Fall 10

envision 2020

our future in focus

special edition of Ampersand, the magazine of the College of Arts & Sciences

envision 2020

our future in focus

energy

innovative

connectivity

engagement

Dear Friends,

The fall semester at UK is an exciting time – one that includes the beginning of a new academic year, the return of faculty and students to campus, start of the football season, and a time to reconnect with your alma mater during homecoming festivities. The College of Arts & Sciences has also been energized by a new initiative which will set us on an inspiring path to the future.

We are creating a blueprint of the future for our students and alumni, our faculty and staff, and our communities and the world. This new initiative, Envision 2020, will begin a new conversation on what a college of excellence looks like in 10 years. Envision 2020 will work in conjunction with the University of Kentucky's overall plan to become a Top 20 college by the end of the decade.

The steps we take today will put us on the path to creating an even more dynamic, purposeful, and relevant college for future generations. By 2020, our College will be defined by four characteristics: innovative preparation for life and career, multidisciplinary scholarly research, connectivity with the world, and substantive community engagement.

We will prepare students to be future-ready – prepared to not only enter and excel in their chosen career fields but also armed with a skill set which promotes social responsibility and global readiness. Our goal is to foster individuals who, regardless of their chosen career and field, are innovative, flexible, dynamic, and both willing and able to be active participants in their communities and society.

We will also focus the creative and intellectual capacity of A&S on research, teaching, and scholarship which will address the most pressing issues of the day and ultimately contribute a larger public good. Our creative research efforts will allow A&S to partner with the Commonwealth of Kentucky, the nation and world, and promote the exploration of interdisciplinary lines of inquiry.

The College will be cyber-enabled, infused with the latest technologies to enhance the discovery, teaching, and learning of knowledge, and able to engage with Kentucky and the world in various conversations. As a College, we will also commit ourselves to working closely with local schools, students, alumni, and members of the community to respond to the needs of the Commonwealth and the world.

This special issue of "Ampersand" is dedicated to Envision 2020 and highlights the four main areas of the initiative – innovation, creativity, connectivity, and action. Make sure you also check out the Envision website which will feature additional articles, podcasts, videos, and blogs from members of the A&S community. We invite you to join the conversation at www.envision.as.uky.edu.

None of these goals are possible without the continued support of our alumni and friends. Join us on this exciting journey – as we bring our future into focus.

Yours,

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We'd like to hear from you. Send letters and story ideas to, Ampersand, at the address on back cover or by fax to (859) 323-1073.

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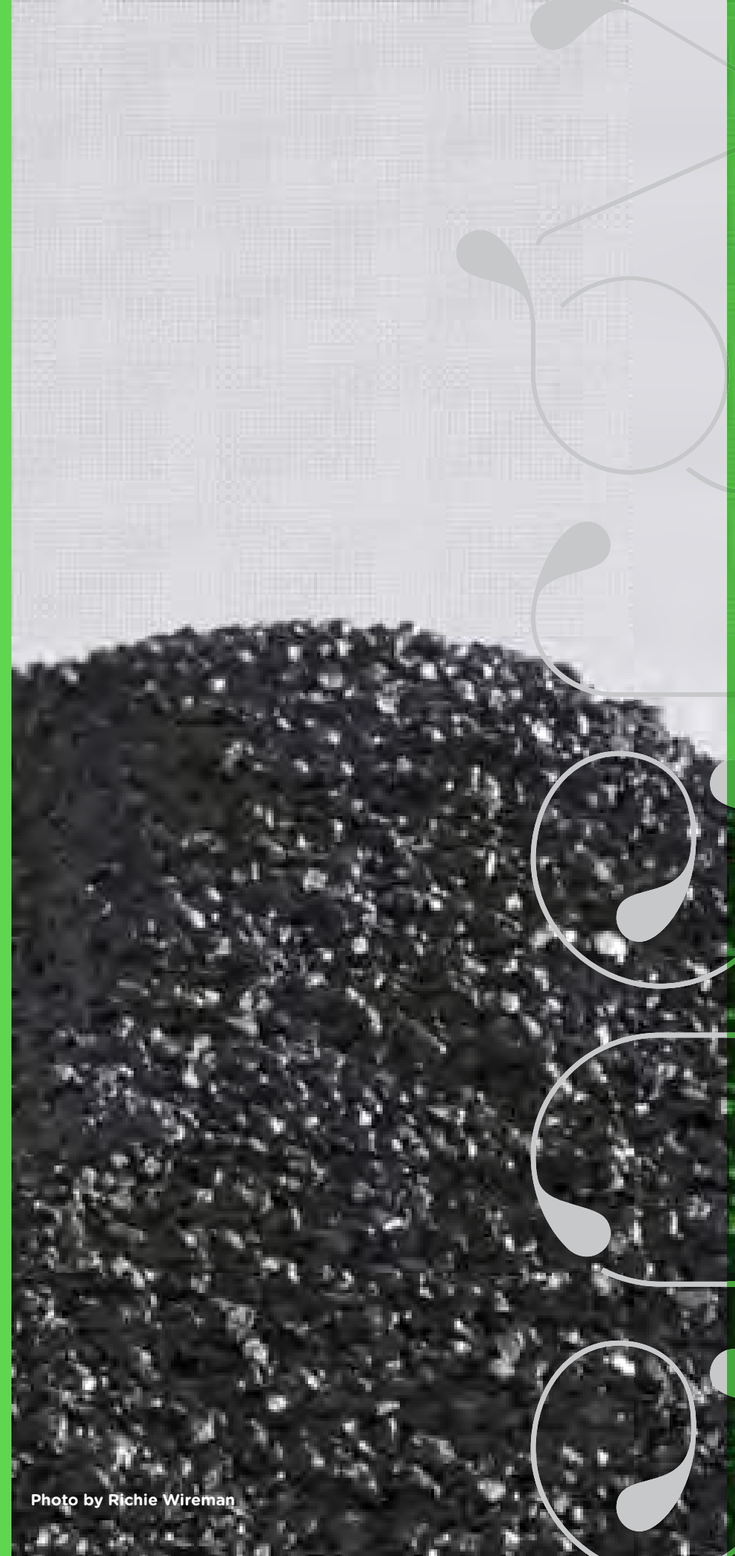

Photo by Richie Wireman

the future is

energy

RESOURCEFUL CONVERSATIONS

A&S is tackling energy research from many angles

BY REBEKAH TILLEY

Asked to imagine the face of energy in Kentucky, most of us will immediately think of a coal miner. It may be in the memory of our father coming home from work, a fading picture of our grandfather's face covered with coal dust or our sister telling us about how things have changed at the mine. The history of coal mining in Kentucky is a complicated one, and its future is uncertain. →

"The U.S. Geological Survey says that there is really only 9 percent of mineable coal left, and when that's gone it's just not going to be financially viable to get to the rest of it; it's going to be too hard to reach," said Erik Reece, writer-in-residence in the UK Department of English. "This is something the industry never talks about—the fact that we're coming to a place where it's just not going to be financially viable. If that's the only economy in Eastern Kentucky, then what's going to happen after that?"

"Now may be the time to prepare Kentucky for a post-coal economy," said Mark Lawrence Kornbluh, dean of the UK College of Arts & Sciences. "This generation will encounter a completely different world—not just 50 years from now, but 10 years from now. We need to be proactive and think about our future."

Encompassing the bench sciences, the social sciences and the humanities, the College of Arts & Sciences is uniquely positioned to take a holistic approach to energy research—one that has the potential to set the standard for the rest of the country.

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Photo by John J. Cox

Alternative Vision

Erik Reece looks beyond Kentucky's coal-driven past

BY GUY SPRIGGS

English professor and writer-in-residence Erik Reece has expressed his views on the coal industry and energy policy in Kentucky in such works as his 2006 book "Lost Mountain." He also believes the University of Kentucky has an opportunity to effect positive change and become a more energy-responsible institution.

Reece understands the influence of coal in Kentucky, but feels that the effects coal has on Kentucky's environment and local economies are largely overlooked. "It's a very cheap source of energy because there's so much of it, but the problem is that people aren't factoring in the true cost of coal," Reece said. "We're not paying for the externalities in terms of all the dirty water, the toxic air, the deaths due to coal truck drivers. The health cost is devastating."

Because of Reece's experiences as a writer, environmentalist and Kentuckian, he believes that the way to the future is an energy portfolio that doesn't include coal. "I'm not naïve enough to think that it's going to end next year. But it would be nice to see an ideological and philosophical shift toward the realization that the entire world is going to have to be off of coal in 20 years."

"I think UK has a responsibility to Eastern Kentucky, and part of that responsibility is helping put in place a green collar economy, creating jobs around alternative energy," Reece said. UK can play a major role as the state's flagship university, Reece says, by helping to plan for what the post-coal economy is going to look like.

While Reece continues to promote a greater focus on sustainable energy research at UK, he sees new endeavors such as the Solar House and materials recycling as a step in the right direction, encouraging more research of that variety. But changes in UK's energy policies won't come about only as a result of new research, Reece explains. "There is a lot of movement from the faculty and from the students, and that's where it's going to have to come from."

UK's English Department has responded by increasing the Writing Program's emphasis on sustainability and Appalachian Studies. The goal, Reece says, is to emphasize writing as an act of citizenship and as a way of taking responsibility for one's actions, which includes taking responsibility for the way one consumes resources.

Moving forward, Reece sees several steps UK can take to improve the university's energy use, starting with a pledge to not burn any mountaintop removal coal and signing on to the American College & University Presidents' Climate Commitment. Most important, however, is the development of a more coherent energy policy.

"We need to lay it out and say that these are our goals and this is how we're going to achieve more energy efficiency. All students, faculty and staff need to know what that policy is and what part they might play in it."

Cooking Up Energy

BY REBEKAH TILLEY

Chemistry is a bit like cooking. Except rather than the latest in Southern cuisine, UK professors of chemistry John Anthony and Mark Watson are looking for ways to cook up organic substances and train them to harvest sunlight.

When you think "organic" you probably think farmers' markets, food co-ops and milk with cream on top. In this case though, Anthony and Watson are attempting to create solar panels made of organic or carbon-based components rather than inorganic silicon from which current solar panels are made. Organic solar cells are less energy intensive to create, are potentially more efficient and will cost considerably less than their silicon cousins.

Both chemists are currently in the process of developing and refining two different types of organic materials that could prove to be the foundational material of tomorrow's solar cells.

In his quest for organic solar cells, Anthony is working with aromatic molecules. Using a natural biological process called self-assembly, Anthony creates molecules that are designed to absorb the maximum amount of light and transmit a charge in the right direction.

"Self-assembly is the basis of life," explained Anthony, describing how self-assembly plays a role in our own bodies. "Molecules want to interact in specific ways to build specific structures. They create membranes that then lead to cells that then lead to organs and bodies, and these things want to stick together in a specific way. And we harvest that same idea with non-natural molecules, but instead of building biological structures, we build electronic structures."

"It's all about designing molecules."

Watson's work is similar to Anthony's in that they both make organic materials for electronic applications, including harvesting solar energy. However, Watson focuses on a different type of molecule called a polymer.

"We use the same elements largely – carbon, hydrogen, sulfur, fluorine, etc. – but we arrange them into molecules in different ways and completely change the properties," said Watson. "One of the big driving forces behind working with organic is you have so much control over properties."

After determining a way to build a polymer that conducts both a negative and positive charge, Watson and his collaborator's findings were featured on the cover of Advanced Materials.

In the future, organic solar cells could be found on campus in a surprising number of forms. Light-blocking solar film may filter out UV rays while supplying power for the Classroom Building's air conditioner and heater. The tops of bookshelves in the W. T. Young Library may have panels that absorb fluorescent light, cycling energy back into the lighting system. Students may carry bags that feed solar power back into their laptops and wear shirts that charge their cell phones while they walk to and from class.

These organic molecules are flexible enough that they can potentially be manipulated to take the form of paint on campus buildings and sealant on parking lots capable of harnessing a tremendous amount of solar power.

"As chemists we can engineer things like that," said Watson. "It's kind of neat to think that rather than burning oil and gas and getting a one-time energy benefit out of it, we can build up something from petroleum feedstock that harvests sunlight and gives you sustainable energy for an extended period of time."

And that's something we can all drink to.

Photo by Richie Wireman

...4 This section contains stories about A&S faculty across the disciplines who are proactively preparing for our energy future from a multitude of angles. Most people are familiar with standard forms of alternative energy—solar, wind, geothermal and nuclear. Kentucky's future could be built upon an energy portfolio that creates jobs around this alternative economy.

Scientists in the Department of Chemistry and the Department of Earth & Environmental Sciences are developing new energy-generating tools that have the potential to become part of the transition to Kentucky's "green collar" economy. Chemistry professors John Anthony and Mark Watson have made significant advances in developing organic solar panels that are far less expensive and more efficient than their silicon counterparts. (See page 6).

Earth & Environmental Sciences (EES) chair Dhananjay Ravat developed research connections across the globe as he researched ways to more efficiently locate "hot spots" that could potentially be used for geothermal energy plants. And, should our future energy 9

Civic-Minded Sustainabiliity

Interdisciplinarity is key to future of energy policies

BY GUY SPRIGGS

When discussing the future of energy policy – with regard to both the United States and the University of Kentucky – political science professor Ernest Yanarella places emphasis on America's dependence on extractive natural resources. "The fact that the U.S. has been blessed with such an abundance of natural resources [means] that we are, as historian David Potter put it, 'People of plenty.'"

Yet we have been profligate with our use of these resources, Yanarella notes, in spite of the fact that energy sources such as coal are depleting. Because of this, it seems that we won't always have the energy supplies that have historically made Americans the people of plenty, and Yanarella believes that signs of this future are all around us.

"To me there is no question that, in the face of peak oil and climate change, there will be renewed and increasingly intense interest in the connections between energy, environment and sustainability," Yanarella said. As director of UK's Environmental Studies Program from 2004 to 2010, Yanarella has been focused on expanding the framework of issues relating to the environment and sustainability in order to find new ways of coordinating UK's energy efforts.

"We really need to plan for that day when the costs of getting coal out, including the social and environmental costs, are seen as so high that we can no longer depend upon [it] as a major contributor to our economy."

The problem UK's curriculum has to contend with, Yanarella observes, is overcoming the logic of departmentalism. "This is a time when the social and the environmental and even the economic problems that we're confronting require a more interdisciplinary model for doing research," he said.

In moving forward, Yanarella encourages UK and the state of Kentucky to treat alternative energy more seriously. "As [UK] continues to develop its sustainability agenda and infrastructure, it really needs to place a greater focus on conservation and energy derived from solar power," Yanarella said. "We need to more than redouble our efforts in research and development to advance that agenda."

Yanarella believes that this research & development approach should be built upon a metaphorical tripod of sustainability – maintaining environmental quality, economic abundance and social equity – but should also include a fourth leg: cultural sustainability. He says that in the transition from depletable to non-depletable energy resources, a new cultural paradigm will need to take hold and inform how we look at nature and how we relate to one another.

Because of this, Yanarella contends, the humanities are co-equal partners with engineering and the sciences in advancing this broad agenda. "What should we value? That is the overriding question of the humanities. We're really going to have to look toward the humanities, toward cultural producers, to help create those products that will provide the foundation for this new sustainability culture."

UK's growing emphasis on interdisciplinary research can help keep the university relevant amid what Yanarella sees as the "multi-faceted policy problems that we are inevitably going to have to face as a university, as a city, as a state and as a nation."

That, Yanarella says, is the civic burden and responsibility of a university education: crafting solutions that can carry us collectively into the next century.

Photo by Richie Wireman

...7 consumption demand the creation of more nuclear power facilities, EES professor Edward Woolery is working to ensure they are placed in locations that are least likely to be affected by the New Madrid fault that runs close to Western Kentucky. (See page 11).

While the hard sciences are providing advances in alternative energy production, social scientists are examining ways in which people of differing opinions can come to workable, sustainable policy decisions. And as political science professor Ernest Yanarella argues, those in the humanities add the last essential piece that binds them all together by posing the fundamental question: what shall we value?

"They ask us to put a mirror to our social face and to look to the consequences of our personal and our social actions," said Yanarella, who has worked over the past six years on issues of environment and sustainability policy as the director of UK's Environmental Studies Program (see page 8). "In that sense, they are absolute partners with social scientists, hard scientists and engineers in advancing this broad agenda."

