of tiny robots fared well, scoring two goals against last year's second-place team, Singapore's Field Rangers. After some initial hardware and software glitches in the first three matches, played against teams from Iran, Australia, and France, the Ohio University engineers juiced up a "superbot" with a high-voltage battery to face off against Singapore.

"We were one of two first-year teams in the competition. The other team played for two minutes and then their system died, and they never got it back up," Chelberg says.

The Ohio University team also was a crowd favorite of the 117,000 visitors who attended the match during its five-day run, he says, and was cheered on by a group of Japanese school girls who chanted "Go RoBobcats" in English.

RoboCup isn't just about fun and games, though. The engineers hope to use the technology behind the soccer-playing robots to



MORE THAN A GAME RoBobcats' technology has the potential to be used in everyday life.

PHOTO: Rick Fatiga

help create a network of space satellites for NASA, develop a team of robotic pet dogs that could assist people with Alzheimer's disease, and design a fleet of robots that could be embedded in buildings to respond to emergency situations.

AG

For more information about the RoBobcats, visit the Web at <http://zen.ece.ohiou.edu/~robocup/>.



TEXT AND PHOTOGRAPHY

BY ANDREA GIBSON

Tale of the Turtlemán

A study of diamondback terrapins uncovers hidden dangers for Maryland's prized reptile

B iologist Willem Roosenburg has a sixth sense, it seems, for where the turtles have been. Strolling along a Maryland beach where the creatures reportedly have crawled ashore to bury their eggs, he stops at an inconspicuous swatch of sand, squats down. His bare hands gently probe for the nest.

“Here’s another one,” he calls out a few moments later to his graduate student, Phil Allman.

“There’s Willem, using his Jedi powers,” Allman remarks with a smile and a shake of his head, marveling at the way Roosenburg hones in on the nests, where about a dozen pecan-sized eggs are incubating a few inches beneath hot sand.

Soon, the student promises, he’ll be as good as his teacher.

Roosenburg has had plenty of practice. For the past 16 years, he’s patrolled Patuxent River, documenting the population of the diamondback terrapin, the prized official state animal of the biologist’s home state of Maryland. The critters, which get their name from a patchwork of diamond-shaped black rings on their shells, live in the brackish waters between land and sea along the Gulf and East Coast from Texas to Massachusetts. In Maryland, they’re an important part of the Chesapeake Bay ecosystem, where they dwell with the state’s famed blue crab (the source of the culinarily revered crab cake).

The ecologist has explored basic scientific questions about the diamondback terrapins, such as the gender and age of turtles in the river, how the animals choose their nesting spots, and why the temperature of the nests determines the gender of the hatchlings. But Roosenburg’s research also is prompting the state of Maryland to explore ways to make the environment safer for these favorite reptiles.

It all starts in a sleepy bend of the Patuxent, where Roosenburg sets out at dawn in a motor boat, clad in a white wading suit and a fat pair of black sunglasses, in search of the small creatures. The biologist, who grew up across the river in Calvert County, is now a familiar sight on these waters, where some locals have dubbed him “the Turtleman.”

BORN ON THE WATER

Roosenburg’s predilection for life on the water may be in his blood. His father worked as a research technician for the Chesapeake Bay Laboratories, and Roosenburg enjoyed watching the biologists labor at work they clearly loved. His father also taught a young Roosenburg a lesson about the potential impact of such research. Puzzled over why

◀ **TURTLE TIME** A female terrapin waits to be examined by Roosenburg and his research team.

oysters in the river were turning green in color, his father traced the problem to the drainage system of a nearby industrial firm. The work led the government to require the installation of new stainless steel pipes to staunch the leakage of metals into the water.

Roosenburg followed his own passion for science through college and graduate school, and after dabbling in studies on various reptiles and fish, he returned to his original interest in turtles. Searching for a research niche and inspired by a fellow biologist’s work in Michigan, Roosenburg decided to focus on the little-studied diamondback terrapin population of southern Maryland — a sort of homecoming.

For many people, the term “terrapin” is probably unfamiliar outside the realm of college sports, where the creature serves as mascot for the University of Maryland, this year’s NCAA national champions in basketball. The university’s athletic logo features “Testudo,” a terrapin in a fierce pose, eyes glinting and sharp beak poised for snapping. “Fear the turtle!” fan T-shirts declare.

In real life, however, there’s little to be scared of. The docile reptiles live a quiet life in the river, feasting on clams, snails, small fish, and some vegetation. They lay a dozen eggs on the shore each summer to propagate their species.

Problem is, there are more and more people populating these river banks, and construction of new homes is crowding out areas where terrapins lay their eggs. Animal conservationists such as Roosenburg might argue that a more appropriate state motto would be “Fear *for* the turtle.”

“(Terrapins) are sensitive in this area because of the large shoreline development happening — it’s basically a bedroom community for Washington, D.C.,” he laments. “Everyone wants a waterfront property.”

Fishing practices and a burgeoning taste for turtle meat also threaten the terrapins. Some of the traps commercial and recreational fishermen use to catch crabs, eels, and other critters trap terrapins, holding them under water until they drown. And while actual fishing of turtles for human consumption is minimal, a growing Asian market for the reptile’s meat could endanger the population further. For example, if the price of terrapin meat climbed to \$4 to \$5 per pound, fishing of the animal could become more active. If so, the terrapin population could plummet by 90 percent in less than five years, Roosenburg warns.



SOURCE: Maryland Department of Planning

And after fishing out thousands of turtles from the Patuxent River for study, this is a scientist who knows his numbers.

BY THE NUMBERS

The sound of toenails scratching against plastic echoes from the bin where today's catch of turtles waits to be counted and analyzed. Dry and awkward out of water, the frisky ones scrape their feet against the container, eager to return to the river. Others withdraw their soft, leathery heads into their shells, biding their time. The turtles' skin ranges from dark to light gray in color; some are spotted. The shells, which all bear the diamond-shaped rings, may be black, gray, or golden.

"Here's my poster boy," says Roosenburg, hoisting a small male into the air. The turtle has a bright, honey-colored shell and silvery gray skin with black freckles. In the terrapin world, he's a beauty.

But the scientist isn't searching for examples of reptilian good looks today. He wants to know which turtles are thriving in the Patuxent — and which are not.

Since 1987, Roosenburg has captured and released 9,000 diamondback terrapins into the river. Each summer, he and several Ohio University students camp out at a house on a quiet crook of water, venturing out by boat at daybreak to set and check a series of long, tubular "fyke" nets in spots where turtles have been known to swim. After netting between 20 and 30 terrapins, the team returns to shore, where Roosenburg or one of his assistants measures the size of each creature (females are about twice as large as males), notes the gender, and counts the rings on the shell to estimate age. (The rings can wear off over time, making them an unreliable source for older animals.)

About 90 percent of the turtles he finds have been caught more than once. On a first catch, a turtle's shell is marked. Each time it's recaptured, more data is entered into the animal's file. Turtles have turned up between a few and 20 times over the course of the project.

Sitting at a wooden picnic table in the yard of his summer rental home, Roosenburg measures a female turtle with an instrument called a caliper. He calls out figures to a student, who pencils the numerals into a log.

"Hold still, babe," he tells the turtle. Her feet, punctuated with a sharp set of toenails, paw at the air.

Roosenburg has caught fewer and fewer females like this one over the past several years, which, he says, suggests the diamondback terrapin population is on a slow, gradual decline.

It's a problem not overlooked by the state of Maryland. In June, the Diamondback Terrapin Task Force, led by Governor Parris Glendening, announced new strategies to conserve the terrapin population. Measures include the creation of a voluntary network of terrapin nesting sanctuaries on private lands; stricter enforcement of a new, terrapin-friendly crab pot for recreational use; and a large-scale population and habitat survey, in collaboration with the U.S. Geological Survey and other partners. And the University of Maryland has agreed to donate a portion of the proceeds from the sale

of the "Fear the Turtle" T-shirts to the terrapin cause.

While the state is pursuing a number of conservation strategies, debate continues on whether to call for a moratorium on the commercial harvesting of the diamondback terrapin, as Roosenburg and others on the task force have suggested. The government's deliberation hasn't slowed down Roosenburg's work, however. The Turtleman continues to look for ways to save the turtles.

A GREAT CATCH

Several years ago, a Maryland fisherman was alarmed to find 49 dead turtles in a recreational crab pot set to catch blue crabs. The terrapins swam into the submerged wire mesh cage and drowned. Was this happening in other crab pots? Roosenburg launched a study to find out.

The fisherman's experience was not a fluke, Roosenburg's findings suggest. About 2,000 turtles were caught and killed each year in recreational crab traps before 2000. That year, Maryland residents learned of Roosenburg's solution to the problem: He modified a design created by a New Jersey turtle researcher and built a better trap. The scientist suggested expanding the conventional pot from



SIZING UP Ohio University undergraduate Beth Cook measures the size of a male terrapin found in the Patuxent River.

About 2,000 turtles were caught and killed each year in recreational crab traps before 2000, when Roosenburg introduced a better, turtle-friendly trap.

2 feet to 6 feet in height; the top 2 feet of the cage stick out above the water, giving terrapins unwittingly caught in the traps access to air. Roosenburg also tested small excluder panels that prevent most terrapins from entering. When Roosenburg's studies found that the pots outfitted with these by-catch reduction devices not only reduced turtle deaths by 100 percent, but actually caught a few more crabs, the Maryland Department of Natural Resources began requiring all residential crab trappers to use the new version. Eventually, Roosenburg hopes to test a similar device for commercial crab pots. He's taking small steps toward the issue for two reasons, however: The commercial crab pot study will be much larger in scope than the residential pot study, and changes in regulations for commercial fishermen are politically sensitive.

But crab pots may be only part of the problem. This summer, Roosenburg started studying whether eel traps also could be killing terrapins. Eel fishing isn't nearly as prevalent as crab potting — the primary market is Europe, where smoked eel is a delicacy. In 1999, Maryland watermen caught 300,000 pounds of American eel, compared to about 32 million pounds of blue crab. But Roosenburg, who catches eels for fishing bait, began noticing dead turtles in the 2-foot-long cylindrical cages — about one every five days.

“That was an alarming rate, and many of those turtles had drowned and died,” he says.

In the area under study, 72 pots are planted in various places in the river, half of which are fitted with a white plastic ring designed to prevent terrapins from swimming into the traps. By late June, the research team had found only two turtles trapped in the conventional eel traps, and none in the pots with the protective devices. The researchers also found that the traps equipped with the device caught just as many eels as those without the ring.

But it was too early in the study for Roosenburg to declare that his original concerns about eel pots were unfounded. He suspected that if the researchers were trapping at a different time of the year or using older eel pots with worn and stretched material, they might find more terrapins. Indeed, by mid-August, the team had encountered at least eight drowned turtles in the older-style traps.

Every two days, students led by Roosenburg or Tom Radzio, an Ohio University graduate student in biological sciences and a leader of the eel catch project, drive out in the motor boat to check the traps. Both types of traps are packed with razor clams, a favorite food of eels and terrapins (though



A BETTER TRAP Half of these eel pots are outfitted with a small plastic ring to prohibit terrapins from entering and getting trapped.

the stench is stomach-turning to humans), and tossed overboard. The old pots are hauled up into the boat, where the students empty the catch into a mesh bag. Most of the pots contain two eels and a few random blue crabs and small fish; the latter creatures are released.

The eels are brought back to shore, where Radzio weighs and counts them. They are as slippery as their reputation suggests, with a body that feels like a firm tube of Jell-O. Scott McGuire, a researcher with the Chesapeake Biological Laboratories, will take a sample of the eel catch for a study on the age and size of the American eel population, as well as to check for mercury levels in the fatty flesh of the creature. Fish are continuously monitored for chemicals and toxins, and the MDNR periodically issues warnings to the public about the consumption of certain breeds.

McGuire's connection to Roosenburg goes beyond their shared interest in eels. At age 12, the southern Maryland native, now 23, began assisting with the Roosenburg's terrapin research project, returning for several summers. It's a

tradition Roosenburg continues today. This summer, he's invited two local high school students to join the research team.

The scientist has used his terrapin project as field research experience for dozens of Ohio University students as well. These are people who thrive on outdoor work — rising early in the morning to get dirty and wet, roasting under the sun as they wrangle nets, traps, and a variety of creatures that are simultaneously slippery, stinky, curious, and, it must be said, cute.

"I get to spend all day on a boat. How great is that?" asks Amy Schroeder, an undergraduate from Westlake, Ohio.

Roosenburg, 43, and his students enjoy an easy rapport. The biologist is quick with wit and what Schroeder calls "Willemisms," such as his quip "You can tune a guitar but you can't tuna fish." (Roosenburg quickly points out that the source is rock guitarist Joe Walsh, a name that doesn't register with his Generation Y students.)

Those students who take to the field experience may move on to bigger things — graduate study and careers in biological or environmental science, where they may find themselves asking more questions about the critters they've encountered in the Chesapeake Bay. Graduate student Phil Allman, who is working on a doctoral degree, is already at that stage of scientific inquiry. He's helping Roosenburg examine another aspect of terrapin life that could aid in the creature's conservation.

TRACKS IN THE SAND

The turtles have been busy on Poplar Island. The damp sand is peppered with footprints making a path between land and water. Roosenburg and Allman follow the tracks, searching for the spots where the female terrapins have laid nests — called clutches — for their eight- to nine-week gestation period. Some of the nests are obvious — a half-moon of freshly tamped-down sand — while others require

Destruction of terrapin nests has risen over the last few decades, in part because predators of the animals that prey on turtle eggs have disappeared, and also because animal rights activists have weakened the raccoon trapping industry.



A GOOD EGG Terrapins lay about a dozen of these pecan-sized eggs under a few inches of hot sand. They hatch after eight to nine weeks.

the keen eyes of scientists who have followed the terrapins for more than a few summers.

This quiet beach is the site of a major environmental reclamation project led by the U.S. Army Corps of Engineers. Here, the researchers find about a dozen undisturbed nests scattered around the isolated island. But on the main shores of Maryland, raccoons, muskrats, birds, and other predators threaten the viability of the turtle nests. In a study of 844 turtle nests along the Patuxent in 2000 and 2001, Allman discovered that 91 percent had become prey. Destruction of terrapin nests has increased over the last few decades, in part because the predators of the animals that prey on turtle eggs, such as wolves and mountain lions, have disappeared, Roosenburg says. At the same time, the number of raccoons — which feast on the eggs — has risen. Animal rights activists have weakened the raccoon trapping industry, he says, which thrived on the sale of fur pelts.

Humans are becoming just as deadly to terrapins, however. To prevent beach erosion, Maryland residents sometimes build barriers such as sea walls and piles of rock known as “rip rap” along the shore. Access to the turtles’ favorite nesting grounds — sunny, sandy areas above the high tides — is denied.

The terrapins’ preference for those nesting areas isn’t coincidental — or arbitrary, according to Allman’s study, which he presented at the annual meeting of the American Society of Ichthyologists and Herpetologists in July. Roosenburg already knew that nests laid in cooler, shaded areas will produce primarily male hatchlings, while those laid in warmer areas, about 85 degrees Fahrenheit or hotter, will produce mainly female terrapins. But the turtles are purposely choosing these hot spots over other available nesting sites, the researchers now suggest. They suspect that this phenomenon, known as temperature-dependent sex determination, as well as the terrapins’ choice of warmer nest sites, may be adaptive survival strategies. But they need to study the issue further.

“It’s one of the \$64,000 questions that’s still out there,” Roosenburg says.

To try to answer that query, the researchers will work with a laboratory scientist to examine what changes happen inside the egg at the molecular level to prompt an embryo to become male or female. Allman’s dissertation will stretch beyond Maryland, as he has visited sites in Florida and New York to gather data on other terrapin populations.

THE LURE OF THE RIVER

It’s these basic scientific puzzles about the diamond-back terrapins’ physiology that might bring Roosenburg back into the lab more often during his next phase of research. For example, the turtles of Chesapeake Bay are much larger than those in coastal regions with saltier waters. Roosenburg’s curiosity is piqued: Is it the salinity or something else about the environment or food base that causes the size difference between populations around the country?

“Once you learn a little,” he says, “you realize how much you don’t know — and then you keep asking more questions.”



THE TURTLEMAN Biologist Willem Roosenburg shares a laugh with his crew of students after a morning of checking nets for terrapins.

But the scientist hasn’t shelved his past work either. In five or six years, Roosenburg will return to the crab pots to study the effect the modified trap has had on turtle mortality. He hopes to find the terrapins’ numbers on the rise.

