FALL 2014

&

Magazine of the
College of Arts & Sciences

A NEW AGE OF SCIENCE AT UK

AS.UKY.EDU

ampersand
Fall 2014

&

The Magazine of
The UK College Of Arts & Sciences

Dean
Mark Lawrence Kornbluh
kornbluh@uky.edu

Editor
Jennifer T. Allen '00
jennifer.allen@uky.edu

Office of Development
Laura Sutton '89
lsutton@uky.edu

Design
Shaan Azeem, Art Director '13
shaan.azeem@uky.edu
Andi Clark
Will Hieronymus

Contributing Writers
Scott Bradley '13
Keith Hautala '06
Jon Milby '05 '08
Allison Perry '04
Robin Roenker '98
Guy Spriggs '07 '11
Mary Venuto '13

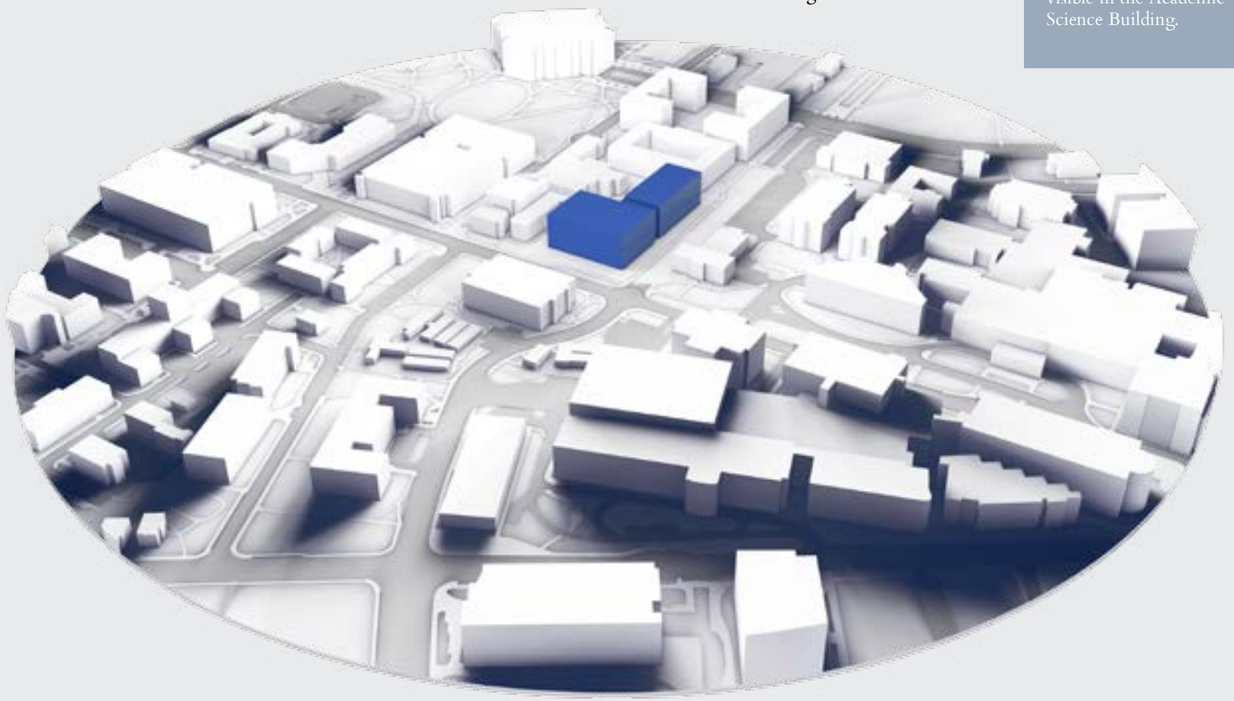
Contributing Photographers & Illustrators
Brian Connors Manke
Dana Rogers '13
Lee Thomas '75

Direct comments or questions to:
Director of Communications & Creative Services
UK College of Arts and Sciences
202 Patterson Office Tower
Lexington, KY 40506-0027

Ampersand is published for alumni, faculty and friends of the College of Arts & Sciences at the University of Kentucky.

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.

Table Of Contents



Features

STEMCATS AND LEXENGAGED

Photos by Dana Rogers and Brian Connors Manke

Coming fall 2015, Arts & Sciences will add two new living learning communities to UK: STEMCats and LEXengaged.

STEMCats is designed to help students succeed at UK. The program prepares students both academically and socially through participation in FastTrack, research opportunities, and special seminar courses. Students participating in STEMCats will build confidence, enthusiasm, satisfaction and a sense of belonging to UK, and experience a smoother transition to college coursework. This leads to improved performance and higher academic achievement. STEMCats is sponsored by the Howard Hughes Medical Institute.

UNIVERSITY OF KENTUCKY
STEMCats
Sponsored by HHMI

LEXengaged will give students an up-close and personal connection with the city they'll call home while attending UK. Through dynamic and hands-on experiences in service learning, social justice, community outreach, leadership, and public service programs, students will gain a greater sense of place and belonging. Lexington is a city that continues to grow, yet it's still small enough for strong campus and community partnerships that will prepare students to be active and engaged citizens for the rest of their lives, here in Lexington, or wherever their paths may lead them.

UNIVERSITY OF KENTUCKY
LEXengaged
Residential College

THE ACCOLADES CONTINUE FOR FRANK X WALKER

Photos by Dana Rogers

Kentucky Poet Laureate Frank X Walker brought home the gold this past February when he won the NAACP Image Award for Outstanding Literary Work in Poetry.

Walker, an associate professor of English at the University of Kentucky as well as founder of the Affrilachian Poets, was recognized for his most recent book of poetry, "Turn Me Loose: The Unghosting of Medgar Evers."

Published last year on the 50th anniversary of Evers' killing, the award-winning book addresses the life and murder of the civil rights leader as told through the Walker-crafted poetic voices of those closest to the man and the 1963 assassination in Mississippi — Evers' widow, Myrlie Evers; his older brother Charlie; the white supremacist assassin who killed him, Byron De La Beckwith; and De La Beckwith's two wives.

"Frank X Walker's searing, haunting poetry dramatically captures a terrible moment in U.S. history," said Jeff Clymer, Chair of the UK Department of English. "Even more, Frank's poems move his readers, emotionally and intellectually, toward a fuller understanding of that history.

Walker, who is affiliated with UK's African American and Africana Studies as well as the Appalachian Center, has published other poetic works about historical African-American figures, including York, who accompanied Lewis and Clark on their exploration of America, and Isaac Murphy, the Lexington African-American jockey who was the winningest rider in horseracing.

Passport to the World
Year of the Middle East
CROSSROADS OF THE WORLD
University of Kentucky • College of Arts & Sciences

The 2014-15 College of Arts & Sciences' Passport to the World Initiative celebrates the culture of the Middle East. Year of the Middle East: Crossroads of the World, co-chaired by Jewish Studies professor Jan Fernheimer and history professor Paul Chamberlin, will focus on the rich, diverse culture of this area through multidisciplinary lenses.

For more information visit: **middle-east.as.uky.edu**.

MAJOR ADVANCES IN...MAJORS

By Mary Venuto | Photos by Dana Rogers and Lee Thomas

The University of Kentucky is growing. Not only with new, innovative buildings and more bright, top-tier students, but also in what is offered academically. It's crucial for a university to not only stay current, but to also be ahead of the curve in preparing students for the challenges of tomorrow. Arts & Sciences is unveiling a number of new majors this fall that will equip students with the skills and abilities to be future leaders in a wide variety of fields.

Environmental and Sustainability Studies

The Bachelor of Arts in Environmental & Sustainability Studies (ENS) is designed to provide students who have a foundation in the natural and physical sciences with an area of expertise in economics, environment, or society. A perfect example of an interdisciplinary major, the ENS major can provide undergraduates studying biology, chemistry, earth and environmental sciences, and engineering an understanding of the humanities and social science components of sustainability.

"The ENS B.A. degree will provide UK graduates the ability to pursue meaningful careers in the growing number of environmental occupations and bring valuable knowledge and insight to jobs that would not ordinarily be classified as 'environmental,'" said David Atwood, professor in the Department of Chemistry.

Listen to a podcast with David Atwood about the new ENS degree at: www.as.uky.eku/atwood

Master of Fine Arts in Creative Writing

The College of Arts & Sciences is pleased to offer Kentucky's only Master of Fine Arts in Creative Writing Program. "This is an exciting time for creative writing at UK – it's been 67 years since the first fiction writing class was taught here, and there is an ever-growing interest in creative writing at the undergraduate level," said Julia Johnson, associate professor in English and the acting director of the program.

Beginning this fall, MFA candidates will have the opportunity to study poetry, fiction, and non-fiction with a faculty that includes writers with national reputations. The current faculty includes Columbia University's John. B. Oakes Award winner Erik Reece and co-founder of the Affrilachian Poets, Frank X Walker. With one of the nation's oldest and most distinguished undergraduate creative writing programs, MFA students will reap the benefits of UK's established literary tradition. Literary publications like "Limestone" and "Pluck!", writers' conferences with national reputations like the Kentucky Women Writers Conference, and affiliation with The Carnegie Center for Literacy and Learning further distinguishes the new MFA program.

Learn more by visiting: english.as.uky.edu/mfa-program

Health, Society and Populations

The new Health, Society, and Populations (HSP) program is designed to offer students contemporary scientific and clinical approaches to health and illness that combine insights from multiple disciplines. Students will gain a unique understanding of health outcomes from studying the social, cultural, behavioral, and biological factors that contribute to unequal population health distribution.

"The HSP major is a great fit for students with health-related interests that bridge the social and natural sciences and it provides numerous career path options in the health and human services sector. This major is the first of its kind in Kentucky," said co-director Carrie Oser. The HSP program is extremely flexible and a unique learning opportunity in interdisciplinary studies.

Learn more by visiting: health.as.uky.edu

Writing, Rhetoric and Digital Studies

Writing, Rhetoric and Digital Studies is doubling up its celebration as they now offer a brand new B.A./B.S. and are also the newest department in the College of Arts & Sciences. The major will train students to go into fields such as professional writing and editing, digital studies (including production), and graduate studies in rhetoric, and will also prepare them for professions such as law.

"While departments of writing and rhetoric are becoming more common, they are still relatively rare," said Roxanne Mountford, who was the initial director of the program (as it worked toward becoming a department). "The Commonwealth of Kentucky now joins Minnesota, Rhode Island, Texas, and Florida in having a stand-alone departments devoted to the study of writing, rhetoric, and digital studies in one of its major universities. I'm really proud that we could make this innovation happen at the University of Kentucky."

UK AWARDED $1.9 MILLION TO IMPROVE RETENTION OF STEM MAJORS

The University of Kentucky has been awarded a $1.9 million grant to improve retention of students in the STEM disciplines: science, technology, engineering and mathematics, through a collection of initiatives dubbed "STEMCats."

UK is one of 37 research institutions selected by the Howard Hughes Medical Institute (HHMI) to receive an award, from among 170 institutions competing for a share of $60 million in total funding. The five-year awards, ranging from $1.2 to $2.4 million, are intended to enable schools to focus on "significant and sustained improvement in retaining students" in the STEM disciplines.

Although the need for STEM graduates is growing nationally, fewer than half of all students who enter college with the intention of majoring in a STEM field leave with a STEM degree. Nationwide, STEM matriculation rates hover around 40 percent, but among historically underrepresented ethnic groups the rate is only half that, roughly 20 percent.

Part of the challenge for educators is that many first-year students arrive on college campuses without adequate preparation for the rigors of college-level science and math, said Professor Vincent Cassone, chair of the UK Department of Biology and STEMCats project director.

"They have no idea what to expect, and I think it comes as a shock to some of them just how much work is actually involved in passing an introductory-level STEM class," Cassone said. "By the time they realize it, they may already be in trouble. It's not that they can't do the work. They just are not mentally and psychologically prepared for the challenges they face at the university level. The STEMCats initiatives are designed to help students get ready to succeed."

UK is partnering on these initiatives with colleagues from Bluegrass Community and Technical College (BCTC).

Mark Lawrence Kornbluh, Dean of the UK College of Arts and Sciences, said that collaboration is a core strength of the STEMCats project.

"The strong collaborative relationship of this grant is a hallmark to the initiative, and will serve the program well in its multi-layered approach to improving student success, diversity and retention in STEM education," Kornbluh said. "The grant's attention to all areas of instruction — in-class pedagogy, co-curricular research experience, preparatory training, residential life experience, among others — demonstrates the thoughtful commitment the university as a whole has to the success of STEM education at UK."

The STEMCats project has five key components, each aimed at improving the recruitment, preparation and retention of STEM majors.

1. 'FastTrack' Courses for Math, Biology, Chemistry and Physics

To improve preparation of incoming students, two residential FastTrack courses, in biology and chemistry, will be offered preceding their fall admission, in addition to the successful math FastTrack courses already being offered. Similarly, a physics FastTrack course will be offered preceding the start of the physics curriculum in the sophomore year. Each course will be one week in duration.

