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The Western Scholar

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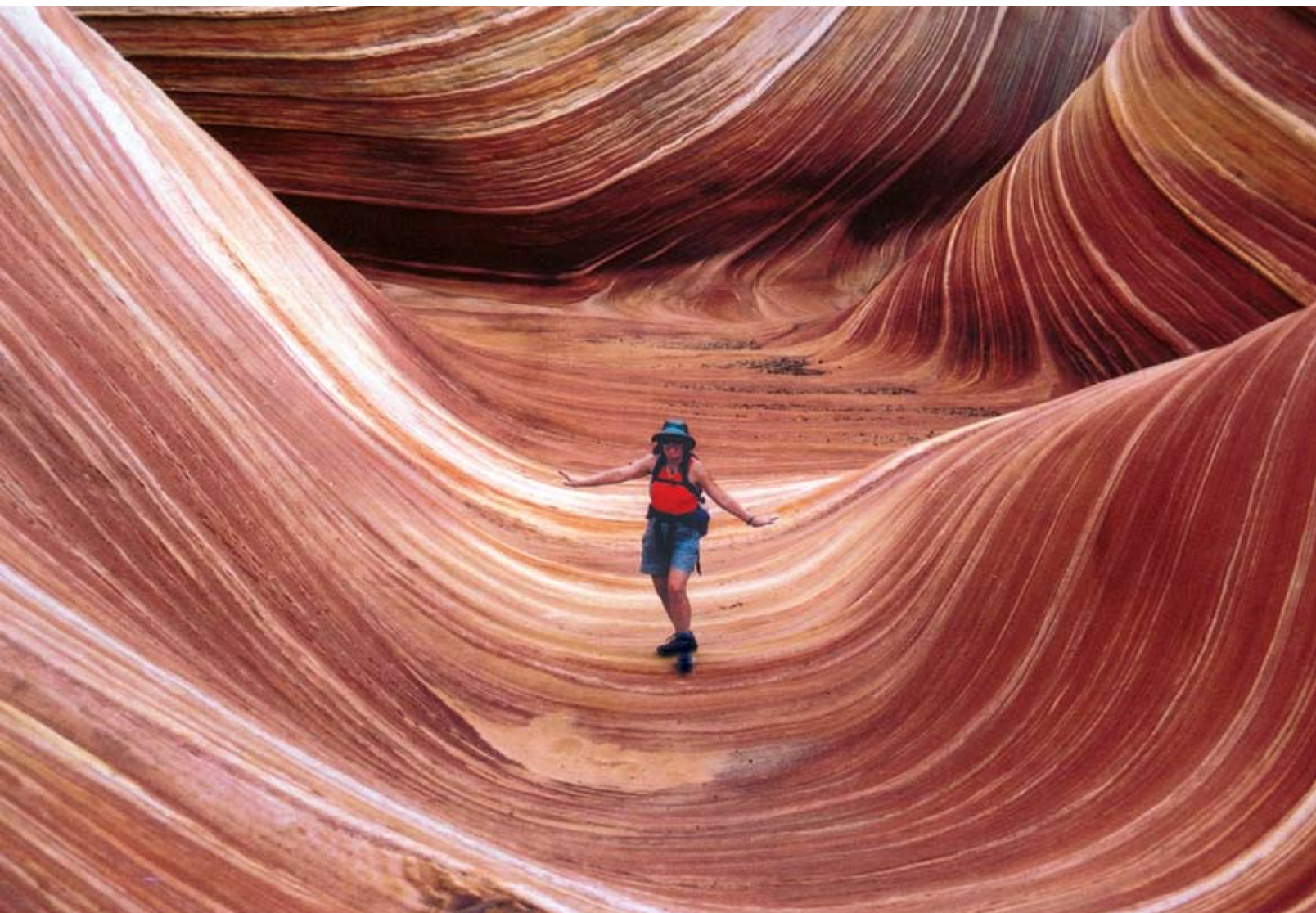
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The Western
SCHOLAR

THE SPIRIT OF SCHOLARSHIP AND RESEARCH AT WESTERN KENTUCKY UNIVERSITY





William Tallon, Ph.D.

WKU's first hundred years has just past. The university is embarking on a new century that features the integration of teaching with research. This change in culture will influence the ability of our students to engage themselves with new modes of learning. It will enable them to meet potential employers as they engage in real time and real problem studies with the many industries and other employers in the region who are growing to rely on the faculty and student experience at WKU to build their businesses.

This model has taken off to enhance WKU's goal of becoming a prominent national university of choice with a strong international reach. As the new dean of the Gordon Ford College of Business at WKU, I am amazed at the myriad of opportunities for students to perform research and creative activities such as learning marketing techniques by doing surveys in local businesses and then discussing the results with business leaders. The numbers of student and faculty foreign exchange programs also amaze me. These opportunities enable faculty and students not only to embrace other cultures, but to enlarge their knowledge by learning how business is conducted abroad. This experience is what student engagement is all about. I am happy to be a part of the movement to increase the quality of student engagement.

I am delighted to see that the eight feature stories in this issue of *The Western Scholar*, or *The Scholar*, as it has come to be known, show faculty from each of our colleges at work on their research projects and with their students. Taken together, the stories illustrate what WKU is all about today,

and how its prominence is becoming manifold because of what our faculty and students are doing together during their undergraduate and graduate experience, and after they leave WKU as well.

WKU faculty are certainly well known in Barcelona, Spain, and nearby communities for work to make student learning more participative instead of the traditional memorization style. In this regard, Professors Cynthia Houston, College of Education and Behavioral Sciences, and Roxanne Spencer, University Libraries, explain their international venture on behalf of modernizing student learning. Their colleague from the Department of Curriculum and Instruction, Professor Kay Gandy, who you can see on the cover, is not standing on the moon but in one of our national parks as part of her excursion with her students across the America landscape. This trek enables Dr. Gandy to teach at sites that students would otherwise only see in pictures. Her story is an odyssey in itself and shows a new approach to learning through student engagement in real time.

Professor Rezaul Mahmood and his students in the Department of Geography and Geology in the College of Science and Engineering are perfecting one of WKU's applied research strengths in climatic studies. They are collecting temperature data to determine the need for people to water the soil based on temperature variations. Dr. Mahmood's enthusiasm, the quality of his students, and a \$1.5 million federal grant promise to make the physical geography that impacts our lives predictable. The story about long-time state climatologist Glen Conner tells us more about his lifelong work to unravel the mysteries of weather stations all over the United States. There is no question about Professor Conner's national reach on behalf of WKU. The intricacies of the calculations of Dr. Mahmood and Professor Conner and students are matched by the mathematical research of Professor David Benko who has solved a perplexing mathematical problem. His solution to "Hilbert's third problem" in geometry has put WKU on

the international map in mathematics. The newer problem of how to store data that we take from the web is being solved by Computer Science Professor Quangming Xing. Professor Xing and his students have created a database management system to compact and store data. Their collaboration is a vivid example of applied research and has enabled students to present papers on the work at professional meetings across the country.

There is also the link between predictability in our lives and the sweep of technological innovation. To what extent do we need to use technological devices and still keep our sanity? Professor Kumi Ishii in the Department of Communication in the Potter College of Arts and Letters has set out to supply some answers. Her story in *The Scholar* discloses what she has discovered about the usefulness of e-mail in our daily lives. After reading it, you will understand more about "the human side of the digital divide," as she calls it. Department of History Professor John Hardin communicates his research about the African-American role in Kentucky since it became the fourteenth state in 1794. His collaboration with historians across the state to produce the *Kentucky African American Encyclopedia* will enable students and citizens to understand our diversity and the significant contributions that African-Americans make to our culture.

Reviewing these stories, and the research briefs of faculty at the end of *The Scholar*, enabled me to grasp the dynamics of the integration of learning and student engagement that is occurring in my new home. I know that you will enjoy sharing our contributions to academe and perhaps realizing that these efforts are illustrative of the depth and sweep of academics at WKU. Our bicentennial century promises to be creative as we learn to live in the future to help the citizenry in the present.

William Tallon, Ph.D.

Dean
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THE SPIRIT OF SCHOLARSHIP AND RESEARCH AT WESTERN KENTUCKY UNIVERSITY

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About the Cover

Dr. Kay Gandy, assistant professor in WKU's Department of Curriculum and Instruction, teaches future educators to make geography and social studies come alive in the classroom. She is shown here riding "the Wave" formation in Paria Canyon near Zion National Park.

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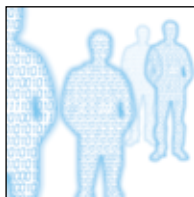
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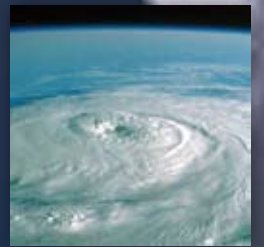
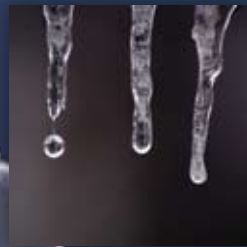
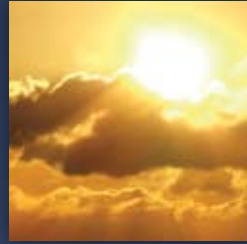
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CSI:

CLIMATE SCENE INVESTIGATIONS

BY TOMMY NEWTON

IF THEY MADE A TV SHOW FOCUSED ON THE RESEARCH OF RETIRED STATE CLIMATOLOGIST GLEN CONNER, IT MIGHT BE CALLED “CSI: BOWLING GREEN” OR “CSI: HELENA” OR “CSI: MILWAUKEE” OR “CSI: SALT LAKE CITY.”

For Conner’s work, however, “CSI” isn’t Crime Scene Investigation; it’s more like Climate Scene Investigation.

In recent years, Conner has traveled to two dozen cities to develop histories of weather stations whose records extend into the early 1800s. “The interesting thing is that it’s real detective work because the information is not available easily. You don’t open a book and copy it out.”

For his “History of Weather Observations for Helena, Montana, 1866-1948,” Conner visited libraries, government agencies, and other non-weather sites to find records, documents, maps, photos, and other information. “You just have to look,” he said.

The Weather Station Histories are one part of the National Oceanic and Atmospheric Administration’s Climate Database Modernization Program. The project, administered by the National Climatic Data Center (NCDC) in Asheville, North Carolina, also involves imaging paper, microfilm, and other records, and making them available online to researchers in a password-protected database; and then digitizing the weather data from those records to expand old climate databases or to create new ones.

By digitizing the climate databases, researchers and others will be able to use the data to determine what variations are normal and to provide a better base for making climate analysis. Much of the data was collected before the cities had grown to their current size and before urban heat islands had formed.

Once researchers begin looking at the digital database records, they will be alert for anomalies in the data and will try to determine whether the anomalies occurred naturally over time, or were caused by humans, knowingly or unknowingly, Conner said.

For example, if a spike in the temperature data had occurred, the researcher would look at the digital data to determine whether any data entry errors had occurred. However, that’s unlikely since two or three people input and check the data as it is digitized.

That’s where Conner’s detective work in compiling the weather histories is important for researchers. “Many things can appear to have caused a change in climate,” he said.

Those include the following:

A change in location of weather stations. For example, in Bowling Green, the weather observations began downtown then moved to Ogden College in the late 1800s, then back downtown, then back to the Hill during World War II, and then to the airport. Each time an observing station moves, the altitude and nearby environment changes. In his report on Helena, Montana, Conner found seven observation sites.

A change in instrumentation. A spike in temperature data at a station might have been caused by a broken thermometer or other changes in the equipment.

A change in observers. Some observers in the late nineteenth century might not have been as conscientious in collecting data at 7 a.m., 2 p.m., and 9 p.m. as required. If there was a change in observers and the data changed, it would alert a researcher to possible problems.