These demographic studies are costly and physically taxing, though, Roosenburg says, and not without some unexpected challenges. Two years ago, an industrial spill slathered several inches of crude oil over the scientist’s entire study area, and Roosenburg estimates that hundreds of terrapins were impacted. His research team found a number of creatures with chemical burns and other ailments, and some of those turtles died during rehabilitation. Roosenburg sued the company, and this spring was awarded a \$10,000 settlement to be used toward his research project. He acknowledges that the company did a good job of cleaning up the accident, but as he scans the river, he admits he’s not sure what long-term effects the spill might have on the diamondback terrapins.

Despite such disappointments, it’s clear that Roosenburg isn’t ready to give up on the river. The scientist is in his element on the boat, where the morning light glints off his sunglasses and the water pumps against the craft as he shifts into high gear. A dozen diamondbacks fidget in a netted sack, anxious for a swim. The boat flies by buoys and wooden posts, which mark the river with the Turtleman’s name. ▲

For more information on Willem Roosenburg’s research, visit the Web at www.biosci.ohiou.edu/faculty/roosenburg/.



DIGITAL ILLUSTRATION: Courtesy of Christina Ullman

IT WAS ON A SUNDAY EVENING in March 1997 that Tim pondered suicide. His doctor called him at home to share the results of the HIV test he had taken a few weeks earlier. It was positive. As her voice filtered through the receiver, he caught his breath, and began to cry. He phoned a close friend for help. Tim explained what had happened. The friend hung up, leaving Tim alone with the news that a virus that had killed thousands had invaded his body.

He doesn't remember opening the bottle. Somehow, the pills were in one hand, the other reaching for a glass of water.

Dog lovers will swear that their pets sense human emotions. Tim will attest to that until his last breath. For as he lifted the pills to his mouth, Cagney, a large, white Dogo Argentina, knocked him down, scattering the pills across the floor of the small kitchen in his trailer in rural central Ohio. His first thought was for his pets' safety. He scrambled to gather the pills before Cagney and two other dogs could eat them.

He curled into a ball and cried, his dogs licking away his tears as they fell. *I can't die*, he thought. *Who would take care of the dogs?* His mind turned to his herd of about 70 cows whose milk provided him with the meager living of a small dairy farmer. They would need milking in a few hours. *Who would take care of them?* he wondered.

Tim had no way of knowing what lay ahead of him. No idea that the search for medical care and social support would take months. No warning of the tension a newspaper article about his HIV status would cause in his small town. He didn't know what the future held, but he knew that he couldn't stay on that cold kitchen floor.

He walked down the hall to his bedroom and set his alarm clock. 4 a.m. would come early, he thought, as it always does. The cows would beckon. The dogs would be hungry. That routine would not be changed by his doctor's phone call. But his life, Tim knew, was changed forever.

Rural America's Red Ribbons

Nearly 1 million Americans are living with the virus that causes AIDS. For those who make their homes in the nation's rural regions, fighting the disease is only half the battle.

BY KELLI WHITLOCK

NOTE: The last names of Tim and Curtis have been omitted to protect their privacy.

Each week, one out of every 16 people living with HIV and AIDS in rural America will seriously contemplate suicide. Research has found that limited access to health care and living in poverty are significant contributors.

NO SAFE HAVEN

Over the next several months, Tim began taking medications to hold the virus at bay and learning what he could about what was happening inside his body. The information he sought wasn't easy to find. The nation awoke to the nightmare of AIDS nearly two decades ago, but the country's rural areas still appear to be sleeping. Tim's frustration at the lack of local HIV/AIDS services eventually turned to determination. Within a year of his diagnosis, he found himself an advocate-in-training for others in rural areas who were living with HIV.

The Centers for Disease Control and Prevention puts the number of rural residents living with AIDS at around 50,000; far greater is the number of people in these small communities who are HIV positive, but who have not yet developed AIDS.

"That's more than 500 times the population of many of the towns they live in," says Timothy Heckman, an Ohio University health psychologist who studies AIDS in rural America.

Early in the AIDS epidemic, many who had left their rural communities for the city returned to the country after their diagnosis. Most came home to die. But since the discovery of protease inhibitors, drugs that prevent the virus from replicating, in the mid-1990s, many have come home to *live*. There also are those who were living in small towns when they tested positive for HIV, people who chose to stay in the close-knit hamlets they loved.

Now, many with the virus are finding that some of the very qualities that led them to make a home in rural America — isolation from the noise and chaos of large cities, the close nature of the communities — are now causing them physical and mental anguish. The antiviral drugs have, for many people, turned HIV into a chronic illness, not necessarily a fatal one. This has prompted a new direction for AIDS research in recent years, with medical and behavioral scientists turning their attention to the long-term impact of an HIV diagnosis and all that goes with it. Most early studies in this area were focused on urban residents. But a small group of scientists has honed in on life in rural America for people with HIV. Their findings suggest this attention is long overdue.

"If you looked at the literature in the mid-1990s, no one was really talking about HIV in rural areas," Heckman says. "Even now, when I go to a conference and talk about rural AIDS, it's me and seven others."

Heckman, an associate professor of psychology, is leading one of the few national studies ever done to examine HIV and AIDS in rural America. The research, funded by a \$1.3 million grant from the National Institute of Mental Health, is examining everything from treatment adherence to suicidal tendencies in 329 men and women living in rural areas in 14 states.

Although the project began just three years ago, the idea for the study was planted long before that. Shortly after completing his PhD in psychology at the University of Vermont in 1993, Heckman began a job search that led him to the Medical College of Wisconsin for a tenure-track position. He began assisting with a study of HIV and AIDS already under way and befriended a man employed to assist the researchers with the project. He was the first person with AIDS that Heckman had ever met.

After a while, the man decided to return to the small rural community where he was raised. Heckman lost touch, but later learned that moving home brought no respite to the man he'd known. In fact, he discovered that this man would spend hours in his room crying. He felt isolated and discarded.

Heckman began wondering then how a person with AIDS might be treated in his own hometown, a small community of about 10,000 people in the southeastern corner of Pennsylvania. Would life in that rural community be any different from what the man had experienced? It was a question that would become the focus of the studies Heckman continues today.

Life for many of these people, Heckman is now finding, is lonely and desolate. Most of his study participants feel cut off from support services, are living in poverty, and have seriously limited access to health care — issues Heckman and his study collaborators say have led many to consider taking their own lives. Last March, Heckman stood before a crowd at the Annual Conference of the Society of Behavioral Medicine and etched out the bleak image his data are uncovering: As many as one out of every 16 people in the study have seriously contemplated suicide.

That image is, unfortunately, all too accurate. Soon after Tim was diagnosed, he went to his small community's phone book looking for an agency or organization that would give the dairy farmer information about programs he needed. There were no such listings. Medical care also is absent from his small community, and he must drive nearly three hours to see his doctor.

"There's no 1-800 number that anyone would be able to find unless they go into a health department," Tim says. "And they're not going to do that in a rural community because they may know the person behind the counter."

Indeed, the adage about small towns pulling together to help their own has been tested. Tim's mail often arrives from his tiny county post office in a plastic bag with a pre-printed disclaimer that the torn envelopes inside were damaged during sorting and delivery. This seems to happen more often with mail from the Ohio Department of Health, Tim says. Sometimes, he adds, the mail arrives without the apologetic plastic bag, the envelopes ripped open with no explanation.



HARD AT WORK Running a dairy farm is weary — but rewarding — work. Tim has about 70 cows in his herd, and he knows them all by name.

PHOTO: Bill Petrie

This all began about a year ago, shortly after the 45-year-old was featured in a news article on HIV published by *The Columbus Dispatch*. The story, which included his first and last name and listed his hometown, was picked up by the Associated Press wire service and ran in his local newspaper. Soon after, he heard rumors that the owners of the dairy barn and land he leases were going to turn him out. Those stories later turned out to be exaggerated, though the owners have admitted the attention prompted by the AP article has been troublesome for them. They won't force him to leave, they've told him, but they would prefer it if he found another place to live and work. That experience is behind Tim's decision to withhold his name from publication today.

Over the years, Tim began to hear stories similar to his own. While he doesn't deny that anyone affected by the AIDS virus can be faced with what seem to be insurmountable problems, the issues in rural life, he claims, are unique. The voices of small-town residents often are muted by the clamor of city dwellers in national conversations about HIV and AIDS, Tim says. Put simply, they are just outnumbered.

"Most people have no idea what it's like to live with HIV in a rural area," he says. "I know people in cities, and it's just not the same."

COUNTRY LIVING

Close to 1 million Americans are living with the AIDS virus, 7 percent of whom live in rural communities, says Shari Steinberg, an epidemiologist with the HIV/AIDS Surveillance Branch of the CDC.

"Even though the rates are low in rural AIDS, the numbers aren't and we need to pay attention to that," Steinberg says. "Each of these people has their own special needs and even their collective needs are different than the urban needs."

When compared to urban residents with HIV, rural patients are more likely than their urban counterparts to be female, white, unemployed, and have an income of less than \$10,000 annually. They have less access to mental and physical health care, feel more isolated, receive less support from family and friends, suffer more community stigma and discrimination, and have a greater fear that their HIV status will be discovered. These and other findings come from a smaller study Heckman conducted while a faculty member at the Medical College of Wisconsin. The research, published in the spring 1998 issue of the *Journal of Rural Health*, included only participants from rural Wisconsin. But the results prompted the larger, multistate NIMH project, which Heckman began the year before he joined Ohio University in 2000.

Medications for HIV and AIDS can cost thousands of dollars a month. The financial obstacles to staying healthy are often greater in rural areas, where poverty rates can outpace those in urban centers.

One important goal of the NIMH project was to collect on a national scale the type of demographic data gathered during the earlier study of HIV and AIDS in rural Wisconsin. But another was to evaluate a telephone-based support network Heckman created called Project Connect, which brings together rural residents from around the country via a weekly 90-minute teleconference call. There are about eight people in each group (groups are separated by gender and sexual orientation), and the sessions are moderated by a mental health professional.

For the study, participants were randomly assigned to one of three groups for eight weeks. One group was designed to teach participants skills for coping with a life altered by HIV disease. Another offered information about support services such as medical care, transportation assistance, and the like. The last, a control group, involved no intervention at all. Participants completed a survey at the outset, following intervention, and again at four and eight months.

Arlene Kochman, a social worker and former colleague of Heckman's in Wisconsin, moderated groups of both men and women who spent eight weeks sharing their problems and insights with strangers known only by first names, if even that.

Women with children were worried about their kids' futures. Gay men didn't know which was worse: sharing their HIV status with family and friends in their rural communities, or disclosing their homosexuality. Heterosexual men were afraid people who discovered they had the virus would also assume they were gay, opening the door for the discrimination most gay people in the study already had experienced.

"I think society has become more tolerant, but I don't think rural America has caught up because they don't see (HIV/AIDS) enough," says Kochman, now a project director at the Yale School of Medicine.

Many participants cried when the eight-week project ended. One of the women in the last group Kochman moderated told the others, "I'm giving you my first name, last name, address, and phone number because I'm not going to let you go."

"If you tell me that one hour in one week for eight weeks can make a difference," Kochman says, "it's sad because it's so little."

THE PRICE THEY PAY

It's a cold mid-November afternoon and the cows are beckoning. Tim dons his coveralls and boots, still dirty from the morning milking, climbs into a beat-up truck and drives down the hill to the barn where his herd awaits.

He fills a bin with grain and ushers in the first round. Calling the cows by name (all 70 of them), he coaxes them toward the bin, clamps a metal harness around their necks to keep them in place, and connects a milking machine to their underbellies. As the heifers munch nervously, a pump drains



▲ ROUTINE VISIT Every few months, Tim makes the nearly three hour drive to Columbus to see his doctor.

PHOTO: Jo McCully

► COMING TO THE COUNTRY Health psychologist Timothy Heckman is one of only a few researchers in the United States to focus his HIV studies on rural populations.

PHOTO: Rick Fatica

their milk, which is forced through a series of pipes connected to what looks like a large metal thermos. The milk is kept cool there until Tim's buyer picks it up.

He's tired. His day began at 4:30 a.m. and he's had no time to rest. He recalls the days when his work left him fatigued, but not exhausted. He didn't need time to rest then. But now, the toll of the 15 pills he swallows each day is too great. The side effects are almost unbearable, he says. Diarrhea, headaches, nausea, dizziness, fatigue. He always tries to take advantage of the energy he does have, he says, adding that most of it goes into running his farm. What's left is often spent on efforts to educate the public and the Ohio Legislature about the plight of HIV-positive rural residents like him.

Tim has spoken at the Ohio Statehouse twice, once before a panel of senators and a crowd of 250 others. He has written the governor to protest the state's refusal in 2000 to apply for a \$1 million health education grant from the CDC. The federal agency awarded the funds to any state that applied, but Ohio legislators halted the application because the grant required states to offer information on preventing the spread of sexually transmitted diseases.

Funding for HIV/AIDS services and programs is a subject Tim follows closely. Like most people with HIV, he has no choice. AIDS medications can cost thousands of dollars a month. Even patients with health insurance face significant financial obstacles to staying healthy. The problem often is worse in rural areas, where poverty rates can outpace those in urban centers. At first, Tim tried to cover his medical costs without state assistance. He would spend \$1,400 a month for his medications, then spend months waiting for his insurance



company to pay him back. The toll on his finances was devastating. He took a second job at another dairy, working nearly 20 hours a day. He wasn't sleeping. He worried about money constantly. His T-cell count began to drop, a red flag that the immune system may be weakening.

Early in 1998, Tim signed up for the Ohio HIV Drug Assistance Program — OHDAP for short. All states have such an initiative, supported through the federal Ryan White C.A.R.E. Act, which provides funding for health care, support services, and a variety of other programs designed to assist people with HIV and AIDS. Last year, Congress allocated \$1.8 billion to the fund, half of which was designated for Title II programs, which help cover costs for health care and support services such as OHDAP.

For now, the amount of funding states receive is based on the number of AIDS cases they report. (Beginning in 2004, that formula will be expanded to include HIV infections.) Each state develops its own eligibility criteria, sets limits on how much money individuals can receive, and creates a list of drugs the program will cover. In a 2001 study published in *The Annals of Pharmacotherapy*, researchers at the University of North Carolina-Chapel Hill and Texas A&M University found a great disparity among the design of drug assistance programs throughout the country.

Some states covered fewer than 20 HIV drugs, while others covered hundreds. (New York had the most, with 225 drugs on their formulary. Georgia and Nebraska had the least; each covered just 13 drugs through their programs.) Some states had long waiting lists filled with hopeful would-be participants, while others had no waiting lists at all. The research also noted that some of the states

with the shortest approved medication lists were more likely to be in poorer, more rural parts of the country.

“The findings from this study,” the authors wrote, “suggest that persons living in rural areas of the U.S. have less medication coverage than do their urban counterparts.”

A few years ago, the Health Resources and Services Administration, which administers Ryan White funds to the states, set aside a portion of Title III funds, which support early intervention services, to address the needs in rural areas.

“Congress has shown bipartisan support in re-authorizing Ryan White and in providing financial support,” says Richard Aleshire, a program administrator with the Ohio Department of Health AIDS Client Resources Section. Still, as medical costs and HIV infection rates continue to rise, finding enough money to meet patients' needs is becoming harder and harder.

“I think what frustrates me more is that we're not further along,” Aleshire laments. “I thought at this point, we'd have a vaccine and be closing down shop. We're 20 years into this and still, 40,000 new people each year test positive for HIV.”

FOLLOWING DOCTORS' ORDERS

Tim doesn't believe an AIDS vaccine will be discovered in his lifetime. The best he could hope for, he says, is an expansion of services for people like him who call the country home. What he wouldn't give, he says, is to be able to live where he wants without having to drive two and a half hours to get the medical care he needs.

Every three months, Tim makes the drive to Columbus to see Dr. Seth Griffiths, who has treated Tim since shortly after his diagnosis. On this April morning, the trip seems



especially difficult. Tim has been feeling more tired than usual lately, a side effect of his HIV drugs. He was finding that he didn't have enough energy to get through the day. So he began skipping his medications every few days to regain the energy they robbed from him. Dr. Griffiths is not pleased.

"We know that if people miss their meds, it sets them up for failure," he tells Tim, who accepts the scolding guiltily.

Problems with treatment adherence are not uncommon among people with HIV, but may be more common among rural patients, according to Bernadette Heckman, a postdoctoral research fellow in psychology at Ohio University who is involved with the NIMH rural AIDS study. Among other questions, participants in that project were asked about their adherence to the medication regimen set by their physicians. When she analyzed the data, she found that 50 percent had skipped at least one medication dosage in the past seven days.

The reasons were varied, she says, but most either wanted to avoid negative side effects or simply found the multipill regimen too difficult to follow. Some just forgot to take their medicine. People who were new to a town or rural community and people of color were also more likely to miss their prescribed dosages.