2. STEMCats Living Learning Community

Based on the successful model of the "Wired" freshman residential college, students enrolled in the STEMCats program will be immersed in a community of learners within one of the residence halls on campus. There, they will engage in constant community-based academic and social activities. STEMCats from underrepresented minorities will have additional support from sophomore mentors from minority backgrounds, who will also reside in the community.

3. Freshman STEM Research Course

A new, multidisciplinary and inquiry-based research course — containing discussions, seminars, workshops, discovery-based wet-lab activities, and scientific and professional development activities — will be piloted in a year-round course that meets weekly. Course meetings will be conducted by a Community of Scholars, comprised of research faculty from across campus and by invited external experts.

4. Team-based Summer Research Experience

During the summer session at the end of their freshman year, groups of eight to 10 STEMCats will join a research project in a laboratory of a faculty member in the Community of Scholars. STEM faculty across campus will be recruited as mentors for a cohort of 200-250 students each summer. The research experience will be enriched by research-related educational and professional activities, including students' presentation of their work in science forums.

5. Improving Introductory STEM Curriculum

Following the successful model of the current, two-part "Calculus for Life Sciences" series, new introductory chemistry and physics courses will be developed, with an interdisciplinary focus and a life-sciences orientation. Biology-enriched chemistry introductory courses are already underway.

To learn more about the program, visit stemcats.as.uky.edu

SEDIMENTARY, MY DEAR WATSON

Kevin Yeager's lab can measure the rate of coastline loss in Louisiana or document the effects of exposure to radioactive fallout.

By Guy Spriggs

With sea levels rising, will coastal land along the northern Gulf of Mexico naturally build itself up enough to combat the loss of its coastline? As the coastline continues to disappear, where will the rate of loss be worst?

When did pollution in Maine's Penobscot River begin? Is the polluted material being introduced into our food chain? Are new laws helping reduce the pollution level?

If we wanted to answer these important questions, where would we turn?

These questions – and many more – can be solved by the unique equipment and skilled researchers working in Kevin Yeager's Sedimentary, Environmental and Radiochemical Research Laboratory (SER2L) at the University of Kentucky.

"This is one of the best equipped environmental radiochemistry laboratories in the country," said Yeager, a sedimentary geologist and environmental radiochemist in the Department of Earth and Environmental Sciences (EES). "There are very few laboratories that do what we do, and even fewer that can handle the number of samples we do. We represent a unique capability here at UK."

Yeager came to UK in 2011 after renovations to the Sloan Building provided space for new equipment and workstations. SER2L is a common-use facility, meaning other EES faculty and students who need its resources are welcome to use it. "The College [of Arts & Sciences] and the University have invested in this facility and they want it to be as fully utilized as possible," he said.

SER2L already has established partnerships with researchers in the Department of Geography and College of Agriculture, Food and Environment, but Yeager wants there to be greater awareness of what the lab can offer to the research and academic environment at UK.

"We're always looking for new collaborations. We bring something new to the University – the things we're doing didn't previously exist here, and now they do," said Yeager. "We want the broader UK community to know about us and what our capabilities are."

In addition to the research capabilities of SER2L, the lab also offers invaluable experiences for undergraduates. For Yeager, it is important to employ undergraduates so they are able to build research skills while also being paid. "We try to employ undergraduate research assistants as often as we can, and it's great for them to get money by doing something they can add to their resume," he said.

According to Yeager, SER2L has four main components: sediment archiving, physical sedimentology, aqueous geochemistry and radiochemistry. The archive is housed in Bowman Hall, allowing Yeager to facilitate similar work being done by other scientists.

"We have sediment samples from all over the world that are in dry or cold storage. We do that because scientists will read our work and ask us to send them materials for use for something else," Yeager explained.

All of the work done in SER2L is built upon the analysis of sediment. The isotopes characterized by Yeager and his research assistants are comprised of elements that are particle-reactive and can be analyzed by the various instruments in the lab. Since particle-reactive elements tend to stick to particulate matter, sediment can be examined to determine where it came from, how old it is, how rapidly it has accumulated, and more.

The main space in SER2L is devoted primarily to sedimentology and aqueous geochemistry. The workstations there rely on both common equipment – analytical balances, graduated cylinders, centrifuges – and more complex tools – acid digestion hoods, a clean water system, mortar miller – to process sediment core samples collected from the field.

Yeager describes the analytical space in the lab as an "instrument park," but its capabilities are far from ordinary. For instance, this space contains five gamma ray spectrometers – lead-shielded containers used to measure gamma radiation coming from sediment sample(s). "People think the lead is there to protect us from the radiation, but it's actually the other way around," Yeager explained. "We are being bombarded by radiation from the sun and from space, and we only want to measure the radiation coming from the sample."

The laboratory also features a research-grade dissecting microscope, a Malvern mastersizer (used to derive the size distribution of sediment) and an alpha spectrometer (used to measure the emission of alpha particles). However, when discussing the capabilities of SER2L, Yeager underscores the important roles played by research analyst Kimberly Schindler and graduate assistants like Stephen Prosser.

Prosser, a graduate student researching in SER2L, came to UK and joined Yeager's group to pursue his interest in studying sedimentary responses in rivers. "Once I visited campus, the lab and the group, it was all set for me. I loved the atmosphere, the camaraderie and the higher level of science being completed in the lab," he explained.

During his time in SER2L, Prosser has learned every chemical method and how to operate every instrument in the lab. These newly-acquired skills have given him the chance to analyze sediments for his own research at incredibly fine scales, as well as participate in contract work on larger research projects. "We all collaborate on each other's projects and other non-student-driven projects. It's nice to have your hands in more than one thing," said Prosser.

As research analyst and laboratory manager, Schindler is in charge of teaching procedures to student assistants and running day-to-day operations in SER2L. She has worked for Yeager since her time as an undergraduate at Texas A&M University at Galveston.

"She knows how to run all these machines and how to do all the methods in SER2L. She's an invaluable resource to the students who come through here. Kim is essential in maintaining a safe working environment for the people in the laboratory," Yeager said.

"We have a few mottos around the lab. One is 'quality over quantity.' We strive to do quality research work, and all of us profit from the work we produce," Schindler added. "Another is that we are a collective. We endeavor to make it 'our' work and we all benefit from the help we receive from each other."

With unique equipment and a well-trained staff, SER2L participates in an incredibly wide range of research, from showing the effects of the Deep Water Horizon oil spill on the ecology of marsh organisms to measuring coastal accretion and its relationship to sea level rise to understanding the record of past climate change as captured in sediments from large inland lakes – and many more. &

Photos by Dana Rogers


Professor Kevin Yeager

Wei Ji, Graduate Student


Phil Wolfe, Graduate Student
Kimberly Schindler, Research Technician

To learn more about the Sedimentary, Environmental and Radiochemical Research Laboratory – including opportunities for research and collaboration – please visit: http://www.SER2L.com/#environments

View a photo album of the lab at: ampersand.as.uky.edu/SER2L

TALKING 'BOUT REGENERATION

Four A&S biologists and their dynamic research attempt to unlock the secrets of how bodies heal.

By Keith Hautala
Photos by Brian Connors Manke

Regeneration is one of the most tantalizing areas of biological research. How are some animals able to regrow body parts following an injury? Why can't humans do the same thing? Can scientists learn the secrets of these animals? Could that knowledge someday be used to develop new therapies to help people heal?

Four professors in the University of Kentucky Department of Biology — Randal Voss, Jeramiah Smith, Ann Morris, and Ashley Seifert — are undertaking the basic scientific research needed to begin to answer these and other questions. Each of them approaches the problem from their own angle, focusing on various aspects of regeneration using different vertebrate models.

This formula, divergent research programs with a common, uniting focus, has fostered a dynamic and productive collaboration among this group. Together, they make up the core of an unofficial regeneration "cluster" within the department.

At its base, regeneration in vertebrates is a complex molecular crosstalk between cells, similar in many ways to the cellular "communication" that occurs in the development of an animal from a single cell to an adult organism. Certain genes are activated or deactivated at specific times to turn undifferentiated cells into tissues and organs, and to arrange them into complicated body parts such as limbs and joints.

We humans carry in our DNA a genetic legacy that we share with all other vertebrates, a common set of genes that successive generations have carried forward for hundreds of millions of years. By studying the genetic mechanisms that enable regeneration in our distant evolutionary cousins, scientists hope to one day uncover some latent healing abilities that may lie hidden in our own genome.

Jeramiah Smith is a genomics expert who works with sea lampreys. These jawless, eel-like creatures diverged from our common ancestors in the Cambrian Period, about 500 million years ago. Lampreys have the ability to regenerate spinal cord cells, which is a neat trick for any vertebrate. But Smith says a big part of the appeal for him in studying these animals lies in excavating the natural history cached in their DNA.

"If I had my choice of a career and didn't have to think about paying for my kids' school and all that stuff, I would probably be a paleontologist and dig for fossils," he says. "But really, genomics is almost as pleasing, if not more pleasing than that. By accessing the genomes of these animals, describing them, and then comparing them with other genomes that have been sequenced, you're often the first person to know what was going on half a billion years ago. It's sort of like the kid-in-the-dinosaur-museum thing."

Smith also works closely with Stephen Randal Voss on sequencing the genome of salamanders, an amhibian group which veered off our common vertebrate path about 300 million years ago. Though we share many of the same genes, the salamander genome is massive compared to our own— about 10 times as large.

Voss's research focuses on axolotls, an unusual type of salamander that lives wild only in one tiny part of Mexico. Unlike most salamanders, which undergo a metamorphosis from larva to adult, axolotls retain their juvenile form throughout their entire lifespan, a trait known as neotony or paedomorphism. But the main reason that axolotls are among the most-studied salamanders in the world is their amazing ability to regenerate a variety of body parts.

"It's hard to find a body part they can't regenerate," Voss says. "Salamanders in general, and axolotls especially so. The limbs, the tail, the spinal cord — even half of their brain has been removed and shown to regenerate."

Voss's research involves assembling a vast store of genetic data using RNA extracted from regenerated axolotl tissue. From this data, Voss will elaborate a model for how genes are turned on and off over very small timescales. This model will serve as a blueprint for other regeneration researchers to build from.

Sandwiched between the sea lamprey and the axolotl on evolution's vast timeline — about 400 million years ago — another vertebrate appeared on the scene with the ability to regenerate an impressive variety of different tissues: the zebrafish. This minnow-like freshwater fish is central to the research of Ann Morris, who is interested specifically in its ability to regenerate retinal cells.

We humans lack that ability. Degenerative diseases of the retina (such as retinitis pigmentosa or macular degeneration) are the leading causes of blindness in older adults. If scientists can learn how zebrafish are able to repair their retinas, it could point the way to new strategies for developing treatments to preserve vision, or perhaps even to restore it, in humans.

The structure of the retina and the types of cells found in the retina are very similar across all vertebrates. By studying how the retina develops in zebrafish embryos, Morris says researchers can learn a great deal about how the process works in mammals, and specifically in humans.

An oft-repeated maxim in biology classrooms is that "regeneration recapitulates development." So, if our retinas are so similar, how is it that zebrafish can regenerate retinal cells and we can't? That's an excellent question, Morris says. The answer is suspended between two distinct possibilities.

"One is that at some point, you know, everybody had the ability to regenerate, and that ability in certain lineages was eventually lost," Morris said. "So perhaps all the mechanism is still there in the genome and it just needs to be reactivated. The other is that as these different vertebrate lineages diverged, certain vertebrates evolved that ability whereas others didn't. I happen to believe it's probably more of the former, that some of those abilities are there, but they're latent and we have to discover how to reactivate them."

One possibility is that mammals essentially "traded" much of their regeneration ability in evolving adaptive immune systems. Animals that excel at regeneration tend not to exhibit the same responses to injury that mammals do — such as inflammation and scar formation — and mammals, for the most part, lag far behind other vertebrates in their ability to regrow missing parts.

That's what makes the African spiny mouse, a sort of master of regeneration in mammalian circles, so remarkable. Ashley Seifert, whose research is focused on skin regeneration, started studying these animals about five years ago, shifting from a salamander model.

"What's phenomenal is that they're able to regenerate complex tissue structures," Seifert said. "So they can regenerate pieces of their skin that includes hair follicles and sebaceous glands, which are associated with the underlying dermis, the structural component that gives the skin strength. And then, in the ears, amazingly, they can regenerate cartilage. Any orthopedic surgeon will tell you that would be a huge advance if we could figure out how to regenerate cartilage in a mammal."

Seifert's research is taking him and postdoctoral scholar Tom Gawriluk to Kenya for the summer, where they will divide their time between trapping spiny mice in the wild and working with colleagues at a university in Nairobi and the University of Georgia to examine how immune trade offs can affect regenerative ability.

In spite of their disparate approaches, all four researchers agree that the regeneration cluster that has cohered in the Department of Biology has potential for growth. In fact, Voss says, the group's diversity is perhaps its greatest strength.