Looking at issues through such a multi-disciplinary lens is the aim of an arts and sciences education.

"Students leave the College of Arts & Sciences with decision-making 10

skills that enables citizenship, responsibility and community," Kornbluh said.

Reece sees this directly applied in the A&S writing program. "We want to emphasize writing as an act of citizenship, writing as a way of taking responsibility for one's actions, and, of course, part of that is taking responsibility for the way one consumes resources," he said (see page 5).

Become part of the conversation as we imagine the new face of energy.

Photo by Richie Wireman

On Solid Ground

Geologists find energy answers below the surface

BY REBEKAH TILLEY

Ten years from now, the University of Kentucky's campus may not look that different on the surface, but it could be powered by something else entirely. A geothermal plant may heat the hot water for dorm showers and student computers may be powered by nuclear energy. In a world in which our traditional energy sources are being depleted every day, everyone is exploring options.

Two professors in the UK Department of Earth & Environmental Sciences – Dhananjay Ravat and Edward Woolery – are leading the exploration.

Dhananjay Ravat is looking for new ways to locate geothermally active places in the Earth's crust that can be used for geothermal energy plants and "direct-use geothermal energy"—re-circulated water heated by hot rocks within the earth's crust —In order to reduce electrical power consumption. To more effectively find the "hot spots" deep in the earth's crust, Ravat is working with researchers in Italy, Egypt and Australia to develop techniques using the Earth's magnetic field.

"The magnetism in the rocks is controlled by temperature," Ravat explained. "If you exceed a certain temperature then the magnetism vanishes. Only when the rocks are cooler than that temperature can they be spontaneously magnetized."

Using that principle, this unique method helps researchers determine optimal locations for the exploitation of clean geothermal energy.

However, in the same way that not every place is windy enough for wind power or sunny enough for solar power, not every place has close enough access to the "hot spots" of the Earth for geothermal power. Another alternative energy source is nuclear power.

A study being conducted by the Electrical Power Research Institute (EPRI) suggests that at the rate we are using energy, the Central and Eastern U.S. will need to build an additional 250 to 300 nuclear power plants by 2050. These plants will need to be on geologically safe ground away from areas of likelihood for large earthquakes and near sufficient surface water supply for cooling the reactors.

For the last six years, Edward Woolery and his team have collaborated with the Lanzhou Seismological Institute and China Earthquake Administration to study the locations of active geologic faults capable of producing large earthquakes in an attempt to determine how large an earthquake could be for a given area, and how often earthquakes might occur.

Once it is decided that a nuclear power plant will be built, one of the critical decisions to be made is where it will be located. "Seismic hazards influence the location of nuclear power plants more than any other natural hazard," explained Woolery. "Our research will undoubtedly impact locating this type of alternative energy source in Western Kentucky."

Unfortunately, lack of knowledge about fault zones has made assessing potential nuclear plant sites filled with uncertainty.

"Our goal is to reduce the uncertainty so that when power plant planners, designers and other stakeholders are given a seismic hazard number, whether high or low, they can have confidence that it is based primarily on what we know," Woolery said.

More than just providing power for future UK students, Ravat and Woolery hope that their research will have a direct impact on Kentucky's economic future.

"Solving problems directly related to issues that affect economic development will hopefully enhance and stimulate the latter," Woolery said.

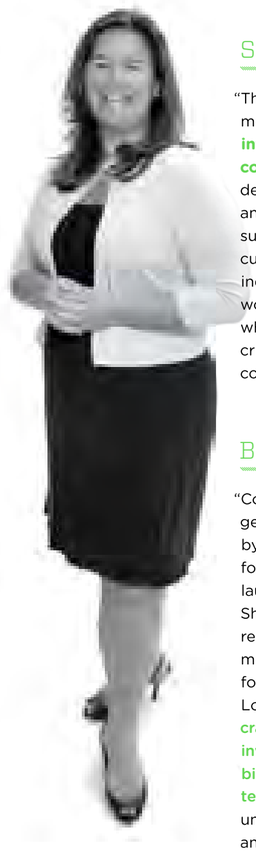
& envision your field in 2020

For this special issue of "Ampersand," faculty from the College of Arts & Sciences were asked to help create short, descriptive paragraphs summarizing how their respective disciplines will change over the next 10 years. These professors share keen insight on the trends and issues that will inform their fields of study, shining a light on how new movements and technologies will shape the research and scholarship of tomorrow.

COMPILED BY GUY SPRIGGS // PHOTOGRAPHS BY LEE THOMAS

Chemistry

"Chemistry is continuing to play an important role in every aspect of life, ranging from environmental remediation, the development of sustainable energy, the discovery of new therapeutic agents and the synthesis of novel materials. **The boundaries between traditional chemistry divisions are being replaced by project-driven research teams** composed of chemists with varying expertise and researchers from other fields of study. As a discipline, we are adjusting our curriculum to prepare the younger generation of chemists to work efficiently in international and interdisciplinary teams for the future." **— Yinan Wei**



Sociology

"The discipline of sociology will be moving toward **developing more interdisciplinary and international collaborations among scientists** dedicated to the study of society and social problems. Traditional subfields such as the sociology of culture, sociology of gender, social inequalities, medical sociology, and work and occupations remain strong, while other subfields, including criminology and social networks, are continuing to grow." **— Carrie Oser**

Biology

"Complex organisms share similar genes, yet Earth is populated by an amazing diversity of life forms. Research by Nobel Prize laureate and Kentucky native Phil Sharp defined dynamic genetic reprogramming through pre-messenger RNA splicing as a force in biological development. Looking forward, **our work in cracking the "splicing code" will involve the integration of genomic, bioinformatic and biochemical technologies** to enhance our understanding of biological diversity and its response to environmental challenges." **— Brian Rymond**

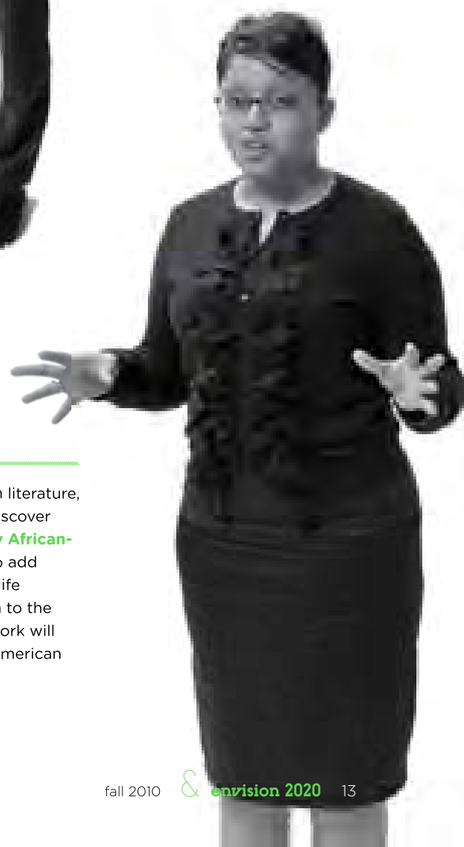
English

"I'm a cultural critic working on post-WWII American literature, film and television by examining how culture constructs and distributes its narratives and how those narratives change and compete with one another. These changes, which determine what a culture accepts as realistic or viable, are vast and multifarious, in part because geometric growth in media technology continues to modify how we access visual and print media and how we understand the contexts of media production and consumption."

— Alan Nadel

Statistics

"We're living in a **data-driven world.** More than ever, it is important to understand how to make good decisions based on data. Statistics is the science of learning from data. Knowing the concepts and principles of statistical inference is becoming as vital as the ability to read and write. Statistics will play an increasingly important role in deciphering the meaning and assessing the value of the data that surround us." **— Arne Bathke**



English

"Moving forward, my field, 19th century African-American literature, will continue to draw heavily on archival research to rediscover **lost, forgotten and underappreciated literary texts by African-American writers.** This archival research will continue to add substantially to our understanding of African-American life and culture in the United States from the antebellum era to the present contemporary era. As well, continued archival work will expand scholars' understanding of canon formation in American literary history." **— Rynetta Davis**

Statistics

"Bradley Efron said, 'This is the information age, statistics is the prime information science, and there is every reason to believe in a greatly increased statistical presence in the academy of the future.' Today, we generate huge numbers of data sets (e.g., DNA sequences from genomes). I believe that statisticians will play an important role in extracting information from such huge data sets so that other scientists can use this information for their applications."
— Ruriko Yoshida

Modern & Classical Languages

"I am currently collaborating with two graduate students in German Studies to complete a series of communicative lessons based on popular German films. We will be presenting our findings in November at the annual American Council for the Teaching of Foreign Languages Conference and publishing the materials in an upcoming edition of the journal *Unterrichtspraxis/Teaching German*. Over the next 10 years, I look forward to **working with world language teachers around the state of Kentucky to develop the linguistic and cultural competencies of our students** by encouraging them to participate in these interactive research opportunities." **— Jeff Rogers**

Mathematics

"During the last century, mathematicians have made deep advances in various sub-disciplines such as analysis, topology, algebra and combinatorics. I believe the next 10 years and beyond will bring, in addition to continued advances in these areas, a focus on bridging the gaps between these areas. My research involves the **interaction of algebra, topology, geometry and combinatorics**, and I am excited to be doing research that involves multiple areas and methods." **— Benjamin Braun**

Biology

"Great strides have been made in teaching science over the past 15 years, and most of this improvement has occurred at the K-12 level. **Top research universities like the University of Kentucky must meet the demands in the educational instruction of future science students.** We are working to close the gap between secondary science educators and higher education so that by 2020, students can make a seamless and successful transition into an interactive and exciting college experience in science and research." **— Jeffrey Osborn**

Psychology

"In the past decade, psychologists have employed new tools for studying relationships between mind and body and between brain and behavior. **Future advances in brain-imaging procedures will allow real-time observation of brain responses to complex sequences of events,** and those tools will lead to a much deeper understanding of relationships between brain and behavior. In the coming decade, these trends will continue and psychologists will increasingly engage in interdisciplinary efforts to advance our understanding of human behavior." **— Robert Lorch**

History

"Thanks to modern technology, historians have access to a wider range of sources than ever before. Our own experience of globalization raises new and important questions about the connections between cultures in the past, and historians have never been more open to interdisciplinary dialogue than we are today. Even so, the basic insight of our discipline – the importance of time and context in human existence – will still matter far into the future." **— Jeremy Popkin**

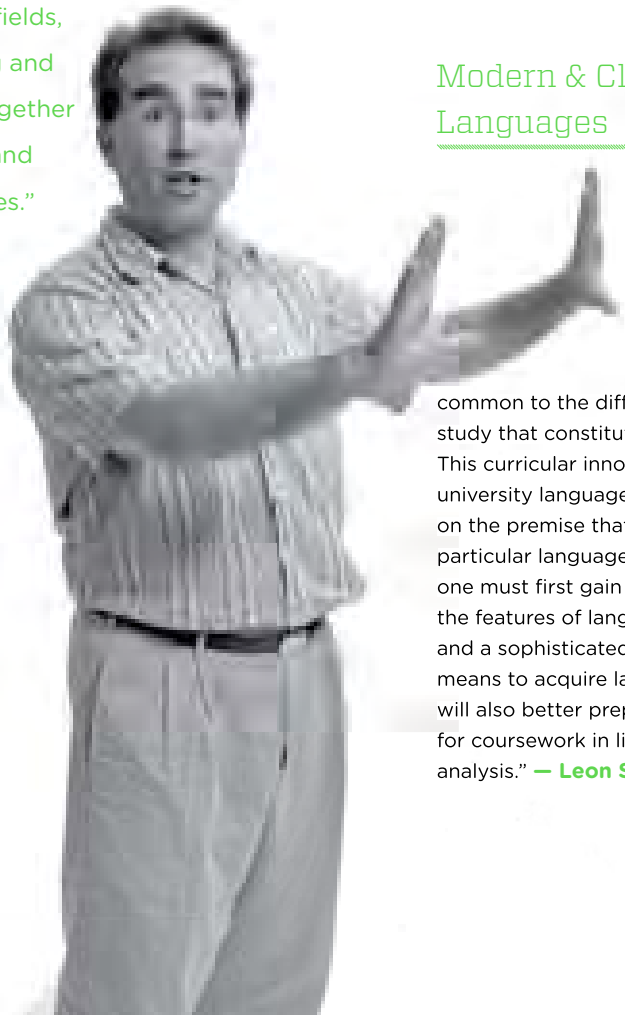
Anthropology

"Cultural anthropology is dramatically increasing its role in solving societal problems. For example, we can study what motivates a small population of people working toward sustainability, then advocate applying that philosophy to a larger population. In the future, technological advancements will increase our research on the polarization between societies with technology and those without. We can then apply our academic work toward increasing advancements like Internet access and solar energies in rural populations. Future research in this area will also bring anthropology together with other fields, such as engineering and design, to work together across scientific and global boundaries."

— Lisa Cliggett

Psychology

"The discipline of psychology is becoming more and more translational, meaning that it is doing more to turn basic scientific findings into application. One reflection of this movement deals with improving quality of life through psychoneuroimmunology following evidence that suggests **positive, optimistic mental states can actually improve health.** A second involves the interfacing of psychology with new technology, as neural networking and human factors approaches can inform our understanding of the similarities between the brain and computer function." **— Michael Bardo**



Modern & Classical Languages

"The Department of Modern and Classical Languages will soon launch a set of courses introducing students to the objects and methods of inquiry common to the different fields of study that constitute the department. This curricular innovation, a rarity in university language programs, is based on the premise that regardless of the particular language one wants to study, one must first gain an understanding of the features of language in and of itself and a sophisticated awareness of what it means to acquire language. Such training will also better prepare future students for coursework in literary and cultural analysis." **— Leon Sachs**

the future is

innovative

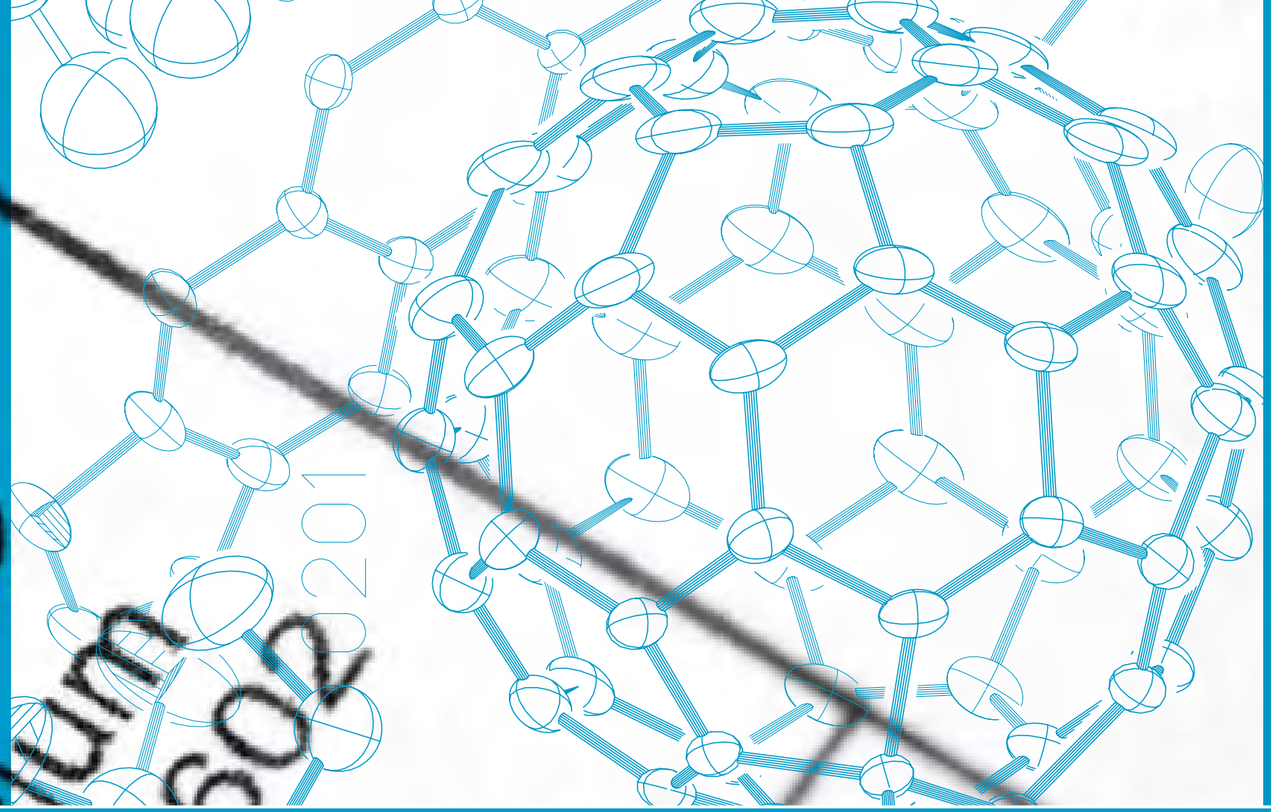
INNOVATION IN KENTUCKY

Novel approaches to traditional academic work reach across all disciplines in the College of Arts and Sciences, and these groundbreaking endeavors make it possible for students and professors in the College to affect the world around them in new ways. Armed with exciting techniques and technologies, A&S is looking to the future to build more productive learning and research environments today. →

BALLOONING CREDENTIALS

Gang Cao's helium liquifier captures a quickly disappearing element

BY KATHRYN WALLINGFORD



Beneath Earth's impermeable rock layers, helium is generated from the decay of radioactive materials. Once released, helium, the second lightest element on earth, escapes from our atmosphere – too light for gravity to hold, helium floats away.