For Curtis, it was a combination of many of these and other factors. As the former U.S. Air Force soldier leans back on a black sofa, his two dogs at his side, he grudgingly admits he isn't taking the drugs his doctor has prescribed as

he's supposed to. They make him sick, leave him feeling drained. He has a job for a local service agency, taking people who cannot drive to medical appointments. When he's not working, he's volunteering with AIDS outreach organizations near his home and at the state level in Columbus. The work is rewarding. It also gives him the opportunity to talk to others with HIV who live in towns such as his.

Curtis lives in the house he knew as a child growing up in the 1960s in central Ohio. When his parents bought it, it only had one room. Over the years, his father added extra rooms and built a second floor. Curtis lives on the lower level; his mother lives above. His backyard has room for his two dogs to play and a garden, which grows near a towering pine tree. The pine had been the family's Christmas tree one year decades ago. After the holiday, his father planted it out back. Although he worries about how people in this small town of about 5,000 might react should they learn of his HIV status, he doesn't want to move. But he fears what would happen if someone uncovered his secret.

"I know small towns," he says. "People talk."

DEGREES OF MEDICINE

Like Tim, Curtis has chosen a doctor outside of his small town. Though there is one local doctor who accepts HIV patients, Curtis questions the physician's knowledge about

Staying on top of the latest developments is, to say the least, time consuming for physicians. But it's a commitment Dr. Ellis Frasier says more physicians should make.



▲ ON CALL Dr. Ellis Frasier treats people with HIV and AIDS at his clinic in Ross County.

PHOTO: Jo McCully

◀ STAYING PUT While Curtis worries about gossip in his small hometown, this is where he wants to be right now.

PHOTO: Bill Petrie

the treatment of HIV. It's a concern Timothy Heckman says he's heard before.

"A lot of the stuff we do seems to suggest that it isn't that rural health care providers are refusing to provide care," he says. "The problem is finding a doctor who knows enough about HIV to treat the patient."

A 1996 study of where HIV patients seek health care found that just 1.4 percent of the people receiving treatment for HIV got that care in a rural area. Of those, 38 percent saw a doctor who had treated fewer than 10 other HIV patients during the six-month study period. Only 22 percent of rural patients were seen by doctors who had treated 50 or more HIV-positive patients during the six months. The number for urban patients was 85 percent.

"The vast majority of people with HIV in rural areas are not getting their care there, or at least they're not telling their primary care provider they have HIV," says Dr. Susan Cohn, an associate professor of medicine at the University of Rochester Medical Center, and author of the medical treatment study.

About 10 percent to 15 percent of her AIDS patients today live in rural counties outside Rochester, Cohn says. However, she estimates that of her rural patients who also see a local doctor, less than 5 percent to 10 percent have any "meaningful interaction" with that local physician.

"The care of HIV is so much more complicated and so much more involved today than it was in 1990," says Cohn,

whose research was published last year in the *Journal of Acquired Immune Deficiency Syndrome*. Today's physicians have 16 to 17 drugs to choose from when devising a treatment strategy for their patients, she says, adding "I would be surprised if many general providers are at all comfortable with this. I do this full time and I am at times professionally aghast at how much new stuff is going on and how little I know."

Staying on top of the latest developments is, to say the least, time consuming for physicians. But it's a commitment more doctors should make, says Dr. Ellis Frasier, a physician in Ross County who treats about 45 patients with HIV from rural southern Ohio.

Frasier treated his first AIDS patient in 1984 during his residency at Grant Medical Center in Columbus. In those days, about 80 percent of the AIDS patients he saw were dying. Today it's a different story. Now, treating a patient with HIV involves management of a chronic disease that is complex and controversial.

He knows doctors in his region who refuse people with HIV because they're afraid of how their other patients might react. Last year, after one of Frasier's patients died, a local funeral home refused to accept the body. The funeral director told Frasier he had a family. "How can I take this home to my family?" he asked. It harkens to the early days in the AIDS epidemic when funeral homes burned the bodies of AIDS victims or, in states that allowed the practice, buried the bodies without embalming them.

With all the information available about how HIV is transmitted and guidelines for proper precautions, Frasier says it's frustrating that at times, he still comes face to face with this type of fear. And so do his patients, many of whom participate in a support group Frasier moderates.

An evening in early summer found nearly a full house at the weekly gathering. When asked about the challenges of being HIV positive in a rural community, few in the group had nothing to say. One man had trouble finding a dentist. Another had found one a few years ago who would always schedule his appointments late in the day. He would arrive to find the dentist's office locked. Many had problems finding a doctor who would treat them, until they came across Frasier.

"In 1994, I left the hospital at Ohio State University weighing 60 pounds," one man said, glancing toward Frasier. "I'd be dead if it wasn't for him."

MIND AND BODY

If finding a doctor in rural America is difficult for people with HIV, finding mental health support is near impossible. According to the federal Substance Abuse and Mental Health Services Administration, the nation's mental health care system does not have the resources necessary to provide services for Americans infected with or affected by HIV. Most small communities have no

mental health services. Those that do often are unprepared to counsel people living with the virus.

Yet, the need for mental health care in rural America is great. Studies suggest people with HIV are more likely to suffer from depression, anxiety disorders, sleep disorders, and substance abuse. Many in Heckman's NIMH study laid claim to one or more of these problems, as well as others. "Very early on it was obvious that rural people were reporting more stigma and a lower overall quality of life," he says.

It also was evident early on that if these people were going to get the help they needed, it would have to come to them. Many in the study were unable to drive or had no car. Others were too sick to leave the house. Those who could drive and were well enough to travel were afraid they would walk into a mental health clinic or join a support group, and everyone in their hometown would know it. A telephone-delivered support network could sidestep these issues, Heckman thought. But would it work?

As more participants completed the study, the researchers began comparing the responses gathered before the study began and after it ended, examining family support, suicidal tendencies, treatment adherence, feelings of loneliness, and a host of other problems identified at the project's outset. The results were cause for guarded hope.

The best response was seen in participants assigned to either the informational support group or the coping skills group. People reported less hostility, fewer problems with depression,

and more support from family and friends. Researchers also noted a decrease in suicidal thoughts among both groups, and a significant increase in treatment adherence among those in the coping skills group: At the study's onset, only about 50 percent in that group followed their doctors' orders. After the group completed the eight-week telephone support group, that number rose to 60 percent.

The findings offer cause for hope, Heckman says.

"These short-term findings suggest that participation in a telephone-delivered mental health intervention program may be especially effective for rural persons who initially test positive for HIV or for those who are going through an acute stressor that may be relatively brief in duration," he says, adding that the next step in the project is to see if the positive effect of the intervention lasts for the long term.

The researchers have been sharing the information they've gained with AIDS service organizations, which may be able to use the data as they seek funding for services people with HIV and AIDS so desperately need. Operating a telephone-delivered support network may indeed be inexpensive enough for agencies to afford. Eight weekly 90-minute sessions moderated by one or two social workers could be offered to eight participants for a total cost of about \$1,216, Heckman notes.

UNDER STUDY

Though he knows it's unlikely, Heckman longs for the day when AIDS will be eradicated and he will be forced to



IN THE MOMENT Curtis once found it hard to think of the future. Today, he's making plans.

PHOTO: Bill Petrie

CURTIS

Curtis has a new job at a machining plant in Pittsburgh. It's probably not permanent, but the pay isn't bad and he likes the people he works with. This and other changes in his life prompted a decision: He will go back on his HIV medications, and this time, he'll take them as prescribed. In fact, he's enrolled in a treatment adherence clinical trial in Pittsburgh. Twice a day, he fills out a form with information about the medicine he takes. One of his pill bottles has a computerized counter embedded in the lid, which records how often he opens the container. He takes six pills in the morning and nine at night. They make him tired. He rides to work with someone because he often falls asleep during the drive to and from the city.

But he's hopeful now. He has plans to get a financial license, and possibly sell insurance. In November, he said he didn't like to plan for the future. By July, he's mapping out a course for a new career. His face is bright as he talks about the coming weeks, months. Six months ago, when asked what he wanted in life, Curtis looked away, paused, then said "To be happy." For today, at least, he is.

find another focus for his research. Unfortunately, it doesn't appear that time will come soon.

Meanwhile, he and his colleagues are interested in pursuing further studies on treatment adherence and prevention among HIV-infected rural populations. They already are working on a few new projects that were born out of findings from the Project Connect study. After identifying alarmingly high rates of suicidal thoughts in rural HIV patients, Heckman applied for and received a one-year, \$128,000 emergency grant from NIMH to give closer scrutiny to this understudied issue. He has enrolled more than 225 people in the project, which should end soon. Heckman hopes to have preliminary findings by the middle of next year.

Many older participants in Project Connect voiced problems and concerns that differed from those of their younger counterparts, a finding that spawned a two-year study of a telephone support network called Project Empower specially tailored for HIV-infected people age 50 and older. So far, 40 people from Ohio, New York, and Pennsylvania have enrolled in the project, which is supported by a \$435,000 grant from the National Institute on Aging.

It's an important effort, as new medical treatments continue to help people with HIV live longer lives. Statistics from the Ohio Department of Health suggest that 15 percent of the state's HIV/AIDS case load is over 50. What's more, among recent HIV/AIDS diagnoses in

Ohio, 7 percent were in people over 50. Through June 1999, 75,000 people nationwide were at least 50 years old when they tested positive, according to the CDC.

It's not the first time Heckman has centered his attention on this age group. A study of 113 people with HIV who were age 45 or older, which was published in 2000 in the journal *Psychiatric Services*, found that 27 percent had contemplated suicide in the week before the project began. Another 29 percent reported moderate to severe symptoms of depression. He also led a small, pilot study a few years ago that found that intervention delivered in face-to-face group settings helped people over 50 cope with mental health issues surrounding their HIV status. Project Empower was designed after this effort.

"I would never advocate for a telephone-delivered support group as a replacement for face-to-face meetings, but they can be a complement to those meetings," Heckman says. "And there are people who have problems with confidentiality, geography, or their health for whom a telephone group may be their only option."

For Tim and Curtis, and the thousands of other rural residents living with HIV and AIDS, these sorts of problems are commonplace. Having options is not. At least, not until now. ▲

For more information about this research, visit Heckman's Web site at www.psych.ohiou.edu/people/faculty/heckman.html. You can also search the Research Communications' Web site at www.ohio.edu/researchnews, keyword "Heckman." For general information about HIV and AIDS, visit the CDC Web site at www.cdc.gov/hiv/dhap.htm.



MOVING ON Tim feels it's time for a fresh start. As soon as he can save the money to move his herd, he'll leave central Ohio.

PHOTO: Bill Petrie

TIM

It's 10:30 a.m. and the humidity is already high. Just two days before Independence Day, Tim notes wryly. It's supposed to be hot. He's just had a shower to wash away the grime from his morning chores (milking, grass cutting). He looks healthy: 5 feet, 11 inches tall, 167 pounds, with a mop of brown hair. His eyes are bright blue. The image almost denies the existence of the virus that courses through his veins.

He leans back in a dark green patio chair outside his trailer. It's the first time he's relaxed since his day began at 4 a.m. There's a slight breeze, and Tim raises his face to a tree that offers merciful shade from the already-hot sun.

The calls of his guineas and the occasional bark of a dog break the silence, but only briefly. It is quiet here. From his seat, he can look down over the valley, almost see his barn through the trees. The cows will be hot today, he mumbles worriedly.

He will miss this place. The last year has been too hard, the fallout from the news article has drawn too much attention to his life. He has decided to leave as soon as he can save enough money to move his herd. He's looking in northern Ohio. For a place in the country. It might be different there, he hopes. He can start over and decide when and if he will share his story with others.

He'd like to own his own house, a big one with lots of rooms under trees that offer shade in the summer and color in the fall, his favorite season. He wants a big barn for his cows and a rolling pasture on which they can graze. He wants to be loved and to give love in return.

At times these things seem out of reach. But there are moments when his gaze looks past the virus that changed his life. And then, he says, he believes all things are possible.

Here's what a true print is not: the reproductions of Monet's water lilies or Van Gogh's *Starry Night*, stamped out by machine by the thousands and even millions, sold in the frame store at the shopping mall. And don't even count the "limited edition" series of 50,000 prints of a trendy painter's splashings that sell for \$500 a pop.

Printmaker Bob Lazuka shudders to think.

"Those should sell for \$15 like a poster you'd buy at a novelty shop," he says.

A real print, he explains, is an impression of the original mark an artist makes on stone, metal, silk, or even plastic, born onto 100 percent cotton paper after squeezing through a few thousand pounds of pressure per square inch on a formidable printing press. And, of course, reproduced by hand to build a series of 50, 100, or 150 identical images, signed by the artist and sold to galleries and the general public. An art aficionado in Green Bay, Wisconsin, could have the same original piece of artwork hanging on her wall that a printmaking enthusiast in Finland owns. These are prints. The posters that cause Lazuka to shudder are reprints.

Sharing a work of art in multiple is especially satisfying for printmakers, considering the arduous process they often go through to make it. Take artist Art Werger. He's enthralled by intaglio, a form of printmaking that requires him to painstakingly etch detailed drawings onto copper plates, using a 6-inch-long metal tool and acid, before rolling them through the press several times in different colored inks. Each time the paper emerges from the press, the image whispers a bit louder with life. It's a process that produces a new series of prints every two months to one year.

It sounds like hard work because it is. And that's what printmakers like about it.

"It takes a certain kind of individual to be a printmaker," says Lazuka, an associate professor of printmaking and director of



BY ANDREA GIBSON

Art Under Pressure

Those immersed in the age-old pursuit of printmaking — painstaking, precise, and, finally, sublime — know that it's work that doesn't let the artist off easy.

Ohio University's School of Art. "It's not just a discipline but a kind of madness. You need to be a little obsessive about things."

But ask any of the artists with the university's printmaking unit — which is considered by professional printmakers to be one of the premier programs in the nation — and they'll agree that the process of creating a print is worth the effort. Many artists throughout history would vouch for that.

FIRST IMPRESSIONS

Andy Warhol and Roy Lichtenstein made it hip in the 1960s. Pablo Picasso tried it thousands of times. So did Henri Matisse, Edgar Degas, and a number of other big names in the art world. They were skilled printmakers, following a creative tradition that began thousands of years before they were born.

Experts trace the roots of printmaking to the Sumerians, circa 3000 B.C., who first cooked up the idea of rolling stones over soft clay to make multiple impressions of an image. More than 3,000 years later, the Japanese and Chinese were rubbing paper against wood blocks, and the Egyptians followed up a few hundred years after that by printing images on textiles.

Like a lot of things, printmaking in the 21st century has adopted a certain technological edge, and it's not uncommon to find artisans using computers, printers, and photography to craft their work. But many printmakers, including the ones at Ohio University, still use such classic techniques as lithography, in which a grease pencil is rubbed over a coffee table-sized slab of limestone, and engraving, in which the artist uses a sharp tool to carve images in metal. Paper is pressed over the stone or metal plate to produce the print.

"Whether (printmaking) is an expanding field or shrinking field depends on how you define it," says Sergio Soave, a past president of the Southern Graphics Council, a nonprofit professional printmakers organization. "There's a strong tradition and there are many universities and communities in the country where very traditional printmaking is thriving. There are other communities that have decided to change the definition to include digital media."

Ask Soave, a professor of art in printmaking at West Virginia University, and he describes printmaking as a vehicle for creative communication — specifically, art that is affordable, portable, multiple, and democratic. Lazuka agrees with the broad definition, favoring a colleague's remark that a print is simply "a mark made by pressure."

Taking a peek at the portfolios of some of Ohio University's artists, it's clear that this open-ended description of the genre suits their work. While these artisans share some similarities in process, philosophy, and final product, their individual approaches illustrate the wide range of work being created in the field of printmaking.

HEAVY METAL, SOFT PAPER

Wood and copper. Linoleum and silk. Stone and plastic. If it's solid and stable, an artist can make a print from it.

Werger, a professor of printmaking at Ohio University and a nationally renowned intaglio artist, uses one of the more meticulous processes. Intaglio requires the exact opposite approach to a conventional painting or drawing: Instead of adding an image onto a blank canvas or sheet of paper with paint or pencil, the artist scratches away at the surface of the metal plate with a



▲ *6TH QUARTER (KOSOVO)* Lithograph/screenprint, 22 x 30 inches.
Artist: Benjy Davies, 1999.

◀ *YELLOW AND RED* Etching on handmade paper, 32 x 16 inches.
Artist: Mary Manusos, 1991.

tool — a process of subtraction. When the artist wipes ink over the plate, it sinks into the grooves. The deepest marks produce the boldest or darkest colors, while the untouched surface of the metal will print white on paper.

Intaglio has allowed Werger to create several stunning series of prints. *Swimmers*, a sequence of 10 individual images created between 1998 and 2000, shows mostly girls and women clad in bright swimsuits from an underwater vantage point. The colors are bold and tropical and the shimmer of sunlight in the water is almost photographic.