"I think it's fantastic that we have researchers in the department that each have a model representing one of the major vertebrate classes," Voss said. "We're only missing somebody to work on reptiles at this point. It's not beyond the realm of possibility to think about creating a center. We're all taking a very systematic, systems biology approach to the problem. If we had a 'Biocomplexity in Systems Biology' theme that connected us, with regeneration being the problem that brought us together under that umbrella, that would be a great next step." &

▶ Watch a video about this regeneration research at: ampersand.as.uky.edu/regeneration

AXOLOTLS R US

The Ambystoma Genetic Stock Center at the University of Kentucky, providing axolotl specimens to researchers at some 150 laboratories around the world, has a long and interesting history. The animals in this breeding program are descended from a long line that biologists have studied for more than a century.

Axolotls first came to the attention of scientists in the late 1800s. The first specimens to leave Mexico were sent to researchers in Europe. It wasn't until the 1930s that axolotls first arrived in the United States from a lab in Poland.

The animals were eventually moved to Indiana University, which maintained the collection for decades under the directorship of Rufus R. Humphrey and (later) George Malacinski. Indiana provided axolotls to researchers across the United States and internationally until 2005, when the collection moved to the University of Kentucky where it is under the direction of Stephen Randal Voss.

"They have personalities just like any vertebrate," Voss said. "Probably more so than fish, in that if you go into the room, they'll instantly see you're there. They'll come to the front of the cage. We have a few that we call 'pets' that we feed when we go in, and they're expecting to be fed."

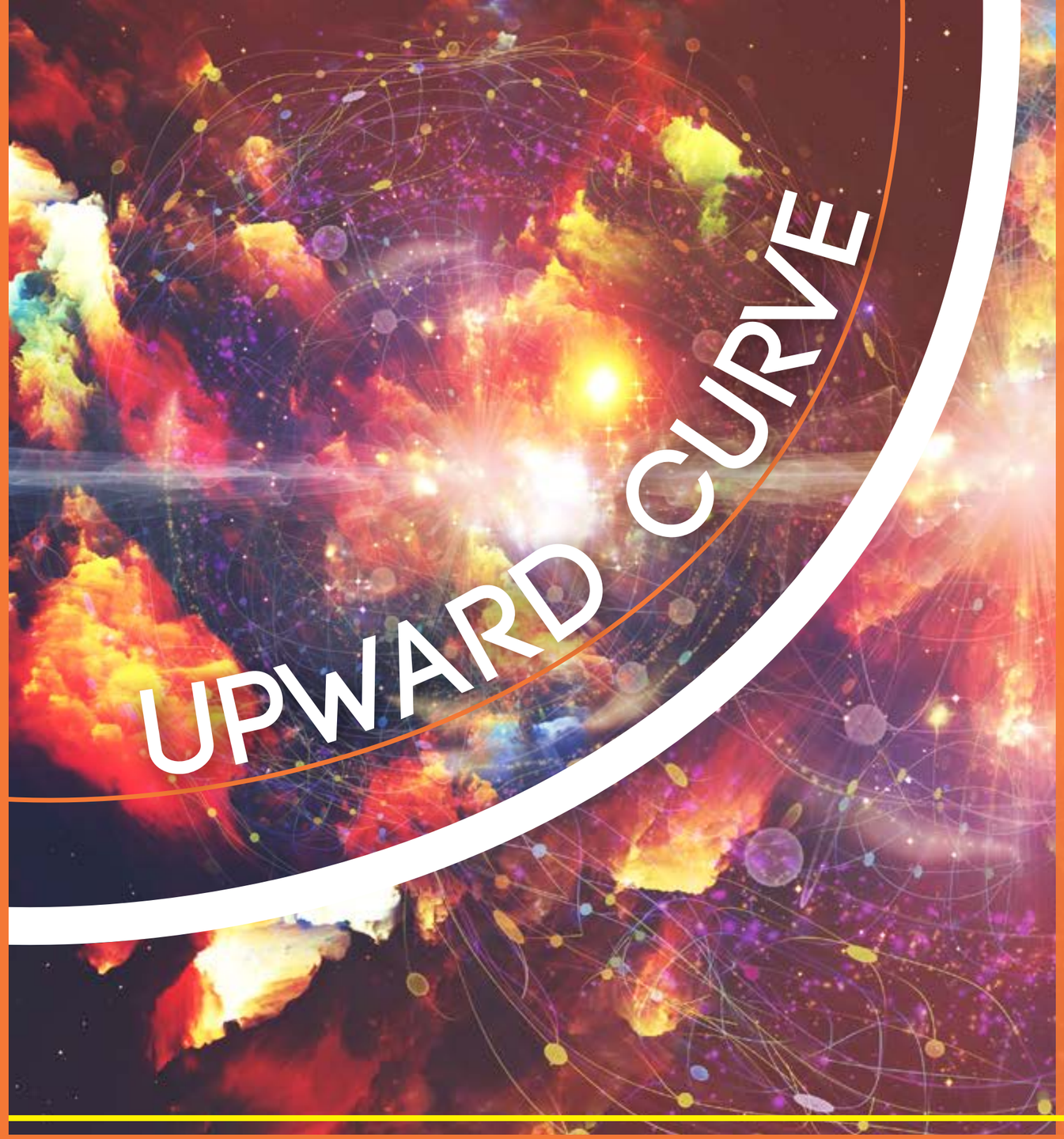
Note: The center emphatically does not distribute axolotls as pets, however, and will only send specimens to qualified researchers.

Learn more about the regeneration labs at UK by visiting:

ampersand.as.uky.edu/photos-regeneration

ampersand.as.uky.edu/podcast-regeneration

ampersand.as.uky.edu/video-regeneration



UPWARD CURVE

UK's Physics and Astronomy faculty are exploring science at its largest and smallest scales.

By Robin Roenker

It's an exciting time to be part of the Physics and Astronomy faculty at UK.

"I think we are in the midst of a pretty steep upward curve, particularly in terms of our research but also in terms of our education," said the department's chair, Sumit Das, a high-energy physicist whose research interests focus on string theory and black hole physics.

As evidence of UK's increasingly high-profile national reputation, Das points to the unprecedented 70 percent acceptance rate of the department's top-choice graduate students this past spring — 16 of the 22 students enrolled this fall.

"I think word is getting around that we have an active, engaged Physics and Astronomy faculty performing some of the best work in their prospective fields," Das said.

Condensed Matter & Materials Physics

UK is indisputably leading the nation in the development of novel materials.

The Center for Advanced Materials, directed by Physics and Astronomy professor Gang Cao, is one of only one or two such centers in the nation charged with the discovery and development of new materials.

Along with Cao, the center's faculty, including Physics and Astronomy professors Lance De Long, Joseph Brill, Ambrose Seo, Doug Strachan, and Kwok-Wai Ng, work to develop and understand the properties of new materials, including transition metal alloys and compounds, heavy transition element oxides, and thin film superconductors.

While future applications of these new materials will undoubtedly lead to advancements in technology, Cao's group is primarily interested in simply understanding the fundamental properties of the new materials that they are producing in their labs —including a class of electric insulators made from transition metal oxides.

Through ultra low-temperature, high pressure, and high-magnetic field testing of single-crystal samples of the new materials they are developing, UK's researchers push the boundaries of science's understanding of electron behavior in elements like the so-called 4-d and 5-d transition metal oxides (a reference to their position on the period table) like strontium and iridium, for example.

"People take for granted that copper is a conductor and plastic is an insulator, but we are trying to answer the fundamental question: why are certain materials insulating, and others are conducting," explained Cao, whose 2008 groundbreaking research paper outlined a new, previously unrecognized role that "spin-orbit coupling" plays in determining a material's electric conductivity.

Since the publication of Cao's paper, physics driven by spin-orbit coupling is "one of the most actively pursued fields now in condensed matter physics," he said.

"UK has established itself as the leader in the development of heavy transition metal oxides," Cao said. "We have close to 50 collaborations going on with institutes all over the world, including all of the U.S. National Labs as well as some in Germany and China."

Nuclear Physics

The majority of faculty involved in nuclear physics research at UK are divided into two primary interests. One group, the so-called "fundamental interactions group" or "medium-energy group," conducts their research entirely off campus, at higher-energy particle accelerators found at national labs like those in Oak Ridge, Tenn., and Fermilab, near Chicago.

The other group uses UK's own in-house particle accelerator, the Van de Graaff Accelerator, situated in the rounded silo-like portion of the Chemistry-Physics Building, to conduct experiments using lower-energy particle collisions.

Fundamental Interactions Group

UK Physics and Astronomy professor Tim Gorringe, who is part of the fundamental interactions group, is currently part of a prominent, large-scale multi-university collaborative project, along with UK professor Renee Fatemi, called the Muon g-2 experiment, which is being conducted at the Fermilab.

Mainstream media has covered work at the Large Hadron Collider at CERN, which in

continued on p12

continued from p11

2012 documented the discovery of the Higgs Particle. "That is what we call the energy frontier, where you're colliding particles at higher and higher energies to produce new particles," explained Gorringe. "But our work is not at the energy frontier. Our work is what we call the precision frontier, or the intensity frontier. It's where you don't use the highest energy beams of particles, but instead use the most intense beams of particles to make the most precise measures of things."

The Muon g-2 project is charged with measuring the magnetic moment of the muon—a term that describes the strength of its magnetic interaction. The muon, similar in many ways to the more familiar electron that makes up ordinary matter, is one of the 17 particles of nature that described the Standard Model.

If Gorringe's team is able to establish that the muon's magnetic moment (measured on a scale of 1/10th of a part in a billion) differs statistically from the value that is predicted by the Standard Model, then their results could potentially offer evidence for the existence of dark matter or other new matter. This dark matter/new matter is postulated by physicists to exist but has not yet been directly measured, and the Standard Model currently does not account for it. Their results could potentially be truly ground-breaking.

"The Standard Model has held up well for physics since the 1960s," Gorringe said. "But there's an increasing belief that it must be incomplete, and that astrophysical observations have revealed that dark matter and so-called dark energy likely do exist."

Several other UK faculty involved in fundamental interactions research are working on another high-profile, multi-university collaborative research project called the nEDM experiment, which stands for neutron electric dipole moment. The project's goal is to measure a precise electrical characteristic of a neutron, called the electric dipole moment, which may or may not exist. If it is found to exist, that discovery may lead to an understanding of a major question of modern physics: why it is that the universe is made of vastly more matter than anti-matter.

"If the electric dipole moment exists, it signals a breakdown of what in physics is called time reversal symmetry, which is a basic symmetry of nature," Gorringe explained. "The breaking of time reversal symmetry is thought to be a crucial ingredient in answering why there is such an asymmetry in the universe between matter and anti-matter."

Low-Energy Group

On campus, at the Chemistry and Physics Building's Van de Graaff Accelerator, joint UK Physics and Astronomy/Chemistry professor Steve Yates and Physics and Astronomy emeritus professor Marcus McAllister and their colleagues work on projects that require lower-energy particle collisions.

One of the very few facilities in the country specializing in neutron physics research of a particular type, UK's Van de Graaf Accelerator has been continually funded since 1963 by prestigious National Science Foundation (NSF) and Department of Energy (DOE) grants for research on an array of nuclear physics investigations as well as Homeland Security and corporate applications.

"Neutron physics is a very difficult area, and there are few specialized facilities in the world that do the kind of precision work that we do here," Yates said. "That is what sets UK apart. We have really carved out a niche for ourselves; we do the kind of measurements nobody else can do."

One research interest of the "low-energy" group, classified as nuclear structure research, aims to identify and answer ancillary questions involved in the worldwide research effort to measure the mass of the neutrino, which has not previously been identified. "It's one of the big unknowns in physics," Yates said.

Other projects seek to inform the design of better — i.e., safer and more efficient — nuclear reactors. "Part of what is being measured in our laboratory is determining what materials and properties can be used most effectively in new nuclear reactors," said Yates. The research is particularly timely, as the nation's pool of current reactors has passed the 40-year age mark.

> "I think word is getting out that we have an active, engaged Physics and Astronomy faculty performing some of the best work in their prospective fields."
>
> ***-Sumit Das,*** *Physics Chair*

"We're measuring the neutron reaction probabilities of materials like iron that could be used in new reactor construction and fuel assemblies, as well as materials like sodium that could be used for the coolants," Yates said, adding that improved modern reactor designs would prevent future nuclear disasters like those in Chernobyl or Three Mile Island.

Astrophysics/Astronomy

Two recent additions to UK's astrophysics and astronomy faculty have deepened the department's interest in the study of star formation and galaxy evolution.

Having joined the UK Physics and Astronomy Department within the last two years, both Renbin Yan and Dale Kocevski research the ways in which black holes at the center of galaxies may play a regulatory role in the galaxy's star formation.

New stars can only form when gas clouds within a galaxy cool and condense, but super massive black holes that exist at the heart of most, if not every galaxy (it is believed) emit radiation that heats the gas in space surrounding them, thereby slowing or even altogether stopping the formation of new stars.