A change in what is being observed. In the early days, observers were required to observe meteors, auroras, and



Glen Conner

Once researchers begin looking at the digital database records, they will be alert for anomalies in the data and will try to determine whether the anomalies occurred naturally over time, or were caused by humans, knowingly or unknowingly, Conner said.

The issue of climate change isn't a new idea. In fact, Glen Conner says it has been around since at least 1804 when C.F. Volney wrote a book about the soils and climate of the United States.

"He wrote that most people knew that the climate was getting warmer and they also knew why it was getting warmer. The reason was that the forests were being cut," Conner said. "Volney wrote that people knew the more forests they cut, the warmer it got."

Conner said Volney's study is interesting because 200 years later many Americans are concerned about the destruction of forests in the Amazon. "Everybody understands the relationship between deforestation and climate change, but nobody likes to think about its being our own forests," he said.

In the early 1800s, Thomas Jefferson wanted a weather station in every county in Virginia to collect information and to make maps to understand the climate. "Weather networks in the United States were recognized as being needed early on," Conner said.

In 1817, the surgeon general agreed that Army surgeons would keep a diary of the weather at frontier forts to collect data "before settlement changed the climate," Conner said. One of the forts was Newport Barracks, Kentucky, across the river from Cincinnati, where observations began in July 1825.

In 1834, the Navy started a network principally in coastal areas but also at cities like Memphis, Tennessee, which had a naval yard.

In 1847, the Smithsonian Institution created a national network specifically for research purposes. Conner said a "mind-boggling" amount of data was collected three times per day (7 a.m., 2 p.m., 9 p.m.) on a large form. "By the time the Civil War started we had more than 500 stations reporting."

In 1870, Congress passed a resolution to create a weather service within the Army Signal Corps. "The reason for the Army Signal Corps getting that task was that they had the telegraph and the data could be submitted in virtual real time by telegraph from the observation site to Washington." Those data were used to draw the first weather maps and attempt the first weather forecasts, called "probabilities" in those days.

Soon the Smithsonian shifted its network of observers to the signal service, which had Army observers plus volunteers including one at Ogden College in Bowling Green. In 1891, many of those observers went to work for the new weather bureau which was under the direction of the U.S. Department of Agriculture.

In the 1940s, the weather bureau moved many of its observation sites to airports because the weather data was important to the growing aviation industry. Later the weather bureau became the modern-day National Weather Service.

earthquakes, things which are not now considered to be weather. Even the time of observations changed when standard time was implemented.

Before that, observations were taken on solar time which differs from location to location.

"All of these things that could cause changes in the data or changes in the way you analyze the phenomenon are what you would call station histories," Conner explained. By generating the station histories, Conner is providing a reference point for researchers to resolve data issues. "If they know the anomaly and what caused it, they can adjust the data set they're using," he said.

Conner and two other climatologists — Steve Doty, a retired employee of the NCDG; and Gary Grice, retired director of the Southern Region of the National Weather Service — are involved in writing the station histories.

The histories written by Conner are about sixty pages long and include text, charts, photos, and maps showing the location of observations, equipment used, a list of observers, and types of observations made. Conner has completed more than twenty histories, and is writing more. "Nothing in these station histories involves analysis of the data because what we're writing is a reference book for people who do that analysis," he said.

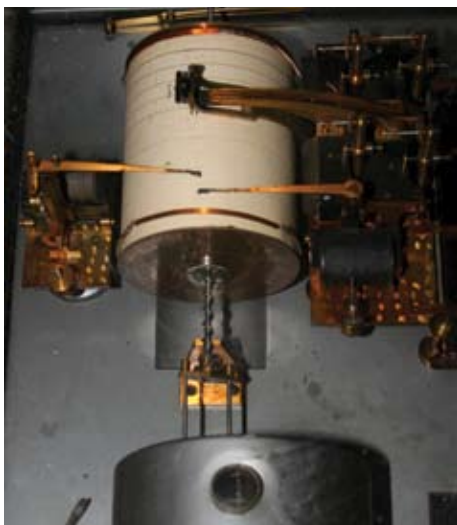
Before Conner visits a city like Helena or Milwaukee, he does online research to compile a list of anything about the city's history, its people, or its buildings that would include climate details. In photographs of cities, for example, Conner is looking for buildings that might have weather instruments. In a panoramic photo of Helena, he spotted what looked like an observation site. When the photo was scanned digitally and enhanced, Conner could see the wind instruments.

Conner also collects a wealth of data from various United States agencies — Army Surgeon General, Smithsonian Institution, Army Signal Corps, National Archives, National Medical Library, Agriculture Department, Weather Bureau, National Weather Service — that have compiled weather and climate information since the 1800s.

Conner also finds data in people's diaries, which may not have been part of an organized network, but are valuable to understanding climate. "In the early 1800s all observing data are valuable because there isn't much available at all," he said. "It might only be for a few months, but it is important data."

Conner's work isn't limited to the station histories. Research compiled during his career at WKU remains at the Kentucky Climate Center and he contributed articles on weather folklore and climate folklore to the new Kentucky Almanac.

He also makes presentations and writes papers based on his station history research. In "Nineteenth Century Weather Observers: A Whodunit," that looks at the



An antique Triple Register is used to measure sunshine, wind, and rainfall.

Smithsonian Institution's network of observers and their qualifications, Conner explains that most of the observers in that network were college-trained people such as doctors, engineers, and pharmacists. "Therefore I have a great deal of confidence in the data they produced," Conner said.

Conner remains confident in observations made by the others whose data he's uncovered and investigated in recent years and whose data will assist researchers in the future. "One of the things that I believe strongly is that data recorded by these people and these networks over the years accurately depict what the weather has been

at those spots in those years," Conner said. "Although the climate there might vary according to the environment around it, I have more confidence in those data than in modeling data that are not affected by environment at all. When these data become available from the National Climate Data Center, I'm confident they're going to be used extensively and in preference to modeling what one might presume the climate was like. When that occurs, these histories will be important." ■



A New Approach to Hilbert's Third Problem

BY TOMMY NEWTON





DAVID BENKO'S "NEW APPROACH TO HILBERT'S THIRD PROBLEM" HAS BEEN CALLED AN ELEGANT AND ELEMENTARY NEW SOLUTION TO ONE OF THE MOST CHALLENGING PROBLEMS IN MATHEMATICS. SO

HOW DID THE WESTERN KENTUCKY UNIVERSITY MATH ASSISTANT PROFESSOR DO IT?

It could be a combination of the following factors:

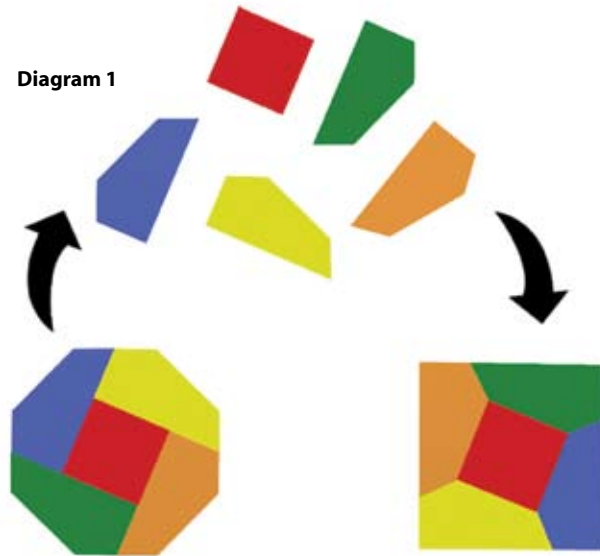
- Having a father who is an international chess grandmaster and an eight-time winner of the U.S. Open Chess Championship.
- Having a mother who is a mathematics professor.
- As a teenager, solving problems in a Hungarian mathematics and science journal, and then submitting problems for others to solve.
- Winning mathematics and computer programming competitions.

Benko explains, "I started playing chess at age seven, and at age thirteen I started to write computer programs. I believe that chess and computer programming motivated me to discover the beauty of mathematics and to become a mathematician."

Dr. Benko has earned two doctorates in mathematics — in 2001 from the University of South Florida and in 2006 from the University of Szeged in Hungary (where he also received his bachelor's degree and two master's degrees). Benko, whose primary research interest is approximation theory, has been at WKU since 2004.

Dr. Benko found Hilbert's third problem in a book by Hungarian mathematician Miklós Laczkovich. David Hilbert, a German mathematician who is recognized as one of the most influential mathematicians of the nineteenth and early twentieth centuries, presented a list of

Diagram 1



twenty-three unsolved problems at the International Congress of Mathematicians in Paris in 1900. These problems have become some of the most well-known problems in mathematics.

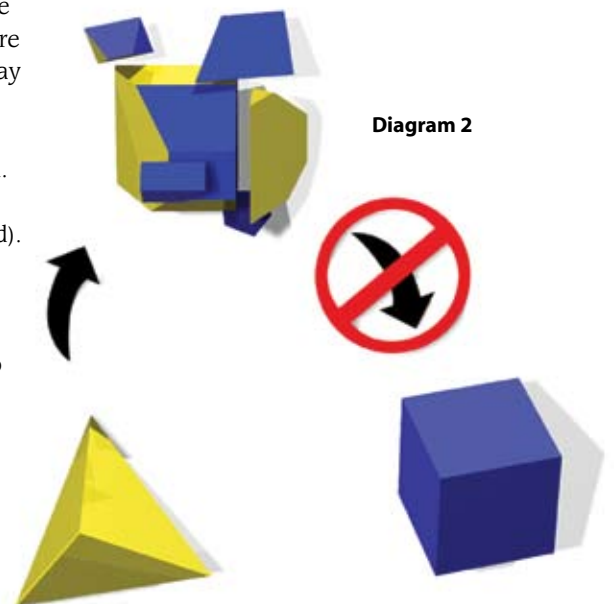
Benko explains, "Hilbert's third problem is a geometry problem *in space*. First let us get acquainted with the same problem *on a plane*. If two polygons have the same area, it is always possible to decompose one of them into a finite number of polygons that can be rearranged — like a picture puzzle — to form the second polygon. This is called the Bolyai-Gerwien theorem (even though Wallace was the first one who proved it in 1807). For example, suppose we want to decompose an octagon into a square. By the foregoing theorem it is possible to achieve that. In fact, there are many ways to do that." One way is shown in Diagram 1.

Hilbert's third problem is a question concerning polyhedra. Polyhedra are solids with flat sides (e.g., a cube, or a pyramid). The formulation of Hilbert's third problem is simple: Given any two polyhedra of equal volume, is it always possible to cut the first into finitely many polyhedral pieces which can be reassembled to yield the second? Based on research by

Johann Carl Friedrich Gauss in 1844, Hilbert speculated that this is not always possible.

This was confirmed in 1902 by Max Dehn. He proved that the decomposition *cannot* be done in the case of the *regular tetrahedron* and the *cube*. In other words, the regular tetrahedron cannot be cut to smaller polyhedral pieces in such a way that by rearranging those pieces we get the cube! (see Diagram 2) A regular tetrahedron is a body which is formed by four equilateral triangles. (see the yellow body below.) However "his solution was complicated and hard to understand," Dr. Benko says. Over the past century, mathematicians have simplified Dehn's solution, by using formulas called "Dehn invariants."

Diagram 2



The negative answer to Hilbert’s question is quite a surprise since the planar version of the same problem is true. Benko adds, “Proving the Bolyai-Gerwien theorem is much easier than solving Hilbert’s third problem. It is easier to prove that something *can be done* than to prove that something *cannot be done*. On the plane we just have to find a strategy for decomposing polygons into each other, and we are done. But how do you prove that the regular tetrahedron *cannot* be decomposed into the cube? Perhaps you try to make a decomposition and it does not work. Then you try another one and it does not work either. Then you try it a hundred different ways and none of them works. Does this prove that it really cannot be done? No. Maybe there is another way which you did not try!”