Like coal and oil, the supply of helium is finite and some predict that as soon as the year 2015, the Earth's supply will have vanished.

Although the declining supply of helium might not be as publicized as the Earth's depletion of oil or other natural resources, its shortage has profound consequences. Helium serves purposes beyond supplying consumers with birthday balloons.

Whereas all other elements, such as water, freeze at extremely cool temperatures, helium is able to maintain its liquid state as temperatures approach absolute zero. This unique property makes liquid helium a vital factor for many applications, including cooling superconductors that are a key component for some of life's most basic luxuries, such as the production of flat-screen televisions, to more essential technologies, such as MRI and nuclear physics, low temperature condensed matter physics and space technologies.

Fortunately, University of Kentucky Arts and Sciences professor of physics and astronomy and director of the Center for Advanced Materials, Gang Cao, has not only found a way to keep helium in earth's atmosphere, but in UK's laboratories.

The University of Kentucky can now make its own liquid helium.

Recently awarded a $4.5 million National Science Foundation EPSCoR (Experimental Program to Stimulate Competitive Research) grant, Cao helped establish the Center for Advanced Materials last year with the goal of not

continued on page 19

continued from page 19

only discovering and improving new materials, but also making the University of Kentucky a national player in condensed matter and materials research.“We have the intellectual asset at the university; now we need to build the infrastructure,” said Cao.

Securing a helium liquefier was a major step in building a more progressive infrastructure and putting the Center for Advanced Materials on the map. Relatively few research universities in the nation have such unique and innovative capabilities, and the University of Kentucky is one of them.

Cao has always been committed to the synthesis and application of materials research. However, he has often been frustrated with the lack of research and funding toward the production of new materials in the United States.

“There are many labs that measure and characterize materials, but there are not parallel efforts to produce these materials,” said Cao. “You have to control materials,” he continued. “I have said this many times: if you control materials, you control technology. Now here at the University of Kentucky, we can do everything under the same roof.”

Besides distinguishing UK as a leader in condensed matter and materials research, the purchase of a helium liquefier has also given UK financial freedom.

In the past, Cao and his colleagues have purchased liquid helium from commercial vendors for a very high price. Over the last eight years, the cost of purchasing liquid helium has quadrupled, increasing from $2.50 per liter to $10 per liter.

“This facility has drastically reduced our dependence on commercial sources for liquid helium. This is particularly important in a time when the market becomes so unreliable,” said Cao.

Professors in the Department of Physics and Astronomy, including three professors who were recently hired through the NSF EPSCoR grant, and professors in UK’s Chemistry Department are taking advantage of this new resource.

Using recovered helium gas from individual labs in UK’s Physics and Chemistry building, gaseous helium is initially collected into a holding tank. Then moving through two compressors and finally the liquefier, liquid helium is produced and ready to use for research. In just one hour, the UK’s Department of Physics and Astronomy can produce up to 47 liters of liquid helium.

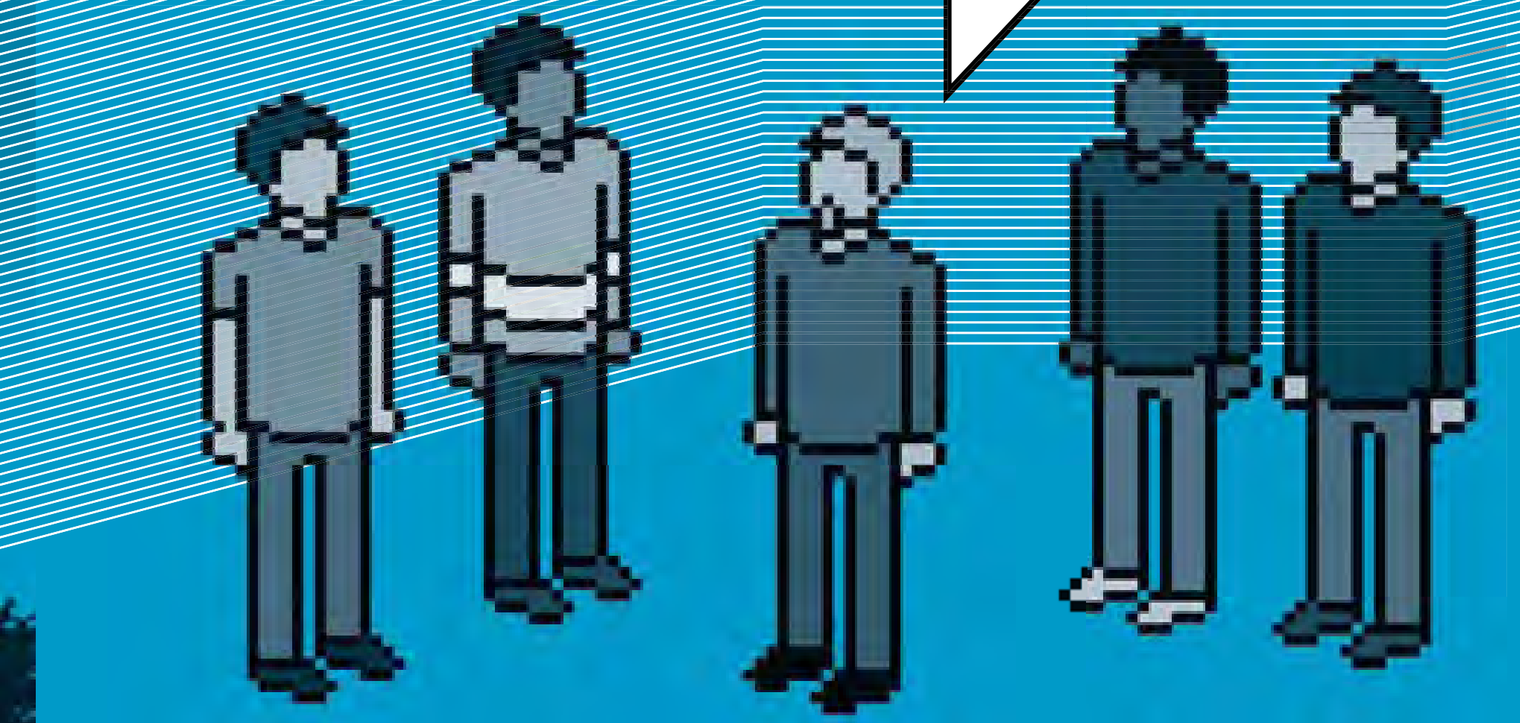
Typically using 400-500 liters per week, UK physicists and chemists are utilizing UK’s generated liquid helium to cool superconducting magnets and better understand the physical properties of electronic materials – properties such as quantum oscillations, superconductivity, quantum Hall effect and magnetism.

Whereas in the past the acquisition of helium from distributors could sometimes be undependable, let alone expensive, Cao said, “We have no excuses now. This is a big milestone for UK as well as the Center for Advanced Materials.” In the next few years, Cao hopes that the center will lead the nation in condensed matter and materials research.

CHALKING IT UP to TECHNOLOGY

Professor touts use of *new* technologies for shared learning

By Guy Spriggs



UK political science professor Chris Rice teaches courses that transcend the limits of the lecture hall. His students still meet in class and do readings, but they also engage in writing and research projects facilitated by Web-based social networking tools like blogs,[1] Twitter,[2] WikiSpaces[3] and Second Life.[4]

1. Short for "Weblog," a blog is a website that typically takes the form of an online diary or serves as a space for personal news updates or opinion-driven commentaries. You can follow Dean Kornbluh's Arts & Sciences blog at http://web.as.uky.edu/DeansBlog.

2. Twitter is a social networking website that allows users to send and receive short, text-based messages as a series of micro-blogs. You can follow the College of Arts & Sciences on Twitter at http://twitter.com/UKarts_sciences.

3. Wikispaces is a collection of Web-based, encyclopedia-style entries that allow for online collaboration in the sharing of knowledge and information.

4. Second Life is an immersive virtual world that allows users to create representative identities called "avatars" and interact with other users from all over the world.

"PEOPLE say, 'These other technologies are bad, I'd rather just have a marker and a markerboard,' but that's just a technology. It's still a thing," Rice said. Instead of being afraid of these changes, Rice suggests that others should embrace these technologies as the next step in enabling shared learning experiences.

"Technology will drive [the way we do things] just as the introduction of the chalkboard did. We don't think about how all these other technologies changed how the university operated, but they did."

There was a time, Rice explains, when education was more individualized and limited technology forced students to work on small personal chalkboards. But then an advancement that we accept and overlook today completely changed the educational landscape.

"We figured out how to make big slate boards and mount them on the wall, and all of a sudden: social technology. It created this massive step forward in classroom learning. Brilliant."

Rice explains that the most important thing with the use of any technology is that it be driven by good pedagogy. "The key is not the technology itself. The key point of why we use [these technologies] is because we want to engage our students in this amazing thing we call learning. It just enables learning to be more collaborative."

These efforts are not meant to replace the classroom environment or face-to-face interactions, but to supplement and inform those experiences. "We are engaged in three main missions: we're here for teaching and learning, research, and service to our state. Those things will not change, but the way we do these things may very well change," Rice said.

"It's all technology. The chalkboard is a technology, the classroom is a technology, the university itself is a technology. This is just one other technology." Rice insists that his approach can't really be called non-traditional because his students still do the same things and achieve the same goals. They simply do so in a different setting.

"Don't let the technology overshadow the human elements of all this. It's the human element that drives it. The technology is not really the important thing; it's just an enabler of what we want to do as humans, as teachers, as learners, as collaborators."

In the following pages, Chris Rice – known "in-world"[5] as Ricetopher Freenote[6] – takes us on a tour through UK Island[7] in the world of Second Life. By demonstrating the capabilities of such online environments and explaining what makes such approaches so valuable, Rice is also teaching us about the methods he will continue to use to teach others in the future.

5. "In-world" refers to places and people as they exist in the world of Second Life. The opposite of the in-world environment is known as "meatspace," which indicates anything that exists or occurs in the real world outside of Second Life.

6. Ricetopher Freenote is the name for Christopher Rice's avatar, which he uses in the world of Second Life to interact with other users, collaborate with other researchers and teach his students.

7. UK Island is an area in Second Life built and maintained by staff and faculty from the University of Kentucky. The accompanying Q&A shows images from various areas located on UK Island.

1 // memorial hall

&: We're starting at UK Island's Memorial Hall, which serves as a welcome center for visitors in Second Life. What can this space achieve for UK?

CHRIS RICE: One of the things that we would ideally like to do is for students who want to come and learn more about UK and experience UK, to be able to take the virtual tour of campus and see the webcams that are all over campus. This is another way of doing that – of providing a form of interaction with students. It's a tremendous opportunity [to reach prospective students].

2 // interactive learning

You've said that students coming to college now expect this sort of interconnectivity as well as shared learning experiences. What does that mean?

CR: It's like the boundaries of physical space no longer limit what you can learn and how you can collaborate. We should be thinking of ways we can engage students using these technologies, not doing it in an uncritical fashion. So many people think, "Well, if you say that, you're just throwing it open to anything." Well, no. As instructors, as teachers, we need to understand how to use these technologies effectively [and] how they can be used to hinder or help learning, and then we have the obligation to teach our students to do that effectively. I think we can, and I think we have to.

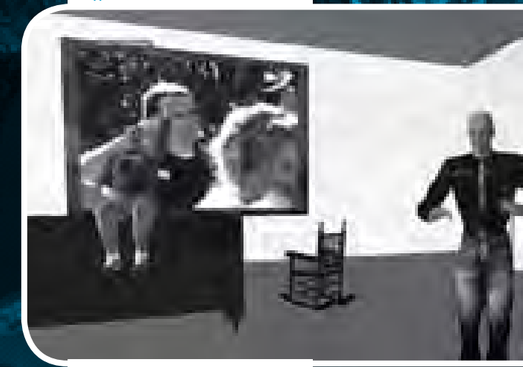
3 // guide on the side

How will embracing these social networking technologies affect the university landscape and the role that teachers play in education?

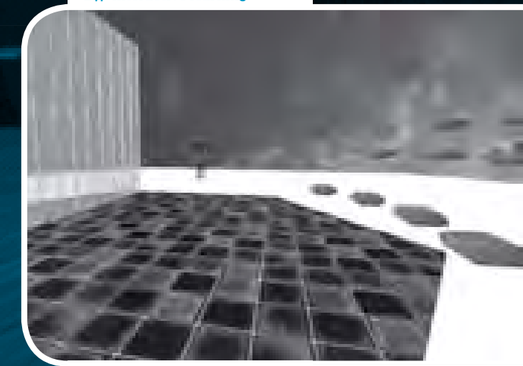
CR: What we think of [as] classrooms, where you have these rows of desks and a podium at the front and a professor just holds forth – I think those days are probably going to come to an end sooner rather than later. The role of what it means to be a professor will change over time. We talk about this already in education: that you go from being the sage on the stage to the guide on the side. It is possible to make learning environments more interactive, and professors will have to learn to produce quality educational experiences with these new technological capabilities.

continued on page 26

1 // memorial hall

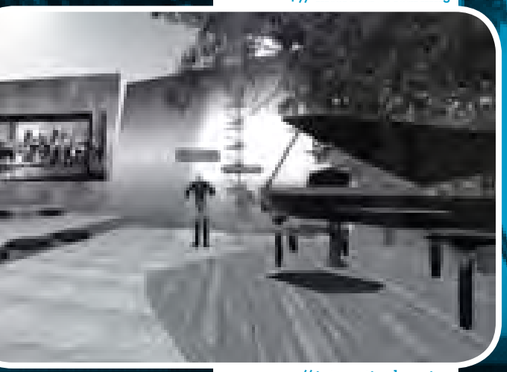


2 // interactive learning

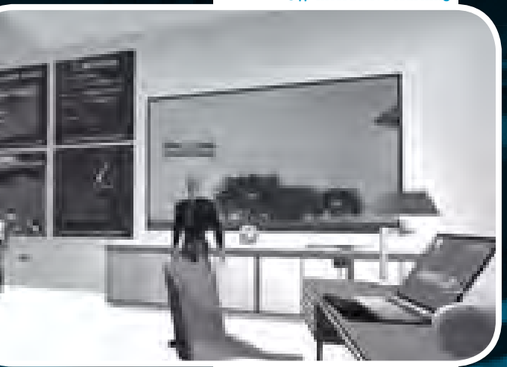


3 // guide on the side

4 // interactive learning



5 // interactive learning



6 // laboratory

continued from page 25

4 // interactive learning

While you take advantage of these new technologies as a way to reach and enrich your students, you don't embrace terms like "the cyber-infused classroom." Why is that label undesirable or inaccurate?

CR: I really don't like those terms. It puts too much of the focus on the technology. I feel badly because there are many faculty members that are really reticent to adopt these technologies because they hear these terms and they think, "No, I want to teach and to engage my students; I want to turn them into researchers or learners or poets," but that's exactly what you're doing here. The technology should not be the driving force; it should enable and enhance the learning experience and our sense of connection.