At least, "that is the current theory we're all trying to prove right or wrong," Kocevski said.

While the role of the black hole in the process of galaxy evolution is still being studied, one fact is certain: over the last half of the universe's life (roughly the last seven billion years of its nearly 14 billion years of existence) the rate of new star formation has decreased dramatically.

"We call it the 'quenching' of star formation," said Yan. "This is one of the major problems in astrophysics and astronomy today, namely, why the star formation stops, sometimes in a very sharp and abrupt manner across these galaxies."

Both Yan and Kocevski are involved in ground-breaking, international sky survey projects that aim to offer a glimpse of galaxies' evolution over time.

Kocevski is involved with the CANDELS (Cosmic Assembly Near-Infrared Deep Extragalactic Legacy Survey) project, which uses the new infrared Wide Field Camera 3 (added to the Hubble Space Telescope by shuttle astronauts in 2008 as one of their last missions) to view distant galaxies so far away that their light is no longer in the visible spectrum. Instead, their light is detectable only as infrared wavelengths.

With the infrared camera, the CANDELS project will take images of roughly 250,000 galaxies, capturing a glimpse of what they looked like 10 billion years ago, when they were in the early stages of their development, Kocevski said.

In 2018, NASA will launch the James Web Space Telescope (JWST), a fully optimized, purely infrared telescope that will allow astronomers to glimpse galaxies at just 200 million years after the Big Bang. "By the end of the decade, with the JWST, we'll be able to see a glimpse of the Milky Way Galaxy as it was originally forming," Kocevski said.

While Kocevski's research focuses primarily on "high red-shift" galaxies which are extremely far away from our own, and whose light has, therefore, shifted further into the infrared spectrum, Yan instead focuses on "lower red-shift" galaxies, which are closer to our own Milky Way Galaxy.

Yan is the survey scientist for a project called MANGA (Mapping Nearby Galaxies at Apache Point Observatory), which is part of an international collaboration project called Sloan Digital Sky Survey IV. "The advantage of looking at galaxies that are more nearby is that you can spatially resolve them," said Yan.

Using hexagonally-packed fiber bundles, Yan and his colleagues will obtain spatially-resolved spectroscopy (3D spectroscopy) to understand how star formation rates vary in the center versus outskirts of various galaxies, he said. Yan's research will be conducted over six years using a dedicated 2.5-meter telescope at Apache Point Observatory in New Mexico.

While previous 3D spectroscopy sky surveys have been done for 100 galaxies or so at a time, Yan's MANGA project is on a more massive scale, surveying 10,000 galaxies in the nearby universe.

Both Yan and Kocevski agreed that advances in technology have made this an exciting time in astronomy's history. "This really is the golden age for our field," Kocevski said. "Technology has always driven advances in astronomy — from the development of the telescope onward — but we're seeing a faster pace of advancement of technology in our field today than perhaps at any time in recent memory." &

What is the Standard Model of Particle Physics?

Developed in the 1960s and 1970s, the Standard Model describes the interactions of the basic building blocks of matter, which are governed by four fundamental forces: strong, weak, electromagnetic, and gravitational. It incorporated all that was known about subatomic particles at the time and predicted the existence of as-yet unobserved particles as well, like the Higgs Particle, which was identified in 2012. The model currently contains 17 named particles, classed among three groups: quarks, leptons, and bosons. It does not account for the existence of dark matter.

The University of Kentucky Accelerator Laboratory (UKAL)

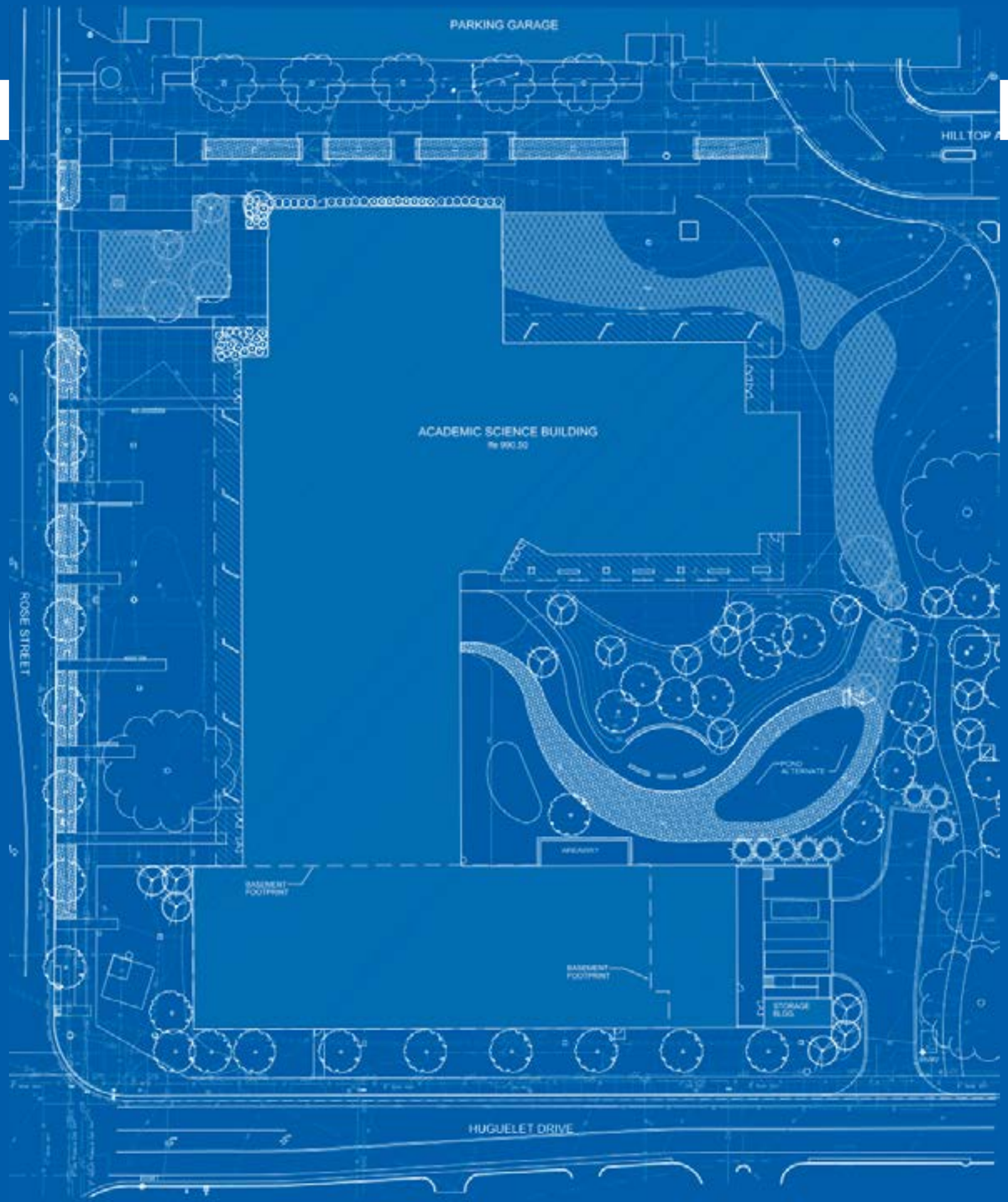
Ever wondered what is inside that silo-like part of the Chemistry-Physics Building? It is home to the University of Kentucky's Van de Graaff Accelerator.

Opened in 1963, the UKAL is the premier facility in the United States for studies with fast (MeV) neutrons. The accelerator underwent a major upgrade in the 1990s. Over the last five decades, the facilities have been used for research in nuclear physics as well as for Homeland Security and corporate applications.

Learn more about what's happening in the Astronomy and Physics department by visiting: pa.as.uky.edu/features

Envisioning the Academic Science Building

A Q&A with Dean
Mark Lawrence Kornbluh



Listen to Dean Kornbluh's full podcast by visiting ampersand.as.uky.edu/kornbluh

This fall construction began on the University of Kentucky's new Academic Science Building. Scheduled to open in Fall 2016, the building's design places integrated, engaged learning as its centerpiece.

In the following interview College of Arts & Sciences Dean, Mark Lawrence Kornbluh, talks about the purposeful design of the new building.

Q: The Academic Science Building has been described many times as "integrative." What does that mean?

A: Science by nature is an integrated study of the world. Scientists draw upon multiple disciplines and techniques to answer questions and make discoveries. Teams of researchers come together – often with different theoretical and methodological perspectives, different training, and in the case of research universities, from different career stages (e.g., undergraduates, graduates, post-doctoral scholars, and faculty members). Knowing this, we purposely designed the new building to enhance the integrative aspects of 21st century science. For example, all levels of instruction will be housed next to each other so that introductory undergraduate students work directly with more advanced undergraduate and graduate students and faculty in the creation of knowledge. Such proximity will allow for the most advanced instrumentation to be shared and available to all. Similarly, faculty from multiple disciplines (e.g., Chemistry, Biology, etc.) will be housed collectively to foster inter-disciplinary work and thought, rather than being siloed in separate buildings based on disciplinary lines.

Q: Why is it so important to integrate research and lab space with classrooms and student study areas?

A: Studying science is the gateway to a host of career options. It is also one of the cornerstones to an educated mind. For many, however, the study of science is difficult. To be able to train our students appropriately and ready them for the 21st century job market and world, students need to succeed in their science-based studies. The building's design not only allows for, but fosters, enhanced student learning. By housing faculty offices, laboratories, classrooms, study space, and tutoring all in one location, class work will naturally spill out into laboratories, impromptu study sessions, scheduled office hours, among other interactions. In essence the formal curriculum, the co-curriculum, and the student support

continued on p18

continued from p17

offerings will be married under one roof – with the goal of creating a community of science.

Q: How will the Academic Science Building foster undergraduate education?

A: Every science student on campus, and the vast majority of all undergraduates at UK, will experience 21st century science with 21st century laboratories and instrumentation. All key gateway science courses in general and organic chemistry and biology as well as more advanced laboratory courses will be housed in the building. Greater success in these classes will serve science majors across campus, as well as the many non-science students who will take these as general UK Core courses. For students coming to campus in the next few years, this will be transformative for their education.

Beyond student reach, the building itself is designed to foster active, inquiry-based learning. Hallmarks include active-learning laboratories, advanced instrumentation, flat classrooms with movable work spaces, lecture halls with multi-media presentations and demonstrations capabilities, IT-enabled discussions, visualizations and simulations; and a myriad of informal learning spaces that facilitate interaction and knowledge exchange. At every planning stage, the building's defining principles are enhanced student success and scientific integration.

Q: How does that relate to graduate level research?

A: Science today is multi-generational. Research is conducted in teams, made up of undergraduates, graduate students, postdoctoral scholars, scientific staff, and faculty. Graduate students and postdoctoral scholars are key components to any scientific enterprise. Not only are they training to become the future workforce, but they are making discoveries and contributions in their own right. Thus, the Academic Science Building is designed to facilitate their role in the discovery and application of knowledge as well as foster collaboration. Graduate students will serve as teaching assistants in classes; their offices will be located in the new building; and their research will be conducted in the laboratories. Their role as mentors, instructors and researchers will only be enhanced by the increase in quality of the facilities they utilize.

Q: Do you have any additional thoughts on the new building?