Benko further says, “I looked at Hilbert’s third problem in the book and I wanted to see if I could prove it myself without reading the proof. It took me about a month, but I came up with a solution.”

Dr. Benko then asked other professors, and also checked the mathematics literature about his solution. It turns out that his approach is similar to that of a French mathematician, Raoul Bricard, who published a paper in 1896. In his paper Bricard claimed to have proved that the regular tetrahedron cannot be decomposed into the cube. However there was a gap in Bricard’s argument which nullified the whole proof. No one, even to this day, has been able to fix this gap.

In his article submitted to the *American Mathematical Monthly*, Dr. Benko writes that his method has been overlooked for a century. “This proof is completely elementary. Since it uses no linear algebra, it could even be presented in a high school math club,” he writes. Dr. Benko’s new solution to Hilbert’s third problem is based on an idea which he calls the method of “integer measures.” The solution uses a number theoretic property of the rational numbers.

In explaining how he arrived at the solution, Benko draws several examples. “Sometimes when I have an idea or theorem in mathematics, I create a story to describe it. I have friends who are not mathematicians and I want to explain the problem in a way they can understand,” he says. Two examples that proved helpful in his solution are “the pearl problem” and “the ladder problem.”

In the pearl problem, Dr. Benko says two people want to make a pearl necklace and are given threads of varying lengths and colors. They have identical sets of threads, meaning that the lengths of threads having the same color are the same in both sets. However the threads are in different positions (see Diagram 3). Each person has to place pearls on the threads in such a way that the number of pearls are the same on threads which have the same color. A possible way is demonstrated on Diagram 4. (Observe that the number of pearls is 4 on both red threads, the number of pearls is 2 on both blue threads, and so on.) “Can we always do this even if we have, say, 100 threads? The answer is: yes we can,” Benko explains.

Diagram 3

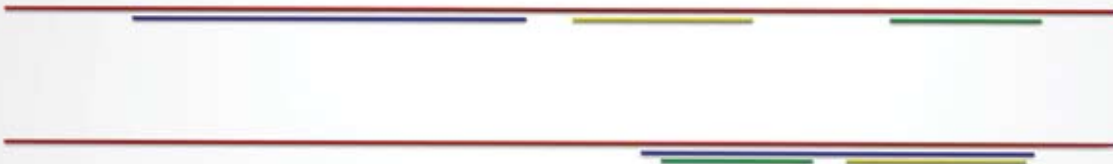
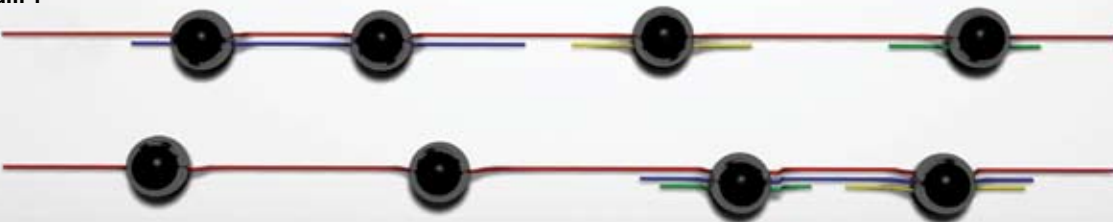
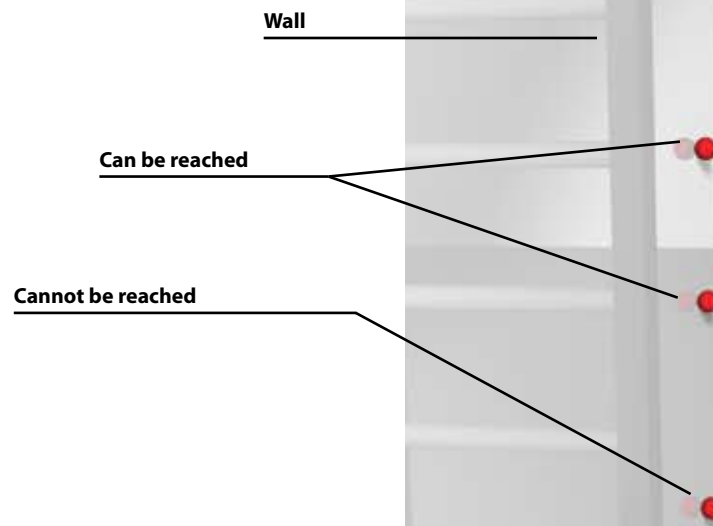


Diagram 4

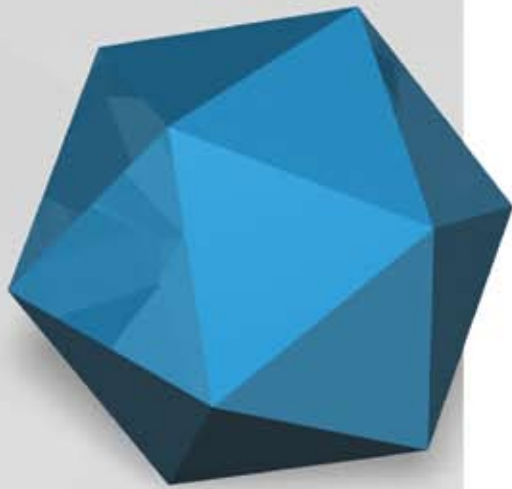


I looked at Hilbert's third problem in the book and I wanted to see if I could prove it myself without reading the proof. It took me about a month, but I came up with a solution.

Diagram 5



In the ladder problem, Benko says ants are trying to climb a slippery wall to reach sugar pieces (small points) spaced along the wall above each other. Since they can't climb the wall, they use a ladder. However, the rungs of the ladder must line up with the sugar pieces for the ants to reach them (see Diagram 5). In order to do that, they borrow Szalinski's miniaturizing machine from the movie *Honey, I Shrunk the Kids*. With this they can shrink or magnify the ladder as much as they want but they can use the machine only once. (We assume that the original ladder is extremely long so even after shrinking it stays long enough.) Shrinking the ladder seems to be a good idea since we can get rungs which are dense. But unfortunately they will be very thin. On the other hand by magnifying the ladder we can get rungs which are very thick but sparse. So it is not clear at all whether the ants can collect all the sugar pieces with a properly shrunken (or magnified) ladder. Yet, the answer is that they always can.



Seemingly, the pearl and ladder problems have nothing to do with Hilbert's third problem. But the fact is that by using the ladder problem, one can find a solution for the pearl problem. And then using the pearl problem, one can solve Hilbert's third problem.

The method of Dr. Benko's solution to Hilbert's third problem can also be applied to get new solutions to some other problems. For example: a rectangle with dimensions m and n can be tiled with finitely many squares if and only if m/n is a rational number. (Tiling means a covering without any gaps.) This theorem was first proved by Dehn in 1903. To demonstrate the statement, let us suppose that m is the square root of two and n is one. Since m/n is now the square root of two — which is not rational — our rectangle *cannot* be tiled with squares, even if we are allowed to use one million small squares.

"We talked about things in geometry which could be done and things which could not be done. Let me tell you two more problems in mathematics which have shocking solutions." Benko says.

In 1925, Alfred Tarski posed his famous circle-squaring problem where he asked if it was possible to cut a circle into finitely many pieces and reassemble them to get a square of equal area. In this problem the

pieces can be arbitrary sets — not just polygons. In 1990 Laczkovich gave an affirmative answer to the problem. His decomposition used about 10^{50} different pieces. (The number of atoms in the universe is estimated to be 10^{80} , so 10^{50} is an extremely large number!) Further, these pieces were so strangely shaped — mathematicians call them non-measurable sets — that they could not be cut out with scissors.

An even more puzzling result is the "doubling the ball paradox," discovered by Stefan Banach and Alfred Tarski in 1924. They proved that one can decompose a ball into some pieces, and then reassemble the pieces into *two* balls of the same size! So we can buy a melon of ten pounds, decompose it into some pieces and then reassemble those pieces to get *two melons* of ten pounds each — at least theoretically. Because of this paradox some people reject a fundamental axiom of mathematics called the "axiom of choice" — an axiom which was used in the proof.

"I would say mathematics and real life are not always the same," Benko muses. "If you want to decompose the melon into those pieces, you cannot do it with a knife. But mathematically it can be done."

And as David Benko learned in his youth, that's the beauty of mathematics. ■





Writing the History of Kentucky's African Americans

BY CAROL CUMMINGS

ROBERT PENN WARREN, THE NATION'S FIRST POET LAUREATE, ONCE SAID THAT HISTORY CANNOT GIVE US A PROGRAM FOR THE FUTURE, BUT IT CAN GIVE US A FULLER UNDERSTANDING OF OURSELVES, AND OF OUR COMMON HUMANITY, SO THAT WE CAN BETTER FACE THE FUTURE.

Western Kentucky University Associate Professor John Hardin, by serving as a general editor of the *Kentucky African American Encyclopedia: Black Life and Culture in the Commonwealth*, is spearheading a statewide project that will give Kentuckians a better understanding of their African American heritage.



John Hardin



“Kentucky African Americans have been a part of the Commonwealth of Kentucky from its inception.”

Dr. Hardin, a third generation Kentuckian and a Louisville native, has always been interested in history and in education. His parents were school teachers who graduated from Kentucky State College in the 1920s, though both found it difficult to make a living by teaching. Hardin’s heritage, as an African American educator and the son of African American educators, contributes to his love for this project. “Kentucky is an historically significant state, as it was the fifteenth state in the union,” he said as he leaned back in a chair in his comfortably cluttered office. “History is an ongoing, living, breathing thing. As an historian, you research the data and discover back stories that describe the people, culture, and events of the era. African Americans came to Kentucky with Daniel Boone, so we have to go back to the beginning.”

The *Kentucky African American Encyclopedia* will chronicle the cultural, political, social, and economic history of Kentucky’s African descendants; present this rich history as encyclopedia entries; and make this research available to a diverse audience — the general public, colleges and universities, and elementary and secondary school teachers and students.

“A project like this has never been done for any state,” he explained. “It will include biographies of famous black Kentuckians, and it will reflect different pieces of the Commonwealth’s African American heritage in all 120 counties.”



A project supported by the University Press of Kentucky, the *Kentucky African American Encyclopedia* will include approximately 1,200 entries, each of which will be reviewed at least twice. In the statement of need for the *Kentucky African American Encyclopedia*, the editors write:

“Kentucky African Americans have been a part of the Commonwealth of Kentucky from its inception. Enslaved blacks traveled with the first white pioneers and worked with them to erect Kentucky’s early settlements. Throughout the state’s history, Kentuckians of African descent have made notable contributions to all aspects of life. They have served in the military, constructed buildings, organized hospitals, established businesses, erected churches, formed benevolent societies, participated in athletic events, shaped the cultural landscape, entertained audiences, educated masses of school children, held political offices, and fought for respect and equality. Kentucky African American history is as diverse as the state.”

“The project began in 2001,” Dr. Hardin explained. “The collaborators batted around a concept and created a unique proposal for the project. The University of Kentucky has provided office space for the staff and has implemented a website. They are also providing graduate assistants and undergraduate student assistance. The project has been endorsed by twelve organizations, including WKU, Kentucky State University, the University of Kentucky, the Kentucky Historical Society, and the Kentucky African American Heritage Commission.”

“Knowing the value of an Encyclopedia, this one will fill a gap in Kentucky history. From the Big Sandy to the Mississippi, the editors have revived the significant contributions and lives of African Americans.”

JOHN KLEBER

An advisory committee will provide oversight for the program. “The committee will be made up of males, females, blacks, whites, Kentuckians, and a few out-of-state individuals,” he said. “The committee will advise on entries to include, and they will serve as writers, topical editors, and readers for completed entries.”