5 // interactive learning

In the School of Music facility we can see one of the ways that technologies like Second Life increase accessibility to educational experiences. What makes this area special?

CR: One of the things that this facility can do is allow students to have a broader audience. So one of the things we talk about is creating public scholarship, and in music or art that means creating a public face for what it is that you do. What it does is open up to a broader audience these performance aspects by bringing performers here to campus that couldn't be here in the physical realm but could be here virtually. It really helps to create a sense of the physicality, the presence of performance, that just watching a video cannot reproduce.

6 // laboratory

This anatomy lab is meant to emulate conditions in a real-life laboratory. How is this space a good example of the teaching and training capabilities offered by technologies like Second Life?

CR: Students come in, they have to put on lab coats, and they're expected to work with their team, follow proper lab procedure, ask questions. So before you actually get into the lab, you can learn how you're supposed to act in a lab, how you're supposed to go about proper procedure, which is a great boon for distance education as well as blended learning environments. It's not like it takes the place of being in a lab – you can't ever do that – but it can cut down substantially on the time you need for basics when you get [into a] real lab. Now you can spend your face-to-face time on higher-value, higher-order learning.

7 // eye exhibition

The anatomy lab is currently featuring this exhibit on the human eye. What do features like this eye display illustrate about teaching and training in Second Life?

CR: When you see that big 3-D simulation of the eye system, it gives you something that you can't do in real life. You can see things from the inside. You can actually go inside of it. Unless you can really do that – which of course you can't – this is the closest you can come to it. It really gives you an incredible sense when you're working on this system. You can imagine a doctor who has worked on a model versus a doctor who has actually gone inside and explored this giant 3-D model and has that sense. These are things that you can't do in real life. We call it NPIRL,[8] and that's where really some fantastic things can be done in Second Life.

8 // augmented reality

As this technology continues to evolve, there is the possibility of using new tools to further improve the learning environment. What will things look like as we move forward?

CR: [There are] two technologies that I really want to get my head around for the teaching and learning experience. Number one [is] augmented reality.[9] We have students who are increasingly coming to the university with this ability to run this augmented reality software that allows us to take learning out of the classroom and into the world. I think that's a big part of our future, [as are] these geolocative programs like Foursquare[10] or Gowalla[11] where people are bringing in space as a dimension of their social interaction.

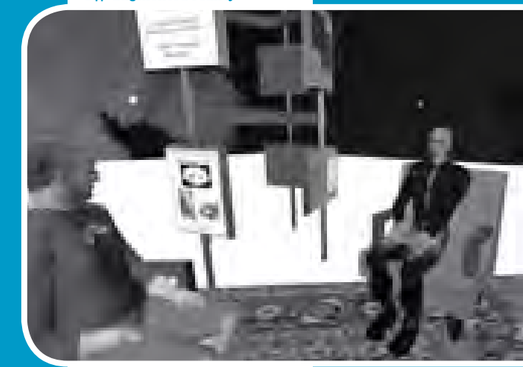
9 // augmented reality

So this is really about the university responding to changing technologies so that it can continue to achieve its education goals?

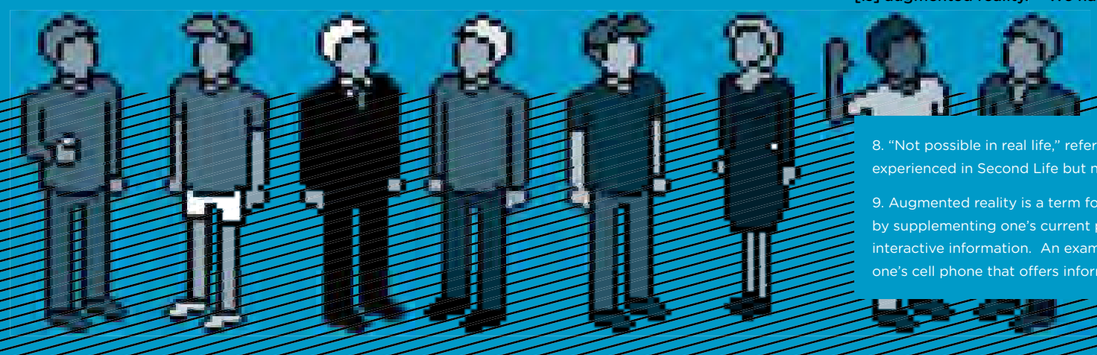
CR: We have to figure out how to create the type of educational processes and experiments that effectively help [students] to acquire knowledge. It just changes the model of how we deliver it, because we've gone from being an information-scarce world where there wasn't the Internet and there weren't all these sources of knowledge to [a world] where you're just swimming in information. So how do we adapt what we do to a world like that, to where students aren't out just getting bad information or not being able to think critically about information? We have to teach them, and we have an obligation as professionals to figure out how we take these changes and still do what we do, which is research, teaching and service.

7 // eye exhibition

8 // augmented reality



9 // augmented reality



8. "Not possible in real life," referring to things that can be done or experienced in Second Life but not in real life.

9. Augmented reality is a term for technology that functions by supplementing one's current position or surroundings with interactive information. An example of this would be a program on one's cell phone that offers information about buildings or landmarks

10. Foursquare is a location-based social networking program that allows users to check in at certain locations and connect with friends online as well as in person.

11. Similar to Foursquare, Gowalla is a location-based networking game in which users win items and prizes by checking in at special locations.

Beyond Beakers

Innovative work in A&S labs has potential to solve a variety of issues

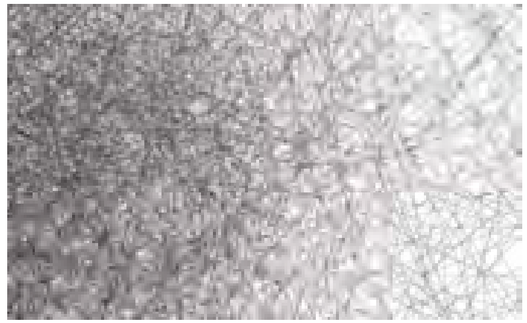
BY GUY SPRIGGS

The traditional idea of the science lab – white coats and bubbling beakers – does not begin to capture the reality of all the exciting developments taking place in UK's College of Arts & Sciences. While the labs do investigate so-called basic science and test core hypotheses, the work done by researchers at UK has the potential to solve a lot of problems relevant to day-to-day issues in Kentucky and the rest of the world. Scientists here address problems that span from health and nutrition to the environment, and various research projects involve more specific topics such as creating new energy resources and confronting issues of drug dependency. Their research may be divided by discipline, but answering the questions of tomorrow continues to tie these new developments together and create new opportunities for discovery.

Photo by Tim Collins

SUSCEPTIBLE SYNAPSES

Biology



In his lab, **Robin Cooper** tries to understand how neurons work and how they can be tuned up or down in order to decipher the communication mechanisms of the nervous system. By investigating how cells develop and how synapses act differently, **Cooper is able to ask new questions about the function of specific synapses** and discover why some are more susceptible to modifiers than others. Cooper is able to record and track development from a single neuron, which reduces variability and allows new questions to be asked about the application of basic principles in more complex biological systems. Instead of focusing on how his research can be applied to one specific question, Cooper instead uses his lab to show students the applicability of reductionist scientific principles toward answering bigger questions and to encourage future learning and research.

BRIGHTER ENERGY

Chemistry

John Anthony does his work in the field of semiconductor research, primarily confronting issues of energy supply through the development of solar cells. Anthony's lab is involved not only in the study of the capability of solar cells but also in the process of making the materials that are used to construct them. By testing solar cells, Anthony is able to develop solutions for increasing the efficiency and lifetime of the new generation solar cells, providing a marketable, low-cost product. **Anthony envisions high performance, lightweight solar cells that could be purchased at the hardware store** and attached to any roof to generate electricity. This research can help in solving a lot of the world's energy-related problems by providing low-cost, pollution-free energy on a commercial and consumer level.

UNRAVELING REGENERATION

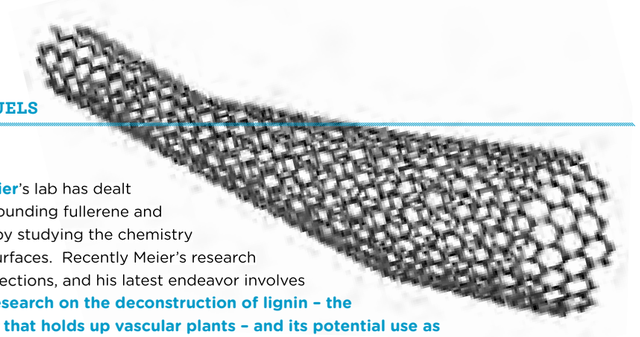
Biology

Randal Voss' lab uses functional genomic approaches, measuring the abundance of transcripts made from genes to learn about cellular processes that salamanders use to naturally regenerate tissues. Voss is part of a growing community of researchers that hopes to **unlock the secrets of limb and spinal cord regeneration.** To accomplish this work, Voss is characterizing all of the genes that are expressed in the large salamander genome, which is significantly larger and more complexly structured than the human genome. By describing the behaviors of genes during regeneration, Voss aims to translate information and re-engineer a regenerative response in humans.

COMBATING CONTAMINANTS

Chemistry

David Atwood's lab deals with issues of contaminant mitigation, sensing and removal in water, with arsenic as the primary target. The scientific methods used in Atwood's lab allow him to synthesize and tailor basic elements to create these selective receptors. With his understanding of these contaminating agents, Atwood is able to **design mitigating molecules or compounds with specific built-in functionality that can match up with unwanted elements** like arsenic, lead or cadmium. The next step in Atwood's research involves collaborative work on sensors that can detect levels of arsenic in real time to optimize water treatment systems. Since studies have linked arsenic to health problems such as heart disease and type-2 diabetes, Atwood's research is invaluable in determining levels of contamination and allowing water to be treated more effectively.



BUILDING BIOFUELS

Chemistry

For years, **Mark Meier**'s lab has dealt with questions surrounding fullerene and carbon nanotubes by studying the chemistry of curved carbon surfaces. Recently Meier's research has gone in new directions, and his latest endeavor involves **interdisciplinary research on the deconstruction of lignin – the structural polymer that holds up vascular plants – and its potential use as biofuel.** Working with horticulturalists and other chemists, Meier's experimentation revolves around finding an efficient method for cutting the polymer up so that it can be processed as a replacement for liquid fuels like petroleum, hopefully taking advantage of a solid waste that would otherwise be burned off. Meier's goal is to use chemistry to solve these difficult problems while demonstrating to students the importance of applying the chemistry they learn.

ID'ING ALZHEIMER'S

Chemistry

Mark Lovell's research combines elements of chemistry and molecular biology in order to develop new approaches to better identify and treat Alzheimer's disease. With the instrumentation in his lab and access to patients at different stages of development of the disease, Lovell works on **creating a better understanding of the potential causes of Alzheimer's and identifying novel biomarkers that could indicate its onset.** By looking in spinal fluid for biomarkers reflective of brain chemistry, Lovell hopes to find a chemical signature for the disease that would allow patients at risk for Alzheimer's to be identified before they begin serious cognitive decline. Lovell also researches oxidative damage in lipids, DNA and RNA in hopes of clarifying the causes of Alzheimer's and discovering ways to introduce therapeutic intervention methods early in the disease.

AWE-INSPIRING INSTRUMENTS

Earth & Environmental Sciences

The instrumentation in **Chris Romanek**'s lab deals primarily with isotope ratio mass spectrometry, which allows for a broad spectrum of applications in scientific fields from anthropology to zoology. By analyzing the isotope composition of materials, Romanek is able to answer questions about the life histories of ancient bivalves or even **assess whether or not biological factors were involved in the formation of extraterrestrial materials like meteorites**. Romanek's equipment can show how materials have been modified over a variety of time scales, but it also has more practical applications such as determining the natural or synthetic origin of anabolic steroids found in animals or athletes. With one of the best equipped labs in the eastern United States, Romanek is focused on solving questions that can be answered through the use of this instrumentation and sharing those skills with other researchers.

FOLLOWING THE FLOW

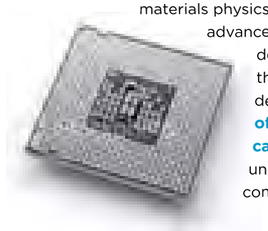
Earth & Environmental Sciences

Alan Fryar's work focuses on issues of water quality and water supply, and his time is split between fieldwork collecting samples and the use of analytical equipment in his lab, which he uses to investigate water chemistry parameters. Fryar looks at water quality issues regarding deep, regional aquifers with groundwater flow to streams and karst landscapes, such as those in Kentucky developed on limestone. By getting a better idea of how water-dissolved chemicals and bacteria move and react in the field, **Fryar is able to discover why contaminants affect water quality in some areas and not others.** Since these questions of water quality and water supply transcend the state and apply to other systems around the world, Fryar and his students have been able to confront water issues in western Kentucky and India, among other places.

WEALTH OF MATERIALS

Physics & Astronomy

Through his work with UK's Center for Advanced Materials, **Gang Cao**'s lab has found an important niche in the scientific community by filling a gap in the development of novel electronic materials. Cao is not only involved in the study of electronic materials and their capabilities, but also in their creation and development, meaning that his lab does not have to rely on outside sources supplying them with samples. Since condensed matter and materials physics has played a critical role in the technological advances that have changed our lives in the last decades, Cao emphasizes the bulk materials that are essential in creating new electronic devices. This research helps in the **creation of such things as faster, lighter, higher-capacity sensors and computer chips**. Cao's uniquely directed lab plays an integral role in the continued synthesis of these necessary materials.



INNOVATIVE INTERVENTIONS

Psychology

Mike Bardo's behavioral neuroscience lab researches predisposing mechanisms that may reduce and prevent drug abuse, primarily among adolescents and young adults. Bardo focuses on this specific developmental period because of the rapid brain growth that occurs throughout puberty and because adolescence is a period of heightened risk for drug experimentation. With his lab, Bardo hopes to be able to identify brain-related risk factors for dependency and **understand what causes some to develop drug abuse problems while others do not.** By finding the mechanisms in brain development that may predispose young adults to drug abuse, Bardo works to identify risk factors that increase vulnerability to drugs, thereby making it possible to intervene and help adolescents from developing substance abuse disorders.

MOUNTAIN HISTORIES

Earth & Environmental Sciences

With the electron microprobe in his lab, **David Moecher** is able to examine individual mineral grains in rocks and gather information on mineral chemistry that reveals the history of mountain belts and the formation and evolution of Earth's crust. This analysis can be applied to rocks in ancient seismic zones, helping Moecher to **understand how earthquakes rupture and providing information on seismic hazard mitigation.** Moecher's research also yields important information on the formation of mineral deposits such as gold, diamond or petroleum, allowing him to analyze how such deposits are created and understand what characteristics could be looked for in order to find them. Moecher's lab is the only such facility in the state, making it a valuable exploratory resource for Kentucky and beyond.

REDUCING RELAPSE

Psychology

The research in **Chana Akins**' lab focuses on the association between drug abuse and visual cues, particularly the high rate of drug relapse triggered by environmental stimuli. Akins looks at how environmental factors associated with previous drug use can cause drug-seeking behavior in rehabilitated users long after drug taking has ceased. This research contributes to more effective treatments that involve decreasing the influence of these cues during drug taking. Akins' lab also examines how drugs affect sexual motivation since such high-risk sexual behavior has serious health consequences related to HIV and other sexually transmitted diseases. By better understanding the relationship between these visual cues and drug use, **Akins hopes to minimize risky sexual behaviors as a result of drug abuse and find ways to extinguish the presence of factors that increase the possibility of relapse.**

STRESS SYSTEMS

Psychology

Mark Prendergast focuses on studying how stress hormone systems promote alcohol dependence, helping to understand brain behavior and function for the purpose of developing new therapeutic targets for substance abuse. With the technology in his lab, Prendergast is able to start from single, isolated brain cells and extend his findings to live animal models, investigating how drugs of abuse change behavior and chemistry on the most basic level and observing how blocking certain stress-related hormones or receptors can affect the development of alcohol dependence. Since unusual stress hormone response patterns are common in alcoholics, and since stress hormone systems have not been studied thoroughly as a therapeutic target for the prevention of alcohol abuse, Prendergast's research helps to **create a clearer picture of the effects of alcohol dependency and develop novel methods of combating drug abuse.**

Re-Try Sci-Fi

What has science fiction film taught us? Where will it take us?