A: The new Academic Science Building will stand as an embodiment of science and science education in the 21st century, breaking down barriers and building connections. As a state-of-the-art facility, built with the latest green technology, the building will be the epicenter of the university's scientific community, linking the medical campus with the academic campus – connecting North campus and South campus, integrating disciplines, knowledge, and ways of learning in innovative and important ways. When the building opens in the Fall of 2016, it will anchor academics at the University of Kentucky for the 21st century. We're excited to get started. &

By the Numbers

2 TEAL lecture halls

57,282 Square feet of brick

304 doors

20 Chemistry and Biology wet labs

4 TEAL classrooms

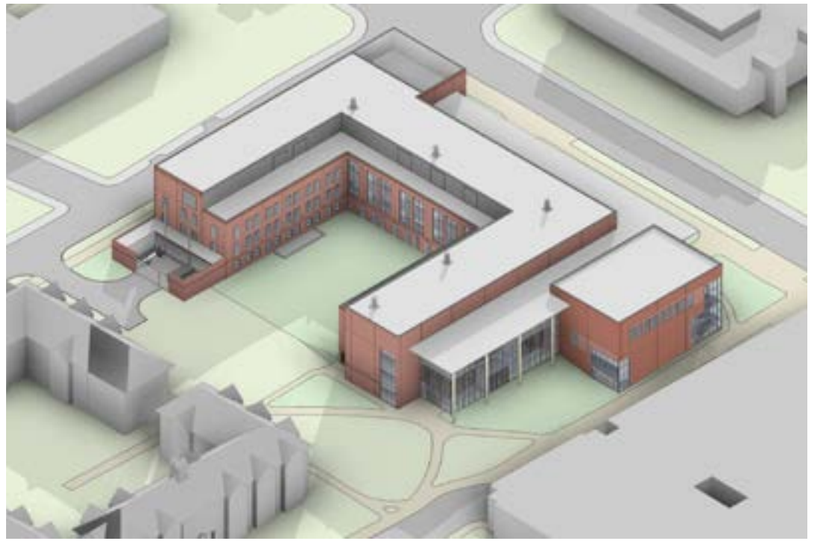
8 student study areas

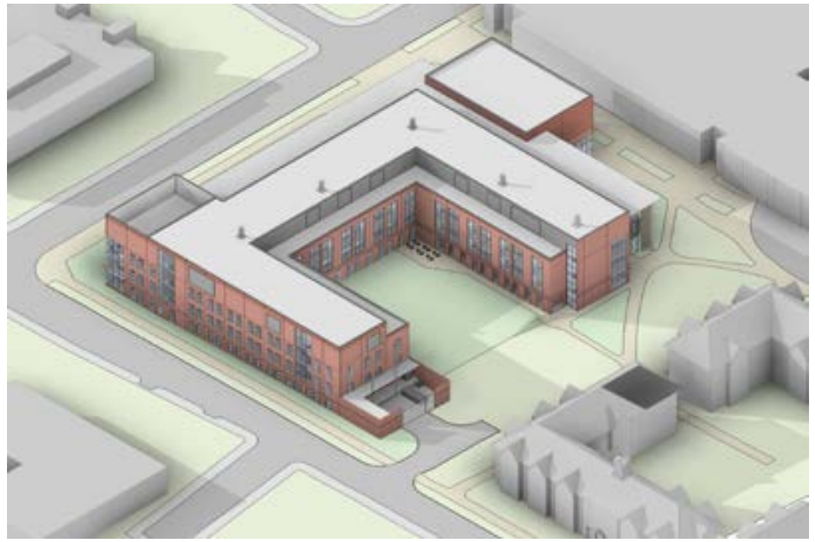
UK Athletics is funding $65 million of the more than $100 million Academic Science Building. It is an unprecedented partnership between athletics and academics in American higher education.

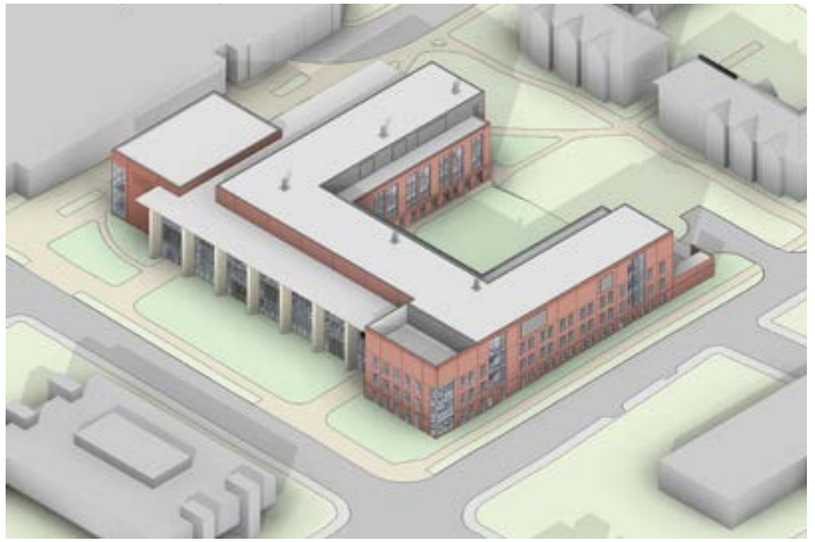
Turning Dreams Into Reality

New Academic Science Building will focus on creating space that will facilitate active learning.

By Guy Spriggs







UK's new Acedemic Science Building is scheduled to open Fall 2016.

According to Dean Mark Lawrence Kornbluh, the College of Arts & Sciences has dreamed for a new academic science building for 20 years. More recently, the University of Kentucky has made commitments to the principle of active learning: not just sitting in class taking notes but participating in the learning process.

Plans for the upcoming Academic Science Building (ASB) emphasize environmental responsibility, utilizing natural light, outdoor teaching areas and rainwater recycling. But the value of the ASB's design extends far beyond its construction – the innovative lecture halls and classrooms inside will help the College realize its dream of improving science education through exciting new models of engaged in-class teaching.

The teaching space in the ASB will be composed of next-generation lecture halls and groundbreaking TEAL (Technology Enabled Active Learning) classrooms. While some classes in the College (such as BIO 155) are already taught using interactive computer assistance, the new capabilities offered by the ASB stand to change the academic culture of STEM education at UK.

Traditional lecture halls place students in fixed single rows of stadium seating facing the front of the room. This arrangement limits students' access to information and minimizes their ability to interact with each other.

Lecture halls in the ASB will maintain the same basic stadium structure, but are also designed with two rows of seats per tier with a table in-between. Even though these lecture halls will have as many as 300 seats, this design means students will be able to form groups and take part in active learning exercises in ways not possible with UK's current facilities.

"We envision a professor putting a problem on a board and students breaking into groups of 4 or 6 or 8 and working on the problem together," said Kornbluh. "It's designed for students to bring their computers with them and work together. After group work the class can come back together and the professor can tell them to put their answers on the board."

"Some subjects and classes will remain large at UK, but now they are designed for active and interactive learning," he added.

These designs give unique opportunities to the professors who use them. "The structure really enables activities that require working in groups," explained biology professor Peter Mirabito. "Now we can design active class periods instead of just telling students what we know."

The ASB will also feature a variety of TEAL classrooms, ranging in size from 20 to 120 seats. TEAL classrooms group students around tables, allowing them to interact as they learn. But the tables do more than organize – they also contain interactive technologies that allow students increased access to the professor and web-based resources.

Statistics professor Bill Rayens sees these spaces as a great opportunity to implement aspects of both flat classrooms and flipped classrooms. "This will change everything," he said. "It's going to be amazing to have this technology and to have this beautiful way we can reach each other electronically."

"This is really exciting because we'll have eye-level access with all students all the time. In a sense, the class that used to be 120 will feel like a class of nine," Rayens said.

Mirabito looks forward to the additional resources because of the ways they enable group work, individual pacing, and student-assisted education.

"In the TEAL classroom, groups can handle lessons at their own rate. They can make sure they get what they need," he explained. "Students explaining things to each other is a big part of the group dynamic. They get something out of it by teaching as well, and it's a great use of their time."

The new lecture halls and TEAL rooms in the ASB will dramatically change the role(s) played by professors in the classroom. Instead of just providing content, instructors in the ASB will have a new and unique capability to give students access to problem-solving tools and steer them toward solutions.

"With this, students can interact with hands-on things – what I call intangibles or 'ponderables,'" Rayens said. "We can project demonstrations or activities on the walls and broadcast them to each table. Students can work together and report out instead of being held captive by a passive lecture."

"It's a big step away from the approach of just reading the textbook and taking a test," Mirabito added.

The teaching space in the ASB will reinforce the classroom as a site of knowledge creation, allowing instructors to focus on building and reinforcing students' skills. "There are things students can't deliver to themselves: connections and discoveries that need to be guided by someone who knows where they are going. The success of this pedagogy is directly correlated to the architecture of these classrooms," Rayens explained.

"[The ASB] looks like something you would be excited to be part of as a student and excited to send your kids to if you were a parent. Being a student here is going to be better than ever," said Mirabito. &

SCIENCE YOU CAN SEE

Making STEM research visible in the new Academic Science Building

By Guy Spriggs

When the Chemistry-Physics Building was completed in 1962, it was the most advanced science building in the entire state of Kentucky. Chem-Phys transformed science at UK and continues to facilitate first-rate scientific research.

With the completion of the Academic Science Building in 2016, College of Arts & Sciences Dean Mark Lawrence Kornbluh hopes for another transformative addition to the culture of science education at UK.

"It is a building that will really set up students to succeed in science education," Kornbluh explained. "This will have state-of-the-art laboratories where students can learn by doing, where they will have access to the most advanced instruments. The labs embody the active learning principle that underlined our general education curricular reform."

When funding was secured for the ASB in the spring of 2013, Kornbluh traveled with a team from UK to survey state-of-the-art science laboratories. "It was enlightening to see such advanced science buildings. It reinforced our inclinations to bring disciplines together in an environmentally-designed building," he said.

The ASB will house teaching laboratories for the Biology and Chemistry Departments, uniting teaching and research but also placing introductory and advanced laboratories in close proximity. "Natural light will come in and students will have clear sight lines to see what other students are doing. Beginning students will really see the pathway forward in science," said Kornbluh.

"The labs will be surrounded by glass so students in lower division can actually see these instruments being used and get a chance to see what life is like in the upper division," added Mark Meier, recent chair of the Department of Chemistry.

Moreover, the ASB will offer labs designed for collaboration and tailored to specific class purposes. For example, general chemistry is currently taught in a very traditional laboratory with rows of lab benches. In the ASB, students will form groups of four to work on tables in more open space. "[The design] is going to enable us to introduce some instrumentation we haven't been able to before. Students will be able to engage with ideas more thoroughly and actually experiment, which is new," Meier said.

With labs designed specifically for analytical chemistry, synthetic chemistry, biochemistry and more, the ASB is a more advanced and interactive approach to experimentation than the less flexible labs in Chem-Phys.

The ASB will house all of the teaching laboratories for the Department of Chemistry, but it also meets a crucial research demand for the Department of Biology. As department Chair Vincent Cassone explains, biology has the highest student-teacher ratio of any program among land grant universities, making it particularly important to recruit more biologists.

"I envision [the ASB] to be a major home for the Department of Biology. This building is a great opportunity to move current teaching labs from Thomas Hunt Morgan and allow us to create research space for new faculty and grow biology as a program," he said.

These laboratories, then, will offer a cutting-edge educational experience and show the real world relevance of what students learn in the classroom. New labs for neuroscience and microbiology, among others, allow for a broader biology curriculum and bolster the ability to teach future generations of students at UK.

Since biology is such a labor-intensive discipline, the laboratory space provided by the ASB also reinforces the importance of student research. "We couldn't do research without graduate students. They are one of our greatest resources," said Cassone. "Students working in our laboratories are the engine by which the research enterprise works."

Plans for the ASB also include increased safety and accessibility. Carts with chemicals won't traverse public hallways, but will be safely stored and use private corridors to stock the labs. Administrators also plan to keep the building open late so students will have more opportunity to engage in scientific work.

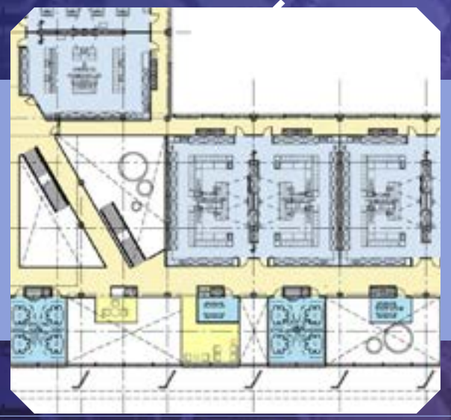
Those involved in planning for the ASB hope the number of students who complete STEM degrees will grow, but these new labs in the ASB won't just affect science majors. Meier believes enthusiasm generated by these new technologies and capabilities will create an improved atmosphere for all students taking courses in the ASB.

"It can really improve morale, and that improved morale will translate into better student success in their majors. This will help contribute to student success all across campus. Chemistry is just a small part of that," said Meier.

"This presents a change in the gestalt of how we teach and create a community of scholars. By having this building and having an open, aesthetically-pleasing area for people to congregate and talk about science, we'll change the psychology of life science research and education," Cassone added.

Future classes will spend a lot of time in the ASB, and Meier and Cassone believe the visibility and capability of these new lab spaces will go a long way toward invigorating, educating, and inspiring those future generations of students.

"The Chemistry-Physics Building has served a lot of people really well. If you think of all the students who have come through this building, it's a staggering number. This building will serve an equally staggering number," Meier said. "Even bigger." &



Exterior render of a TEAL classroom in the Acedemic Science Building.