The editors will seek contributions from faculty and staff of Kentucky colleges and universities, graduate and undergraduate students, Kentucky Historical Society staff, Kentucky Heritage Council staff, local historians, and the public.

“I completed a sabbatical in the spring of 2006, during which I traveled a great deal to help promote the encyclopedia, and we are working to raise funds to support the project,” Dr. Hardin said. “This inclusive project is designed to reflect the diverse cultural and geographical nature of the state. We hope this resource will be useful as a research tool for graduate and undergraduate students, and as a useful resource to help school children understand the African American contributions to the Commonwealth of Kentucky. It will include ample historical pictures

and will have a great deal of visual appeal,” Hardin explained.

“We anticipate that the *Kentucky African American Encyclopedia* will serve as the authoritative reference for primary and secondary school teachers. It will also contribute to African American History Month statewide projects and will document the diversity of the Commonwealth. I am representing WKU through my work on this project, but the project transcends the university,” Hardin said. “It is a public endeavor that is scholarly and will assist the public. It will also support WKU’s vision to be a leading American university with international reach. This unique national project will take an in-depth look at Kentucky’s diversity and rich African American heritage.”

Dr. Hardin, who received his Ph.D. from the University of Michigan, has published two books on Kentucky African Americans, *Onward and Upward: A Centennial History of Kentucky State University 1886-1986* and *Fifty Years of Segregation: Black Higher Education in Kentucky 1904-1954*. He was also a co-editor and consultant on *Community Memories: A Glimpse of African Americans in Frankfort, Kentucky*. ■

For more information, please visit the Kentucky African American Encyclopedia website:

www.uky.edu/OtherOrgs/kaae

Creating International



School library media specialist Laura Crafton shows SEK English language teachers library crafts for preschoolers.

Library Classrooms

BY BOB SKIPPER



Cynthia Houston and Roxanne Spencer

TWO LIBRARY MEDIA EDUCATION RESEARCHERS AT WESTERN KENTUCKY UNIVERSITY HAVE DEVISED A HYBRID OF A TRADITIONAL CLASSROOM AND A SCHOOL LIBRARY SETTING TO HELP WITH ENGLISH LANGUAGE LEARNING IN A P-12 SCHOOL IN SPAIN.



The WKU faculty members involved in this exchange project are Cynthia Houston, assistant professor in the Department of Special Instructional Programs, and Roxanne Spencer, assistant professor and coordinator of the Educational Resources Center, University Libraries. Dr. Houston and Ms. Spencer developed the library classroom proposal for Colegios San Estanislao de Kostka (better known as SEK) Catalunya, a private, primary

through twelfth grade school of about 1,500 students, located in La Garriga, Spain, near Barcelona.

The two WKU researchers became involved at the request of the SEK Catalunya English program consultant, Mariela Gomez, who is also a student in the WKU-University of Louisville Cooperative Doctoral Program in Educational Administration and Organizational Development.

“Mariela Gomez and her family live near Barcelona and her children attend the SEK Catalunya,” Ms. Spencer said. “She was concerned about the way English language instruction was being taught at the school.”

Houston and Spencer visited Spain in May 2005, with support from a grant from the WKU Provost's Initiative for Excellence and the Department of Special Instructional Programs, College of Education and Behavioral Sciences. Through visiting the SEK campus, local schools, and public libraries, they developed their idea for a library classroom. "We wanted to develop a collaboration or research project where we could help the school create library classrooms, with children's books in English, to support language instruction in the primary grades," Spencer said.

SEK Catalunya is working toward a different paradigm of education, notes Houston. "They're trying to move their teachers and parents toward the idea of a more resource-based education instead of a rote textbook orientation to education," she said. "Here in Kentucky, we've had ten years of education reform where we have been exploring and implementing that very idea. When you

have that model of education, libraries become essential, because the students are learning independently, and the teachers are helping the students select and use resources."

Under this model, information also comes from resources other than teachers and textbooks, Dr. Houston explained, adding that research has shown that in an English as a foreign language curriculum, a literature-rich environment creates more interac-

Butler County [Kentucky] school district. Ms. Crafton is also a part-time instructor of the undergraduate children's literature course in the Library Media Education program at WKU. This second research trip was also supported by a Provost's Initiative for Excellence grant. "We had a bit more intensive experience, because at that point the pilot project was off the ground. From the initial caution and wariness on the part of the

The final proposal was for the SEK to create English Language Arts Library Classrooms (ELALC) for the pre-school and primary grades.

tion between the students and the language, increasing their interest and motivation to learn.

The final proposal was for the SEK to create English Language Arts Library Classrooms (ELALC) for the pre-school and primary grades. The proposal described a classroom setting that integrated language arts and library skills instruction for students to become engaged in a resource-rich English language environment.

The ELALC project includes an exchange between WKU faculty and qualified students and SEK Catalunya English teachers. In July 2005, two English language teachers from the SEK primary program attended a training workshop in school librarianship at WKU. "We gave them a very intensive workshop in library skills, collection management, and collection development," Ms. Spencer said. In Fall 2005, a graduate student spent two weeks at SEK Catalunya as part of the required library media education practicum, helping teachers and students implement the ELALC project in primary grades one and two.

In May 2006, Ms. Spencer returned to Spain with a school library media specialist, Laura Crafton, from the

school administration there, we saw dramatic change," Ms. Spencer said. "The program was piquing interest. It was getting results. The school administrators and the teachers who were implementing the program were excited about it."

The SEK-WKU exchange continued in July 2006 when two pre-school teachers from the SEK came to WKU for the library administration and collection management workshop. The teachers studied the basics of collection development, library administration, and classroom activities, and worked with Ms. Crafton at Morgantown Elementary School to see how American school libraries are run.

There were some problems shipping materials to Spain because of the expense and restrictions brought on by tariff concerns. "But despite some slowdowns, things were really starting to work," Ms. Spencer said. Mariela Gomez was pleased with the kinds of materials that they were recommending, and the materials were supporting the language instruction program, "so it was building on the initial idea successfully. The parents were seeing results, and the kids were enjoying it as well," Spencer noted.



WKU LME graduate student helps out at SEK.

“Preliminary indications are that the administrators are going to take this approach to English language instruction to the other SEK schools in Spain,” Spencer said, “which could create additional opportunities for WKU to continue an exchange with the SEK.” This would give WKU faculty and students the benefit of international experience.

“I think the program has a lot of potential for growth,” Ms. Spencer said. “It emphasizes literacy and a love of reading, and combines language instruction and the support of the library. I like the fact that these three components are working together to support instruction.”

The project has also meant a new area of research and writing for Dr. Houston and Ms. Spencer. “We have found that we are enriching the scholarship in this country by working in another country,” Dr. Houston noted. “There’s an interest in this research and in this project because we’re bringing some of our pedagogy and our experiences and our research to a place that has not viewed language instruction or library skills in the same way. The exchange is also influencing us in that we are improving our ability to globalize our curriculum by working with international resources.”

Their work has received international recognition. Ms. Spencer recently

received a Highly Commended Paper Award from the Emerald Literati Network for her journal article in *Collection Building* titled “Developing library classroom children’s collections in English for a Catalunan private school.” Dr. Houston has an article in press with the International Federation of Libraries and Institutions’ *IFLA Journal*, “Building capacity for global education in school library media education through international exchange.” Another article, where Houston and Spencer discuss the values and effects of international collaboration on teacher education using the SEK Catalunya project as an example, was published in Spring 2007 in the international journal, *Library Review*.

“We’re very much in an applied field. We’re very much in a professional field, so some people question what we’re doing as research,” Dr. Houston said. “Because we’re working in the Spanish language, we know we’re going to be able to directly apply what we’re learning here to Kentucky, which is experiencing an incredible increase in Spanish-speaking students. I think it has made us more sensitive to the needs and interests of different educational systems. We are fortunate to have a wide variety of international students here at Western and this experience has put us more in tune with that.” ■



At each grade level, there are differences in objectives and implementation of the ELALCs:

At the pre-school level:

- A mobile library classroom introduces a respect for and interest in books. The initial collection is in English, with age-appropriate story time books and audiovisual media. These encourage students to appreciate books and the worlds of knowledge and entertainment they contain.

For the primary grades:

- Use authentic whole language instruction and introduce library skills and activities in a library classroom setting to increase primary students’ English comprehension, listening, and speaking skills.
- Focus on developing vocabulary and English-language speaking and reading experiences. Story time is used to support linguistic, psychological, cognitive, social, and cultural elements of English-language learning. The progression is from basic library skills through developing reading, writing, and speaking abilities.
- By grades four through six, students engage in more advanced English language learning activities. These are enhanced by increased independent reading using the library classroom, individual and cooperative group language arts activities, and problem-based learning projects.



A Passion for Social Studies

BY CAROL CUMMINGS



Dr. Kay Gandy

KAY GANDY LIFTED UP A BRIGHTLY COLORED QUILT EMBELLISHED WITH A PLUSH MAP OF THE UNITED STATES. WITH A SMILE SHE POINTED OUT "MR. MIMAL," AN IMAGINARY ACROSTIC OF A MAN WHOSE OUTLINE IS COMPOSED BY THE BORDERS OF MINNESOTA, IOWA, MISSOURI, ARKANSAS, AND LOUISIANA.

She began to share a story of MIMAL's travels across America, in a visual description of the various states.

This was just one example of the creativity she imparts to her students in her social studies education classes. Dr. Gandy has truly developed the art of inspiring students to have an interest in and love for social studies and geography.

Dr. Gandy, an assistant professor of teacher education at Western Kentucky University, is no stranger to sparking the attention of the youngest students. In her previous career, she spent twenty-seven years as an elementary teacher in Louisiana. Twenty years into that vocation, in 1996, she discovered her passion. "I was bored one summer, and I found a brochure on summer workshops for teachers buried in the principal's garbage," she said with a grin.

"This particular workshop was sponsored by National Geographic and was to be held at Louisiana State University."

She attended the workshop, and the course of her life changed drastically from that point forward. "It literally changed my life," she said. "I learned more about how to present geography to students, and it ignited a passion in me."

This passion drove her to go on to obtain her doctorate in curriculum and instruction in 2002 at Louisiana Tech University and to travel the United States, doing conferences and presentations. When she retired from elementary teaching in 2003, she made the move to Kentucky and WKU with a desire to teach and inspire a future generation of young teachers.

Dr. Gandy's imagination is filled with creative ideas to make learning about geography a fun experience. Her resources include a set of fifty cookie cutters, each one in the shape of a state. She has also demonstrated U.S. geography by baking a cake, outlining the borders of the United States in the icing, and setting the students loose in decorating the country's landforms. Under her direction, chocolate chips become the Appalachian Mountains, blue icing is used to outline major rivers and lakes, and Snow Cap candies are carefully placed to represent the Rocky Mountains. In short, she makes it hands-on and fun.

That workshop in 1996 was only the beginning of a relationship with National Geographic. "National Geographic started a Geography Alliance in every state," she explained. "After being asked to serve as a coordinator for the Kentucky Geographic Alliance (KGA), I submitted a \$50,000 grant proposal to the National Geographic Society Education Foundation to transfer the operation of KGA from the University of Louisville to WKU." She not only received the grant, but has received an additional \$50,000 to continue running the KGA. Under the umbrella of the Kentucky Geography Alliance, she offers workshops for teachers and provides content, technology, and ideas on how to make geography come alive for students. Her work with these teachers is also hands-on. "We hold a GPS [global positioning system] treasure hunt on campus, and we grid an entire classroom with yarn."