BY GUY SPRIGGS

The classic images of science fiction are familiar to us all: flying cars zooming through futuristic cityscapes, spaceships traveling to the farthest corners of the galaxy and robots living and even working alongside humans.

These images are more than just fictional depictions of a possible future, says Stan Heaton, a graduate student specializing in film studies in UK's English Department.

What these fictional worlds actually show us is an entirely different dynamic for our planet.

"A lot of science fiction shows Earth as this one united thing," Heaton observed. "They don't really envision how much infighting there is on Earth."

Although Heaton says that science fiction is always very leery of the technology that surrounds it, the future it depicts is more than just a product of advanced science.

"All that futuristic, amazing technology assumes that people are working together to make this stuff happen, and that's not always the case."

When looking at science fiction films, Heaton notes a large disparity between how our current era was imagined in the past and how we actually live and, perhaps most importantly, how we travel.

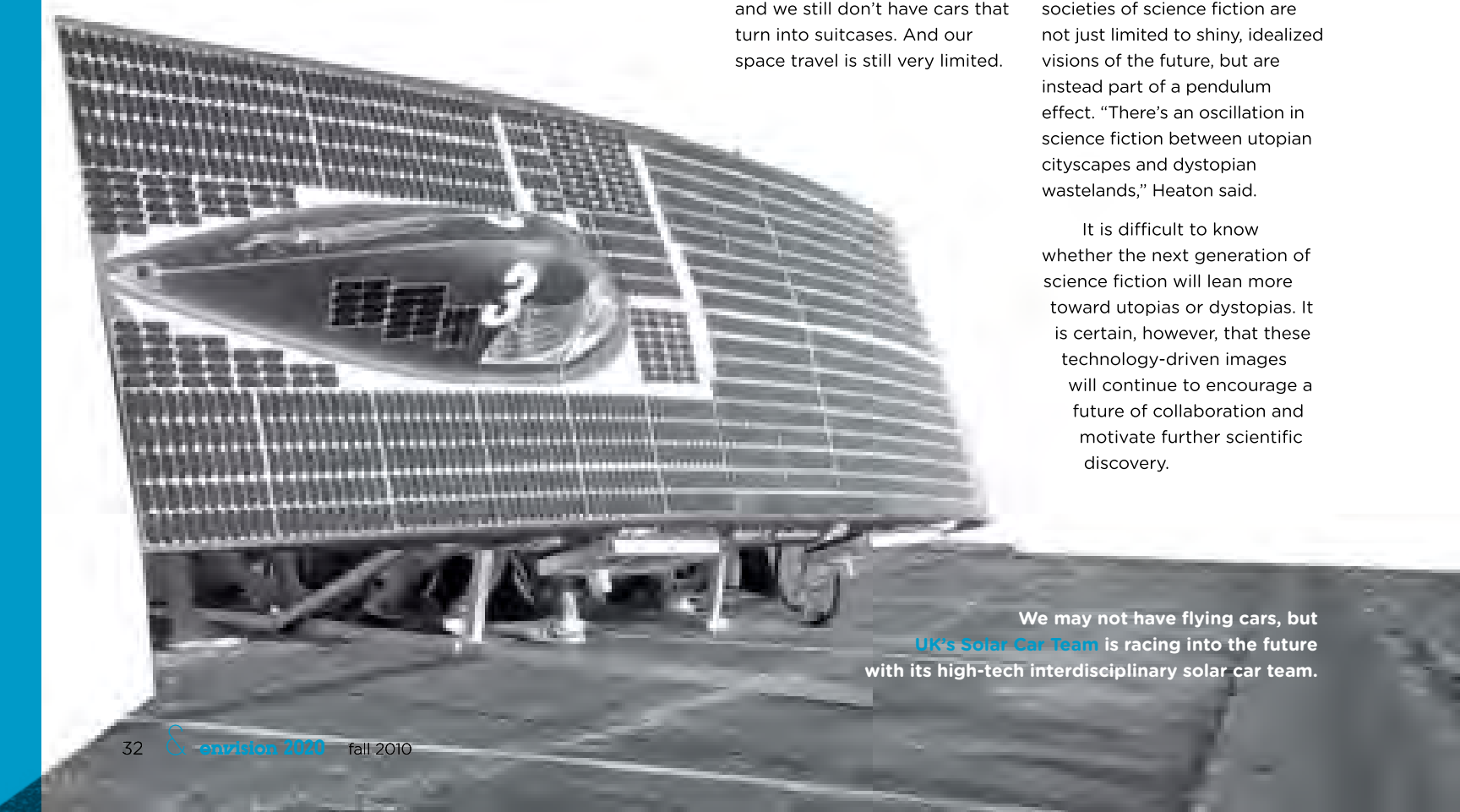
"Flying cars aren't here yet, that's the big one. 'The Jetsons' has been around for a long time and we still don't have cars that turn into suitcases. And our space travel is still very limited.

In '2001: A Space Odyssey' they go to Jupiter. We're not quite there yet."

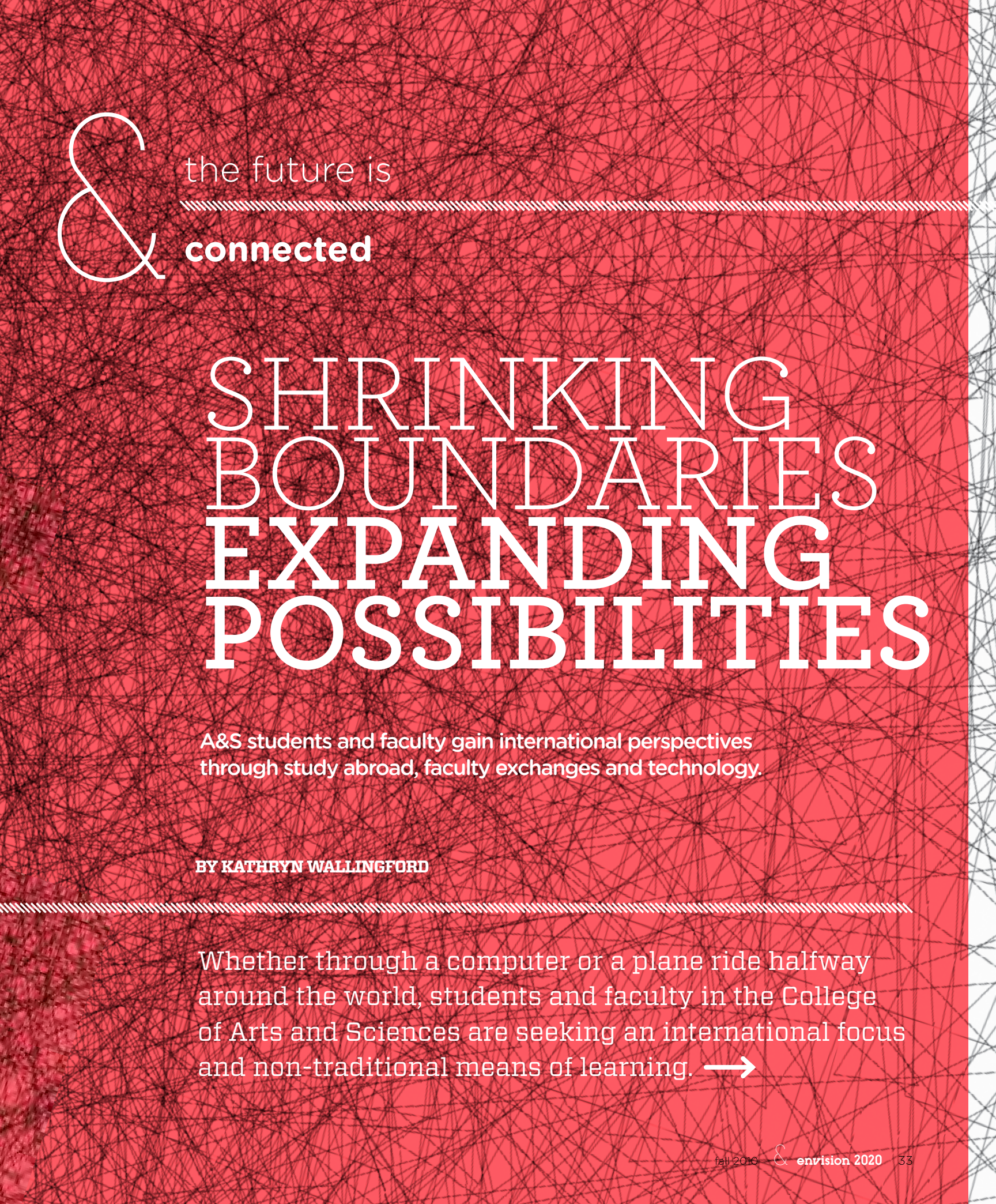
While science fiction makes it clear that new technologies and fuel sources are necessary for further space exploration, part of the disparity between science fiction and reality boils down to simple practicality. "What if people had to drive in three directions? That would be a nightmare. We don't want flying cars," Heaton said.

The "off the ground" societies of science fiction are not just limited to shiny, idealized visions of the future, but are instead part of a pendulum effect. "There's an oscillation in science fiction between utopian cityscapes and dystopian wastelands," Heaton said.

It is difficult to know whether the next generation of science fiction will lean more toward utopias or dystopias. It is certain, however, that these technology-driven images will continue to encourage a future of collaboration and motivate further scientific discovery.



We may not have flying cars, but UK's Solar Car Team is racing into the future with its high-tech interdisciplinary solar car team.



& the future is **connected**

SHRINKING BOUNDARIES EXPANDING POSSIBILITIES

A&S students and faculty gain international perspectives through study abroad, faculty exchanges and technology.

BY KATHRYN WALLINGFORD

Whether through a computer or a plane ride halfway around the world, students and faculty in the College of Arts and Sciences are seeking an international focus and non-traditional means of learning. →

Geographers Without Borders

Imagine you are walking through a rainforest at night, beyond city lights and within the quietness of massive old-growth trees. Occasionally you catch a glimpse of a glider flying low through the air, tiny spiders crawling along the branches of a strangler fig, or possibly a camouflaged python slithering through the forest litter.

While this could very well be a scene from James Cameron's latest blockbuster 3-D production, it is simply a description of a biology class in Australia's Cape Tribulation National Park led by University of Kentucky professor Ruth Beattie.

Every two years during UK's winter intersession, Beattie takes 15-20 university students to Australia to study its diverse ecosystems – from northern tropical rain forests in Queensland to the eucalyptus forests found in southern Australia. The course is listed as Bio 325 and is a three-credit-hour class, but differs significantly from biology taught with PowerPoint slides or Petri dishes.

Beattie first launched the trip four years ago, and feels it is a good introduction to studying abroad, "It is the first time many of these students have traveled outside of the country. I think it encourages students to travel again."

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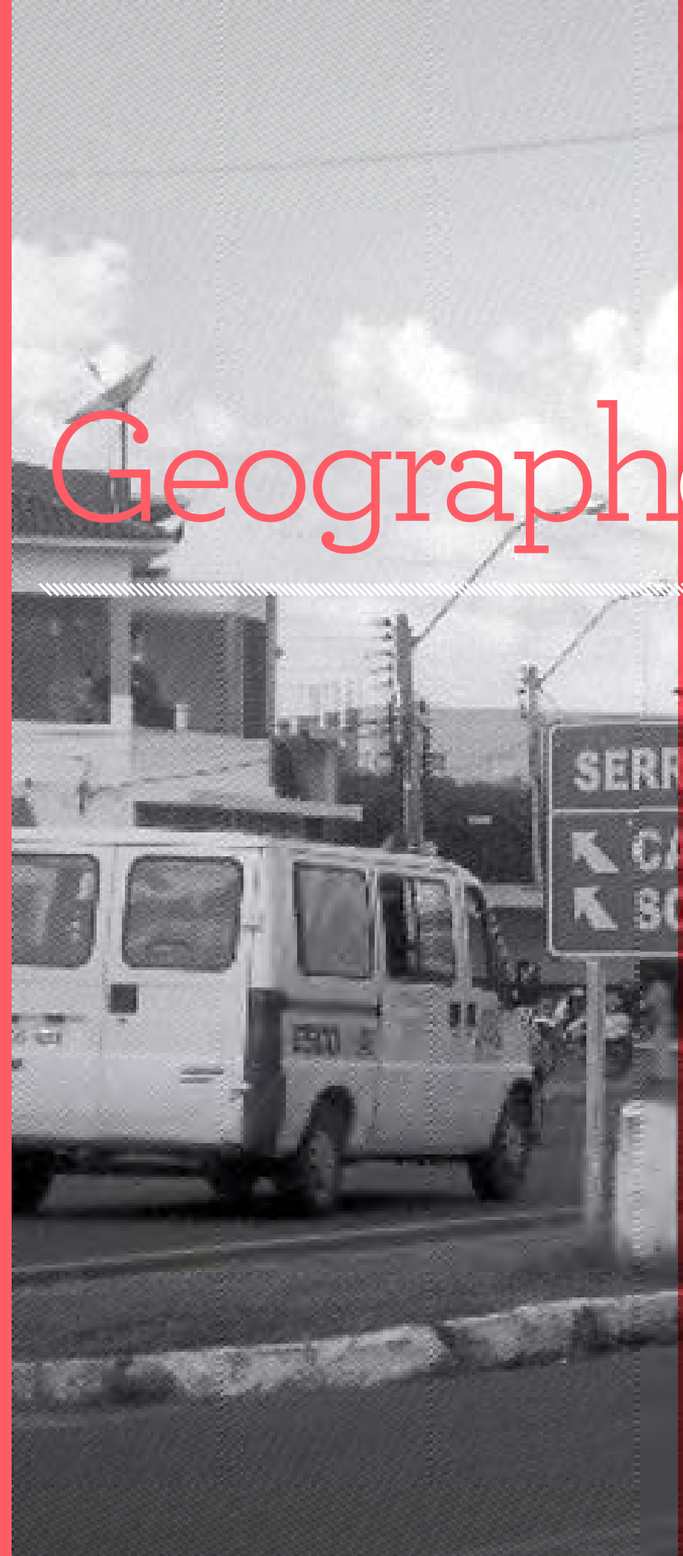

In a recent talk A&S geography professor Stan Brunn gave in South Dakota, he defined geography as a bridging, visual, inspiring, environmental, and humbling discipline. I asked him to explain more about these disciplines and why geography requires the integration of so many disciplines.

BY KATHRYN WALLINGFORD

Stan Brunn: The best way to look at geography is [that] it is a way of looking at the world; it is a perspective. It is a worldview, and that is different from studying some specific topic or specific theme, like plants or animals or human behavior. What geographers are doing is looking at plants, animals, human behavior or earth processes and looking at where those processes are, where those particular plants or animals and societies are and why they are located where they are. So, we are a way of looking at the world, just like historians have a way of looking at the world. But their way is temporary in time, hours and space. We are a bridging discipline with the humanities – arts, music, languages – which all have subject matter important to geography. But those disciplines do not study what geographers do. We study the awareness of all this. That is not a central question for human physics or biology, etc.

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Is it difficult bridging all these disciplines?

SB: I think it calls for a certain interest and talent. I think the students that come into geography or professionals in geography like this integrative aspect. We integrate both physical and social sciences and social sciences and humanities. All disciplines are going to integrate – physiologists borrow from sociologists – but we integrate in a different way. We integrate based on the awareness of something or the why of something. That is our central question. And it takes a certain person to want to answer those core questions.

As you look ahead 10 years from now, what do you tell your students who foresee a career in this field?

SB: Well, I think what sparks students' interest is awareness about something – an interest in where something is and why it is there. I tell students [that] if I were their age, I would learn Chinese and Arabic. When I was their age, I studied the Romance languages. I would also have a strong interest in environmental issues and GIS (Geographic Information System). Those skills can be used in the public and private sectors, local, global, any region, anywhere. That is the kind of advice I give geographers. There will always be a need for geographers and there will always be geographers. They might not always be called geographers. They might be called regional economists, social policy analysts, they may be called financial developers, they may be called UPAC (Union of Pan Asian Communities) engineers, but there is always going to be a need for this sort of knowledge, which is transborder and transdisciplinary.

What do you see to be the major opportunities and challenges for future geographers?