Knowing Your Environment

By Guy Spriggs

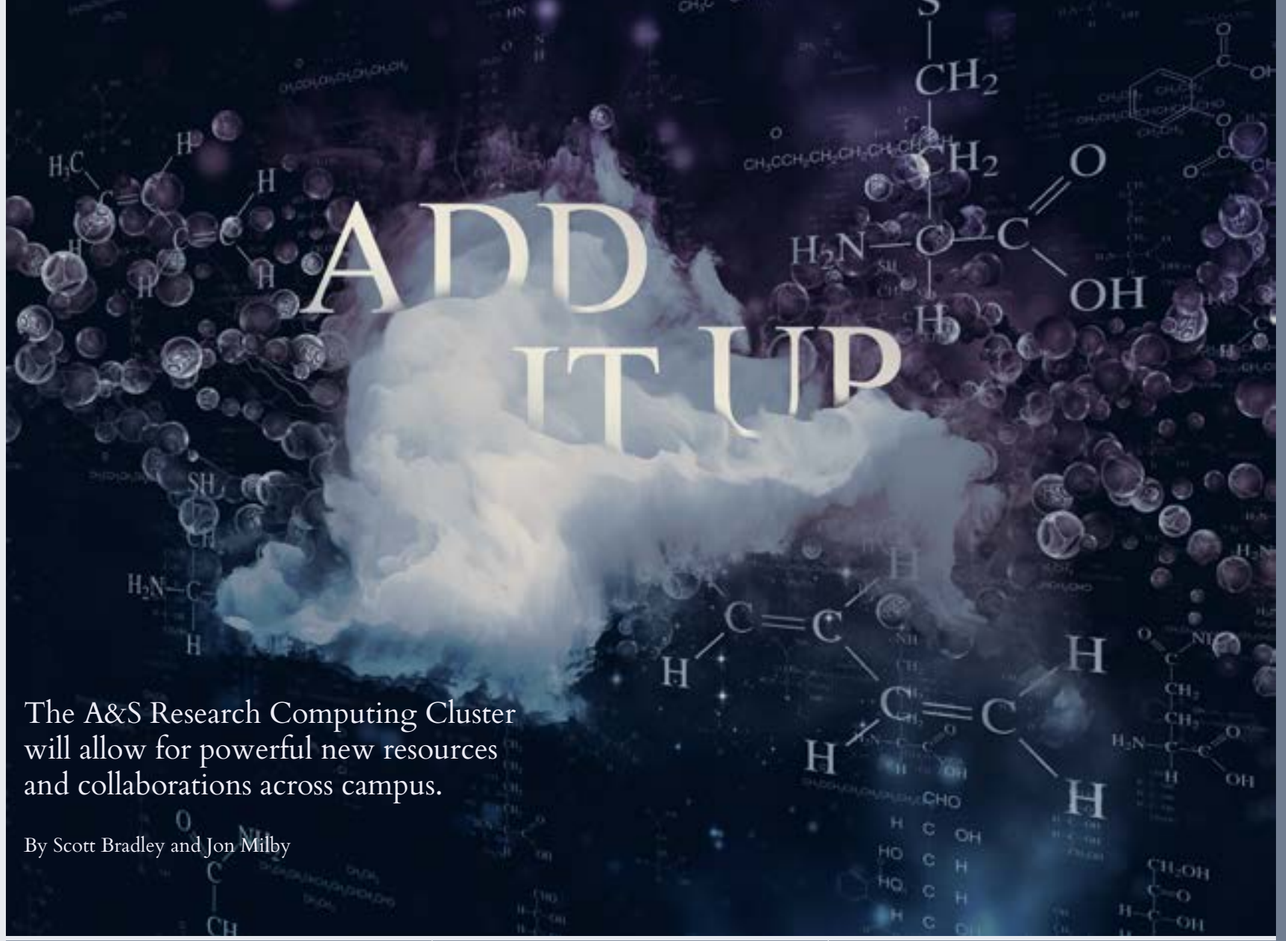
When you think of sitting in a science classroom, you probably don't picture yourself sitting outdoors, surrounded by water and native plants. But that's just what may lie in store for students in the Academic Science Building.

In addition to the groundbreaking features inside, current plans for the ASB also include an outside classroom with a teaching pond and river. A&S Dean Mark Lawrence Kornbluh hopes to surround the whole science corridor in native Kentucky plant materials, giving botany students new hands-on learning opportunities and offering all students the chance to learn more about the environment.

"Dean Kornbluh has been pushing for this courtyard to be a living classroom, and he's empowered the ecologically-oriented biologists to consult with the architects to make a greener approach," said Vincent Cassone, Chair of the Department of Biology. "It will be exciting, aesthetically pleasing, and educational."

"We're integrating everything so we no longer talk about the separation between basic and applied," said Kornbluh. "This is another important step in taking science up to today's applications, translating it into society's needs."

Photo by Brian Connors Manke



The A&S Research Computing Cluster will allow for powerful new resources and collaborations across campus.

By Scott Bradley and Jon Milby

The College of Arts & Sciences is making strides in its representation of computational sciences, complementing recent faculty recruitment efforts in several departments with a new computing environment designed to meet the needs of researchers.

The scale of available computing systems has often limited computational researchers. Supercomputing environments such as those owned by UK and other national organizations have impressive resources available, but are not always a practical option for some types of research. These systems are designed to run continuously and at capacity, creating queues that may make it impractical to run smaller workloads or test new algorithms.

At the other end of the scale, individual workstations address availability issues, but are inherently limited in the amount of resources they can provide. A well-equipped workstation often lacks the computing power required to run even moderately complex simulations in a practical timeframe. The new computing cluster in A&S will strike a balance between these two extremes, providing researchers with access to expanded computing resources while retaining a great degree of flexibility and availability.

The new College of Arts & Sciences Research Computing cluster (which made its campus debut this summer) shares the basic design elements of a modern supercomputer, though at a smaller scale and lower cost. Multiple systems are linked together within a high bandwidth, low latency framework, allowing researchers to run demanding applications across hundreds of processors simultaneously.

The cluster is approximately one-tenth of the scale of a typical supercomputer, but offers resources several times greater than what can be offered by a single workstation. This new system will provide researchers with access to large-scale resources with little to no wait time. By addressing this need and removing common obstacles to research computation, A&S faculty will be able to perform their research more efficiently.

Q&A

with Mark Meier, Department of Chemistry

Q: **How has your field of research evolved over time to get to this point?**

A: Ten years ago, it was inconceivable that you could computationally handle interactions between proteins and solvent, ions and water, modeling 20,000 water molecules at the quantum level. But now, the code and the computational power is there to allow us to look at the question: Can we model the real world in that kind of detail on systems that are reasonably large?

Q: **How exciting is it to see the new computational hires coming together?**

A: It will be very interesting to get our new computational hires in Chemistry, Biology, and others together to talk. These people have tremendous tools to bear. It's very exciting to put them all in a building together, close to the Department of Biology and the College of Pharmacy, allowing us to begin to get interactions back and forth between people that see the problem in the clinic, and the people who can model the problems. There's potential for some tremendous synergy with the location of the Academic Science Building being at the interface between Chemistry, Biology, Pharmacy and the clinical units in the medical center. The same goes for interactions between Chemistry and the Center for Applied Energy Research.

Q: **What's the main bottleneck right now as far as the amount of computational research that can be done?**

A: People. The UK Department of Chemistry did not hire computational people during a generation when other research universities did, so we're a bit behind in this area. I'm really excited about Pete Kekenes-Huskey and Chad Risko - they are perfect fits for UK. They will strengthen the Chemistry Department along with a number of other programs. *(Read about Chemistry's new hires on page 31)*

Q: **How do you expect the Academic Science Building to affect Computation Research?**

A: This is going to have a tremendous, positive influence on a number of aspects of the research program in Chemistry and around the university. We're going to be able to gather together people like the computational folks and their collaborators within Chemistry, to get some feedback and to discover new areas for collaboration.

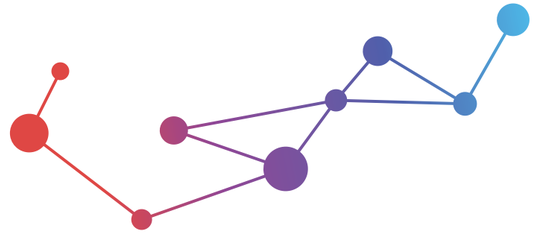
A beautiful facility like this will have an enormous impact on our ability to recruit the best and brightest graduate students, the best and brightest future faculty, and the best and brightest undergraduates. My firm belief is that the ASB will have a very positive influence on many aspects of the research enterprise at UK in addition to the obvious benefits for the teaching program, for decades and decades to come. &

Listen to Department of Biology Chair Vincent Cassone's thoughts on the Research Computing Cluster at ampersand.as.uky.edu/cassone

STIMULATE AND RESONATE

Alan Butterfield has decades of award-winning brain research to his credit, and his commitment and energy to find answers only continues to grow.

By Allison Perry



You might suspect one would get bored with the work after 39 years of working in the University of Kentucky's Department of Chemistry. But chemistry professor Allan Butterfield describes his current project as "one of the most intellectually stimulating projects I've ever worked on." Butterfield, whose many titles include director of the UK Markey Cancer Center's Free Radical Biology in Cancer Shared Resource Facility, studies oxidative stress in the brain, including its effect on the development of Alzheimer's disease. In collaboration with Daret St. Clair, Markey's associate director for basic research, Butterfield is researching chemotherapy-induced cognitive impairment (CICI), known colloquially as "chemo brain" by the cancer patients who experience it.

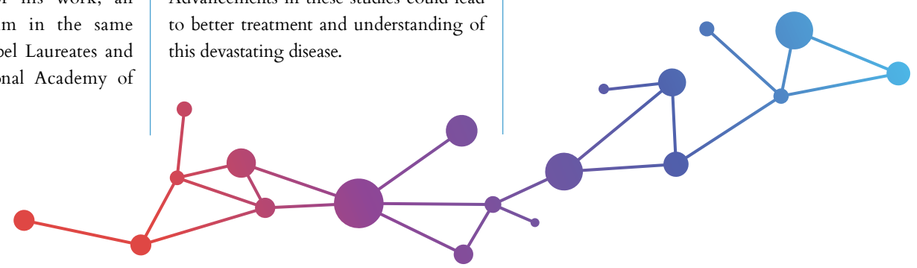
This research is not only stimulating, but groundbreaking, as well. Butterfield was recently awarded the 2014 Alkmeon International Prize for his work, an accolade that puts him in the same company as many Nobel Laureates and members of the National Academy of Sciences.

"I am truly honored to receive this award," Butterfield said. "The Alkmeon International Prize represents worldwide peer recognition of the decades of brain research by our highly talented graduate and undergraduate students, postdoctoral scholars, and visiting scientists in our laboratory that has led to numerous discoveries illuminating molecular mechanisms of brain disorders like Alzheimer's Disease and CICI."

UK's research into these two major neurological problems has the potential to affect millions of patients in the U.S. More than five million Americans are living with Alzheimer's disease, and one of every three senior citizens dies with Alzheimer's or another form of dementia. Butterfield's research has blazed the trail for research on the concept of oxidative stress as a potentially fundamental underlying aspect of Alzheimer's disease, and many other labs across the country have begun pursuing their own studies into the field. Advancements in these studies could lead to better treatment and understanding of this devastating disease.

Additionally, among the 14 million cancer survivors in the U.S., many suffer from symptoms of CICI, which include negative impacts on reasoning and multitasking, confusion, and fatigue — all major quality-of-life issues. These side effects can be long-lasting — decades, in extreme cases — and can have a significant negative impact on a patient's ability to function and even work post-treatment.

Butterfield has received numerous honors for his research over the years, but he is quick to point out that research is not a one-man show — it takes a strong infrastructure that allows collaboration from experts across many areas and disciplines across campus. UK's position as an academic medical center fits that bill. Individual medical centers like the Markey Cancer Center and the Sanders-Brown Center on Aging — both of which implement Butterfield's expertise in redox research — benefit from the resources of eight colleges across UK's campus.



Butterfield says that Markey's Free Radical Biology in Cancer Shared Resource Facility is especially unique, noting that only the University of Iowa has a comparably robust program.

"The FRBC is unique because Markey researchers can directly test the roles of free radicals and oxidative stress in cancer and cancer chemotherapy," Butterfield said. "Samples from cancer patients can be examined on-site for oxidative damage, redox metabolism, and identification of altered proteins, all providing new insights into the molecular bases of cancer and its treatment." &

Hear more from Dr. Butterfield in his podcast about fighting Alzheimers: ampersand.as.uky.edu/butterfield

CHEMISTRY SCORES TRIFECTA

When speaking of a trifecta in horse country, it usually implies hitting it big, and that certainly applies to the Department of Chemistry as they welcome professors Kenneth Graham, Peter Kekenes-Huskey, and Chad Risko to the Bluegrass this fall.

Graham specializes in carbon-based material analysis, and at the University of Florida, he was part of one of the premier research groups that developed carbon-based materials for power generations and displays. He went on to Stanford University as a research fellow where he sharpened his expertise in the fields of organic light-emitting diodes and organic solar cells.

"He will bring with him a very broad analytical/characterization skill-set and an interest in the study of interfaces that are present in devices, particularly those in photovoltaic devices," said Mark Meier, chemistry professor and recent chair of the department.

Graham will apply his expertise in material analysis to the vast array of carbon-based materials synthesized in chemistry and at the Center for Applied Energy Research (CAER).

Kekenes-Huskey has been a postdoctoral fellow at the University of California, San Diego, and his research focuses on using computational chemistry to understand heart function.