Professor Gandy's passion for Geography has taken her across the United States and around the world, to locations that include South Africa, China, Germany, the Yucatan, and New Zealand. In 2006 she and Dr. Darrell Kruger,



Illustrations by Lindsey Looft

from Illinois State University, received a \$70,000 Fulbright Group Projects Abroad grant to take eleven secondary and middle-school social studies teachers to South Africa for a month. Still, her most rewarding travel experience took place in 2002, when she served as a teacher-guide representing the National Geographic Society in a trek across America with *American Frontiers: A Public Lands Journey*.

In the trek across America, the Public Lands Interpretive Association, an Albuquerque, New Mexico-based, non-profit organization that provides interpretive and educational resources to the public, mapped out a Canada-to-Mexico trek that took place exclusively on public lands. A unique project, the trek was designed to highlight the beauty, the accessibility, and benefits of the public lands in the western United States. The journey involved two groups of travelers, one of which started north from the Mexican border, and the second of which headed south from Canada. With a route that lay entirely on public lands, the trek was a feat that had never



Quilt embellished with a plush map of the United States

before been accomplished. The trek began on July 31, 2002, and ended two months later when the two teams literally met in the middle at Wasatch-Cache National Forest near Salt Lake City, Utah, on September 27.

To demonstrate the different ways people get about on our public lands — and to stay within the sixty-day limit of the journey — trek participants used numerous creative modes of transportation for this historic border-to-border journey across America. Participants hiked and backpacked, and they rode horses, mountain bikes, ATVs, and dual-sport motorcycles. They rafted, canoed, drove pick-up trucks, motorboats, and 4WD vehicles, and even spent a few leisurely days on a houseboat. All along the way, the two teams attended special events, round table discussions, and visited schools and communities to learn about public land issues. And, of course, they saw some of the most spectacular scenery of the American West. Their journal entries eloquently describe the feelings public lands awoke in them and also the daily routine of the long trek.

Inspired by the American Frontiers project, the National Geographic Society designed a new geography curriculum around the theme of public lands. Aimed at teaching school-aged children the beauty and the benefits of America's public lands, this curriculum was written to follow the trekkers along the two-month journey, highlighting the diversity and grandeur the nation's public lands. Gandy and the other teachers on this journey wrote lesson plans to contribute to the new curriculum.



A quilted teaching aid purchased in Africa



Students learning to use GPS tracking technology

When Dr. Gandy began her new career in training teachers at WKU in 2003, she discovered that some of her students were experiencing difficulties in their field placement activities. As part of their degree requirements, the students have to teach social studies units in elementary classrooms. This can be quite difficult when elementary teachers spend the majority of class time on subjects other than social studies.

Dr. Gandy explains, "The No Child Left Behind Act (NCLB) of 1991 enforces accountability of Federal funding by requiring States to implement statewide accountability systems. These policy mandates have affected how teachers plan their core subjects in elementary schools." Because elementary students are not tested on social studies in Kentucky until the fifth grade, many teachers choose to focus on other subjects to improve test scores. This leads to a recurring theme that puts social studies on the back burner while teachers spend their time teaching language arts and math — subjects on which students are tested earlier in their elementary years.

Drs. Gandy and Kruger have, over the past two years, charged students in their social studies methods field experiences to collect observation data on the teaching of social studies in both Kentucky and Illinois. "More than 400 students have observed in fourteen schools whether or not social studies is being taught, how it is being taught, the content of each social studies lesson, the length of each lesson and time of day the lesson is taught, the methods

used to teach each lesson, the materials used to teach each lesson, and the assessment used for each lesson," Gandy writes. Students completed a checklist for each of their twelve to fifteen days in the field.

Having received permission from the teachers and principals of each school, students also collected contextual factors on each teacher such as gender, race, and years of teaching experience. Finally, students summarized their findings and made inferences about the teaching of social studies. Below are some the observers' findings to date:

An average of thirty-seven minutes is devoted to each social studies lesson that is taught.

Social studies is taught about twenty percent of the days of field assignments.

Economics is the most neglected strand of social studies being taught in the elementary classroom.

Worksheets are the number one tool of choice, while textbooks are only used fifteen percent of the time to teach social studies. Falling behind worksheets and textbooks were the more hands-on options of maps, software, and games.

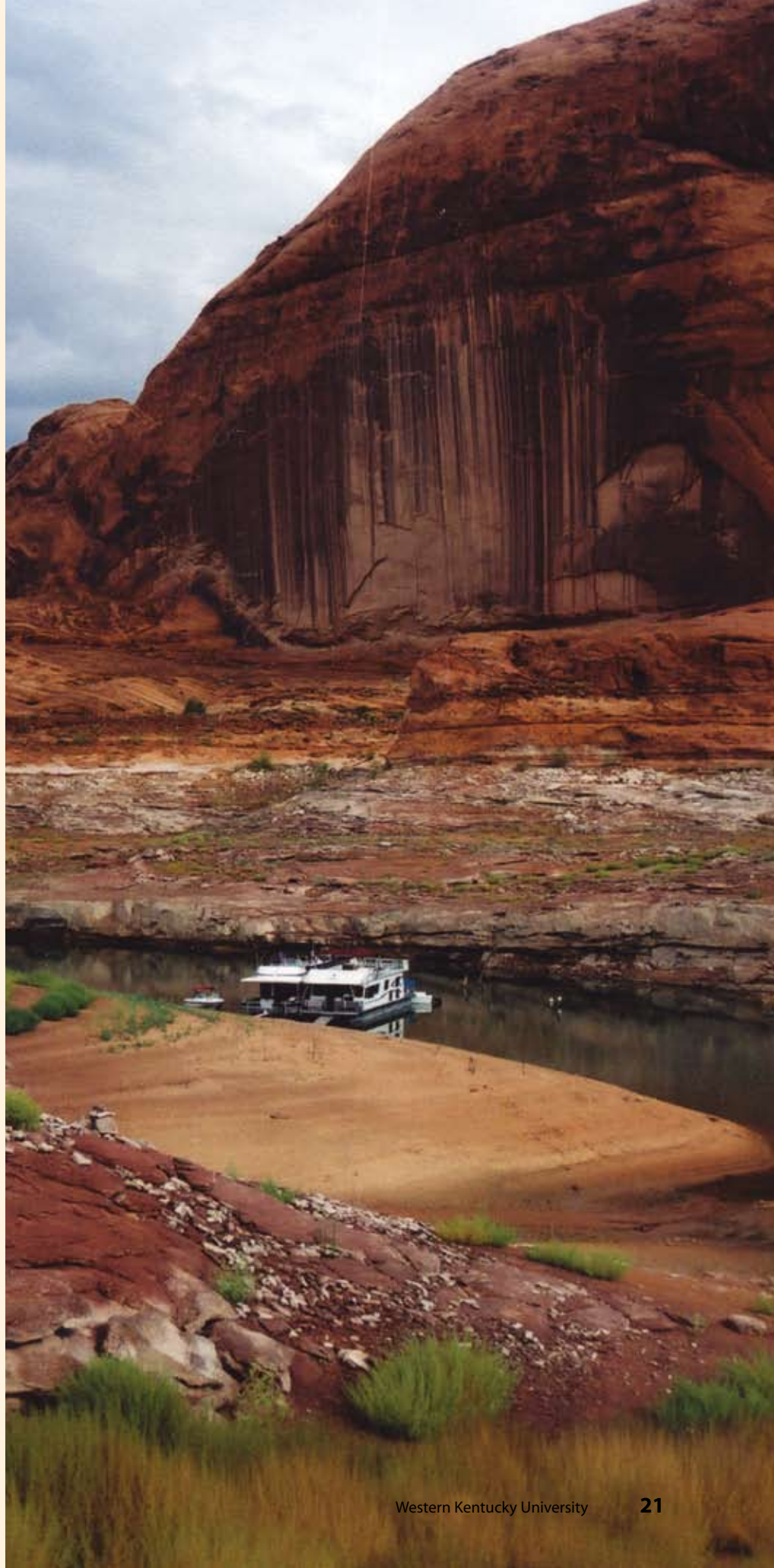
"Since social studies is not a core testing area until the fifth grade, some teachers will decide not to worry about it, since their students are not being tested on it," Gandy explained. "The problem is that all prior years are held accountable for fifth grade test scores."

Her experience in another state allows Dr. Gandy to see great benefits to being a teacher in Kentucky. "I tell my students to be proud to be in a state that is a leader in education reform," she said. "Kentucky is definitely a leader, as it requires higher standards than the federal No Child Left Behind mandate. Our students get excellent experience, mentoring, and feedback."

Kentucky has already taken steps to ensure that all subjects, including social studies, are being taught. "Core content standards are now broken down by grade," Gandy said. "Really good teachers will integrate social studies into other subjects, and good principals make sure teachers are doing that. My social studies methods class encourages future teachers to be creative in the way they teach. Can you tell me one subject that doesn't relate to social studies? From math, to economics, to science, you can find social studies at the core of everything students learn." ■



Snapshots from Kay Gandy's National Geographic sponsored trek across America



WRANGLING

WEB DATA

BY BOB SKIPPER

THE INTERNET OFFERS A VAST AMOUNT OF INFORMATION, MOST OF WHICH IS PRESENTED IN XML (EXTENSIBLE MARKUP LANGUAGE) FORMAT, THE STANDARD FOR WEB PUBLISHING AND DATA EXCHANGE. THE WIDE USE OF XML HAS PROMOTED THE NEED FOR ALGORITHMS AND TOOLS TO EFFICIENTLY MANIPULATE WEB DOCUMENTS.



Dr. Guangming Xing

Dr. Guangming Xing, an assistant professor of computer science at Western Kentucky University, has developed a way to automatically transform this information so that



it can be stored in a database. He is also implementing a system that will more quickly and efficiently classify information contained in Web documents.

"There is a huge amount of information on the Internet. How do we manage this vast amount of web data? That is our main goal," Dr. Xing said. "Before the Web age, most was stored in a relational database. It is very difficult for us to store web data in a relational database because web data are essentially tree-structured."