SB: The major challenge is going to be developing an international perspective. They all need to not plan to spend the rest of their lives in Fayette County or even the United States. We really need to internationalize this University and find a way for students to have an international experience. And I do not mean spending four days in the Bahamas or even a two-week mission trip in Nicaragua. You need a sustained commitment to international development and how people live and work. I think getting students out of their comfort zone where they have to learn another language and appreciate others that maybe have a different religious background and have a different faith experience and just different histories – it just makes you a better person.

FOCUS

...34 UK students are not the only ones gaining an international perspective.

In addition to Fulbright scholarship and international sabbatical research, last year the College of Arts and Sciences launched a Faculty Swap Program. Instrumental in its implementation and maintenance, Professor of Philosophy and Associate Dean of Faculty, Theodore Schatzki, spoke of this new program, "Science and scholarship are already international enterprises and becoming ever increasingly internationally organized. Faculty exchanges are a good means to discover, implement, and further collaborations. Faculty who travel to other countries also often teach and, of course, serve as ambassadors for the University. The faculty who come to UK as part of these exchanges also help expose our students to different ideas and viewpoints."

UK Geography professor, Stanley Brunn, who has taught in over a dozen eastern European and Central Asian countries, was the first to take advantage of this program. Travelling to Ireland's National University in Maynooth, Brunn commented on his faculty swap experience, "It is a win-win-win investment in my view: win for the College having faculty gaining teaching and research experience in other 39

The Classroom Down Under

UK professor shares her interest of Australia with students

BY KATHRYN WALLINGFORD

In Australia, UK students see life from a different perspective.

In addition to an evening spent with the nocturnal animals of Cape Tribulation National Park, during the first week in the Queensland region, travel guides introduce Ruth Beattie's biology class to plants and animals living in the Atherton Tablelands and along the Daintree River within Mossman Gorge. Students learn how the Australian organisms have adapted to the surrounding land, often exhibiting significantly different morphological features than their American counterparts. One example, the basket fern, has developed an ability to grow up to 6 feet in diameter high in the branches of the rainforest trees. This access to sunlight provides a significant advantage to the Australian fern, as opposed to growing in the darkness of the rainforest's understory. "It is much different from the ferns you see growing in Kentucky," said Beattie.

Beattie's favorite way to introduce students to the Australian rainforest is through Kuranda's Scenic Train. In her detailed syllabus, Beattie describes what students should expect: " ... travelling slowly, it winds its way up the epic pioneer track, with every turn revealing a new panorama ... until it reaches a cool, green, tropic delight of native shrubs, ferns, and flowers." After touring Kuranda's Butterfly Sanctuary and Koala Gardens, students then return using Kuranda Sky Rail, a gondola that transports students down over the rainforest.

"The whole experience is literally spectacular," Beattie recalls of the expedition. "Most tourists do not make it up that far. Then you are gliding over the whole rainforest without any buildings or roads in sight."

While in Queensland, students also swim among the barracudas and trumpetfish of the Great Barrier Reef, both in deeper, less commercialized areas along Mackay Reef as well as in the shallower, more damaged section of Michaelmas Cay. "Here students gain an appreciation for the huge diversity the reef offers and the impact of human activity," said Beattie.

During the second week, students travel to the arid Blue Mountains and Featherdale Wildlife Park of Australia's outback. Staying in Sydney, students also have a chance to tour the Sydney Opera House and the site of the 2000 Olympics, Homebush Bay. Although Beattie admits that "Australia is a great place to study biology," she also hopes students will appreciate the cultural diversity Australia has to offer. "Sydney is such a metropolitan area. The number of ethnic restaurants, for example, is eye-opening for students."

Bio 325 offers a much different experience than a normal biology class, but this does not mean that students are not held to the same academic standards. When they are not doing outside readings and writing academic papers, students record their own thoughts in a daily reflective journal. "It allows students to really process what they are thinking and feeling," Beattie explained.

Although the trip is filled with a challenging and rewarding itinerary, travelling across the world is not cheap. UK's study abroad program offers scholarships to help support students, and last year CCSA awarded $500 to the winner of a CCSA-sponsored essay contest. Many students also seek assistance from UK's financial office.

Beattie typically teaches large-enrollment, freshman-level biology classes and has received numerous teaching awards as an instructional specialist, but welcomes the change in pace in Australia. Beattie explained, "Big classes are very anonymous. Through this trip, we get to see different sides of each other."

Almost two years away, Beattie is now looking ahead with excitement to the 2012 trip. She encourages interested parties to contact her for more information on how one can study biology – and see a different side of the world – outside of the classroom.

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universities; win for the faculty member who will work with colleagues on research projects and also may recruit students to come to UK; win for students – UK students have a faculty member who can share multicultural and international experiences with undergrad and grad classes and good for the international university to have an American professor teaching classes."

This fall, Brunn's "Engineering Earth: The Impacts of Megaengineering Projects," for which Brunn is editing, will be released through Springer Publishers. This 126 chapter collection from authors from over two dozen countries and from social, environmental, and engineering fields explores the ramifications of mega-engineering projects, such as Brazil's Trans-Amazonian highway, on community's culture and environment.

"One of the main reasons I am working on this project is because all research working on this project are operating from what I call parallel universes. Engineering side often does not interact with the social side and the social side often does not work with the environmental scientist. So I want this book to be an intersecting of all of them and I think that would be the success of it," Brunn said of his collection.

41

Students Travel via Technological Bridge

Geography department taps into international expertise utilizing modern classroom advances

BY KATHRYN WALLINGFORD

Tevis "Garrett" Graddy will soon earn her doctoral ranks. Like many who choose the path of academia, Graddy has lived and breathed (and will soon defend) her dissertation. This fall, Graddy is teaching Geography of Central and South America and the Caribbean as well as the honors track Space, Place, Culture and Geopolitics in the Department of Geography. In Spring 2011, she will serve as a visiting professor at Minnesota's Carleton College. As a young academic, she looks ahead to the future with her own thoughts on teaching geography and the creation of the Geography Via Film Series.

"Travelling has always been a priority," said Graddy. "Instead of saving money to buy a house, I used money to go overseas. And when I was in different countries, I really focused on long-term stays, living and working in the community I was in."

Her travels have taken her to India, across the continent of Africa, and throughout Europe and Central America. Although she has seen a good portion of the world, her dissertation research focused on Andean and Appalachian seed-saving practices and understanding how communities' ecologies, religions and philosophies influence small-scale sustainable agriculture. Graddy spoke of her research: "I am interested in learning how people receive local knowledge and how globalization interacts with local lifestyles and traditions."

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Photo by Lee Thomas

...39 Currently, faculty exchanges are being coordinated with UK College of Arts and Sciences and the University of Western Cape in South Africa and Shanghai University so others, like Brunn, may continue to enhance their international focus.

For those not able to make it across seas for credit hours or as a visiting professor, classroom pedagogy is becoming increasingly favorable to global communication. Last year, PhD candidate and Adjunct Geography professor, Garrett Graddy, and fellow graduate student, Karen Kinslow, began the Geography Via Film series.

Using the medium of "participatory documentaries," each semester Geography graduate students choose a specific theme important to the field of geography and show a group of corresponding films. For instance, in Spring 2009, Graddy and colleagues featured the Appalachia, Q'eros of Peru, and Oaxaca, Mexico, communities in a series titled "Inter-local dialogues: Across the Americas." After each films viewing, students arranged discussions with film makers, most often through videoconferencing.

As described on the project's website, the series was "born of a simple frustration." Graddy and Kinslow explained, "so often the case in modern academia, good questions are being asked 42

...41 and then answered within the relatively insular confines of respective academic disciplines and even sub-disciplines—without much communication or conversation with people in the larger communities, or even in other areas of study."

Although the film-screening occurs outside of class, it becomes an ideal enhancement to traditional teaching methods. "Ideally, teaching would be taught through travelling. However, this is not always possible. Technology becomes a way to communicate and allow the study of geography to become more of a study with people, not about people, and how we can learn from them," explained Graddy.

Graddy and other Geography professors, including Sue Roberts, have also expanded classroom teaching beyond textbooks. Last year, both professors used videoconferencing to enrich student's learning and supplement class readings through Skype conversations with international non-governmental organizations (NGOs), film makers, and activists pertinent to their course's discussions.

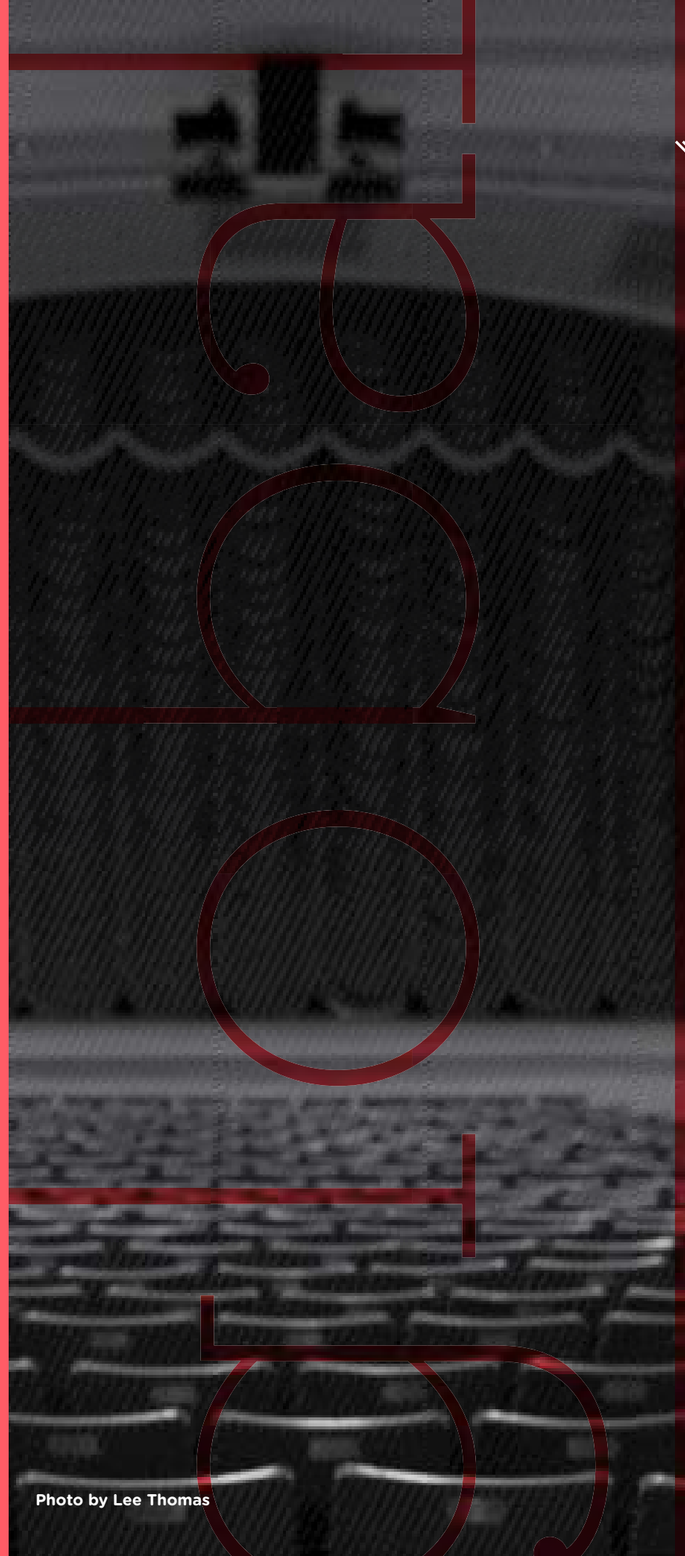

Photo by Lee Thomas

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With a master's in theological studies and proficiency in the Spanish language, Graddy's experiences bring a lot of depth into the classroom.

Although she wishes she could transport a class of 75 to the Peruvian Andes, she knows this is not a reality. Participatory documentaries and videoconferencing have become the next best thing. The dialects and emotions of the individuals on the other side of the screen tell the stories better than words in a textbook.

"As a student and a teacher, I saw how static textbooks were and how they close more doors than open. This generation of students is very technologically savvy, but they are used to having information very accessible. Long reading comprehension is unpracticed. Showing a video or having a Skype conversation with another party in conjunction with social theory is a good way to plow through an article," Graddy said.

Graddy first practiced this teaching method when she co-founded and coordinated the Geography Via Film Series. The first series, "Inter-local Dialogues: Across the Americas," introduced films in line with Graddy's area of expertise – understanding the similarities across communities as cultures interpret economic, political, social and environmental exploitation. Graddy chose films from the Appalachia region, including the "Up the Ridge Film," a story about the racial tension between staff and inmates of Wallens State Ridge Prison System. Latin American documentaries such as "Tinkuy," a film that discusses Q'eros , Peru and its communication with the "outside world" as told by filmmaker Fredy Flores Machacha, were also included.

After each film's viewing, Graddy invited the filmmakers for a post-film discussion. For those that could not travel to Kentucky, Graddy coordinated Skype conversations and translated when Spanish became the primary language.

After the series' completion, Graddy found that the ability to converse with filmmakers from around the world brought a lot of clarity to the film's discussions and the purpose of the series.

"All of a sudden there was a lot of similarities between the different cultures and there was a moment of solidarity. We had meaningful discussions about what 'developed' means and these cultures became more than communities defined as poor people," she said.

This winter, in between her teaching appointments at UK and at Carleton College, Graddy will travel to Bangladesh with her family. "Bangladesh actually has the largest seed-saving banks in the world. It is a great place for me to conduct post-doctoral research," Graddy explained.

Although she might not be able to take her students with her, the culture and communities will one day be transported to Graddy's classroom. The sounds, images and voices will come alive through video – this generation's next best thing to travelling abroad.

OMG, is text messaging changing the English language? :-o

BY GUY SPRIGGS

According to CTIA – The Wireless Association, Americans sent over 150 billion text messages per month in 2009. Because of the abbreviations and acronyms frequently used in texting, some worry that the English language is undergoing a disastrous transformation.

But the undoing of English by text messaging is highly unlikely, says linguistics professor **Rusty Barrett.** "In terms of actually changing the grammar, it doesn't seem that there is anything going on," Barrett said.

"It's two myths that come together. First is [the myth] that new technology is going to uproot normal society, and [second] is the really common myth that young people are changing language and that the way they speak is going to ruin things."

According to Barrett, the vocabulary used in texting is no different from other slang terms that grow and fade in usage. "[Another] good comparison is secretarial shorthand: it is just an abbreviated way to represent spoken language and it doesn't alter the way in which its users actually speak," he said.

People often confuse how their language is written with the language itself, but writing is just a representation of the language, Barrett says. In other words, the norms used for writing don't necessarily coincide with how the language changes.

There has been a shift in grammar that involves sentences without an overt subject – "Waiting for the phone to ring" – that can be seen in technological contexts like updates on Twitter or Facebook, but Barrett says that these usages are restricted to those specific areas. "You find it in television journalism in sentences without an actual verb. But people don't talk like that outside of that particular context."

Despite the spread of communication technology, Barrett says that English seems to be changing at its normal speed. And while there are significant changes taking place in the English language, the lasting effects of text messaging are likely to be minimal.

So for now, it's likely that the only thing any of us really have to fear from texting is an inflated phone bill.

Common texting phrases

BTW
by the way

FWIW
for what it's worth

GR8
great

IRL
in real life

J/K
just kidding

LOL
laugh out loud

OMG
oh my God

TMI
too much information

WYWH
wish you were here

The popular blog, How Not to Act Old, confirms the efficiencies of texting using your thumbs

"Old people behavior of which I am guilty: Holding your phone at arm's length (so you can read the numbers and letters, natch!) and then typing with your index finger. No no no no. You've got to pretend your index finger doesn't even exist. Forget the middle, ring, and pinky fingers too. The young way to dial your phone or to text or type on your BlackBerry or iPhone is with your thumbs. Yes, all with your thumbs..."

http://www.hownottoactold.com/2008/07/28/81-learn-to-type-with-your-thumbs/

Preparing Students for Today's World & Tomorrow's Challenges

The new Division of Writing, Rhetoric, and Digital Media launched Fall 2010

BY COLLEEN GLENN

We live in an age of communication. From writing to speaking to texting to social networking, we are constantly communicating with others. The way that we communicate — the words that we use, the style with which we deliver them, and the mode of delivery — determines the impact and effectiveness of our messages. ¶ Realizing the importance of training students to be skilled writers and communicators, educators across the country are beginning to place a top priority on the study of written and spoken language. At the forefront of this movement, the UK College of Arts & Sciences has launched the Division of Writing, Rhetoric, and Digital Media.