But Werger also has used a related process, called mezzotint, to produce a series of small, finely detailed black and white images that have a moody, film noir quality. For one month last year, while laid up from knee surgery, Werger etched city scenes on 36 individual napkin-sized copper plates. Each day, his wife would crank the plate through his home printing press, producing a paper sample of his progress on the image. When the etchings were complete, Werger printed them in a grid on a large sheet of paper and called the piece *Continuum*. The images, which were completed the day before the September 11 terrorist attacks, seem foreboding in retrospect, tense with urban alienation.

Mezzotint is precise: It requires a deftness with sharp tools and metal to create an image that rivals the nuances of a drawing or painting. And Werger typically runs the plate through the press several times, testing how clearly the image is reproducing on paper.

He lays a copper plate with an image of a Fed Ex truck in progress on the printing press, a 4-foot-long platform with a metal roller in the center. He layers a damp piece of paper over the plate, as well as a soft blanket. Turning a silver wheel on the side of the machine, the plate moves under the pressure of the heavy roller. When it emerges on the other side a few moments later, Werger peels back the layers to reveal the image.

"That's just about done," he says. "It has that punch, that richness of tone I'm looking for."



▲ *DADDY FEET* Lithograph, 7 x 5 inches. Artist: Benjy Davies, 2001.

▶ *BLOOMS* Etching on handmade paper, 46 x 34 inches. Artist: Mary Manusos, 2002.



For Werger, it's that luscious quality of the intaglio print that transcends other styles of art — including other types of printmaking. But the absorbing process of developing these detailed works, though lengthy, also is part of the attraction, says the artist, whose work is in the collections of such venues as the Museum of Fine Arts in Boston and the Philadelphia Museum of Art.

"It's sort of an anarchistic way of working, but I love every aspect of it," he says. "I'm able to craft something I'm completely in control of, and there's something very appealing about that."

Mary Manusos, a professor and chair of the printmaking department, also uses metal etching to create the plates for her prints and, like Werger, seeks a certain richness of color and tone in her work. But her methods and final pieces suggest that two artists can approach the same technique quite differently.

One of the most striking aspects of Manusos's artistry is her use of handmade paper. In her home studio, she transforms pulp into sheaths of paper of multiple blocks of color. The thick, textured handmade paper introduces an emotional element to the work.

"I wanted images that looked watery, soft in the same way that I perceived memory," says the artist, who has shown her work in more than 250 exhibitions in the United States and abroad, including at the Museum of Modern Art in New York and The San Francisco Museum of Modern Art.

While creating the paper, Manusos also is etching an image onto a metal plate that she will ink and press onto the colored paper. The etching provides sharp definition and contrast to the abstract color blocks, and the final pieces are vivid, evocative. During the 1980s, Manusos used this method to create a series of prints inspired by the architecture of Latin America; she had worked in Mexico for a year and later took students on expeditions to the Yucatan for artistic inspiration. The layers of color, paper, and ink in these pieces complement the layers of cultural history that Manusos wanted to capture.

"I was fascinated by that because I grew up in San Diego and all the growth (in California) was very new — everything seemed the same," she says.

Manusos also prefers a spirited, spontaneous artistic process — she works fast, drawing from images and ideas in her head. For a series of 110 flower images she recently completed, the creation of the plates and paper took 10 days. Unlike some artisans, who make a series of identical prints, each of Manusos's wilting flower blooms is a variation on a theme, due to the random placement of color swatches in the handmade paper. Though the etching of the bloom remains static, each print has a fresh, individual feel to it.

If a print isn't gutsy, provocative, or quirky, Manusos argues, it isn't right.

STONES, SONS, AND THE ELEMENT OF SURPRISE

Quirky is a word that also comes to mind when viewing the prints of Benjy Davies, a visiting instructor of printmaking at Ohio University. His whimsical work, which explores issues of fatherhood, includes realistic drawings of the artist, his two toddler sons, and common household objects, paired with childlike doodlings of dinosaurs, animals, and airplanes. In *Story Time*, Davies reads his son a bedtime story while fantastic creatures dance through the margins.

Raising children is kind of like printmaking, muses the artist, who became a father for the third time this summer. They both involve an element of surprise. Though you may have the basic concepts down, prints, like kids, can still offer something unexpected. But that's what keeps it interesting.

"It's never what you think it's going to be," Davies says about his work.

While printmakers do control several aspects of the creative process, there is plenty of room for chance in many of the styles of printmaking, including Davies's specialty, lithography. The artist uses a grease pencil to draw an image directly onto a 2-by-1-foot slab of limestone. He must render the image in reverse, as the printing process will create a mirror image of whatever he draws. After sponging the surface of the stone with water, he smooths a roller covered with greasy ink over the wet slab. The water repels the ink from sticking to any area other than the drawn image. The artist lays a piece of paper atop the stone, which is then pushed through the press to create an impression. He inks the stone with several different colors, which may mix in unusual ways.

For Davies, the process to create a single color print can take several days. The final piece peeled from the press may draw a gasp of wonder from the artist, who has been laboring in a state of anticipation.

"That's part of the appeal of printmaking — the anticipation and the payoff," Davies says. "Of course, there's also heartbreak when it doesn't work."

When it doesn't work, the artist can wipe the stone clean, start again. Davies and his lithography students have plenty of materials to work with in the Seigfried Hall studio, he says, gesturing to a wall of cubby holes, each holding a slab of limestone. Ohio University has one of the largest collections of lithography stones in the country — about 200 — and four printing presses for students and faculty to use, he says.

Though lithography was once a common commercial printmaking technique in the days before Kinko's, lithography businesses today have abandoned the stones in favor of aluminum plates, which are printed by machines. Artists and universities that teach lithography as a fine art form were quick to acquire the stones and presses when those commercial outfits made the switch. The large stones, which weigh between 100 and 200 pounds, speak to the physicality of the work. Printmaking is not always a solo art form; it's not uncommon for an artist to use a press assistant to carry out the physical work of cranking a stone, metal plate, or other source through the printing press.

These heavy stones can produce startlingly crisp images. Black tones are rich and white areas of the paper are clean. The printmaking technique also gives the image a depth that a straightforward drawing couldn't produce, Davies says. The intensity of the image is owed to the fact that lithographs, like other forms of prints, contain layers upon layers of ink and information.

Because each print exists in a series of multiples, often 25 to 100, Davies can show the same original piece of artwork in more than one gallery, and sell or trade it to more than one art enthusiast. His work has been included in more than 75 national and international exhibits and is represented in several public collections, such as those at Ohio State University and the city of Vaasa, Finland. And, of course, he always gets to keep one for himself.

"If I make something precious, I wouldn't want to get rid of it," he says.

ART FOR SALE

Because an original print exists in multiple, it's also an affordable piece of art. A print typically sells for \$100 to \$500, but paintings can go for thousands of dollars, Lazuka says.

But while this makes original prints accessible to art lovers who don't have Swiss bank accounts, such prices can deter art

galleries from acquiring prints, as they can make bigger sales off a painting, he says. To complicate matters, some gallery owners either don't know the difference between an original print and a photomechanical reproduction of an art work or purposely take advantage of the public's confusion over the difference. And so some galleries peddle posters as original prints, says Lazuka, who, incidentally, uses a special form of printmaking called monotype that doesn't produce multiples.

For printmakers, landing their work on the walls of museums and galleries is only one avenue to success, says Soave of West Virginia University. The artists capitalize on the multiple nature of their genre to distribute prints through other means. Some use mechanisms such as postcards, zines (a handmade, noncommercial magazine), and the Internet to place their artwork directly in the hands of their audiences.

"In some ways, it's very liberating to work outside the structure that's available, such as museums," Soave says.

Galleries devoted entirely to printmaking, located in major cities such as New York City, Philadelphia, and Chicago, support the art, however, and a vibrant community of a few hundred printmakers across the country keeps the practice alive through the trade of prints and the development of print collections. Ohio University printmakers are building a portfolio of work by noted artists called the Trisolini Print Collection, and the university's Kennedy Museum of Art also has an extensive trove of 1,700 contemporary prints that it displays to the public regularly.

Of course, the printmakers adhere to their form of art for art's sake. They've tried the rest — photography, painting, drawing — but are committed to the print.

Says Davies: "It's a lifelong passion." ▲

For more information about printmaking, visit Ohio University's School of Art on the Web at www.ohio.edu/art.



CONTINUUM (DETAIL) Mezzotint. Entire piece contains 36 plates, each measuring 4 x 4 inches. Artist: Art Werger, 2001.



ANTICIPATING

Madam President

IT'S NOT A MATTER OF IF A WOMAN WILL BE ELECTED PRESIDENT, RESEARCHERS SAY.

IT'S A MATTER OF WHEN.

Growing up in California's Napa Valley during the 1980s, Ann Gordon was a 14-year-old with a 50-year-old's set of interests. She liked playing tennis and riding her bike, but she *loved* current events and politics. While kids across America watched *The Cosby Show* or *Family Ties*, every evening Gordon clicked on the news. On Friday nights after school, she unwound by watching *Washington Week* on public television. She wasn't a geek, Gordon asserts. She was just inspired.

That inspiration appeared in the form of Geraldine Ferraro, who in 1984 became the United States' first and so far only female vice-presidential candidate. With wide-eyed optimism and awe, Gordon followed that year's election, taking note of Ferraro, a mythical figure among her supporters. Ferraro's historic campaign began at the Democratic National Convention with a speech that proclaimed "Change is in the air." People in the crowd cried. They danced. They chanted. "Ger-ry! Ger-ry! Ger-ry!"

To many of today's young women, Ferraro's place alongside Democratic candidate Walter Mondale is a history book factoid. At the time, however, her candidacy was monumental, an unparalleled political success for a woman. Ferraro's supporters — those like teenage Gordon — believed a female vice president was unavoidable; a madam president inevitable. The boys' club that is the executive branch would be invaded; the White House would no longer be the ultimate tree house

with a "no girls allowed" sign. Ferraro was going to lead women through those ivory pillars. Or was she?

Gordon studied the presidential race for a junior high social studies class, keeping a scrapbook of Ferraro's media coverage, which ranged from giddy to brutal. *Newsweek* praised the "Ferraro Magic." *The Washington Post* reported surges in female voter registration. Gordon read how Ferraro held her own in the vice-presidential debates, ruffling then-VP George Bush. In the end, however, the Mondale-Ferraro campaign faltered, winning only 13 electoral votes. (Years later, Ferraro reportedly said the Democrats would have lost to the overwhelmingly popular Reagan "even if God herself were on the ticket.") Yet her candidacy gratified thousands, if not millions, of American women.

"It was a really important, formative moment for me, coming of age at a time when a woman could be a vice-presidential candidate," says Gordon, now a political scientist and

BY NICK KOWALCZYK

coeditor of *Anticipating Madam President*, a collection of essays published this fall by Lynne Rienner Publishers of Colorado. Gordon's collaborator on the project was Robert P. Watson, an adjunct professor of political science at Florida Atlantic University and editor of the journal *White House Studies*. Their book considers the very same question Gordon pondered in 1984: When will America elect a woman president?

"We're not there yet," says Gordon, who joined Ohio University in 1999 as an assistant professor of political science. She raises her eyebrows, widens her eyes. "But soon."

RESISTING MADAM PRESIDENT

Gordon sometimes thinks she lost something — her twenties. The memories lie within her frenetic mind, bouncing like bumper cars amidst a clutter of ideas. Between 1989 and 1993, she went from high school to a doctoral program. Just a decade after she enrolled as a freshman in college, she left school with a PhD in political science.

She still buzzes when she talks about Ferraro, whom she profiles in her book. (Smiling one day in her Ohio University office, a giddy Gordon notes that while doing research for her book, "I got to call Gerry ... at home.") Yet Gordon knows that, like for any other woman who vied for a place in the White House, Ferraro's candidacy wasn't a Cinderella story.

Americans initially might have been infatuated with Ferraro, but she quickly lost her luster amid negative news reports — many gender-related. Rumors surfaced that Ferraro, an Italian-American, had ties to the mafia. Political opponents and the media scrutinized the business dealings of her husband, John Zaccaro. A male Mississippi state official once asked her if she could bake good blueberry muffins. ("I sure can. Can you?" she replied). A set of playing cards spoofing politicians depicted Ferraro wearing tiger skins and leather. And nationwide, voters were perplexed by the idea of a vice president with a purse.

The country had never been receptive to the idea of a woman running the West Wing. Victoria Woodhull ran for the presidency in the late 1800s, decades before women won suffrage ("To run for president before women even have the right to vote — how brave is that?" Gordon asks). Margaret Chase Smith, a U.S. senator from Maine, sought but failed to get the 1964 Republican nomination. Shirley Chisholm, a black New York congresswoman, campaigned for but didn't get the 1972 Democratic presidential nod.

And since Ferraro, only two women have considered running for president on a major party ticket: Former U.S. Representative Patricia Schroeder in 1988 and Elizabeth Dole in 2000, both of whom ended their candidacies because they couldn't raise enough money or support. Schroeder, who served 24 years in the U.S. Congress, says female politicians face two gender-specific obstacles: sexist men and women with ultra-traditional values who are critical and "terribly uncomfortable" with other women in power. Schroeder used to receive hate mail addressing not her voting record or political views, but her attitude, wardrobe, and hair.

"I don't think there's a man who probably ever sent a check to Al Gore to get some Rogaine ... or to Newt Gingrich, saying, 'Get it thinned, you look like a chrysanthemum,'" says Schroeder, who wrote the introduction to Gordon's book, *Anticipating Madam President*.

During her career, Schroeder also was interrogated on matters that were nonissues for men. A male colleague once asked how she could raise a family and participate in U.S. government at the same time. "I have a brain and a uterus — and they both work," Schroeder answered.

Any female presidential candidate would most certainly face similar scrutiny, whether veiled sexism or outright misogyny. Gordon and other political scientists have heard all sorts of outlandish questions asked of women candidates. *Shouldn't America elect a minority before a woman?* (As if Madam President could come in only one color.) *If she has children, who's going to raise them?* (Like politicians who are dads lose all family responsibility once they hit Washington, D.C.) There are many other questions, ranging from the interesting — *What will her husband be called, the First Man?* — to the ludicrous — *Will she redecorate the White House; will she change it to Pink?*

MEASURING AMERICA'S INTEREST

At age 31, Gordon is part of an emerging group of political scientists looking at women in politics and the presidency, all with the aim of getting Americans to ask, Why not a woman? In March, she and coeditor Watson



ON HER WAY Geraldine Ferraro makes her acceptance speech for her vice presidential nomination during the 1984 Democratic National Convention.

PHOTO: Bettman/CORBIS
BUTTON IMAGE: Courtesy of Jo Freeman



EQUAL OPPORTUNITY Political scientist Ann Gordon predicts the country will soon see a woman in the Oval Office.

PHOTO: Rick Fatiga
BUTTON IMAGE: Courtesy of Jo Freeman

organized a “Madam President” political forum at the University of Missouri-Kansas City, featuring discussions by scholars, Schroeder, and Eleanor Clift, a political pundit who coauthored *Madam President: Shattering the Glass Ceiling*, published by Scribner in 2000.

In her study of the controversial topic of electing a woman president, Gordon continually sees a half-full glass. Many Americans still won't support a woman in the Oval Office, but more women than ever serve in U.S. government. Women hold 13 U.S. Senate seats; 60 have positions in the House of Representatives. Former Secretary of State Madeline Albright and current National Security Advisor Condoleezza Rice exemplify women holding their own in the tricky, touchy realm of foreign policy. Five women preside as governors. All these leaders show that women work in government just as well (or, as is sometimes the case, just as poorly) as men.

“To have a woman secretary of state is a really big step in the right direction, having more women in the Senate, more women governors — these things will help break down the stereotypes against women more than anything else,” Gordon says.

Last year Gordon and Ohio University Assistant Professor of Interpersonal Communication Jerry Miller led a study of 593 undergraduates on the Athens campus to see whether the youngest and often thought to be the most progressive generation of voters would support a woman presidential candidate. The researchers asked students to read a news report about one of two likely presidential candidates, fictional U.S. Representatives John Wilson or Jessica Wilson. Both candi-

dates were described as personally and politically similar and equally capable. Yet students' answers turned on gender. John was seen as a viable candidate by 71 percent of those surveyed, but only 44 percent of the participants — most of whom were women — thought the same of Jessica. The majority of respondents feared Americans would not accept or respect a Madam President. Some also thought, if elected, she wouldn't lead effectively and America's international image would suffer.

As a vice-presidential candidate, however, Jessica Wilson's chances improved: 63 percent of those surveyed thought her viable for the No. 2 spot. (Eighty-five percent thought John Wilson was qualified for VP). Many pundits and scholars think any woman with an eye for the presidency might fare better if she first served as vice president, suggesting that would give her visibility, viability, and national and foreign policy experience.