"Heart disease impacts millions of Americans, for which potentially fatal cardiac arrhythmias are prevalent," Kekenes-Huskey explained. "While considerable progress has been made in understanding the cellular basis of arrhythmias accompanying heart disease, details of underlying molecular factors, and their influence on cellular function, have been elusive."

"Professor Kekenes-Huskey will be developing computational methods that can span these very different realms, and his work will help to shed light on the fundamental molecular processes that underlie this important biological binding event," Meier said.

For the past five years, Risko has worked as a research scientist at Georgia Tech.

"Dr. Risko comes from the world's leading group in applying computation and theory to the design and analysis of carbon-based semiconductors," said John Anthony, UK chemistry professor and CAER researcher.

"His ability to simulate new materials on a computer will help those researchers who are trying to design new materials narrow in on promising targets," Anthony said. "With the hire of Dr. Risko, we complete the much needed set of scientists to tackle really big problems in energy generation, storage and utilization."

Outside the classroom, Risko will work in CAER and apply his skills in materials theory and modeling to develop new ways of synthesizing those carbon-based semiconductors.

ON THE ROAD AGAIN

UK faculty extend the classroom beyond the Commonwealth

By Mary Venuto

Big Blue Nation reaches far past Lexington's city limits. Across the globe, faculty and students of the College of Arts & Sciences are always seeking out new endeavors and fortifying existing relationships overseas.

Alan Fryar in the Department of Earth and Environmental Sciences (EES) was awarded the prestigious Fulbright Program scholarship by the U.S. Department of State's Bureau of Educational and Cultural Affairs. Through its support of education and research, this program promotes collaboration between the U.S. and other countries to address common priorities and concerns. For his project, Fryar is working with professor Lahcen Benaabidate (Faculté des Sciences et Techniques – Fès) to study the influence of climate change on spring flows in Morocco's Middle Atlas Mountains.

Morocco has been in drought since the 1980s, and global climate change is expected to reduce available water resources further. The Middle Atlas plateau is the "water tower" for Morocco's two largest rivers, the Sebou and the Oum Er Rbia, which originate from springs. These rivers are a major economic resource for the country, so an understanding of the impact of climate change on their source is imperative to long-term water management strategies.

"Many countries, including the USA, face challenges in supplying sufficient water for human needs while limiting environmental degradation," said Fryar.

Since March, Fryar and Benaabidate have been measuring water level, temperature, and water chemistry at three large springs, which are used as water supplies for local communities. Initial results of monitoring indicate that the springs do not respond dramatically to snowmelt or rainfall. These observations suggest that the effects of climate change, such as reduced precipitation and increased temperature, on the flow of the springs may be gradual.

Fryar's experiences have not been limited to his research. While abroad, Fryar has attended an international conference on use of satellite technology for water resources management. In addition to acquiring new knowledge, Fryar has also been advancing UK Education Abroad by visiting two study abroad sites at universities in Morocco.

Whether he's abroad or at UK, Fryar explains that students are crucial contributors to the advancement of his research.

"I've been fortunate to work with a variety of students. The study of water is inherently interdisciplinary and my classes routinely draw students from a variety of majors. I love learning from my students and watching them learn from each other."

Geography professor Stan Brunn defines China by its fluidity – where no place or time is the same during a week. In a country with centuries' worth of history combined with recent decades of postmodernism, the past and present are sometimes in sharp contrast side-by-side. "The dynamism in the countryside, in cities, even in shopping malls is inescapable," he said.

"This is the third time I am in China, and it is simply a fascinating country to observe changes almost everywhere."

Brunn is in Kunming, China, helping faculty and graduate students at Yunnan Normal University accomplish their goals. He is determined to assist faculty and graduate students publish in major international scholarly journals, teach graduate classes, and participate in various research projects.

"I am working with students and faculty here on several fascinating projects," said Brunn. "These include social distances among ethnic groups, memoryscapes, social media use by Chinese youth, and the moral geographies of Chinese youth – just to name a few."

6,657 miles away in Cape Town, South Africa, Steven Yates has been maintaining a collaborative relationship with the University of the Western Cape. He will return again to participate in the fourth "Tastes of Nuclear Physics" workshop this fall.

Yates, who holds joint professorships in both the Departments of Chemistry and the Department of Physics and Astronomy, explains that the workshop is a place where world-class speakers give lectures to a group of 30 to 40 students.

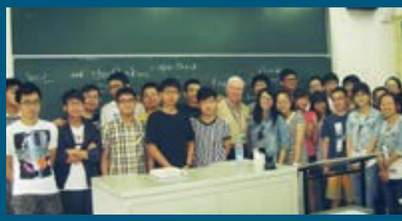
"They're bright, talented people," said Yates, "The only thing that holds them back is the lack of opportunities."

Nontobeko Khumalo was one of the student attendees of those workshops. She graduated from the University of Zululand with a master's degree in physics and is pursuing a Ph.D. at the University of the Western Cape, and is currently at UK doing research in the university's renowned facilities.

"For a 'young girl' from a small village (Nongoma) in South Africa, this is a great opportunity. It was a long trip getting here, but it was all worth it. I was welcomed by beautiful weather and everyone I've met has been nice. So, I would say Kentucky is blessed with the nicest people in the world," Khumalo said. &

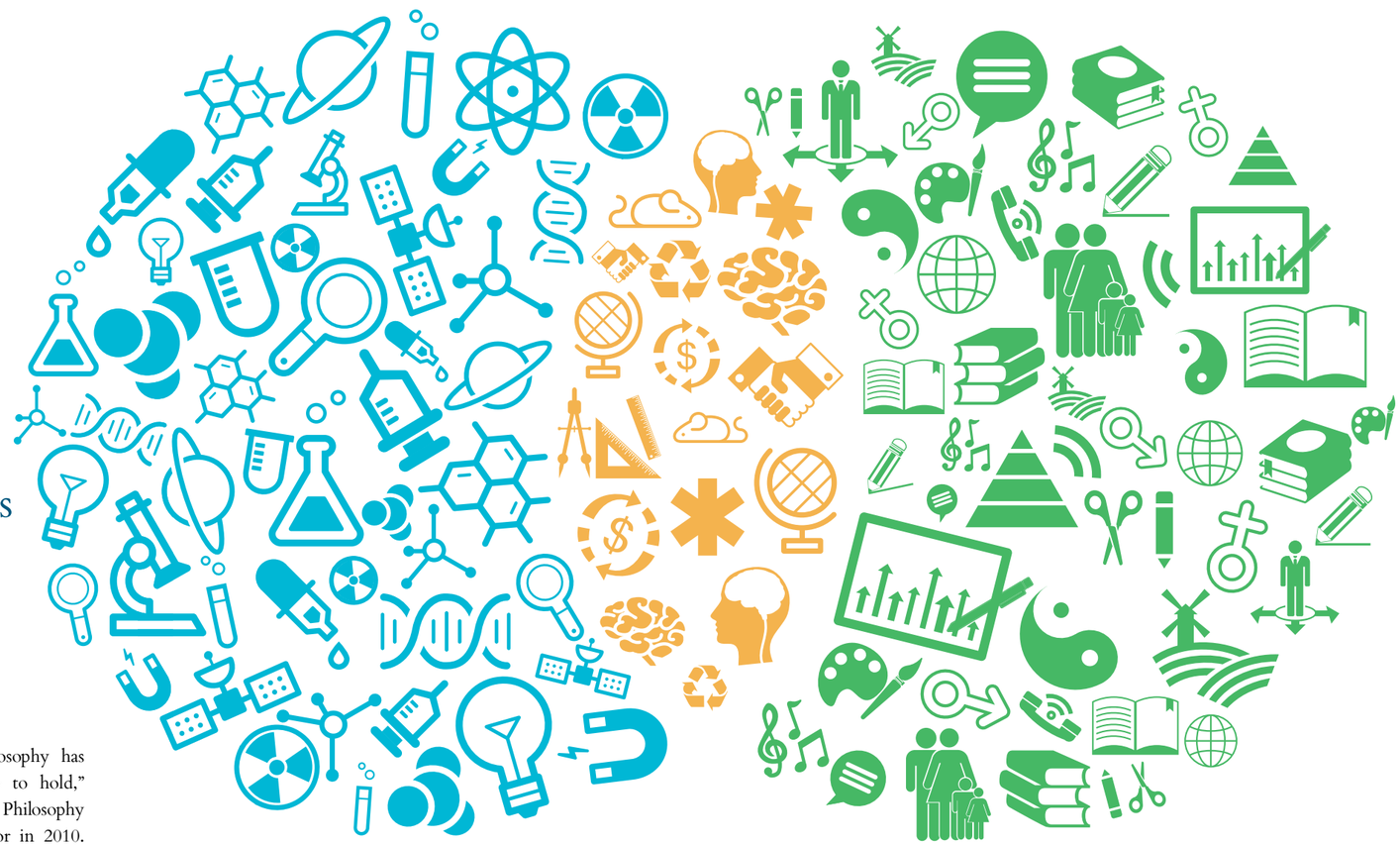
Steven Yates poses with students participating in the "Taste of Nuclear Physics" workshop.
Photo courtesy of Steven Yates.

Alan Fryar with faculty colleagues from Université d'Oran (Algeria) on a field trip to examine geology along the Mediterranean coast.
Photo by Dr. Tarik Ghodbani, Université d'Oran.



Stan Brunn and a contigent of students during his trip to China in the summer of 2014.
Photo courtesy of Stan Brunn.

WE'RE ALL FRIENDS HERE



A&S faculty are erasing the gaps between the natural sciences and the social sciences and humanities.

By Robin Roenker

At first glance, the types of work being done by theoretical physicists and philosophers or by biologists and sociologists might seem to be worlds apart.

But on closer inspection, the questions explored by researchers across the varied fields that make up the College of Arts & Sciences are often, surprisingly, intertwined.

Interests in broad issues connect the work of researchers at UK in fields as varied as history, sociology, anatomy, and behavioral neuroscience. English professors focusing on eco-criticism and nature writing are informed by the research of biologists. Psychologists working to understand the neuro-pathways that lead to drug dependency collaborate intimately with faculty in anatomy and neurobiology.

It's during these moments of truly cross-disciplinary collaboration that the seeming divide between the so-called "hard" sciences and the social sciences and humanities begins to shrink, if not disappear altogether.

The addition of several new faculty members at UK has only served to broaden and deepen this integration of the natural sciences across many of the A&S disciplines. The research interests of new faculty members in Philosophy, History, Sociology, and Psychology as well as a veteran professor of English converge at the rich intersection where the natural and social sciences and the humanities meet.

Philosophy of Science

Meg Wallace is an analytic philosopher who specializes in metaphysics, which is to say that she is a philosopher who spends her time pondering the "essence of things." Does a table exist? If so, what are its attributes? Do the molecules that make up the table equal the table itself? In other words: can the parts be the same as the whole?

While these questions may seem abstract, she attends to them with an analytic rigor bound by precise, definable logical laws.

"Scientists have mathematics. Philosophy has logic. Certain laws of logic have to hold," said Wallace, who joined UK's Philosophy Department as an assistant professor in 2010. "The idea is that we are going to apply the same amount of rigor in exploring these philosophical questions as scientists would use when applying mathematics to their theories."

Applying analytic skills to theories of the world isn't the only way that science informs Wallace's studies. A new course this fall on the Philosophy of Food Ethics taught by Bob Sandemeyer will draw upon research from fields like agriculture and environmental and sustainability studies. And Wallace's 500-level Philosophy of Science course is a popular one. In it she guides her students in analyzing how logical precepts — like Ockham's Razor, the idea that the simplest solution is often the best — have informed the ways in which scientists perceive and choose between various scientific theories, including, for example, a geocentric versus heliocentric view of the world.

The class also explores the ways in which research in certain fields of the natural sciences, like theoretical physics, has moved to some degree beyond our ability to directly empirically test it. "That's really where we tread in the philosophy of science," Wallace said. "We look at that intersection, when the distinction of what counts as empirical and observable and what isn't, gets a little blurry."

The History of Addiction

In the 1600s, coffee and tobacco were virtually unknown to Europe, but by 1700 they were pervasive. These new commodities began making their way in large quantities from the New World, and — almost immediately — users noticed their addictive properties.

Scott Taylor, who joined UK's History faculty in 2012 as an associate professor, researches and teaches about the history of drugs in Western civilization. His forthcoming book traces the introduction of coffee, tea, tobacco, chocolate, sugar, and distilled spirits like rum and gin into European societies between 1590 and 1825.

By studying early 17th century medical and scientific texts written in England, Spain, France, and the Netherlands — leaders of the maritime trade at that time — Taylor has uncovered evidence of Europeans' pervasive unease at the seeming addictive properties of these new imports, an idea so new that even physicians then lacked adequate words to clearly express it.

"Every single one of these things was controversial when it appeared," said Taylor. "They all had medicinal associations to them, but people started using them for pleasure. It didn't take long for people to realize that once you smoke tobacco regularly, for example, you can't stop. The medical writers of the time thought they knew tobacco's properties, what it does, what it's good for, how it cures you. But when they tried to talk about how people become addicted, they would go to religious language, saying it's 'bewitching,' or adopt terms like 'becoming a slave to tobacco,'" Taylor said.