"Rhetoric," **Roxanne Mountford,** director of the new division, explains, "is a term that encompasses all forms of communication."

Departments that specialize in the study of writing and rhetoric understand that the ability to use language effectively gives people a competitive advantage in all aspects of life.

"When surveyed, most businesses and organizations place communication (in writing) as their top priority for new hires," said **Jeff Rice,** incoming professor of writing and digital media. "This is the information age. We hope to work with students so that they will be prepared for the communicative challenges they will face in their future, whether they stay in Kentucky or move elsewhere. How will they produce information? How will they share it with others? What kinds of collaborative situations will they be placed in? Which media will they work with? We are the program to help students with such issues, whatever area of study they are pursuing."

"Writing is no longer considered to be just a flat print medium," Mountford said. "It also includes visuals, design and audio essays. We will develop all these areas across the spectrum of the curriculum."

Students can expect to see course offerings such as Writing for the World Wide Web, African-American Rhetoric and Writing for Documentary Film. As it grows and develops its cutting-edge curriculum, the division will also absorb what had been the Writing Program's general education writing classes and upper-division and graduate courses in writing and rhetoric.

The division will also have a community focus. For example, new faculty members **Vershawn Ashanti Young** and **Adam Banks** have led free seminars for community members, and Mountford herself has been involved in community writing projects for low-income youth.

Five distinguished faculty, three distinguished lecturers, and a postdoctoral scholar have already been hired — an achievement that has drawn national attention. Typically, it can take years to build such a critical mass of new faculty, but with the support of the **dean of Arts & Sciences, Mark Kornbluh,** and **Provost Kumble Subbaswamy,** UK has managed to make this important and exciting change within one year.

"The people we hired, they're all top in their field," Mountford said. Noting their stimulating and varied research interests, she adds, "They're trendsetters."

Eventually, the division plans to offer both an undergraduate and doctoral degree in writing, rhetoric, and digital media. "I think it will be enormously popular because it will help students develop expertise in an area that they can take out into a career," Mountford said. "It's a humanities degree with a practical application."

The Division of Writing, Rhetoric, and Digital Media is on track to become nationally recognized among rhetoric and composition programs. "With the quality of the faculty that we have and are bringing in, we're poised to surpass many longstanding programs in rhetoric and composition," Mountford said. "And it's because we have top faculty that we are able to draw a very exciting pool of students."

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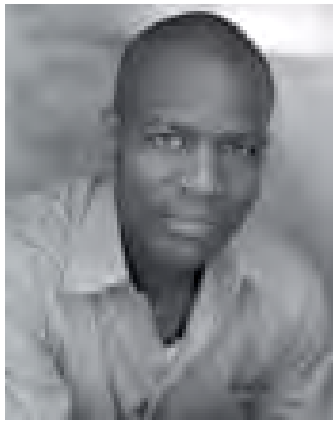
The Division of Writing, Rhetoric, and Digital Media
New Faculty Hires



vershawn ashanti young

Ph.D., University of Illinois, Chicago

Professor Young specializes in black performance studies and African-American communication, paying close attention to issues of class, politics, sexuality, and urban education. He is currently working on the public performance and reception of famous African-Americans such as Barack and Michelle Obama.

adam j. banks

Ph.D., Pennsylvania State University

Professor Banks studies and teaches African-American rhetoric, new media, and technologies. Deeply invested in community education, Banks has designed and delivered free courses for the African-American community in Syracuse, NY, where he has most recently taught at Syracuse University.

janice fernheimer

Ph.D., University of Texas, Austin

In addition to teaching rhetoric, technology, and pedagogy, Professor Fernheimer specializes in Jewish rhetoric. Her current book project focuses on a community of black Jews in New York and how language and speech are used to deal with issues of authenticity and identity.

jeff rice

Ph.D., University of Florida

Jeff Rice's career focuses on new media, pedagogy, and rhetoric. Professor Rice's expertise in digital literacy has taken him from the university classroom to the urban landscape as he engages in the research of communications and networking. (Joining UK in Fall 2011.)

jenny edbauer rice

Ph.D., University of Texas, Austin

Jenny Edbauer Rice deals with public controversies, particularly the ways in which people discuss changes in urban space. Inspired by changes she saw occurring in Austin, TX, Professor Rice pursues ethnographic work that engages in how issues such as neighborhood gentrification and urban use are debated in the public sphere. (Joining UK in Fall 2011.)

& the future is

engaged

In Their Own Backyard

BY KATHRYN WALLINGFORD

Over the next 10 years, university scholarship will emphasize methods of teaching that extend beyond classroom walls. However, as more classes focus on international perspectives, global communication and social networking, many university professors will still focus their efforts close to UK's campus, and face-to-face work will continue to be a vital component of teaching and research. →

Missing Piece to the Puzzle

Cristina Alcalde investigates the male component of domestic violence in Latino communities.

BY KATHRYN WALLINGFORD

With the recent release of "The Women in the Violence," Gender and Women's Studies professor Cristina Alcalde speaks of her latest research direction and provides valuable insight on what it takes to be an anthropologist and a scholar of gender studies in the 21st century.

NEW DIRECTION – THE MALE PERSPECTIVE

When asked about her hopes for "The Women in the Violence," Alcalde said, "The book might not change the situation for many of these women, but I hope it might change the way people think about things."

In fact, it changed her own thinking. In writing this book, Alcalde realized a major component was missing from her work: the male perspective. Feeling this side would jeopardize her relationship with the women of her research, Alcalde chose not to address that angle. But now, years later, Alcalde said, "I am now emotionally ready to include that perspective."

Her understanding of the male gender is currently being explored through her work with a local Latino battered intervention group. Although the men of her study have been prosecuted for acts of violence toward domestic partners and court-ordered to attend weekly meetings, she believes "there is so much more to their lives." While she certainly does not excuse their actions, she feels the complexities of their lives must be understood. "We need to see Latinos as a part of Kentucky and understand their experiences. How has migration changed fatherhood and these men as gendered beings? How has their perception changed of who they are? We do not have a good understanding of their experiences," she said.

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Photo by Richie Wireman

focus

In this section, we take a look at chemistry professor **Mark Watson**, physics professor **Joseph Straley**, and gender and women's studies professor **Cristina Alcalde** and the ways in which they are demonstrating that face-to-face research and interaction are still relevant.

In addition to Watson's research with the production of ambipolar materials and Straley's interest in condensed matter physics, each professor has developed methods for teaching science effectively to local elementary and middle school students. And, with a new book coming out in September about women's experiences with domestic violence in Peru, Alcalde is now turning to local Latino populations to address issues with the male gender, focusing her study on Latino masculinities.

Although ranging from the hard sciences to understanding the complexities of gender constructions, each professor's objective is what Alcalde has often referred to as "dispelling myths." To Alcalde, this means breaking down stereotypes that often accompany Hispanic populations and bringing depth to the life stories of this marginalized group. For Watson and Straley, dispelling myths involves debunking the belief that science is unapproachable and too complicated for young minds. Their local outreach work reminds us how fun science is for young kids. To all three, the value of fieldwork, personal connections and interaction with local communities will be a driving force behind their future local research endeavors. 53

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Alcalde hopes to gain this understanding by observing court hearings and the weekly meetings, as well as conducting in-depth interviews with these men. One day, she would like to include Peruvian males in her study and their experiences with fatherhood and migration.

LESSONS ON BEING A RESEARCHER

As a daughter to an international relations professor, Alcalde travelled a great deal growing up. She quickly observed that "people are treated differently in different parts of the world." Now as an anthropologist, a women's studies scholar and a Latin American woman, Alcalde is in a unique position. She studies the culture and the gender she identifies with most closely. Alcalde explained, "I feel a personal commitment to the Latin American community. Although most Latina/os in this region are from Mexico and I am from Peru, I am also Latina."

This proximity gives her an innate drive to help empower the lives she studies. However, Alcalde also recognizes that she is an academic. She spoke of this relationship: "it is complicated working with people; we have biases. It is important to be passionate, but we also have to use research. There is tension between advocacy and academia, but it is a positive tension."

In order to balance being an advocate and an academic, Alcalde believes in giving back to the community she is studying. Although she recognizes she will always be an outsider, she wants to be more than a person taking notes. While interviewing the women for her book, she also worked at the shelter. According to Alcalde, "It was important for me to be more than just a researcher and be a part of the culture I was studying."

In Lexington, as she observes the meetings for the battered intervention group, she extends an open invitation for the men to speak with her individually after each group session. She said, "I want a chance to hear about their whole life." By conducting field work in this manner, Alcalde hopes to listen to these men one-on-one, rather than as an outsider looking in.

THE FUTURE

Alcalde looks forward to as many chances she has to get out in the field. As she explores more about Latino masculinities, she wants to be a central part of the population she is studying. Although over the next 10 years the importance of online communication will only continue to grow, she said, "Face-to-face work will not lose relevance. I am working with a marginalized community and people that are not as privileged. We can't assume all people have access to computers and technology."

She also recognizes a vital need to publish her work in Spanish. "In academia, everything is in English, but English is not always the primary language." In 2008, Alcalde published "Visiones del Perú de académicos peruanos en Estados Unidos (Visions of Peru of Peruvian Academics in the United States)." Alcalde would like to see a Spanish translation happen with "The Women in the Violence" as well. "I want this knowledge to be more accessible," she said.

Alcalde enjoys seeing these same passions in her students. "I love to see students really want to change things," she said, "especially when they are able to be passionate about issues that are socially relevant."

As Alcalde prepares these students for their own field studies, she will teach them the lessons she has learned. To her, "dispelling myths" and balancing the positive tension between academia and advocacy begins with face-to-face work. Local interactions and personal connections are the key to making knowledge more accessible.

Photo by Richie Wireman

Meet the Professors

cristina alcalde

Cristina Alcalde's research spans from interests in domestic violence to Latin America to Latino masculinities. Alcalde says of her depth of study, "Although my work covers a broad spectrum of interests, all my areas of interest focus on resistance strategies and how people cope with difficult situations."

In Fall 2010, "The Women in the Violence: Gender, Poverty, and Resistance in Peru" will be released through Vanderbilt University Press. The book is a culmination of more than eight years of research in which Alcalde returned to her home country to tell the life stories of Peruvian women and their experiences with domestic violence. In this work, Alcalde informs readers of the "different forms of violence" and "extra layers of fears" that intersect physical violence. Alcalde hopes the book will reveal the lives of these women as creative, rich and resistant as they negotiate structural, institutional and emotional hardships in addition to physical oppression.

Alcalde's book is a testament to the complexities of life stories – stories that can't be told through a linear and predictable lens. The experience of writing the book has led her to her newest field of inquiry: working with Latino males. Alcalde hopes she can now gain a new perspective on gender construction through the male experience as they address issues of migration, fatherhood and identity formation. 54

Meet the Professors

joseph straley

As a young boy, Joseph Straley observed as his father led "public science shows." When he began his own career at UK, he said, "I became the guy that did it." He explained, "About 20 years ago, we would set up physics demonstrations on football Saturdays. It was a variation of UK's AweSome Week. So, visitors would come to the university and see physics beneath their eyes, but here were also other departments putting on demonstrations. It dawned on me there was competition. So, I started doing it in a more organized way and somehow the Petting Zoo got started."

The Petting Zoo consists of hands-on physics activities that teach the concepts of mechanics, magnetism, optics, electricity and pressure. The zoo was completely designed by Straley and is made up of household materials, including items such as plungers, batteries and plywood. Although the zoo is instructive for individuals of all ages, it is targeted at elementary and middle school students.

When Straley first began the zoo, he and colleagues would travel all across Kentucky to assist with the demonstrations. However, he soon found the time spent on the road was taking away from his lab and research. Because he had such a strong commitment to helping people teach science and understand basic physics principles, he developed online virtual workshops for teachers and graduate students that emphasize the same concepts found in the Petting Zoo. 57

My Morning at the Petting Zoo

BY KATHRYN WALLINGFORD
PHOTOS BY MARK CORNELISON

When I told a friend I was going to observe Dr. Straley's "Petting Zoo" at Lexington's Liberty Elementary, she replied, "Oh, that's awesome. I wonder if they will have cute ponies." As I arrived at Mrs. Fehr's class that May morning, one would guess by the laughter that the Petting Zoo was just that – a room full of lamas and koalas and other small creatures. But as I entered the classroom, I found groups of third and fourth graders hovered over tables, mesmerized by what looked like pieces of plywood, magnet and wire – not the feel of some furry animal.

As I entered the classroom, a voice in the back of the room said, "Okay, class. It is time to begin. Please give your attention to Dr. Straley, our visitor from the University of Kentucky who is here to teach us about physics today."

With a distinctive white beard and commanding presence, Straley walked to the front of the classroom and began: "Physics is the study of how everything in the world works. Some of the world's greatest inventions were made possible by the understanding of physics. Rather than giving you a speech, we have 25 things that do something interesting. We need more people like you at the University. So, here is an invitation to join our team."

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The kids looked around the room, a little dismayed with the lack of instruction. "So, let's get started," Straley added encouragingly, noting their hesitation.

Although I was just there to observe, I could tell that some kids were looking to me (an "adult") for an explanation; but I was just as apprehensive as they were. However, it looked like instructions were included with every activity, so I approached the closest table and read the first label I saw. It said, "Bottle diver - When you squeeze the bottle, the divers go to the bottom. Can you tell why? Observe carefully. What happens to the direction ... It sinks!"

Hmm. I thought to myself. Why was it sinking? A little panic crept inside of me and I recalled with slight terror my own struggles with middle school physics.

Perhaps the boy at the station sensed my apprehension when he said to me knowingly, "There are holes in the bottom. That is why it sinks."

Of course! Why did I not think of that? Smart kid.

After this first lesson, I saw Dr. Straley standing in the back and approached him. We had spoken a few weeks earlier and it was good to see in action what he had been describing in our earlier visit. After exchanging hellos, I asked, "How do you think students are doing with the activities today?"

He looked down at me and said with a grin, "They are figuring out the puzzles."

I was hoping for a more detailed summary, but we were interrupted by a boy who ran up to Straley exclaiming, "It's all upside down!" The boy was holding a large wooden contraption that read "model camera activity."

Straley's smile got a little bigger. "You have been looking at the world upside down your whole life." The boy looked up at him, a little bewildered. "You see, light changes directions and gives you a different view. It is about how light moves when it hits the surface. Mirrors and lenses make light go in a new direction; photography is redirecting the light."

The boy looked down contemplatively and said "Ohh." A girl from his group, screamed, "Paul, come on," and Paul put the model

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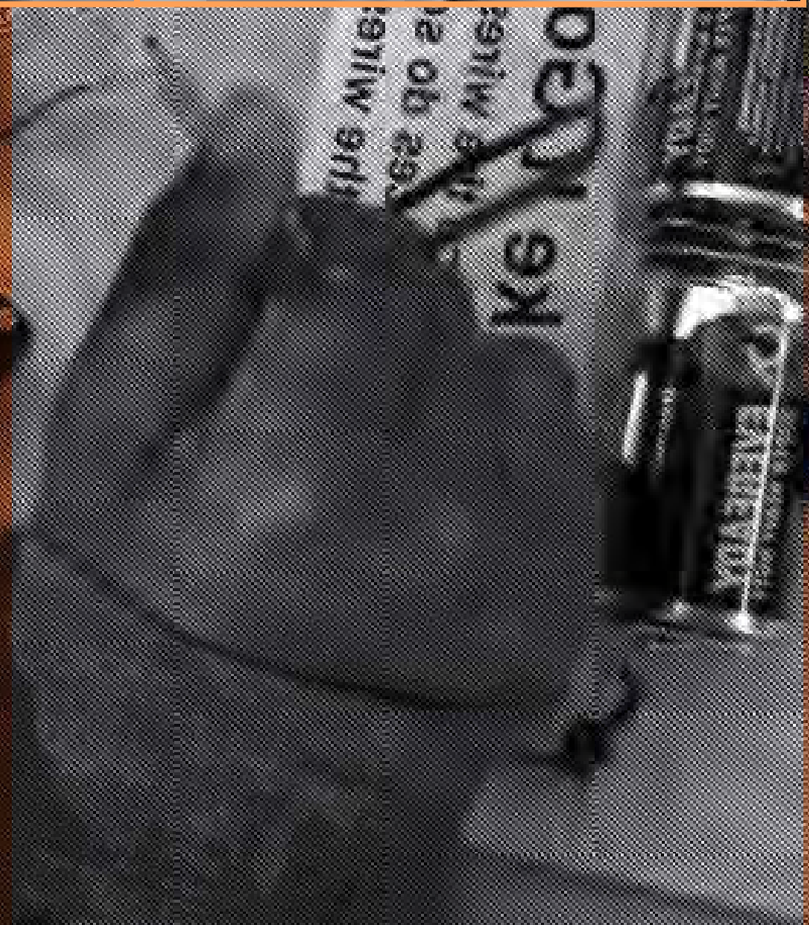

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Although Straley values the online component and feels it is a "better way" to disseminate information resourcefully and effectively, he still enjoys taking his Petting Zoo on the road. He said of the traveling Petting Zoo, "It becomes my lab. It is where I found out what works, what is breakable." Kristi Fehr, an elementary science teacher from Lexington's Liberty Elementary who has seen the zoo in action, says of the experience, "It leaves a good first impression. They might not totally get all the concepts at first, but they have an excellent introduction."