A 1999 national Gallup poll of 1,014 registered voters of all ages found that 92 percent of those surveyed would cast a ballot for a qualified female presidential candidate. (Incidentally, that poll didn't ask voters if they'd elect a man.) While 92 percent is an overwhelming majority, 8 percent of voters still think women are unqualified, a troublesome amount given that six of the last 13 presidents won their elections by margins of less than 7 percent.

But the poll also found a discrepancy: While 92 percent of those surveyed say they would support a woman candidate, only 48 percent of those surveyed think other Americans would do the same. The survey respondents might have misgauged their neighbors' political opinions. Or they didn't want to own up to a socially unpopular answer that they themselves, not their neighbors, would discriminate against a candidate based on gender. Neither scholars nor pundits know which theory is correct.

Yet the outcome of the study by Gordon and Miller, in which so many support the idea of a woman vice-presidential candidate, gives the pair hope for the future. The results may not be definitive proof that America will elect a woman, Gordon admits, but progress is being made. Much of the attention, she says, is due to a growing mass of voters calling for a woman to crack the political glass of the White House. On President's Day 2002, National Public Radio's one-hour show, *Talk of the Nation*, focused on electing a female commander in chief with interviews featuring Ferraro and several U.S. congresswomen. The national White House Project, a nonpartisan organization begun in 1998 that aims to get a woman elected president, uses magazine advertisements and children's promotions to encourage women and young girls to be leaders.

“We want to see a woman at the top of the ticket in 2004,” says Marie Wilson, the organization's president and cofounder who spoke at the “Madam President” forum. “I know that's not going to be easy but we're going to keep pushing.”

About 600 women attended the two-day forum: elderly women who had bought granddaughters a “President Barbie.” Mothers who gave daughters the *Sesame Street* book, *I Want to Be President*. Women who smile at the T-shirt emblazoned with Margaret, Hank Ketchum's *Dennis the Menace* cartoon character, proclaiming “Someday a woman will be PRESIDENT!” And college-aged women, one of whom requested a specific message when she asked Eleanor Clift for an autograph. (Sign it, she asked, “I'll vote for you in 2020.”)

“We’re fond of saying in this country that anyone can grow up to be president. That includes women.”

— ANN GORDON

Cable network C-SPAN broadcast the forum, and a production team making a documentary shot footage for a one-hour film about female leaders in this country and around the world to be aired on PBS next year.

Clearly, interest in a woman in the Oval Office is growing. But while the 2000 Census reports that women account for almost 51 percent of the population, they comprise only 13.6 percent of the 107th U.S. Congress. The nation ranks 52nd out of 179 countries in terms of female representation in national legislatures and parliaments, according to the Inter-Parliamentary Union, an international organization of legislative governments based in Geneva, Switzerland. The United States is surpassed by Sweden, Denmark, Finland, Norway, the Netherlands, Iceland, Germany, New Zealand, Argentina, and Mozambique, among other countries.

“It’s almost an embarrassment that the United States can’t get it together,” Gordon says. Iceland, for instance, had a woman president for 16 years. After Vigdis Finnbogadottir left office, the country’s children considered the new, male president an anomaly. “We’re fond of saying in this country that anyone can grow up to be president,” Gordon says. “That includes women.”

NAVIGATING THE CAMPAIGN

Anyone who runs for president must master the “Big Mo.” Shorthand for unstoppable momentum, the “Big Mo” is a powerful mixture of money, media, and political magic that separates contenders from commanders in chiefs. Without it, a candidate’s chances for election are slim to none. And even with it, the campaign trail will be a rocky path for women candidates, say Gordon and Miller, research collaborators on studies of the effect gender and race have on political campaigns.

“There’s still a perception out there that women candidates are good at some issues and not others,” says Gordon, who met Miller during the presidential debates for the 2000 election. Voters generally see women as caring, compassionate, and honest; men as tough and knowledgeable. Such perceptions create “male issues” — the economy, military, and foreign policy — and “female issues” — civil rights, education, and health care. But to gather momentum, the researchers say Madam Candidate must cross gender lines, working within the system to gather supporters, and adapt to an unfriendly, gender-biased political landscape. In the fickle world of politics, a woman politician can’t be too feminine, or too masculine. Or too anything else, for that matter. She must treat every issue politically, Miller suggests, even personal matters. Whether the issue is a spouse’s business dealings (in the case of Ferraro), spousal infidelity (in the case of U.S. Senator Hillary Clinton of New York), or pregnancy (in the case of soon-to-be former Massachusetts Governor Jane Swift, who gave birth to twins in

May 2001), female candidates must strategize their every attribute. They must arm themselves with experience, especially in traditional male issues. If they’re in the U.S. Congress, they should join committees on the military or economy. If they’re a governor, they should talk about taxes and state leadership with authority.

Many of the problems women candidates face are universal, Miller says, yet issues of family, appearance, assertiveness, and competence are exacerbated for women because of stereotypical expectations held by voters. These issues, he suggests, must be addressed carefully by women candidates.

Fundraising is another problem altogether. Money is the grease and gasoline that keeps campaigns moving, and it costs any serious presidential candidate at least \$25 million to run, says Eleanor Clift, who keeps a running tally of potential women presidential candidates. In any given election year, dozens of men probably could raise that kind of money; only a handful of women might have the same success. Lack of money can kill any campaign. It closed the door on Patricia Schroeder’s presidential hopes in 1988 and did the same for Elizabeth Dole in the 1999 Republican primaries, whose war chest couldn’t compete with George W. Bush’s Texas juggernaut. By December 1999, Dole had raised \$5 million to Bush’s



POLITICAL VIEW Interpersonal communication researcher Jerry Miller studies women in politics.

PHOTO: Rick Fatica

The Road to Office

Women's road to political office and the White House has been a bumpy one, dating back more than 130 years. As history shows, a winning presidential candidacy has eluded these front runners due to the enormous political and monetary support required to launch a full-blown campaign. This timeline tracks the most well-known presidential and vice-presidential candidates and their parties as well as other notable female politicians.

SOURCES: *American Women Presidents, and Guide to Women Leaders*

1872

Victoria Chaflin Woodhull

Presidential candidate for the Equal Rights Party in several states. Her candidacy suffered from lack of funds.

1884, 1888

Belva Lockwood

National Equal Rights Party candidate; got on state presidential election ballots. She was the first woman attorney to practice before the Supreme Court.

1917

Jeannette Rankin

Republican from Montana; becomes the first woman to be elected to the U.S. House of Representatives. She held the position until 1919.

\$69 million. Clift's list of potential female presidential candidates — qualified leaders she believes could raise the necessary money — includes U.S. Senator Dianne Feinstein of California, U.S. Senator Kay Bailey Hutchinson of Texas, Lieutenant Governor Kathleen Kennedy Townsend of Maryland, and U.S. Senator Hillary Clinton of New York.

But political know-how and fundraising finesse are just two elements of Madam Candidate's "Big Mo." Another landmine is the media, which often focuses on male candidates' political views and female candidates' personalities, says Miller, who analyzed issue-oriented political advertisements and media's representation of candidates in four male-versus-female gubernatorial elections in the early 1990s. The hair, hemlines, and husband coverage is nothing new, although many hope for better from the political press.

"In 2000, even though in public opinion polls Elizabeth Dole was No. 2 compared to George W. Bush, John McCain and other Republican candidates got way more press coverage, way better press coverage than she did," Gordon says. "The media talked about her lipstick, they talked about her sex life. I mean, c'mon, it's the year 2000, and yet still..."

Media coverage is something candidates must navigate; they'll be hard-pressed to control it, says Clift, a *Newsweek*

contributing editor and weekly guest on the nationally syndicated Sunday show, *The McLaughlin Group*.

"You cannot change the media," Clift says. "You have to think about as a female candidate how you operate in the existing world."

RESPONDING TO MADAM PRESIDENT

Beware, Gordon jokes, her birthday is on the Ides of March. It's no small irony that Gordon, a subversive to anyone who doesn't think a woman should be president, entered the world on a day marking a political revolt that changed a nation. Her research hints that America soon will tip the power of the executive branch to the so-called fairer sex, an unsettling idea to many Americans and government officials.

"It's time to ask 'What's the big deal?'" says Michael Genovese, a presidential scholar at Loyola Marymount University in California and a speaker at the "Madam President" forum in Kansas City who said to the audience, "Get over it, America. The rest of the world has." Women have led governments around the world, from Margaret Thatcher in Great Britain to Corazon Aquino in the Philippines to Violeta Barrios Torres de Chamorro in Nicaragua. And, Genovese notes, the world hasn't ended yet.

Like any male president, a woman's ability to govern will depend on her experience inside and outside Washington, D.C., her ability to work with Congress, and her mastery of the president's bully pulpit, says Lori Cox Han, a presidency scholar from Austin College in Texas. American presidential leadership typically is defined by alpha male umph, the nation often falling for men like Andrew "Old Hickory" Jackson, tempestuous Teddy Roosevelt, or graceful Ronald Reagan, a tough guy even after John Hinckley Jr. shot him in 1981.

Women politicians, however, are more likely to bring a more open, democratic approach to governing, says Han, and they also tend to work across party lines to achieve their legislative goals. But then again, she adds, women also can be commandeering and tough, like Thatcher in 1980s Great Britain. Gordon's book, *Anticipating Madam President*, includes an essay by Han about women's political leadership.

Skepticism of women's toughness exists; it arose in 1988 when Schroeder tearfully ended her presidential campaign. At the time a senior member of the House's armed services committee (now called the National Security Committee), Schroeder immediately was labeled by political pundits as a weak, emotional leader undeserving of the presidency.



ON THE CAMPAIGN TRAIL Margaret Chase Smith (left) campaigned for the Republican presidential nomination in 1964.

PHOTO: Courtesy of the United States Senate Historical Archive

1922

Rebecca Felton
First woman in the U.S. Senate — appointed to fill a vacancy before the general election. She attended the Senate for only one day.

1964

Margaret Chase Smith
Senator from Maine, won 3.8 percent of the total Republican presidential primary vote; defeated by Richard Nixon at the party convention.

1972

Shirley Chisholm
Congresswoman from New York and the first woman to seek a Democratic presidential ticket; won 2.7 percent of the total presidential primary vote.

1984

Geraldine Ferraro
The first woman nominated as a vice-presidential candidate for the Democratic party. Running mate: Walter Mondale.

1988

Patricia Schroeder
Congresswoman from Colorado, ran for Democratic nomination; withdrew because of lack of funds and support.

2000

Elizabeth Dole
Republican; former Secretary of Labor and Secretary of Transportation. She withdrew before the presidential primaries due to lack of funds.

People said, “We don’t want somebody’s finger on the button that cries,” Schroeder recalled years later. “I don’t want anybody’s finger on the button that doesn’t cry.”

But after the terrorist attacks of September 11, 2001, a steely reserve is once again laudable, having been downplayed for a decade in post-Cold War America. Many in the military don’t want female leadership during the nation’s war on terrorism, or during any war for that matter, says John Davis, a research consultant for the National Defense University’s Industrial College of the Armed Forces in Washington, D.C. Pentagon officials prefer working for folks with military experience, and most women won’t fit that qualification. (Although neither did Abraham Lincoln, Franklin Roosevelt, Ronald Reagan, Bill Clinton, or current President George W. Bush.) Davis described to the audience at the “Madam President” forum the reception a woman president might receive from foreign policy officials, research based on interviews he conducted with U.S. generals, admirals, ambassadors, and other members of the intelligence community, none of whom would allow Davis to use their names.

“Many of them said flatly, ‘If it happens I’ll quit,’” says Davis.

Those officials assumed a woman president would lack respect, Davis adds, both because of gender, and, in their minds, her inevitable miscalculations in foreign policy. But new presidents typically make diplomatic gaffes, notes Davis, pointing to John F. Kennedy’s misfire during the 1960 Bay of Pigs Invasion and his success a year later in the Cuban Missile Crisis, perhaps his greatest foreign policy achievement.

“If a male is allowed to fail and learn from such experiences,” he asks, “why is it such an issue if a female fails and learns?”

No one should assume Madam President will have any qualities other than being a woman, maintains Gordon. The last 42 U.S. presidents were each unique; there likely won’t be another Richard Nixon, another Thomas Jefferson, another Calvin Coolidge. Like all presidents, Madam President the first and those after her will shape their terms based on personality and current events, Gordon adds, not genetics.

“A woman president could change everything and it could change nothing. We don’t know,” says Gordon. “But she would put into sharper focus our notions about gender and the presidency.”

LOOKING AHEAD

Gordon, like many of the politicians she studies, knows how to handle a tricky question. When can America expect to have a woman president?

“It’s going to depend on a lot of things — who’s going to get re-elected, who’s going to run,” says Gordon, who has no political aspirations of her own, hoping rather to be called “professor extraordinaire” than president. “There are just so many question marks there.” Madam President’s election could be as early as 2004, but Gordon anticipates it will happen further into the future. And when the woman who could be president rises to the political forefront, Gordon, a self-admitted political junkie, admits she would like to help the candidate, perhaps as a campaign consultant or adviser.

In the meantime, she’ll be at work on her next project, *When Stereotypes Collide: Race, Gender, and Videostyle in Congressional Campaigns*, a book she’s writing with Jerry Miller about the link between campaign advertisements and voter decisions. She and Miller received \$6,000 from the Ohio University Baker Fund for the book, which will be published by the Peter Lang Publishing Group by 2004. She also will continue building what she says will be the nation’s third largest collection of political advertisements, specifically those of women and minority candidates, at Alden Library using a \$20,000 1804 Special Library Grant from the university.

While working on these projects, Gordon still finds herself wondering about the future. If President Bush runs for re-election and Vice President Dick Cheney does not, Bush might select National Security Advisor Condoleeza Rice as his No. 2, likely prompting Democrats to choose a woman for president or vice president, thereby ensuring a female VP and potentially a woman president. But this is just one of many possibilities Gordon ponders.

Regardless of how Madam President comes to be, Gordon anticipates her election to occur sometime in her lifetime, and she’s enthused about that. And then, she says with conviction, the dream of the junior high student who watched a woman make history in 1984 will become reality.

“Electing Madam President is not a question of if,” she says. “but when.” ▲

For more information about this research, visit the Web at www.ohio.edu/pols/faculty/madam-president/.



BUTTON IMAGES:
Courtesy of Jo Freeman

along a belt OFF FIRE



In late July, Ohio University geologist Dina Lopez traveled to El Salvador to collect data on volcanoes in her homeland. Editor Kelli Whitlock went along for the journey. Excerpts from her journal appear in italics.

TEXT AND PHOTOGRAPHY BY KELLI WHITLOCK



THE EARLY YEARS Born in 1770, Izalco volcano is El Salvador's youngest. It was so active in its early years, it was nicknamed the "lighthouse of the Pacific."

Personal Journal, July 18: Arrived at the airport in San Salvador at 11:30 a.m. local time. Luggage did not make the trip. While waiting in line at immigration, heard music. "New Kid in Town" by the Eagles. Seemed appropriate. Heavy presence of police — heavily armed police. Met Dina outside at 1 p.m. Her brother José drove us to the city. Traffic was very fast, very defensive. There were no lane markings and the road was still damaged in places from the 2001 earthquake. Ate lunch at a pizza shop while watching ER with Spanish subtitles. A man with a shotgun — a hired guard — stood watch outside the restaurant. Checked into my hotel. Armed guards there, too. Spent afternoon touring the city with Dina and her sister Marina. Drove up San Salvador volcano. Breathtaking.

There is a story that Dina Lopez likes to tell. The Tourist Institute of El Salvador wanted to build a hotel on the top of Cerro Verde, a dormant volcano in western El Salvador. People would come for the vista: a close look at one of the mountain's active sisters, Izalco, which lay less than half a mile away. The volcano, the nation's youngest, produced beautiful sprays of fiery liquid called lava fountains, a spectacular view no hotel in the country could match.

So, the institute built the hotel, and on the day it opened, Izalco went to sleep. The moral to the story? If you want to quiet a volcano, build a hotel.

While the tale is a favorite, Lopez knows that man cannot still these earthen caldrons. The great mountains will erupt at their own pleasure, releasing ash, rock, gas, and lava that block the sun, cover the ground, and obliterate the arrogance of mere mortals who would build anything nearby.

History proves their might: On August 29, 79 A.D., Mount Vesuvius rumbled to life in southern Italy, burying the city of Pompeii under 20 feet of ash and volcanic debris. Nearly 2,000 years later, much of the city remains encased in a rocky tomb.

More than 14,000 people died following Japan's greatest volcano disaster in 1792 at Unzen volcano. Most were killed by a tsunami caused by the eruption.

In 1980, Mount St. Helens in Washington erupted with such force, it triggered the largest recorded mudslide in Earth's history. Some 520 million tons of ash darkened the sky in Spokane 250 miles away.