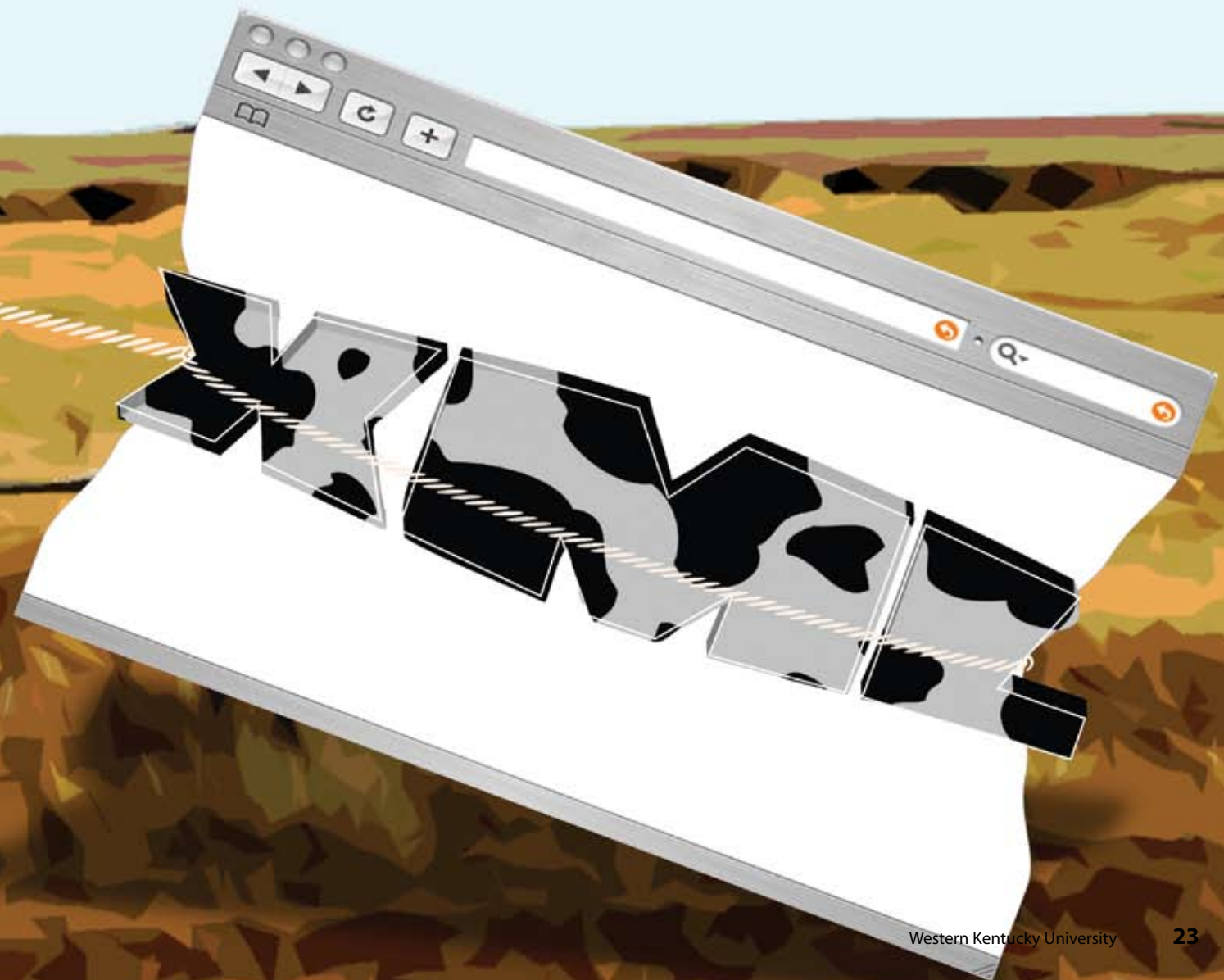
Tree structures can be of infinite depth — think of what your family tree looks like on paper — but a relational database has fixed schema, he explained. "It's just a table. Putting different trees into a fixed table — now that's a difficult task."

Dr. Xing and his students have implemented an XML database management system and used a relational database as the back end to store data. The system will automatically push a set of XML documents into a

relational database. "The storage process is very, very efficient," he said. "We used much less space than other systems, and our queries were much faster in experimental studies. And together with my students, we have published several papers on this."

The system performed well at the XML Mining Challenge at the University of Paris, Xing said.

The transformation of XML documents from one format to another has many applications, such as information filtering (delivering classified information to a relevant party), and web document cleaning (preparing the vast amount of Web data for efficient retrieval). "Given a collection of source and target documents, and the correspondence between the source and target, the question is how to find the rules of the mapping between the source and the target, such that additional source documents can be transformed in target format automatically," Dr. Xing said.



"The successful completion of this project will greatly help automate the process of transforming XML documents. It is expected that our methods can also be used in document classification, Web data integration, management of digital libraries, information management for the health-care industry, and many other ways," said Dr. Xing.

"There is a huge amount of information on the Internet. How do we manage this vast amount of web data? That is our main goal."

Dr. Xing and his students have also implemented a system to classify Web documents. "It can be used in a lot of applications," he said. "Whenever you have a large collection of documents, in order to retrieve the useful information or data from these documents, it is important to put them into different books to make the search space much smaller. That is the goal of classification. We only concentrate on the relative information."

He has found an application for his research in the WKU Center for Water Resources in the area of environmental informatics. Dr. Xing and his students have developed two software programs: a legacy document digitalization system and a semantic e-mail system.

"The Water Center has a huge number of legacy documents just on paper," he said. Those documents are scanned and Optical Character Recognition (OCR) software is used to extract the textual information. That information is converted to XML format, and their system is used to store the XML information in a relational database. The system cuts down on the time needed to manually input the information and improves its accuracy, he said.

The semantic e-mail system can automatically process reports from

small water utility companies by placing database capability behind the e-mail system. "E-mail today is made for a person to read," he said. "We can use e-mail for other purposes. Right now, the water quality reports are hard copies. If there is a problem, the agency will find it and notify the utility and tell them they need to take some action. That process takes a

long time. It really doesn't make a lot of sense."

With the semantic e-mail system, the report is sent via e-mail and is automatically processed, Dr. Xing said. "The information in the e-mail is not just text. It has semantics because it's not just for a human to read; the computer can understand it. Proper actions can be taken," he said.

Dr. Xing has found a use for his system that is even closer to home: "I've been using that as a system to collect homework assignments from my students."

Plans are under way to continue the research. "There's still more work to be done," he said. "Right now we are concentrating on the structure of Web documents because the data can be classified by the structure and also by the topic. Search engines use topic-based searches more often and the structure is used for storage." The next step is researching how to combine the structure information and the topic information together. "That would probably take at least two years."

Dr. Xing's training, including a Ph.D. from the University of Georgia and a B.S. from Nankai University, China, is in theoretical computer science, and he began using his interest in automata theory and implementation to research this

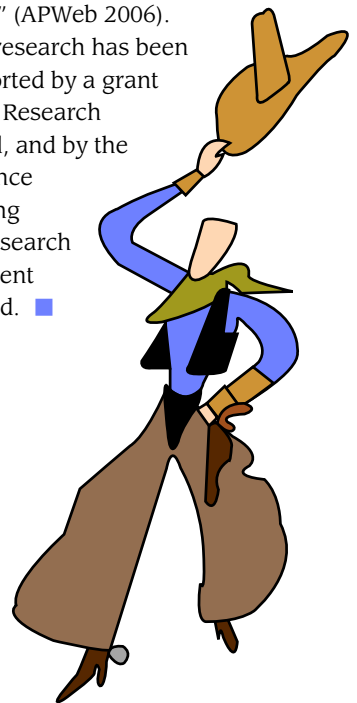
area about 2002. He said he began producing results in about eighteen months.

The research has "a strong theoretical connection because it involves trees, which are a mathematical concept, and grammar from theoretical computer science," he said. "We have developed an algorithm that can find the closest distance between a tree and a grammar. We use this new distance to classify how one document is related to another."

Dr. Xing said the algorithm runs in $O(p \times \log p \times n)$ where p is the size of the schema (grammar) and n is the size of the XML document (tree). Experimental studies have also shown that the running time of the algorithm is linear with respect to the size of the XML document when normalized regular hedge grammar is used to specify a schema.

"How to transform an XML document so that it conforms to a schema is not only theoretically interesting, but critical to a lot of applications like document classification, document integration, and information extraction," Dr. Xing wrote in the article "Fast Approximate Matching Between XML Documents and Schemata" (APWeb 2006).

Dr. Xing's research has been partially supported by a grant from the WKU Research Incentive Fund, and by the Kentucky Science and Engineering Foundation Research and Development Excellence fund. ■





Climate Variation: Answers From the Soil

BY TOMMY NEWTON



Dr. Mahmood

TO BORROW A LINE FROM AN OLD COUNTRY SONG, DR. REZAUL MAHMOOD WAS CLIMATE CHANGE BEFORE CLIMATE CHANGE WAS COOL.

His research, however, isn't directly focused on the hot topic of global climate change. For the past fifteen years, Dr. Mahmood has studied localized and regional climate change through several projects in hydroclimatology and agricultural climatology.

"Climate change has so many different facets, and you need to consider all of them," said Dr. Mahmood, who served as guest editor for a special issue on land use change and climate impacts published in 2006 by the journal *Global and Planetary Change*.

Dr. Mahmood's research has included soil moisture climatology of the Northern Great Plains, land use changes and their impact on climate, soil moisture variation and crop productivity, and monsoonal rainfall dynamics.

"I'm very interested in agricultural climatology and how soil moisture and temperature affect crop growth and yields," he said.

When the Intergovernmental Panel on Climate Change (IPCC) issued its first assessment in 1990, Dr. Mahmood was pursuing a master's degree in geography at the State University of New York at Albany. One of the concerns in that first report was the impact of climate change on agriculture production. The IPCC is due to release its fourth assessment report in 2007.

Dr. Mahmood decided to conduct crop and climate modeling related to dry season irrigated rice production under abnormally high or low temperatures in his native Bangladesh. His master's thesis in 1993 was titled "Climatic Change and Boro Rice Yield in Bangladesh: Application of a Parametric Crop Yield Model."

While completing his doctorate in geography at the University of Oklahoma in 1999, Dr. Mahmood took a look at the climate impact with a dissertation on "Monsoonal Rainfall Variability, Water Stress, and Rainfed Rice Productivity in Bangladesh."

In the latter project, Dr. Mahmood wanted to establish how crop yields varied by changes in rainfall. "If rain comes late, how does that affect the crops? And if the rain quits too early, what impact does that have?"

Dr. Mahmood continued his research on soil moisture variation as a post-doctoral research associate at the High Plains Regional Climate Center at the University of Nebraska from 1999-2001.

"In the 1990s the National Oceanic & Atmospheric Administration (NOAA) came out with new climate outlooks which provided a broadly-defined prediction of seasonal precipitation and temperature," he said. "These 'forecasts' heavily relied on sea surface temperature because two-thirds of our planet is covered by water. At this point, the scientific community started to ask the question, 'If water of the oceans is so important in climate prediction, then what about moisture in the soils

If water of the oceans is so important in climate prediction, then what about moisture in the soils over land areas?

over land areas?" Early modeling work started to show that when we include soil moisture in the atmospheric models their predictions improve."

In this context several large multinational soil moisture data collection and modeling campaigns were undertaken over six continents. With his background in soil moisture, Mahmood investigated various aspects of soil moisture as it relates to climate and weather. His work on soil moisture modeling and variations of soil moisture over various temporal and spatial areas still continued.

During these soil moisture related activities, Dr. Mahmood's research took a turn that he never really anticipated.

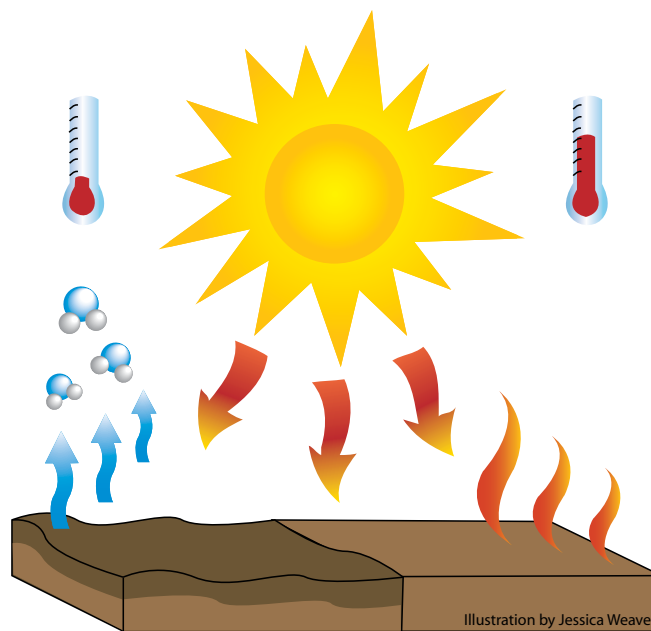
His modeling of soil moisture for the Great Plains included various types of land, including irrigated and non-irrigated. "It was very clear that the application of irrigation artificially increases near-surface soil moisture during the warm growing season," he said. "It also means that most of the incoming solar energy would be partitioned into latent energy and less into sensible energy. In other words, daytime temperature should be slightly lower in vastly irrigated areas compared to non-irrigated areas."

He thought this could be verified by analyzing long-term, near-surface air temperature data. Dr. Mahmood did just that and found a lowering of regional temperatures over the

irrigated Ogallala aquifer region of the Great Plains. "It must be remembered that this effect is confined to local and regional scales and there are other types of land use changes that could lead to warming of local and regional temperatures," he said.