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camera down and hurried along to join his team members.

I then heard the sound of a buzzer, and Mrs. Fehr said, "All right, it is time to move to the next station." Students did not seem to budge, their heads still focused on the gadgets sprawled across the tops of their tables. Mrs. Fehr repeated, "Class, we have to move stations now. You have other activities to complete." I caught a glimpse of Dr. Straley in the back of the classroom with a grin on his face, talking to a student holding what looked like a toilet plunger.

After the students rotated to a new station and began examining the table full of "zoo" activities, a young girl screamed at me, "You look huge!" I laughed at such a bold statement. She placed the Fresnel lens down and exclaimed, "This is really cool!" I guess I looked a little skeptical. To me, it looked like a piece of plastic. She brought it up to my eyes and encouragingly said, "See?" She was right: everything looked different and BIGGER. I giggled a little myself.

I then felt a soft tug on my sleeve. I turned around and saw a boy holding a wooden box shaped like an "S." Again a little nervous I would not be able to recall my own understanding and interpretation of physics, I quickly read the box's accompanying instruction. "How does this device work, what could it be used for?" was all it said. Darn, no help there. The boy then proceeded to turn his back to me and put the wooden box up against his face. He then turned around and sad happily, "It is like a rearview mirror in my mom's car. I can see you!"

I then mimicked the boy's actions. He was right. I guess all I had to do was try it out.

As the 30-minute period progressed, the students continued to not only enjoy the activities, but also excitedly share their observations with the adults in the classroom. When the end of the session approached, the bell chimed once more and Mrs. Fehr said to the class, "Sorry, but time is up. We have another class waiting outside." A few moans followed this announcement. "But, we do have a few minutes for questions," she said.

Immediately, a majority of the hands in the room flew up and Dr. Straley combed the room, still grinning. After he pointed toward a girl in the front of the class, she said, "I am not sure if I did this right," and held up a piece of wood with red and black wires dangling from the surface.

Straley walked toward her and looked at her reassuringly, "Great, I get to tell you about electricity."

Holding the different set of wires in his hands, Straley continued with his lesson: "Something is moving down the wire. It tells us which way the current is going. In this case, light and sound are formed from the energy in the batteries."

He then turned to another student, who waved one hand frantically and pointed to what appeared to be a large shadow box displaying a hammer and doorbell. "Oh, yes," said Straley, "This is one of my favorites. Energy at work. It is best to pull the string as the hammer approaches the bell. See?"

The student pulled the string and smiled up at Straley. "Ohhhh, okay," she said to him confidently.

Mrs. Fehr smiled at the class apologetically and said, "Sorry kids, but we really have to make space for the next group."

A couple kids approached Straley for one more chance to speak with him and others continued to play with the activities. Some found their way to the door. As Mrs. Fehr politely coaxed all the children out of the classroom and made room for the incoming class, the new students looked at the Petting Zoo with apprehension. I knew, however, that in just a matter of minutes they would be teaching me about physics, surprising themselves with delight and reminding us all of the simple joy of science.

Preserving Scientific Minds

Summer Chemistry camp maintains interest in science

BY KATHRYN WALLINGFORD

PHOTOS BY SHAUN RING

I recently stepped in on a planning session between Professor Mark Watson and the Community and Education Coordinator of Lexington's Explorium, Katherine Shaw. Preparing for the Explorium's second annual week-long Chemistry Summer Camp, Watson and Shaw talked lightheartedly about what gets young kids excited about learning about concepts such as viscosity, electrolysis and recrystalization. They both agreed (without a doubt) that science really is fun for young kids. The challenge is keeping third and fourth graders engaged throughout their academic career. "We do not have to build an interest in science, just not squash it," Watson said.

As the kids competed with experiments that require slimy tadpoles and growing fish, Watson shared a few lessons he has learned as an educator and a father. According to his experiences, building a strong foundation in science learning in a field in desperate need of bright young minds starts with a few basic principles.

→ So, what works?

Meet the Professors

mark watson

For the past several years, Mark Watson has been creating science workshops that embrace children's innate curiosity and developing scientific minds at Lexington's Explorium. Believing "all children are born a scientist," Watson hopes his workshops will cultivate future engineers and chemists. In the summer of 2009, he developed a week-long pilot summer camp at the Explorium, a workshop that continued in the summer of 2010. His workshops have been so successful that he was recently given the Kentucky Academy of Science's Young Investigator Award.

As an accomplished organic chemist and a leader of a renowned materials research group, Watson has the ability to inform some of the brightest minds. Although he spends most of his time dedicated to graduate research and undergraduate development, he especially appreciates his experiences with middle school students. "This is the time when students are really inquisitive," he said. Watson believes that his success with this age group is a work in progress, but is also quite simple.

1. Let the Students Teach Themselves

Although at the college level Watson will lecture for an hour at a time, he provides little initial instruction to his students at the Explorium. Why? He wants students to figure things out for themselves. Although he does not provide demonstrations for students before the experiment begins, he does believe in asking engaging questions: Do microwaves really heat things up? How do we distinguish between acids and bases? According to Watson, interesting questions provide enough incentive for these students to really dig in and conduct the experiments. Once students are engaged, Watson is present to provide guidance. By using this method, Watson believes students are forced to ask the questions, troubleshoot and find out what works.

2. Science is a Process

When Watson first started doing workshops at the Explorium, he would hold a session for an hour or two at a time. However, he found that this was not enough time to capture students' attention. As groups of children came to the Explorium, they only had a few hours to explore the entire center, and only a few minutes to stop by Watson's demonstrations. The development of the week-long camp was important for Watson's mission. "It becomes more of a concentrated effort. On the first day of camp last year, all we did was teach the scientific method. We taught the basics of recording data, accounting for experimental error and taking the average. Katherine also made sure that the kids kept a detailed notebook," Watson said, "After a week of doing this kind of stuff, their notes are really incredible. They really knew how to do science."

3. Science is Competitive

"Scientists are always looking for a better way to explain things," Watson informed me during our conversation. On the first day of the summer camp, Watson asks his students to do an experiment a few different ways. By doing so, he hopes they can see that there is more than one method of designing an experiment and there is always room for improvement. He often tells his young students that "scientists are competitive." He believes it is important for children to realize they can always make experiments better, and that in order to become a distinguished scientist, it is important to not only want to be competitive, but to also seek repetition, be creative, and develop new, innovative methods.

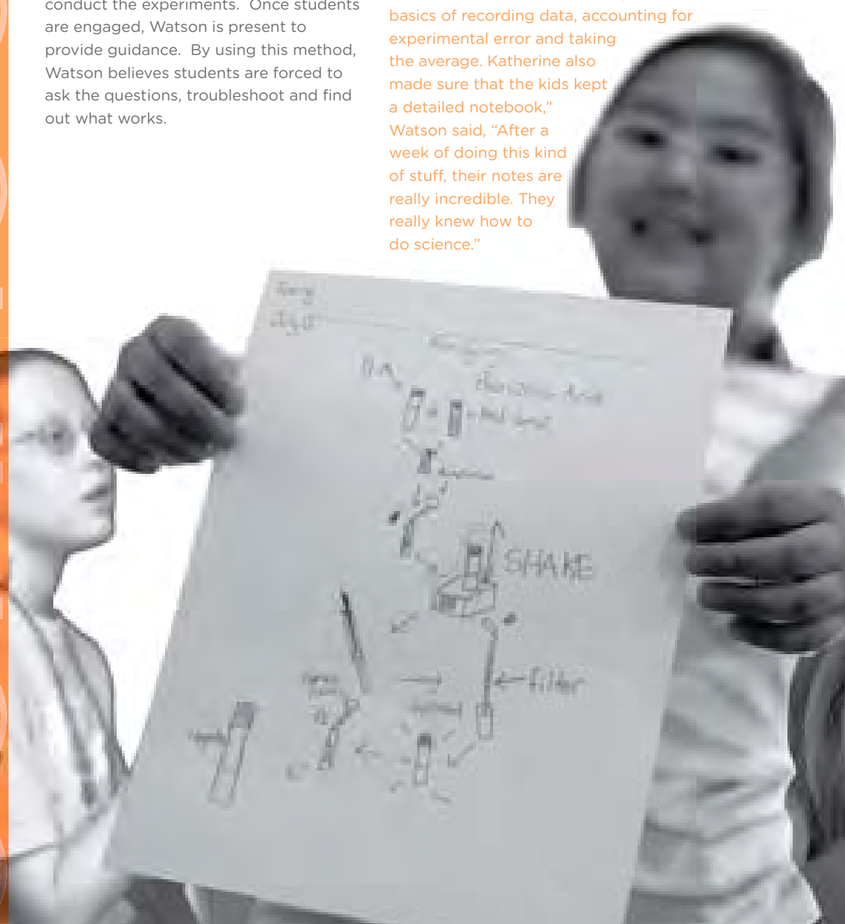
4. Make Concepts Real

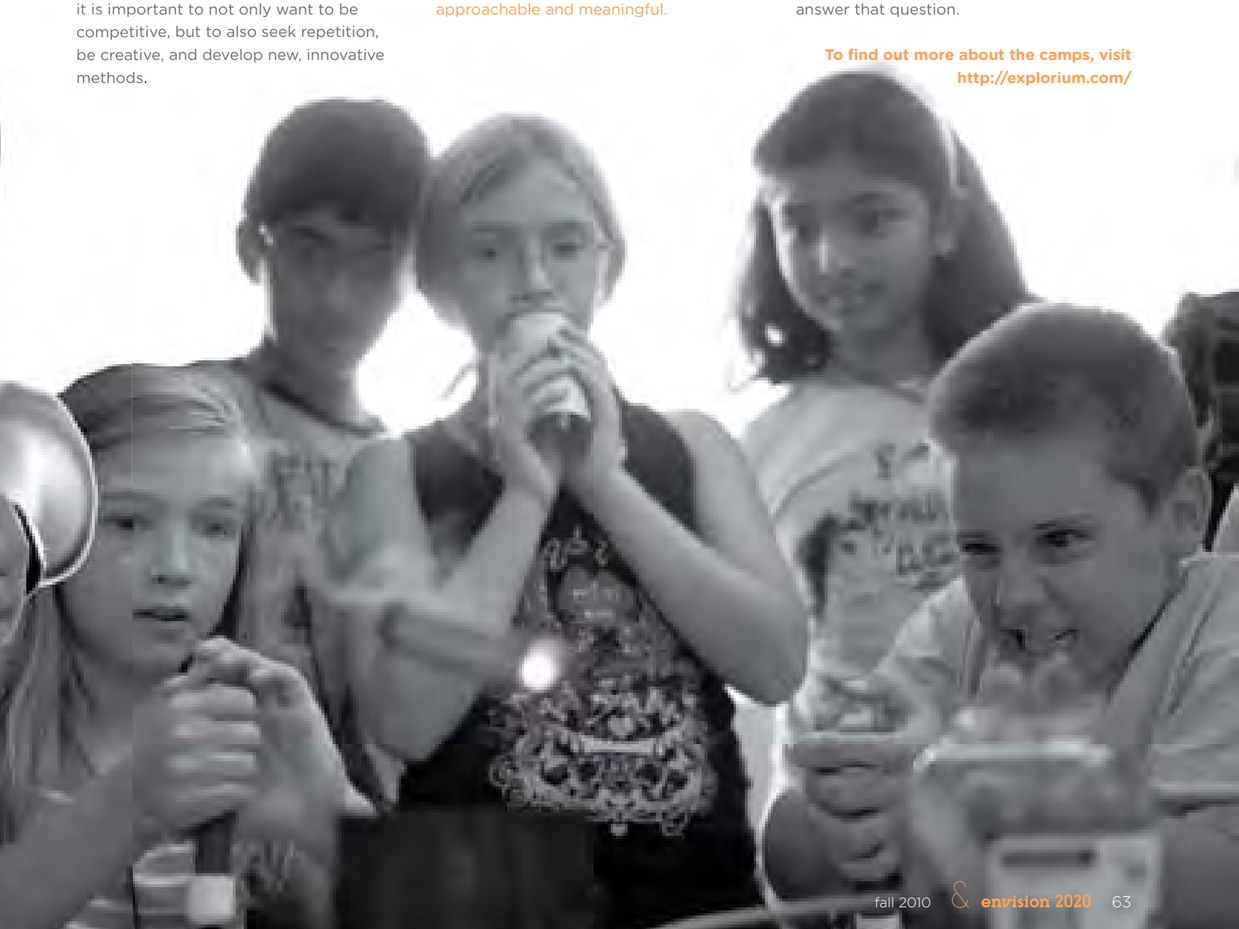
Watson recalled a time during one of his workshops when he was trying to convey to students how small molecules are: "I asked them if they remembered the last time they smelled something funny, a dirty sock, etc." He continued, "I told them that these were molecules going up their nose. They were actually smelling molecules. Molecules are so small you can't see them, but they can certainly find their way into your nose. You should have seen their faces when they thought about the last bad odor they smelled." Students can relate to concepts much easier when they become approachable and meaningful.

5. Keep it Hands On

Early in our conversation, Watson told me, "Kids are tickled to handle real things. Give them a pipette and they really get excited." He said that one of his favorite experiments teaches the concept of viscosity. "Everyone gets involved," he said. "In this experiment, one student controls the stop watch while another student pours the liquids. At the same time, other group members take notes and record observations." He feels that by all students participating, they can see first-hand viscosity in action and experience the rewarding aspect of asking a question and finding a testable way to answer that question.

To find out more about the camps, visit http://explorium.com/





The 2020 Student

Advanced technology will enhance the functionality of teaching tools and the learning capabilities of students. This will make it possible to design new learning environments specifically tailored to individual students. Having the technology to identify how content and skills can be better taught and to respond to student difficulties in learning will help students overcome obstacles and improve the educational experience.

Information for this piece was gathered from Nobel Prize winner Carl Wieman's blog at Scientificblogging.com, Linfield College's 2020 student handbook, the Media Literacy Clearinghouse (Frankwbaker.com) and Transitions Abroad.

The university experience will be tailored to students' convenience

- More students will attend **classes online, even taking classes from multiple universities.**
- Students will expect access to classes from cellular phones and other **portable computing devices.**
- Classroom discussions, office hours with professors, lectures and **study sessions will all be online**, making education more on-demand.
- More web-based computing tools will be incorporated to develop **collaborative, social-based learning**.
- Digital textbooks will become easier to access and more frequently used, **allowing students to approach topics in new ways.**
- Students will be assisted by **digital tutors** when completing their schoolwork.
- Students will be able to participate in **interactive, 3-D learning exhibits** such as historical re-enactments.

Learning will also change for the students of 2020 beyond the classroom

- Students will use the Internet and social media to **increase participation in social causes.**
- Minority students are likely to outnumber whites on college campuses.
- The average **age of students will continue to trend higher** as older students return for additional degrees.
- The globalizing experience offered by technology will lead to **more students enrolling in overseas institutions.**
- Use of social networking technology **will increase collaboration and student interaction** outside of the classroom.
- Students will become more accustomed to receiving information from new sources of technology, **increasing their ability to multitask.**

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