The 1991 eruption of Mount Pinatubu in the Philippines was so massive, volcanic material was shot into the Earth's stratosphere over the North Pole. Scientists later determined the blast weakened the protective ozone layer above the Earth's northern-most point.

After two years of small eruptions, the Soufrière Hills volcano in southern Montserrat exploded in 1997, leaving much of the island uninhabitable, forcing 8,000 of the 12,000 residents to abandon their country. The West Indies mountain is still erupting today.

The destruction recorded in this geological history is familiar to Lopez, a geologist at Ohio University and a Salvadoran native. Lopez grew up at the knee of San Salvador volcano, a slump-shouldered mountain that casts a cautious shadow over the nation's capital. So, when she decided to pursue a career as a scientist, it seemed natural that she one day would set her researcher's eye on volcanoes.

San Salvador is one of many such geological wonders upon which millions earn a living, build their homes, and grow the coffee, corn, and sugar cane that are El Salvador's top agricultural exports. Most volcanoes here are lush, green mountains covered with trees and fertile soil, large, but not too steep to provide a solid foundation for crops and buildings. Only the barren peaks, covered with molten rock too acidic to support plant life, hint at the smoldering chambers below.



SOURCE: USGS

Lopez appreciates a volcano's beauty — above and beneath the surface. Especially beneath the surface. She has tremendous respect for the water and gases that churn deep within a volcano — called a hydrothermal system. Studies suggest that levels of sulfur dioxide, radon, and carbon dioxide are good measures of a volcano's activity. If monitors detect a sharp increase in these gases — and also record significant seismic activity — it could mean that an eruption is likely in the near future. Sulfur dioxide emissions also offer a hint of what's to come: If SO_2 increases to high levels, it usually means there is new molten rock, called magma, in the volcano's chambers. These predictions don't include a specific time or date or tell geologists just how severe an eruption might be, but the warnings can give governments time to prepare and some idea of what to expect.

This sort of warning isn't possible in El Salvador. To get accurate data, scientists must first create a profile of a volcano — collect base gas levels, track normal temperatures, etc. But regular monitoring of volcanoes has been a spotty activity in this Central American country. During the 1980s, the nation's civil war made such studies too dangerous. Skirmishes between the nation's right-wing army and left-wing guerillas were played out on and around the volcanoes. Funds for equipment and trained personnel that could have advanced geological studies were instead set aside for military use. Today, resources remain scarce. Much of the equipment needed must be donated or borrowed from other countries. Travel remains dangerous in some areas of the country.

These are challenges Lopez has chosen to face. How could she not? Two of her sisters and a brother live in one of the subdivisions built on San Salvador volcano. She can't bear the thought of losing them to an unexpected eruption that didn't have to be unexpected.

So, the scientist has embarked on a project to create a geological profile of volcanoes in her homeland. She's joined forces with researchers from the Institute of Technology and Renewable Energy in Spain and with scientists at the University of El Salvador — where she earned a bachelor's degree in chemistry in 1975. The team analyzes gas, soil, and water samples, looking for traits that distinguish one volcano from another.

“At this point, basically all the volcanoes in El Salvador and most of Central America don't have a background story. We don't have a basis to know what is normal for them,” says the 51-year-old associate professor of geological sciences. “Every volcano has its own character, and what is normal for one may not be normal for another. The investigations we are doing are oriented to that.”

Her work also assists those involved in energy exploration: One-fourth of the country's energy needs are met by geothermal power. As the nation's population continues to grow (there were 1.5 million residents when Lopez was a child; now there are 6 million), so does the demand for electricity. To keep up with the pace, power companies must find more thermal energy sources. Lopez's research can help them do that.

Lopez travels to El Salvador about twice a year to do research and visit family. In between trips, one of her collaborators, Tomas Soriano, a professor of physics at the University of El Salvador, analyzes data collected at geochemical stations positioned around the country. The machines monitor changes in carbon dioxide, hydrogen sulfide, and radon in the atmosphere and soil and



LURE OF THE LAND Geologist Dina Lopez has long been fascinated by volcanoes, having grown up in the shadow of San Salvador volcano in El Salvador.

feed the readings electronically to computers in Soriano's lab. But the machines they have aren't enough. They need more.

Personal Journal, July 19: *We arrived in the city of San Miguel about 1:30 p.m. Although the drive was hot, loud, and dirty, the view was spectacular. San Miguel volcano is perfectly shaped — steep sides and flat top. The monitoring station that tracks gas levels is on the side of the volcano, although not close to the top. Dina says the volcano usually has a constant plume of steam coming from its crater. The wind today carried it away from us and I couldn't see it. When I turned my back on San Miguel to look over the valley and city below, the sight left me breathless. Volcanoes jut upward, punctuating the horizon as a reminder that although we are on the Earth for a short time, these mountains live for centuries. And they do live. Their breath is the clouds. Their veins and arteries pulse with hot magma. They raise their chins to the sky and pour out their hearts with soul-shaking groans. When a volcano speaks, the world around it stops. It is not something to be ignored. But we forget that. Cities that attract thousands camp at the mountain's feet. To them, San Miguel is only a mountain with fertile soil, a foundation for crops and the income that comes with that farm work. The volcano is an attractive backdrop to what often is a harsh existence.*

There is an undeniable romantic and mythical attachment to volcanoes. Early Christians believed lava came from the fires of hell and that volcanic groans were in fact the screams of the damned. Greek and Roman mythology claimed volcanoes were either tombs for banished gods or homes to those with the power to make the earth rumble and turn rock into fire. Many cultures around the world thought volcanic activity was a punishment from a supernatural being. They offered human sacrifices to appease these gods. To be selected as a sacrificial offering was considered a high honor.

Centuries later, the wonder of volcanoes persists, aided in part by filmmakers and authors who create such celluloid fantasies as a volcano beneath Los Angeles and lava that courses through subway tunnels. Indeed, Hollywood would have us believe that a volcano is all about the lava, the river of fiery material that pushes its way to the top of a volcano's opening and spills over its sides. But that is only part of it, and, as Lopez

is quick to point out, not the most destructive part. In one type of eruption — one often shown in films — volcanoes spill lava over nearby ground. Gases in the lava bubble and are released into the atmosphere without much fuss. There is damage, of course, but it often is confined to the lands adjacent to the volcano. But with a cataclysmic eruption — such as the type that buried Pompeii and took 1,300 feet off the roof of Mount St. Helens — there usually is no lava flow, only a massive explosion. The gases expand rapidly, sending ash and pieces of magmatic rock called pyroclastics into the air.

Volcanoes also can have ongoing activity, sending plumes of steam into the sky each day. There are several of these in El Salvador, a small nation about the size of Massachusetts. The country may be just one notch on the Belt of Fire, a circle of volcanoes and fault zones that surround the Pacific Ocean, but it's a geographically interesting notch. Volcanoes in Central America sit about 16 miles from each other, making it one of the highest-density regions on Earth. El Salvador is included in that area, with an estimated 25 volcanoes and eight volcanic lakes.

Lopez's favorite is San Miguel, a volcano that looms 6,988 feet over a city of the same name near the Honduras border. More than 150,000 people live in that city; another 100,000 are within the volcano's reach. The slopes of San Miguel are lined with some of the richest, most fertile soil in the country. Coffee plants, decorated with small, green java beans, stretch in long rows around the mountainside. Farmers work these fields, which were plowed on one of the country's most active volcanoes.

One of the monitoring stations Lopez and Soriano use is locked in a cage behind a house on a coffee plantation about midway up San Miguel. Like the other remote stations, the equipment measures the amount of gases in the soil, which Lopez says can be used to monitor fluxes coming from the hydrothermal and magmatic environment. They've been tracking these data for about a year, with the hope that the numbers would point them in the right direction for future monitoring.

"In San Miguel, one thing we have found is that the diffused gases are not expelled at the top of the volcanic edifice, but mainly through the slopes. The top of the edifice is thicker, more impermeable," Lopez says. "This is important in terms of understanding how gases here are diffusing. It tells us where we can gather the best information."

On an active volcano such as San Miguel, collecting the best information is vital. In 1976, San Miguel awoke from a six-year slumber to spout lava fountains inside its crater. Since then, it has occasionally blown some ash into the air, most of which remained near the volcano's cone. But according to the Smithsonian Institute's Global Volcanism Program, volcanic tremors, earthquakes, and gaseous emissions were recorded earlier this year. Though the activity was said to be in the normal range for this volcano, the country's geological survey department announced it would install more monitoring stations.

The attention is valuable, for sure. Constant vigil over the hydrothermal systems beneath San Miguel volcano, such as the work Lopez and her collaborators do, could help predict a



AT WORK, AT PLAY Living in the shadows of an active volcano, such as San Vicente in eastern El Salvador, is commonplace. Fertile soil makes the area ripe for crops and the hot water beneath the ground is a draw for geothermal plants.

massive volcanic event. It's frustrating work, at times. The equipment they do have breaks or stops sending data for some unknown reason. The volcano's plume offers an excellent opportunity to measure gases being emitted from the crater, but the abundance of these gases can make this too hazardous. Then, there's also the problem of equipment.

"If a volcano has a plume, we also like to measure the level of sulfur dioxide in the plume," Lopez says. "The fluxes tell you if there is new magma in the magmatic chamber. But the equipment to make that measurement is very expensive."

In fact in all of Central America, only one research group has this equipment — one in Guatemala who received the device as a gift from Canada.

Personal Journal, July 20: *After a full day of data collection yesterday, we drove last night in the darkness and rain to the Berlin Geothermal Field about 40 miles away that rests on the side of another volcano named Tecapa. There are houses here that the geothermal power plant allows some visitors to use. Last night, I slept on a volcano. Today's work began at 5 a.m. First stop, a spot within the geothermal plant on Tecapa called a fumarole — a big hole in the ground that emits steam filled with gases from deep within the Earth. There, we measured temperatures and radon levels. Both were high. We traveled up Tecapa and over the rim of the volcano, down into its crater. The last eruption of this volcano occurred before records of such events were kept. This volcano is thought to be dormant, but there still are gases being emitted. A sulfur lagoon sat in the center of the crater. Dina says it's a tourist destination. There's a school inside the crater, and a soccer field. Soccer is immensely popular here and children will play wherever they can find a flat piece of land. I am struck by how people build a life in El Salvador — in, on, and around volcanoes, some of which are inactive, some active. They're no more than mountains with good soil to the people here. That isn't to say that they don't respect them. They just don't seem to fear them.*

Guidebooks for El Salvador list Tecapa as a dead volcano. Lopez isn't quite so sure. Steam billows from collapsed wells on the grounds of the Berlin geothermal power plant on the volcano, which stands at 5,226 feet. The wells now serve as vents, fumaroles that the locals call "thundermakers."

It is late July when Lopez and Soriano visit Thundermaker No. 6, a large fumarole at the base of a green hillside overlooking Sihuatepec, a volcano that exhausted its magma source long ago. It is hot and hazy by 7 a.m. The area smells of rotten eggs, the trademark odor of sulfur dioxide. Lopez has an unexplainable affection for the smell. Soriano carries a Pylon AB5 radon monitor from the truck — a rectangular box with a cylindrical Lucas cell connected to a pump, a clear plastic tube, and a long metal spike, which the pair use to measure radon. Lopez inserts the spike into a patch of earth near Thundermaker No. 6. Soriano works the pump to create suction. Gases are pulled from the soil and sent into the cell. They must wait 12 minutes for the machine to calculate the concentration of radon. The levels are high today. So is the temperature. Thundermaker No. 6 is spouting off nearly 300-degree steam. Lopez is concerned, but not alarmed.

"We didn't have measurements of radon from this site

before the 2001 earthquake, and this spot is close to the epicenter," Lopez says. "It could be that fracturing produced by the earthquakes has increased the radon levels. But this doesn't mean an eruption is going to happen here. We just need to keep monitoring the site."

Personal Journal, July 22: *Visited San Salvador volcano to take radon measurements and collect soil samples. Radon was normal. Hot and muggy by 9 a.m. From inside the crater of the old part of the volcano, I could see a grove of orange-roofed houses built into the slope of a hill already scarred by an earlier landslide. When I asked Dina about it, she shook her head. Those houses would never stand up to a landslide, she lamented. Also went to see the crater of the younger part of San Salvador. The crater is about half a mile in diameter and 1,600 feet deep. An awesome sight. During the 2001 quake, a group of teenagers who had hiked down into the crater became trapped when the trails were shaken loose from the mountain. One had a cell phone and was able to call for help. There are no more trails into the crater. Went to the other side of the volcano in the afternoon to see the lava flow from the last eruption in 1917. It's a slope of black rock that won't support anything green for hundreds of years.*

Volcanic eruptions are often accompanied — or preceded — by an earthquake that shakes hillsides so violently, they lose their grip and come crashing down to the valley below in a deadly rush of dirt, rocks, trees, and buildings. In January 2001, a 7.6 magnitude earthquake rattled much of El Salvador to its core. Landslides killed hundreds throughout the country, including entire families living along and below a hillside near the U.S. Embassy in San Salvador.

The memory of this tragedy marks Lopez's face as she offers a tour of the city. Scientists have warned of the dangers of building on areas susceptible to landslides. Some politicians make attempts to prevent such housing and business developments, but often are outnumbered by those who stand to profit from the structures.

Such was the case when a developer submitted a proposal to build a subdivision in the eastern side of the city. When the developer approached the city for permission to build these homes, the mayor rejected the proposal, aware of the fault that lay beneath the very ground the developer claimed was prime real estate. The country's central government overruled the mayor's decision. The homes now house hundreds of families. Politics has long had a heavy hand in such matters, though most agree the influence is not as imposing today as it was during the country's civil war, which began in 1980 following a decade of government rule that put the military in control of the people and created death squads to silence those who would object.

Indeed, it was a fearful time, says Lopez, whose studies were interrupted for two years when the university was closed in 1972. Five years later, she traveled to America, where she completed a master's degree in physics (her thesis was on seismology) at Virginia Tech. More than anything, she wanted to go home to put these newly acquired scientific skills to use. So, when she was

▶ **A LOOK INSIDE** In 2001, a group of teenage hikers were trapped inside the crater of San Salvador volcano when an earthquake destroyed paths that led to the bottom. The paths have not been rebuilt.





MAKING WAVES Extreme temperatures escape from deep within the Earth through vents called fumaroles. This one near the Guatemalan border is one of the region's largest. Children play on a soccer field just a few hundred feet from the pit of bubbling mud, clay, and water.

offered a teaching job in 1979 at the then-reopened university, she took it. One year later, the battles of the 1970s turned to an all-out civil war, and the army closed the university again.

During the 1980s, resources dried up. Lopez couldn't do research because she had no equipment and no confidence that she would be safe in the field. It wasn't until 1992 that peace returned to El Salvador, with the signing of the 1992 Accords of Chapultepec, a peace agreement that resulted in a reduction in the military and the disbanding of the National Guard and Treasury Police, which many believed were behind the death squads. Like so many other Latin American countries, poverty rages today in El Salvador. In July, the lowest-grade gasoline was \$1.85 a gallon. Prices at supermarkets are as high as those in America. Federal law requires employers to pay their workers a minimum wage of about \$5 a day, but most don't earn even that. The birth rate rises almost every year; infant mortality rises with it. Access to health care and education are sorely limited.

And the rich volcanic soil upon which many Salvadorans earn their living could slip away without warning, destroying the crops they work, their homes, and, quite possibly, their lives. There is little Lopez can do about the other challenges her countrymen and women face. But this one is something she can address.

After the civil war ended, Lopez began thinking of plans for a research project in El Salvador. She began the work soon after joining the faculty at Ohio University in 1996. At first, her studies focused on Ilopango Lake, a large volcanic lake near the capital city. Later, she and her collaborators in El Salvador and Spain began studies of San Salvador volcano, which towers 6,211 feet to the west of the capital city. Some scientists believe volcanoes erupt with some regularity — every 1,000 years, every

100 years, etc. Using Carbon-14 dating techniques, geologists date the organic matter in between the layers of volcanic rock. Each layer is older than the last and yields dates for eruptions throughout history, allowing scientists to figure out how often a volcano might erupt. Other studies of San Salvador volcano suggest it erupts about every 82 years. By that calculation, the volcano was due for a major eruption in 1999.

Though there have been no signs of such volatile activity, Lopez and her collaborators are keeping a close watch on the levels of carbon dioxide and hydrogen sulfide. In 1999, Lopez and her collaborators completed a survey of CO₂ on San Salvador volcano and Ilopango. In findings presented at a 1999 meeting of the American Geophysical Union, Lopez reported that CO₂ levels at the volcano were higher than those at Ilopango. But data collected during the trip in July suggest the lake's levels may be rising. She hopes to return to El Salvador before the end of the year for more studies.