WKU has provided the right climate — a tradition of academic excellence in meteorology, the Kentucky Climate Center, and high quality faculty and students — for Mahmood's research since he arrived on the Hill in 2001.

WKU's focus on undergraduate and graduate instruction provides an opportunity to engage students in hands-on research and learning.



Large-scale irrigation of farmland affects the regional climate. Incoming solar energy converts soil moisture into water vapor and heats the soil less. In non-irrigated areas, solar energy is absorbed by the soil, increasing the near-surface air temperature.



Daytime temperatures are slightly lower in irrigated areas compared to non-irrigated areas

“Teaching and research go hand in hand,” he said. “I’m able to use data collected from my research projects in classroom lectures and that’s very beneficial for students.”

Dr. Mahmood’s research now includes the study of flash flooding in the Appalachian Mountains, along with a USDA project on odor emissions from livestock farms and the Kentucky Mesonet project.

Recently, Dr. Stuart Foster and Dr. Mahmood received \$1.5 million first-year funding to establish a meso-scale weather and climate observing network in Kentucky. The Mesonet will gather information from a network of about one hundred stations across the state. “This project will take our department and the Kentucky Climate Center to another level,” Dr. Mahmood said.

The Mesonet will attract more students and will assist communities statewide with real-time climate and weather data. “We will be able to see the impact on people’s lives. This project combines service, outreach, teaching, and research,” he said. “I’m very excited about it.”

Through his classes, Dr. Mahmood identifies students who are interested in and excited about working with him on research projects. “At WKU, unlike larger schools, we actually tap undergraduate students, and I begin working with them in their second year,” he said. The students are eager to work on projects that affect their homes and families. In the flash flooding research, for example, students are trained in cutting-edge, three-dimensional modeling that simulates precipitation and its impact on a geographic region during various time periods. Students on that project and others collect and analyze climate data and present their findings at regional and national meetings.

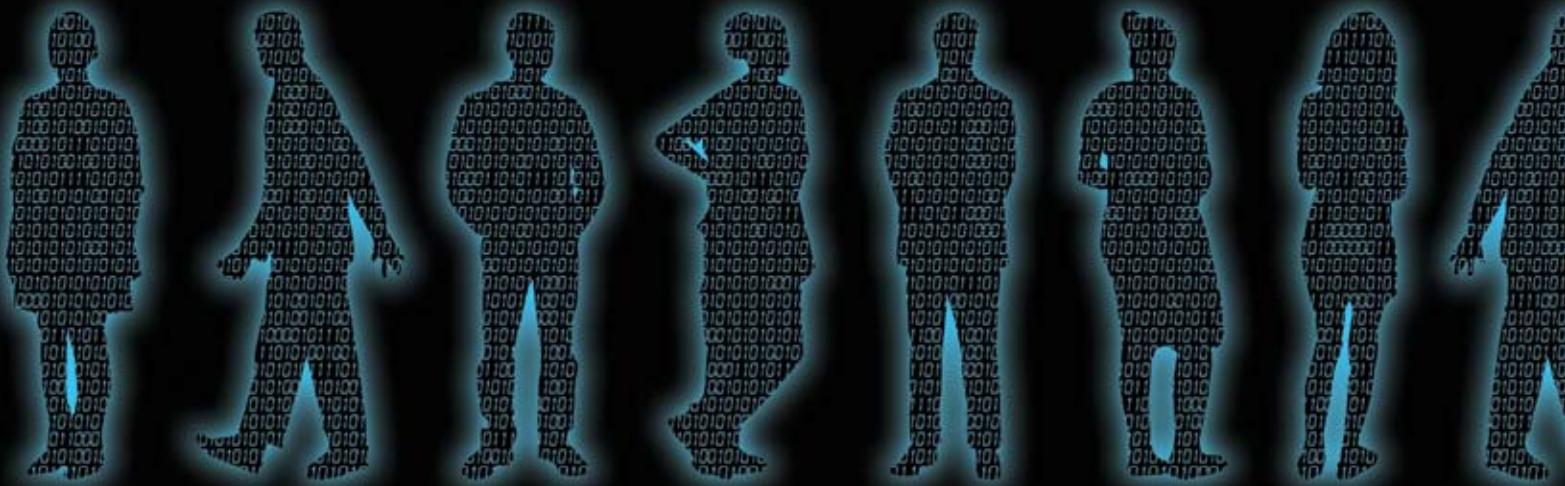
“You need to give them confidence and encouragement,” he said. “It’s important that they stay interested and work at it. It’s their educational experience.”

Several years ago, Dr. Cathleen Webb, head of WKU’s Chemistry Department, and Dr. Mahmood were awarded a highly competitive Research Experience for Undergraduates (REU) grant by the National Science Foundation. This grant, the first REU award for the Ogden College of Science and Engineering, allowed them to bring eight students each year from different parts of the country to spend ten weeks at WKU and participate in research with other participating faculty mentors. The REU activities, which have continued for three summers, have included WKU students each year and permitted them to interact with their peers from other parts of the country.

Dr. Mahmood’s experience began in his native Bangladesh. His interest in climate and meteorology began in high school when he chose a geography course as an elective class. He entered the University of Dhaka as a geography student. “By the end of my freshman year, I knew I wanted to do climatology,” he said. He also knew he wanted to teach and conduct research. After completing his undergraduate and graduate work at Dhaka in 1989, Mahmood came to the United States to pursue his Ph.D.

“I have been fortunate to work with good scientists and learn from them,” Dr. Mahmood said. “I’ve had good mentors and collaborators.”

Currently, Mahmood is actively collaborating with scientists from nearly a dozen other universities and research centers across the country. “These types of collaboration allow us to build large science teams and take ‘a good crack’ at important research questions.” ■



THE HUMAN SIDE OF



Kumi Ishii

ELECTRONIC MAIL, OR E-MAIL, HAS BECOME A PROMINENT COMMUNICATION CHANNEL TODAY, ESPECIALLY AT WORK. BUT HAS THE USE OF E-MAIL CREATED

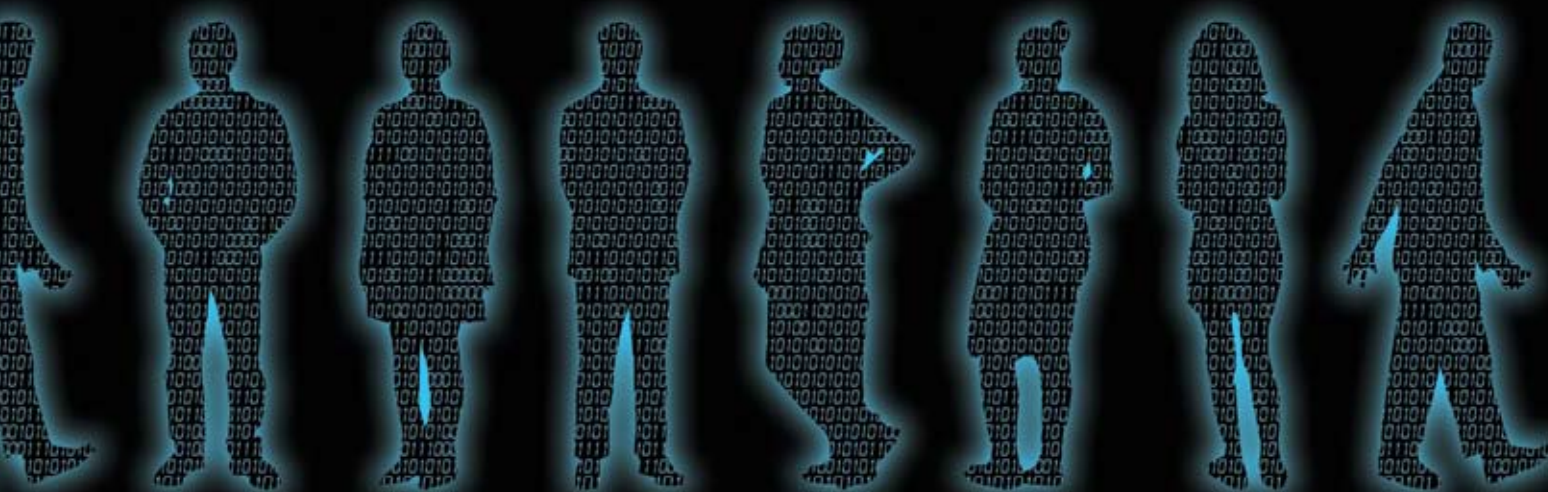
A DIGITAL DIVIDE AMONG USERS? HOW DOES EXPERIENCE WITH E-MAIL CONTRIBUTE TO SATISFACTION WITH IT AS A COMMUNICATION TOOL? KUMI ISHII, AN ASSISTANT PROFESSOR OF COMMUNICATION AT WESTERN KENTUCKY UNIVERSITY, SURVEYED UNIVERSITY EMPLOYEES TO SEE THE EFFECT OF E-MAIL ON THE HUMAN SIDE OF THE CONTEMPORARY WORKPLACE.

“People use e-mail as a quick tool to communicate with others and it takes less effort than face-to-face (FtF) communication,” Dr. Ishii said. “So what happens is that we are increasing the amount of communication by e-mail, but at the same time we need to process a huge amount of messages, and some people are just overwhelmed. Nowadays we are receiving so many junk mails.”

Dr. Ishii said her interest goes back to her experience in Japan while she was working for a global company. “I was in business before coming back to academia, and my boss, who was sitting next to me, just e-mailed me

for anything,” she said. “She seldom talked to me face-to-face although we were sitting next to each other. I wondered why she would not talk to me and why she kept sending e-mails. Sometimes I was not comfortable with the situation.”

She said she also noticed that some people want to use e-mail to avoid face-to-face contact. “Use of technology never replaces face-to-face communication,” she added. “Sometimes e-mail is quick and people feel like they don’t want to disturb busy people by visiting their office, but FtF is still important and the best way to communicate with others in many circumstances.”



THE DIGITAL DIVIDE

BY BOB SKIPPER

Illustrations by Caitlin Elliott

Dr. Ishii wanted to see what factors affected communication satisfaction with e-mail in an organizational setting, so she sent questionnaires to 468 university employees. She received 303 responses that were used for data analysis. In the survey, she measured e-mail experience by asking how long the respondent had used e-mail overall and how long the respondent had used the current e-mail system. She also measured the amount of e-mail communication by the number of messages sent, number of messages received, frequency of access to the e-mail account, and time spent for e-mail communication. She