Personal Journal, July 23: *Left at 7 a.m. for Ahuachapán Geothermal Field in western El Salvador near the Guatemalan border. On our way to see a large fumarole on Laguna Verde volcano, came across a truckload of police. Robbers had been spotted on the road. We turned back, drove to the plant, and arranged to have two armed guards accompany us into the field. The fumarole we visited resembled a geyser. The heat from deep within the Earth boiled the water, which rose to the surface in giant waves, splashing a reddish-brown mixture of clay and dirt all around. There was a soccer field just a few feet from the fumarole. Went next to what Dina called the "steaming ground" — an area about three-quarters of a mile long with*

dozens of fumaroles, some very large, some tiny. The heat and smell were overwhelming. We had to watch our step. Some parts of the ground were little more than soft coverings of fumaroles. Our weight could cause the soft earth to give. The burns from the steam underneath would be quite severe.

Personal Journal, July 25: *I couldn't help but think that researchers who've only studied in the United States have no idea how hard it truly can be to do the work. Most will have the good fortune to never know what it's like to do research in a place where there is no money to purchase equipment that doesn't break, where scientists must borrow tools from other countries, and rely on the good intentions of friends and relatives for transportation, room, and board. Professors in El Salvador make only about \$600 a month.*

The name “El Salvador” means “magic corner.” For scientists studying the nation’s volcanoes, that magic sometimes comes in the form of a screwdriver held by a skilled handyman. Whether it stems from his natural curiosity of how things work or from the necessity of working with old equipment, Soriano has learned to fix just about anything that can be fixed.

Toward the end of their field work in late July, the researchers boarded a borrowed pontoon boat and sailed out onto Ilopango. Damage from volcanic chemicals and manmade pollution has put the lake’s health at risk, adding another degree of importance to Lopez’s work.

Some areas of the lake already have been closed to fishermen, but Lopez suspects there are other regions that also should be avoided. So, on a bright Thursday morning, she and Soriano drove the short distance to the lake to collect data on water temperature and gas levels. After collecting a few readings, it became clear that luck was not with them that day. A bad boat battery proved impervious to Soriano’s fix-it skills and the group was forced to leave without the data they needed.

Lopez and Soriano returned to the lake about a week later. They were unable to get the water readings, but they

did investigate an area of land around the lake where some fisherman had reported seeing dead trees. In this part of Ilopango, the levels of CO₂ in the soil were 25 times higher than in her 1999 survey. There also are reports of hot water in some areas of the lake, a claim the government wants her to investigate on her next trip.

“This isn’t necessarily a sign of volcanic activity. But we need to monitor and check it often,” she says, adding that ideally, the scientists would take readings once a month. However, the \$15,000 equipment they used in July belongs to one of the geothermal plants and isn’t always available.

The pair have other plans to further their work in El Salvador. Lopez isn’t sure how long it will take to create an accurate profile of these volcanoes, maybe a decade, perhaps longer.

“This is a continuous learning process,” she says. “We never know what is going to happen next. We have some basic knowledge already, but that could change as we investigate more.”

While that investigation continues, Lopez also is involved in a number of projects in Athens, Ohio, which, surprisingly, share some common traits with her work in El Salvador, at least from a geological perspective.

The scientist has seen some of the same substances she’s monitored in volcanoes in abandoned mining areas in south-eastern Ohio. Working alongside several graduate and undergraduate students, Lopez has studied the acid mine drainage produced by abandoned mines in southeastern Ohio and collected soil samples from 100 sites in and around old mines.

“We want to see if the concentration of radon in the soils is different in the mined areas compared to the unmined areas,” she says, adding that she also plans to study radon levels in basements of houses close to and far away from abandoned mines.

The work is tedious at times. But the result, she hopes, will be a safer environment for her family and friends in Athens. That motivation is not unlike that which draws her to the volcanoes of El Salvador.

“One reason I do the work in El Salvador is out of scientific curiosity. The challenge of knowing something we don’t know yet,” she says. “The other reason I do it, the main reason, is it’s a place I love and I have many loved ones there. I want to make life better for them and one way to do that is to understand and produce research that could help predict a volcanic event in the future and maybe save lives.”

Personal Journal, July 26: *Awoke early to pack. Took a taxi to the airport and arrived about 10:30 a.m. Wound my way through security, the ticket counter, security again, then to the gate. Flight left on time. My time in El Salvador will remain with me forever. The power of life beneath the earth; the reach of death above ground. Life here is so fragile, but it's a fragility different from what most Americans will ever know. There is no certainty here. No certainty that the child crossing the street will make it safely to the other side. No guarantee that the violent shaking of the ground will end before lives are lost. No certainty that people like Dina will be able to warn the government of a volcanic eruption in time to evacuate. It is a country of beauty and horror, joy and fear. Laughter and tears sound the same in any language. And there are plenty of both here. ▲*

For more information on volcanoes in El Salvador, visit the Smithsonian Institute’s Global Volcanism Program on the Web at <http://www.volcano.si.edu/gvpl>.



ON LAND, IN WATER Lake Ilopango is one of eight volcanic lakes in El Salvador — and one under study by Lopez and her colleagues. San Salvador volcano looms in the distance.

MEDICINE

BIOLOGY, BY DESIGN

NEW CLASS OF PROTEINS COULD AID IN BATTLE AGAINST BACTERIA

As a child, Nick Carr dreamed of becoming a comic book artist. But after taking his first high school biology class, he decided that instead of creating cartoon superheroes, he would design biological ones. His latest design? Tiny bacteria-fighting proteins that could give doctors another weapon in their battle against antibiotic resistance.

"Right now, you go to the doctor and they give you several antibiotics," says Carr, a junior biological sciences major. "As a result, a lot of diseases are becoming resistant to these antibiotics."

To solve this problem, Carr has spent nearly two years studying tiny proteins called antimicrobial peptides that could serve as an alternative treatment to antibiotics. While antimicrobial peptides are naturally produced by humans and animals as a first line of defense against external germs, the peptides Carr is studying are made in a laboratory.

Under the direction of Jack Blazyk, profes-



ON ICE Nick Carr designs tiny bacteria-fighting proteins that could aid studies of antibiotic resistance.

PHOTO: Rick Fatica

sor of biomedical sciences and associate dean for research in the College of Osteopathic Medicine, Carr has found that these synthetic peptides are capable of inhibiting or even destroying harmful pathogens by poking holes in their cellular membranes, apparently leaving human cells unharmed.

These proteins have unique properties that make it hard for bacteria to build a resistance to them, making them a potential candidate as a drug replacement for antibiotics. Carr currently is using four types of bacteria, including *E. coli*, as targets for

the antimicrobial peptides to see how they will react with different bacteria.

"The peptides keep on getting better and better with every test," says Carr, who plans to present the study at the Biophysical Society Meeting in San Antonio in February. "We've gotten some antimicrobial activity that is comparative to or even better than in published studies."

Blazyk's lab has been investigating new antimicrobial peptides since the early 1990s with support from the National Institutes of Health and the state's Technology Action Fund. Ohio University submitted a patent application for the new peptide design in 2001.

Carr, who is funded by a Student Enhancement Award from Ohio University, will study antimicrobial peptides for at least another year. He expects to study genetics and molecular biology in graduate school after his graduation from Ohio University in 2004.

And as progress on the antimicrobial peptides continues, the researchers hope the compounds will be developed commercially in the form of new antibiotics for the treatment of bacterial infections in humans and animals.

TERESA KEYSOR

GEOGRAPHY

THE HISTORY OF ECOLOGY

A CITY'S EVOLUTION CAN SAY A LOT ABOUT ITS ENVIRONMENTAL PAST

Can a city suffer the effects of toxin-producing industries even 100 years after the companies close? Ohio University undergraduate Keith Jackson thinks so. The senior geography major is studying the connection between environmental conditions and poor public health by researching infant mortality in Baltimore from 1880 to 1920.

"Not that people don't already know that things like industry, pollution, and lack of public health systems can cause deaths, but we want to produce definitive evidence," says Jackson.

He started his research in fall 2001 with the aid of a \$3,000 grant from the Voinovich Center Undergraduate Research Scholars Program. Spending afternoons in a tiny cement-block office in Clippinger

Laboratory, Jackson pored over microfilm of Baltimore death records, noting the date and location of 2,300 infant deaths. Because infants are very susceptible to their environment, infant mortality often is used as a measure of poor environmental conditions. After compiling the data, Jackson moved to the second phase of his research: putting the information on a map of Baltimore.

As cities evolve over time, street names and locations often change, which makes finding an accurate historical map a research project in itself. To show correlations between infant deaths and environmental conditions such as industrial pollution, Jackson needed to create a map that combined old Baltimore streets with modern-day locations. The project was completed with a process called georegistering, which uses a computer program to give current coordinates to locations on old maps that have been scanned into a computer. After making a digital version of a Baltimore map from an 1875 atlas, Jackson used the program to layer a topo-

graphical map of Baltimore over his scanned map, creating common reference points. He then added detailed fire insurance atlases from the era, which noted every address, to create a final computerized map he can use to get a more accurate location of infant deaths.

After spending a quarter gathering data about infant deaths and another quarter creating a digital map, Jackson can start combining his information. "We expect to find patterns," he says. "We could see if there was a big cluster of infant deaths here, and there was an industry located here, obviously there is a pattern there. Or we say, 'Why did all these infants die this year but not in this year?' And then we see that two years before, there was a milk ordinance or public sewers were placed in those areas."

Jackson's study is part of a larger, ongoing research project called the Baltimore Ecosystem Study, says his research adviser, Christopher G. Boone, an associate professor of geography. Funded by the National Science Foundation, the BES project seeks

BIOLOGY

OUT FOR A WALK

STUDIES OF MODERN-DAY ANIMALS SHED LIGHT ON EVOLUTION

With a large snout, grizzly fur, and twig-like legs protruding from its awkward body, the pygmy opossum seems like an unlikely candidate for how the walking patterns of animals such as alligators and apes evolved over time. But appearances can be deceiving, as senior Andy Parchman has discovered.

Parchman has spent the last two years studying the evolution of locomotion and posture: How did four-footed vertebrates change from walking low to the ground with body and limbs swinging to the side (called sprawling), to moving with their limbs partially under the body (called semi-erect), to, finally, walking erect?

The student and his faculty adviser, biologist Stephen Reilly, are hoping to answer this puzzle with a bit of help from opossums. The animals make good models for this project, as they are small and have semi-erect postures, which Reilly notes is a locomotive motion that has not been widely studied.

For their studies, the researchers ran the quarter-pound, 8-inch opossum on a 25-cm



WALK THIS WAY Andy Parchman's studies are shedding light on how animals evolved over time.

PHOTO: Rick Fatiga

long by 15-cm wide force plate equipped to measure the forces the animal exerts with each footstep. Data from the plate flows into a computer program Parchman helped design, which records the force data and calculates patterns of energy used on each step. High-speed video is used to record the type of stride the animal uses.

For his part in the project, Parchman has been particularly interested in how

semi-erect animals store and exert energy while in motion.

"A number of scientists studying erect species have this paradigm of how animals store energy when they move," he says, adding that many assume that just because large erect animals, such as humans and dogs, conserve energy one way, that all animals will save energy in the same manner. His research, which was presented at the annual conference of the Society of Integrative and Comparative Biology earlier this year, suggests that this is not the case. Semi-erect animals may not conserve energy in limbs like erect animals. Discovering why and how this happens will be the next step in the research.

Parchman plans to continue working on this project through December, when he will graduate with a double-major in pre-medicine and Spanish, a combination he would one day would like to put to use as a physician. Given this career choice, taking part in a three-year study of evolution may seem like an odd endeavor, but to the aspiring doctor, it makes perfect sense. Evolution is an aspect of science, and Parchman loves science.

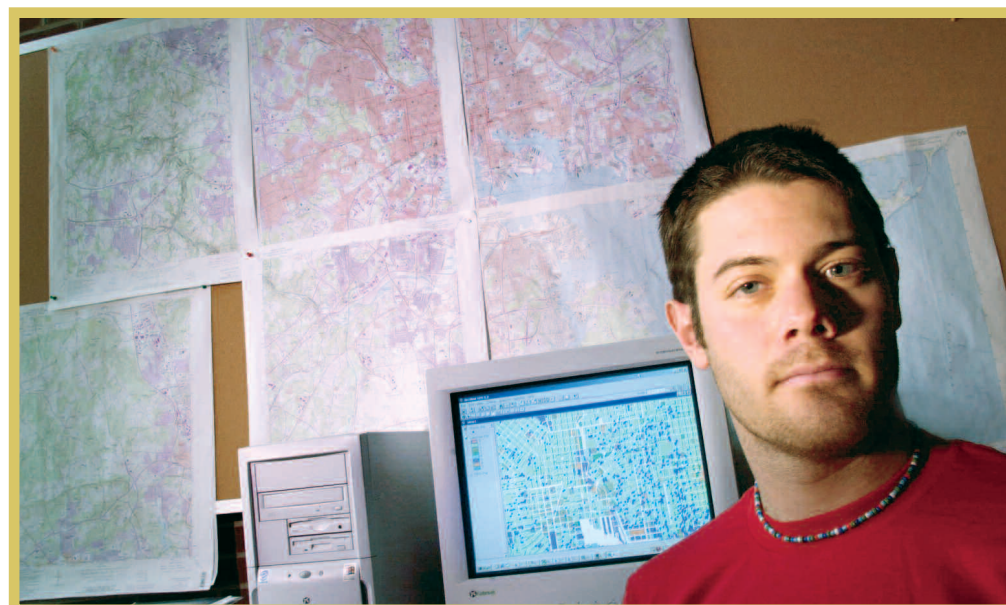
"I got into it in high school," he says. "Science just always seemed to make sense."

ALISON STEVENS

to monitor and understand the ecology of Baltimore by examining the city's past and present. The results could help residents build a better city.

"What happened in the past affects the present," Boone says. "In the 1880s and beyond, local officials made decisions about land use based partly on health conditions in the city. It affected where they built roads, sewers, water supplies, hospitals. It affected zoning decisions on where industry could locate or the permitted density of housing. Those decisions left physical structures in the city that are present today and affect the ecology, health, and social systems of Baltimore in the present."

Although his career plans aren't set yet, Jackson says he'd like to continue his work in environmental geography after he graduates next spring, perhaps turning his attention from urban studies to the great outdoors.



CHARTING HISTORY Historical studies of infant mortality in Baltimore have helped geography student Keith Jackson learn about the city's environmental past.

PHOTO: Rick Fatiga

ROBIN BURFIELD



FOR MORE NEWS ABOUT UNDERGRADUATE RESEARCH AND CREATIVE ACTIVITY, VISIT EXTRA CREDIT ONLINE AT WWW.OHIO.EDU/RESEARCHNEWS/EXTRACREDITI.

EDUCATION

HOME ALONE

SOCIAL ISOLATION MAY INCREASE RISK OF YOUTH VIOLENCE

With so many stories about school violence, it's easy to imagine that children might not find the classroom to be the safe haven of times past. But that's not what a group of students recently told educator Tracy Leinbaugh.

"For all the adolescents we interviewed, school was the one safe, positive place for them. Home was worse," says Leinbaugh, who interviewed 30 boys ages 13 to 18 as part of a small preliminary study on perceptions of youth violence.

Leinbaugh, an assistant professor of counseling and higher education, launched the study to find out what role social isola-

tion plays in youth violence for the victims and the perpetrators. The research is part of an ongoing examination of adolescent violence in rural areas.

Previous work in the field had suggested that adults who are socially isolated are at greater risk for becoming victims of domestic violence. Leinbaugh wanted to find out if solitude also spelled trouble for children. She organized eight mixed focus groups of six to 10 people: mental health care providers, parents, and adult community members, as well as teenage boys who had committed offenses ranging from underage drinking to assaulting a police officer.

The interviews with the boys were the most illuminating, Leinbaugh says, as they confirmed that the teens had been socially isolated most of their lives. Parents often restricted these adolescents to the home,



discouraging relationships with peers and even encouraging the use of violence against others, she found.

"They felt they had been isolated all their lives. They talked about parents not letting them hang out at the corner store with

ENGINEERING

IN THE GRASS

STUDY EXAMINES GRASS'S ROLE IN TNT REMOVAL

Enter the lab of Ohio University civil engineer Guy Riefler and you'll find rows of coffee-cup-sized glass beakers filled not with chemicals or solutions, but three species of grass. The soil these plants are growing in contains another unusual ingredient: the explosive TNT.

Listed by the Environmental Protection Agency as a major pollutant and possible

human carcinogen, 2,4,6-trinitrotoluene still can be found in the soil and groundwater supply at military waste sites nationwide, years after its extensive use in weapons manufacturing during World War II.

While removal efforts are under way, disposal of this toxin is proving to be a difficult and expensive task. In attempts to decrease both complexity and cost, Riefler is investigating a method for removal that is safer, cheaper, and greener than conventional techniques, which include excavation and incineration.

Riefler and doctoral student Stephanie King are infecting grasses with *Pseudomonas putida* and *Rhizobium leguminosarum*, bacteria that have been shown to neutralize TNT. While other researchers have explored bacteria's role in the removal of contamination, they have not uncovered a way to successfully transfer bacteria to the infected site. Riefler may have.

His study incorporates the use of plants to neutralize hazardous waste, a process called phytoremediation. Grass roots deliver TNT-reducing bacteria directly to the soil. Preliminary results suggest the idea works. Now the researchers are doing further analyses to find out which of the three types of grass works best with which bacteria, a question they hope to answer by the end of the year.

The next step is to follow what happens to the TNT as the bacteria spreads. If the technique works, it could be used in shallow waste sites. The method would take longer than current remediation techniques. It can take a month to dig up contaminated soil and haul it away, while it could take years to neutralize the same site using bacteria-laced grass seed. But the result would be fewer trips to a mountainous, unsightly landfill.

"I would much rather look at a field of grass than a landfill or a pit," Riefler says.



SPLendor IN THE GRASS Military waste sites around the country are contaminated with the explosive TNT. Civil engineer Guy Riefler is studying grass infected with a TNT-neutralizing bacteria to see if the technique could be used for remediation.

PHOTO: Rick Fatica

AS



DIGITAL ILLUSTRATION: Christina Ullman

“For all the *adolescents* we interviewed, *school* was the *one safe, positive place* for them. Home was worse.” — TRACY LEINBAUGH

friends, and they felt they didn’t have any choice but to commit some of the violent acts they did,” says Leinbaugh, who presented these findings at the American Counseling Association World Conference in March.

The punishment for these offenses — a trip to juvenile detention or jail, where they would be sent to isolation for misbehavior — only made the problem worse, the boys in the study said.

“The less contact they had with people, the angrier they were,” Leinbaugh reports.

The study findings have prompted Leinbaugh to take a deeper look at the issue of youth isolation. This fall, she

began a second phase of the project, in which she expects to speak to at least 20 to 30 at-risk rural teens who haven’t committed crimes. These include students from low-income families, those who are poor achievers in school, and youth with learning and emotional disabilities.

Through the use of focus groups, she will try to identify similarities between the at-risk youth and the juvenile offenders she previously interviewed. While she expects to compile data from these interviews within the next year, Leinbaugh views this as a long-term study that will involve further interviews and research, and, she hopes, offer suggestions for ways that rural schools and communities can provide better intervention for at-risk adolescents.

AG

PHYSICS

THE FINE PRINT

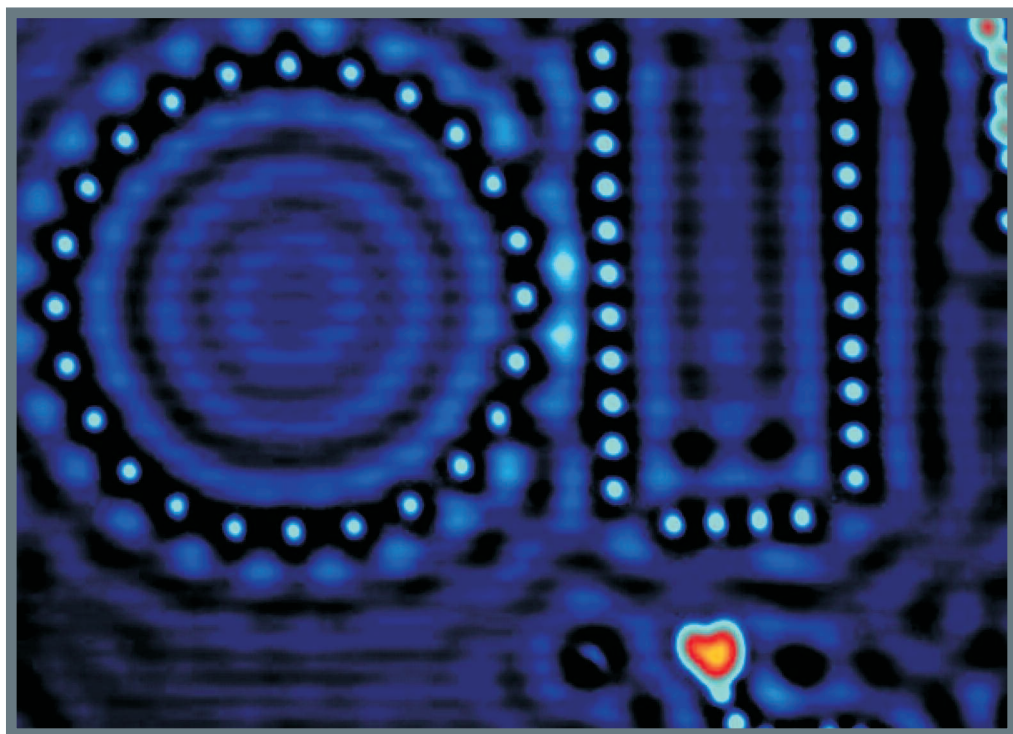
SCIENTIST USES NANOTECHNOLOGY TO CREATE AN ATOM-SIZE ACRONYM

The latest work of physicist Saw-Wai Hla is literally a small sign of his big school spirit. Enthusiastic about his new position as assistant professor of physics and astronomy at Ohio University, which he joined in fall 2001, Hla arranged 50 atoms to spell out what arguably is the tiniest acronym of the university name.

Made from atoms of silver, the letters aren’t visible to the naked eye, even with a magnifying lens: The diameter of the “O” alone is only about 31 nanometers. One nanometer equals one-billionth of a meter.

Hla designed the image as a whimsical example of nanotechnology, the science of developing atom-scale structures. Scientists and engineers involved in this growing field expect to build nanoscale devices for applications such as computer data storage, drug delivery, and stronger construction materials.

To create the nano-sized “OU,” Hla employed a high-powered scanning tunneling microscope and a needle, similar to the size and appearance of the needle on a record player, to break atoms off an aspirin-sized tablet of silver. Hla used the needle to crush the surface of the silver and pull out a cluster of atoms. Next, he separated the individual atoms and realigned them to



SPELL IT OUT To create this tiny Ohio University acronym, physicist Saw-Wai Hla used a high-powered scanning tunneling microscope and a needle to break atoms off an aspirin-sized tablet of silver.

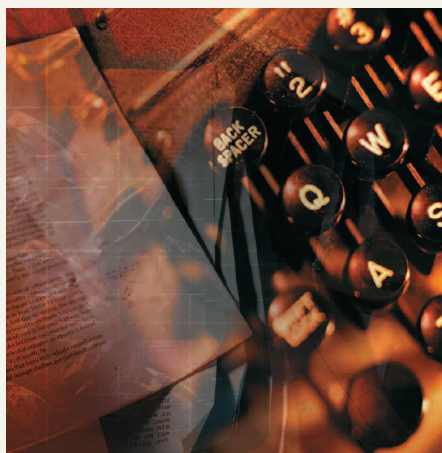
IMAGE: Courtesy of Saw-Wai Hla

form the letters “O” and “U” (as well as a small heart shape, seen at the bottom of the image). Because atoms move randomly at room temperature, Hla cooled the silver to a chilling -440 degrees Fahrenheit to fix the nanoscale letters in place.

The tiny “OU” isn’t just a pretty picture;

it’s a technological advancement: Hla is the first scientist to extract individual atoms from a solid surface using this technique. Next, he’ll use the process to join single molecules, the first step in building a nanoscale device.

AG



LITERATURE

THE BODY'S FIRE

A COLLECTION OF POETRY

From the frantic traffic of Cleveland's Euclid Avenue to the snowy marshes of Newfoundland, poet Scott Minar leads the reader on a trip both personal and geographic, writing about the sea, sky, and maple trees with the same intimacy with which he details the contours of a woman's body in this new collection of 25 poems.

"I think these are poems about nature with a capital 'N.' By that I mean human nature, the nature of our societal and familial relations. And how that does or doesn't tie in to the natural world as well," says Minar, an assistant professor of English at Ohio University's Lancaster campus. Written over the past two decades, the book includes work that previously has been published in literary journals such as *The Paris Review*, *The Georgia Review*, and *Prairie Schooner*. "Caesura," which opens on the early-morning streets of Cleveland, was nominated for a Pushcart Prize by award-winning writer Joyce Carol Oates.

The pieces in Minar's second collection of poetry are united by a common emotional tone, which the writer describes as pathos, joy, and liberation. The book also marks his collaboration with Australian photographer and designer Douglas Holleley, whom Minar says added a new dimension to the work through his graphic design of the poems.

SCOTT MINAR

Clarellen Press, 60 pages. www.amazon.com

HISTORY

INTELLECTUALS IN ACTION

THE ORIGINS OF THE NEW LEFT AND RADICAL LIBERALISM, 1945-1970

Lamenting the lack of an effective left in American politics is a venerable tradition," writes Associate Professor of History Kevin Mattson in the introduction of this new book, which explores the origins and ideologies of the New Left political movement in the mid 20th century.

At a time when the Democratic Party has become more centrist and conservative, Mattson re-examines the writings of several intellectual thinkers, including anarchist reformer Paul Goodman and radical liberal Arnold Kaufman. These and other intellectuals

advocated ideas such as a nonMarxist participatory democracy, citizen dialogue, community organizing, and the need for serious political restructuring. They criticized the limits of the countercultural rebellion led by factions such as the hippies and the Beats.

"The idea that the intellectual was part of a democratic process goes to the heart of these thinkers' political theory — the idea of a participatory democracy," the historian writes.

Mattson, who came of political age during the conservative Reagan era of the 1980s, argues that these intellectuals still have lessons to teach us about the possibilities of democratic radicalism.

KEVIN MATTSON

Penn State University Press, 312 pages. www.psupress.org

COMMUNICATION

COMBATING AIDS

COMMUNICATION STRATEGIES IN ACTION

In Thailand in the early 1990s, the government directed the nation's 488 radio stations and 15 television stations to broadcast free public service announcements about HIV and AIDS prevention. With slogans such as "Would you prefer to go to your child's college graduation or to his or her funeral?" hitting the air waves every hour, bolstering a \$48 million educational and public health campaign, rates of HIV infection began to drop. New cases of the disease fell from 143,000 in 1991 to 29,000 in 2000.

Thailand is a successful example of how developing nations can use communication strategies to educate the public about the need for the prevention of AIDS, which is raging in Africa and Asia, according to the authors of this new book. Arvind Singhal, Presidential Research Scholar and professor of interpersonal communication at Ohio University, and Everett Rogers of the University of New Mexico interviewed hundreds of doctors, government officials, HIV-prevention program directors, and patients in Brazil, India, Kenya, South Africa, and Thailand to determine how these countries could better use communication to stop the spread of the deadly virus.



Understanding the customs and cultures of these developing nations is crucial to effectively developing public service campaigns, the authors argue.

"Many communication activities are not culturally appropriate, so they may offend, which is easy to do when dealing with a sensitive topic like HIV/AIDS that involves sex, stigma, and death," the authors write. "Most HIV/AIDS communication interventions are flying blind."

Singhal and Everett discuss many ways governments and nonprofit organizations can work within the cultural framework to deliver effective messages that ultimately can change the behavior of individuals. Communication can serve as a "social vaccine" to the devastating AIDS virus, which infects 14,000 people each day — 95 percent of whom are in developing countries, the researchers write.

ARVIND SINGHAL AND EVERETT ROGERS

Sage Publications, 300 pages. www.sagepub.com

Bookmakers is compiled by Andrea Gibson.

A ROOM WITH A VIEW

It was a dark and stormy night... So begins a terrifying story told by many small aircraft pilots who found themselves in bad weather with no clear view of the ground below. But flying under these conditions doesn't have to mean flying blind, thanks to new technology that will give pilots a virtual view of the terrain when visibility is low. The research was featured recently on WOUB-TV as part of the Science Spotlight TV series.

Watch the program online at www.ohio.edu/sciencespotlight/sky.html.



IN THE COCKPIT Technology is giving pilots a clearer vision.

PHOTO: Rick Fatiga

MIGRAINE RELIEF

Nearly 8 million children and adolescents in America suffer from migraine headaches, resulting in more than 1 million lost school days each year. But popping pain relievers may not be the best way to cut the pain.

Read more about the study at www.ohio.edu/researchnews/medical/teen_migraine.html.



OF NOTE

Human musicians meet electro-acoustic accompaniment in Elegy and Honk for English Horn, a recently debuted work by Professor of Music Mark Phillips. The artist, a Presidential Research Scholar, often combines technology with traditional composition. Listen to Phillips' work through a new multimedia Web site, "Discover Research @ Ohio University."



DIGITAL IMAGE: Christina Ullman

Find it on the Research Communications homepage at www.ohio.edu/researchnews/ on the left-hand side of the page.

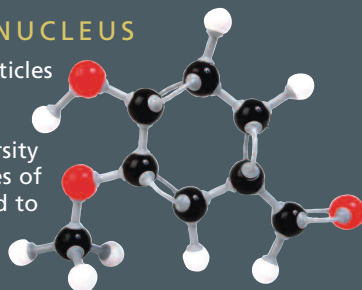
ON TECTONICS AND BOD PODS

What do a project in neutrino physics, a new database for regional humanities studies, the tectonic evolution of part of northeastern Mexico, and a human "bod pod" all have in common?

Find out online at www.ohio.edu/researchnews/news/1804_award.html.

INSIDE AN ATOMIC NUCLEUS

Protons. Neutrons. Tiny particles that make up the heart of an atomic nucleus. Don't let their size fool you, says Ohio University physicist Daniel Phillips. Studies of these small particles could lead to big discoveries about astronomical phenomena.

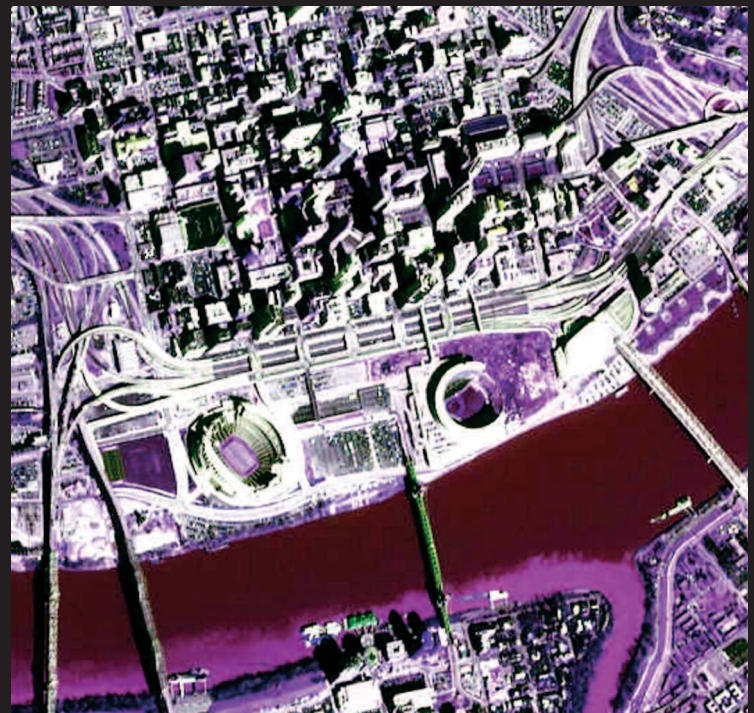


Read more about it at www.ohio.edu/researchnews/news/phillips_award.html.

FROM THE EXPERTS

What issues do rural schoolchildren, teachers and principals deal with — and are they different from issues in suburban and urban school systems? Ask Aimee Howley, a professor and chair of educational studies and one of Research Communications' recent Featured Experts.

Learn more about her work at www.ohio.edu/researchnews/experts/howley.html.



EYES IN THE SKY Satellites stand watch for terrorist activity.

AN EYE ON TERRORISM

Satellites orbiting 500 miles above the planet are giving one geographer a bird's eye view of targets vulnerable to potential terrorist attacks.

Read more about it at www.ohio.edu/researchnews/science/homeland_security.html.



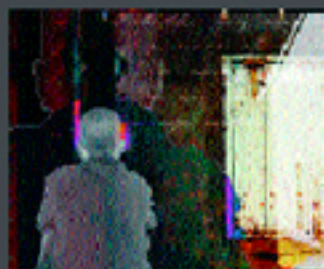
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5

TONING UP

Today's cochlear implants don't have enough channels to allow users to hear music or perceive tonal languages. However, adding more channels may change that.



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ISOLATED VIOLENCE

Studies of adolescents uncover the link between social isolation and youth violence for victims and perpetrators.



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