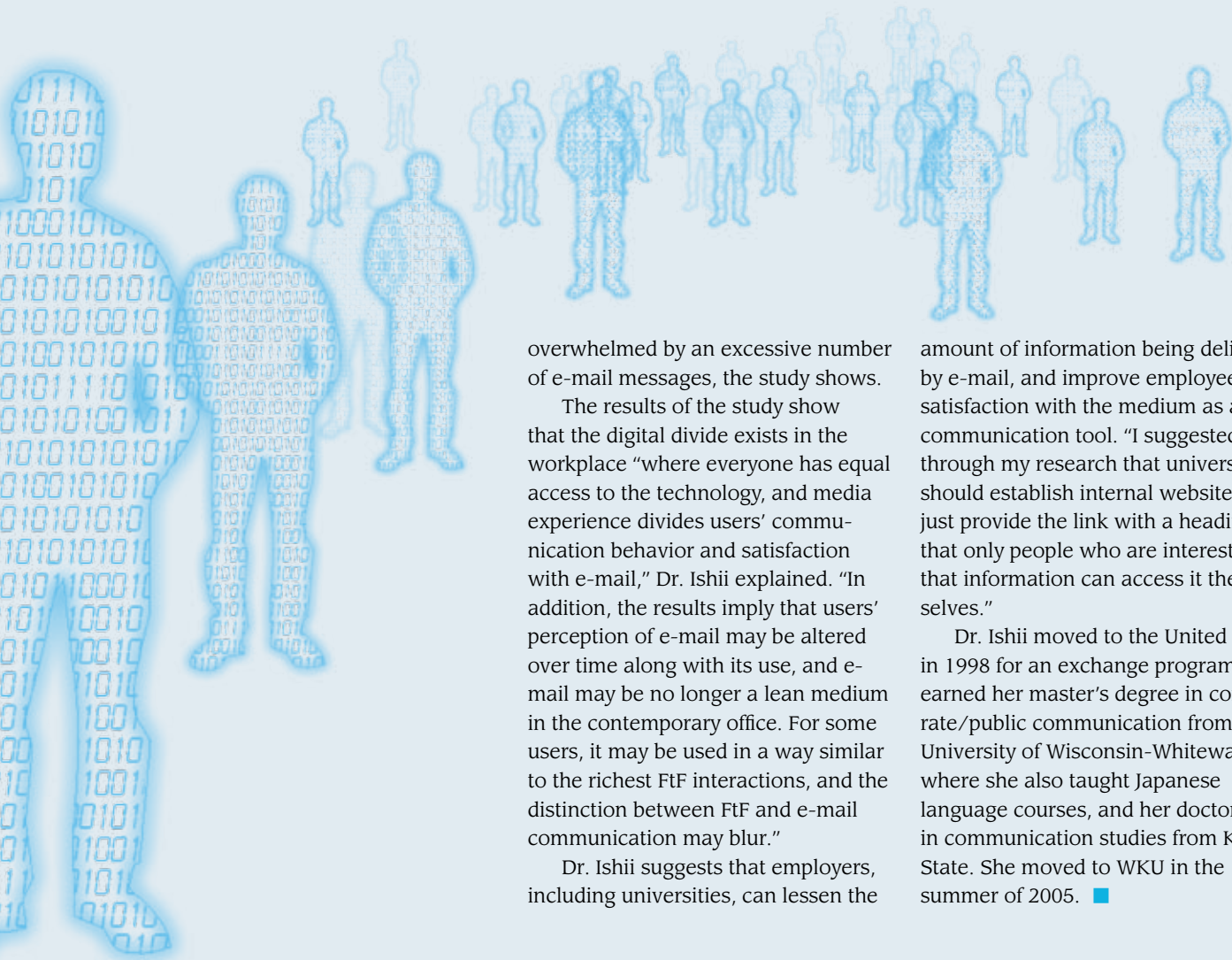
also looked at the purpose of e-mail use and measured communication satisfaction.

The results of her work were published in the *Journal of Technical Writing and Communication* (Vol. 35, Number 4, 2005) in the article “The Human Side of the Digital Divide: Media Experience as the Border of Communication Satisfaction with E-mail.”

The digital divide often refers to the knowledge gap created by digital media, but “This study considers the human side of the digital divide in an organizational setting and investigates if the digital divide exists in

the workplace by examining multiple dimensions of communication satisfaction,” Dr. Ishii wrote in the article. She adds that her data “indicate that e-mail experience differentiates communication satisfaction with amount of e-mail and e-mail use for equivocal tasks (e.g. conflict solution, negotiating, decision making).”

Dr. Ishii said organizational communication scholars value communication satisfaction in the workplace because of its strong relationship with job satisfaction and job productivity. Individual differences affect the amount of e-mail usage as well as the satisfaction with



overwhelmed by an excessive number of e-mail messages, the study shows.

The results of the study show that the digital divide exists in the workplace “where everyone has equal access to the technology, and media experience divides users’ communication behavior and satisfaction with e-mail,” Dr. Ishii explained. “In addition, the results imply that users’ perception of e-mail may be altered over time along with its use, and e-mail may be no longer a lean medium in the contemporary office. For some users, it may be used in a way similar to the richest FtF interactions, and the distinction between FtF and e-mail communication may blur.”

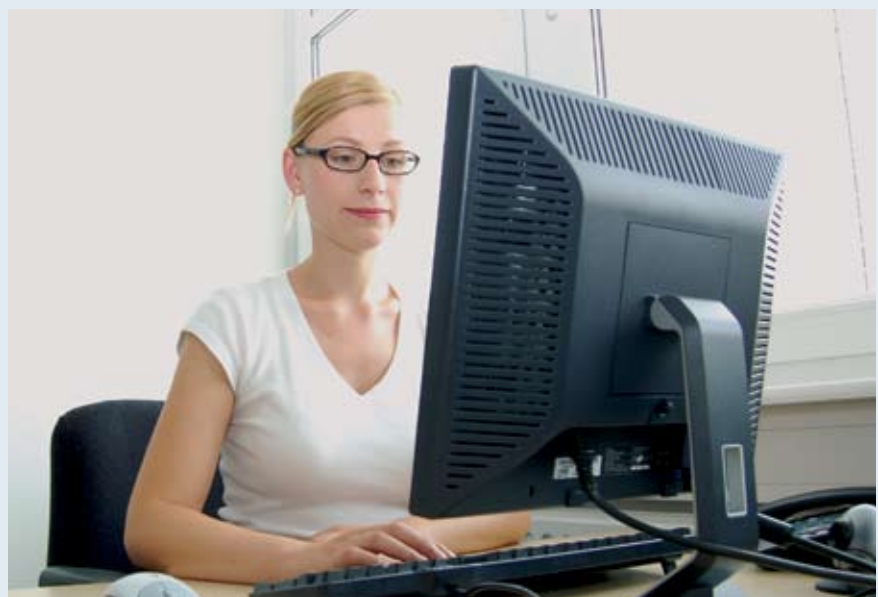
Dr. Ishii suggests that employers, including universities, can lessen the

amount of information being delivered by e-mail, and improve employee satisfaction with the medium as a communication tool. “I suggested through my research that universities should establish internal websites and just provide the link with a heading so that only people who are interested in that information can access it themselves.”

Dr. Ishii moved to the United States in 1998 for an exchange program. She earned her master’s degree in corporate/public communication from the University of Wisconsin-Whitewater, where she also taught Japanese language courses, and her doctorate in communication studies from Kent State. She moved to WKU in the summer of 2005. ■

e-mail as a communication tool, she said. For example, younger or newer employees and women are more likely to use e-mail to socialize in the work setting, and effective managers are less likely to use e-mail for equivocal tasks. “Yet, those who are more experienced with e-mail perceive the medium as richer than do those who are less experienced, and thus, those who perceive e-mail to be rich are more likely to use it for any purposes,” Dr. Ishii wrote.

Less experienced users, while they may be comfortable using e-mail to communicate with co-workers whom they know well, may be easily



RESEARCH BRIEFS

Exercise and Immune System Cells

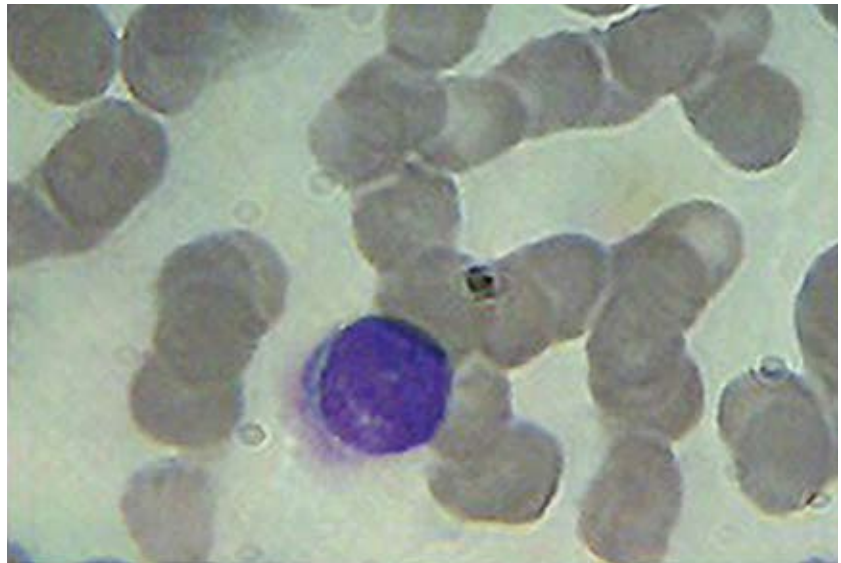
Dr. James W. Navalta, Department of Physical Education and Recreation,



Dr. James Navalta

was awarded a Summer Faculty Research Scholarship to study the elimination of immune cells through apoptosis, which is a genetically

directed cell death process. As the immune system represents a line of defense against foreign pathogens, it is necessary to maintain a balance of immune system cells for good health.



A white blood cell, called a lymphocyte (in purple), surrounded by lighter colored red blood cells. Lymphocytes carry out a variety of immune functions including making antibodies to help deal with future sickness, as well as direct cell to cell killing of foreign microbes.



The project will study immune cell death brought on by cycling exercise under three conditions: rest, immediate post-exercise, and two hours after exercise. The search for apoptotic cells due to exercise will be conducted microscopically.

Dr. Navalta's tests will be innovative because most similar tests have used the treadmill alone, and

with Dr. Brian K. McFarlin of the Laboratory of Integrated Physiology in the Department of Health and Human Performance at the University of Houston. Dr. McFarlin has conducted cycling tests and compiled a database of blood smears that will be used for the evaluation of cell death brought about with this type of exercise.

Too few immune cells leave the body vulnerable to illness. Too many immune cells can be harmful, if the cells lose the ability to recognize one's own body, as in autoimmune disorders.

comparisons to other exercises which are non weight-bearing (such as cycling or swimming) have not been investigated. Thus, he will formulate a comparison of immune cell death by using two different exercise types.

This collaborative project will be completed in cooperation

Outcomes of this critical project will no doubt improve exercise recommendations for many people. Moreover, Dr. Navalta will present his findings at regional and national sports medicine conferences, and he plans to submit a journal article for *Medicine and Science in Sports and Exercise*.

What Motivates Students to Cheat?

Dr. Michelle W. Trawick is an associate professor of economics who is studying cheating in business courses. Her goal is to try to stop the cheating by discovering the motivation for it. Curbing this behavior is at the forefront of ethics literature, and it is a hot topic in business programs because of very public, real-world examples of unethical decision-making.

Existing research shows that students who select into business majors are more likely to cheat than their



Dr. Michelle Trawick

non-business peers. Researchers believe that cheating is greater in business majors because business students are motivated to perform well for extrinsic purposes (“show me the money”), such as getting the best job possible right out of college, instead of for intrinsic purposes (the love of learning). With these results fairly well established, Professor Trawick will look at business majors at two institutions to determine if cheating motivation varies across major fields of study within business. For example, is it possible that accountants are motivated differently than economists?

The literature further suggests that there are cures to cheating in business courses through the application of a variety of in-class deterrents. Professor Trawick’s research will test for the efficacy of these in-class deterrents across majors within the college. Perhaps, if motivation differs across majors, then successful deterrents will differ as well.

The results of Professor Trawick’s work will benefit students in business courses at WKU and in their careers after graduation.

Tango!

Clifton Brown, of the Department of Theatre and Dance at WKU, was recently awarded a Junior Faculty Scholarship to study an intriguing social dance, the Tango, in Buenos Aires. He will study the dance as it has evolved and as it reflects the origins of the dance as an Argentinian folk tradition. He will work with private instructors and with a tango master at public dance schools.

The experience will expand his knowledge and choreographic expertise, as well as improve his partnering skills, movement repertoire, and instructional technique. WKU students will benefit culturally and from the breadth of new instruction Professor Brown will bring back. He will also



Clifton Brown

create a new work for the WKU Dance Company and will use the new knowledge for future projects involving national and international dance companies. A further outcome will be the creation of university and public workshops in a global dance form that will enhance the traditional course in ballet, modern dance, and jazz.