Taylor's book will address the ways in which these addictive commodities changed European social structures, impacted trade and slavery, and offer a lens through which to view broad human themes like willpower, class, and gender prejudice.

continued on p36

continued from p35

Health, Society and Populations

There's a growing awareness in medical fields that one's health is directly impacted not only by biological processes but also socio-cultural, behavioral, and psychological influences — so much so that the new, revised Medical College Administration Test (MCAT), set to be introduced in 2015, will include a new section emphasizing understanding of the social and behavioral sciences.

Illustrating this pre-med preparation/curriculum shift, UK's newly launched Health, Society, and Populations (HSP) major will draw from courses across disciplines to blend insights of both the natural and social sciences in its approach to health studies. "This new liberal arts major will provide students with a greater understanding of the cultural and structural factors that influence who is more or less likely to live a healthy life and have access to the resources necessary to do so," said anthropology professor Erin Koch, who will co-direct the new major with sociology's Carrie Oser.

Koch's work on responses to tuberculosis in post-Soviet Georgia has produced policy-relevant insights about the strengths and limitations of top-down approaches to public health. While Oser's work on health disparities and health services utilization among special populations of drug users has led to intervention studies for both patients (HIV interventions) and healthcare providers (collaborating with criminal justice organizations to implement evidenced based practices).

Mairead Moloney, a medical sociologist who joined the UK Sociology Department as a new hire this fall, is also affiliated with the new HSP major. She will help develop a new Introduction to Sociology course, which will be required of all UK pre-med students.

"We'll talk about the health care system and explore why it is that some populations are healthier than others," said Moloney. "It will be a real mixture of health care and sociology."

Moloney's own research includes work with hospitals' transitions to Electronic Medical Records, studies of cancer incidence among minority groups, and a quantitative analysis of 15 years of medical data, which suggests a steep rise in the use of prescription drugs to treat insomnia. "When patients talk about sleeplessness, they often mention hating their job or the stress of caring for children or a parent," Moloney said. "So there is a real sense that we may be medicalizing or transforming life issues into medical issues via prescriptions of sleep aids."

The Psychology of Addiction

Psychologist Josh Beckmann's interests in behavioral neuroscience — specifically, the neurotransmitters that may play a role in drug addiction — and his cutting-edge research with UK's psychopharmacology program have provided him with frequent opportunities to collaborate with UK faculty in the medical and biological sciences.

For instance, Beckmann and Greg Gerhardt, in anatomy and neurobiology, are collaborating on a current project that uses state-of-the-art, micro electrodes capable of providing real-time data on the release of different neurotransmitters in rodents' brains as they intake various substances or perform various tasks that have an abuse potential. The study is one of the first ever to provide researchers with real-time data on neurotransmitter release, according to Beckmann, who joined UK's Psychology Department in Spring 2014, after having completed his postdoctoral fellowship here.

"In particular, we are measuring the release of a neurotransmitter called glutamate. We know that glutamate is involved in the learning processes in the brain that are associated with memory and reward — and therefore may play a role in reinforcing the use of drugs of abuse in some people," Beckmann said.

The goal of Beckmann's work, at its essence, is to better understand the underlying neuro-circuitry within the brain that can lead to addiction. That work, in turn, may one day inform the development of pharmacotherapies to help substance abusers overcome their addictions.

Environmental Literature

After receiving mass praise for his critically acclaimed 2006 work *Lost Mountain: A Year in the Vanishing Wilderness* — an investigation into the environmental effects of radical strip mining in Appalachia — UK English professor Erik Reece followed up in 2013 with *The Embattled Wilderness: The Natural and Human History of Robinson Forest and the Fight for Its Future*, which he co-wrote with UK biology professor James Krupa.

Reece's interest in Robinson Forest dates back at least a decade, he said, when he first discovered it as a go-to retreat for students in his nature writing class at UK.

"There are cabins there. You can get the kids away from their screens, since there's no cell phone reception there. I wanted to find a place where they could go to really get off by themselves, to write in solitude. I was trying to give them that Thoreau experience," said Reece.

But because Robinson Forest is surrounded by areas that have been strip mined, Reece and his students came to an unsettling conclusion: "You can't write about Robinson Forest in a strictly pastoral way, as Thoreau wrote about the natural world. You also have to also write about it as a threatened landscape," he said.

Reece's work is marked by cross-disciplinary collaboration. He teaches courses in both the Appalachian Studies Program and Environmental and Sustainability Studies major. While researching his books, he collaborated with faculty in biology, forestry, sociology, and anthropology. He has even led a UK course about coal with sociology professor Dwight Billings.

"Robinson Forest became a kind of laboratory for me, a way to do real interdisciplinary work and research," said Reece, whose next project is a look at the Utopian movement in America, from its earliest beginnings in the 19th century to today. &

CAMPUS' NEW FLAGSHIP

A discussion with Academic Science Building architect Rob Deal

Rob Deal is the executive vice president of JRA Architects, the Lexington-based firm in charge of the new Academic Science Building. Although many designers and consultants have come together to form the design team for the ASB, Deal is the lead project manager – which means he is keeping a very busy schedule. Fortunately, we were able to sit down and have a discussion with him about UK's newest landmark building.

&: Take us back to the beginning of the process – how you initially landed the contract and traveled around with the group to look at similar or comparable facilities in North America.

Rob Deal: The University is very selective with their choice of designers. Our firm has had a very long history on campus. We've been doing work on campus since 1946. Ernst Johnson who founded the firm did Memorial Coliseum, Lafferty Hall, Funkhouser – our presence is all over campus. It's been a good partnership for decades.

UK is the flagship university in the Commonwealth, and this is the flagship building. For us it's just a very special opportunity.

To partner with us, the university also selected Payette Associates out of Boston who do labs in science buildings.

On our tour of facilities in the country, we covered 10 buildings in seven business days. We scheduled everything right down to the wire. I'm still shocked to this day that it went off without a hitch.

&: How important was that trip in hindsight in forming some of the decisions you would make and the steps you would take next?

RD: The newer buildings emphasized student interaction and put science on display to support the academic mission of those programs.

So, the simple things like incorporating glass into the lab environment where you can see into the labs from public spaces was a common theme for all the new buildings.

Comparing it to the Chemistry-Physics building, one of the biggest shifts I think people will notice is the amount of daylight that will enter our building. It has glass everywhere, we kind of refer to it as being porous. So light will enter the building and transmit through the common space, into the labs, and come into the core of the building.

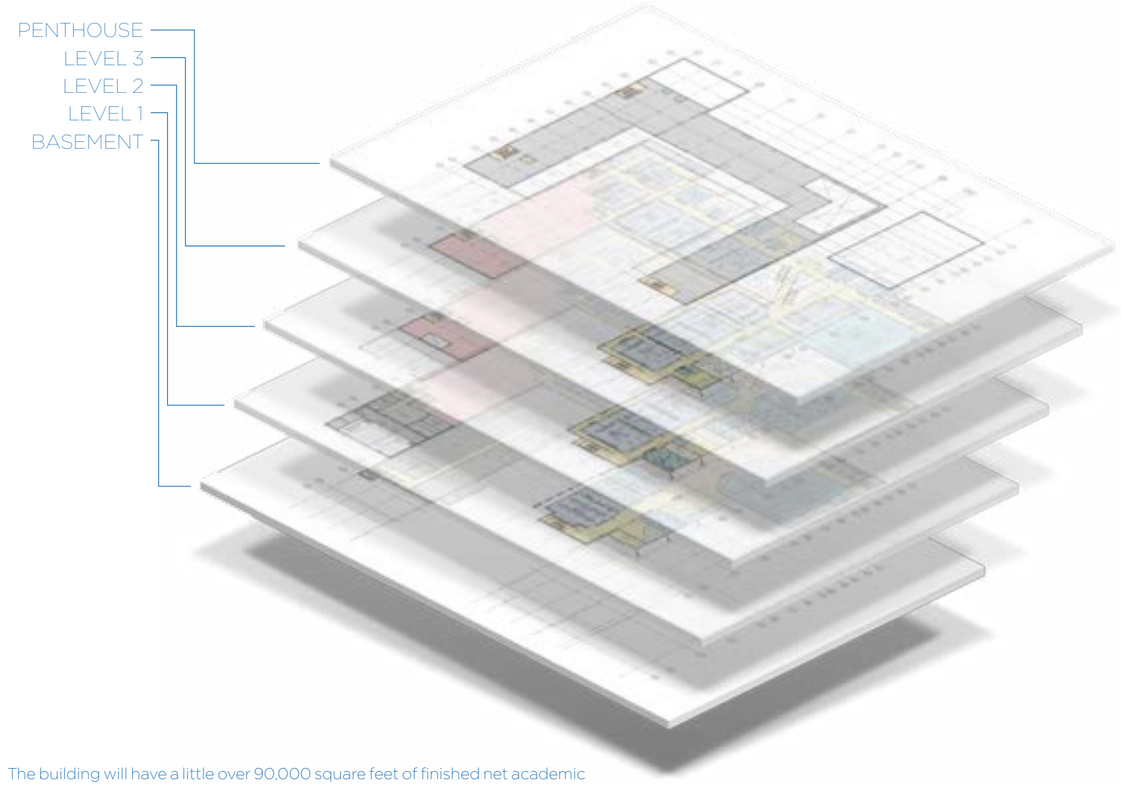
We want this to be a student-friendly building. We want non-A&S majors to come there to study and be a part of the building. It has that kind of potential for impact on campus.

&: How did those spaces feel to you guys when you were in them?

RD: I think they're 180 degrees from what's on campus now. The closest thing I know on campus is another building we did, the David Marksbury Building. It's similar in a lot of ways. It has a facing curtain wall; the new Academic Science Building will have a curtain wall. It's very transparent and it will be a LEED building, so it will be environmentally friendly and green. It's the flagship building and it's going to end up embracing that spirit – very modern.

&: Talk a little about the work that went into the actual design of the building.

RD: When we got back from the tour, the next months were spent in a programming phase and that's not really putting pen to paper and coming up with designs, but it is a study of university curriculum, looking at section size, looking at growth. This is a building the university can grow into for many, many years. And so there was a lot of analytical data crunching to anticipate that growth and identify



The building will have a little over 90,000 square feet of finished net academic space and 40,000 for research. The total structure is 236,000 sq ft.

new programs, like neuroscience, which will be supported in the building.

In terms of design, there have been several versions of the building with different materials. Really, you can look around UK's campus, and if you spend enough time on it, you'll come to the realization that it is a red brick campus. The building is nestled up against the library on one side, the new dorms behind, PS2 (Parking Structure #2) on the other side, you realize there are all these different textual expressions that surround our building.

I think what we do is a funny little thing, we keep playing with it and eventually say 'That's right, that's a UK building.' It's actually fairly modest in its design, it's not wild and crazy, it's not putting a new material on campus. It's kind of bold in its simplicity, yet it looks like it belongs on campus.

We did a building over on Transy's campus a few years ago and one of the best compliments I ever got was that someone was lost at the groundbreaking and couldn't find the new building. I think we want this to fit in and blend with the campus context and I think we're headed in that direction.

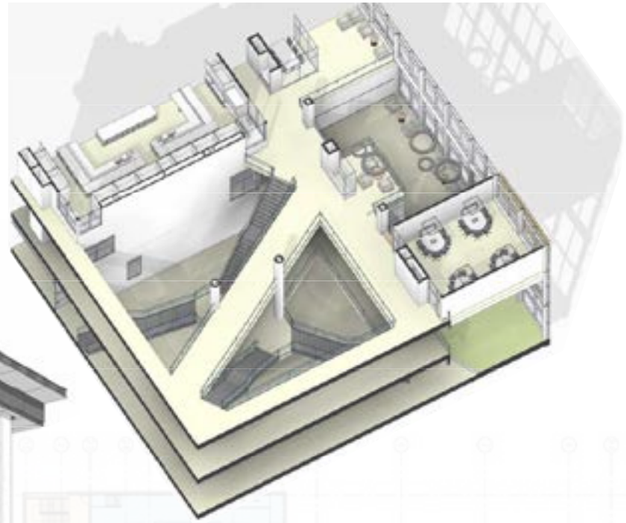
&: Can you talk a little about any exciting features that will be incorporated in the building?

RD: Active learning spaces – there are several in the building. They are sort of team-based learning pods with the smaller ones in groups of six around a common screen where the facilitator has common control of all the tabletops. If groups are working on different problems and the group working on problem A has something to share with the rest of the class, the facilitator can display it for everyone to see.

There is a lot of space to gather with soft, lounge furniture. If you're between classes or just want to study, there are abundant options throughout the building on all levels.

If you want to reserve a room, there are study rooms throughout the building that can be reserved. The building will have dedicated learning centers for biology, general chemistry, and organic chemistry publicly situated on the floors where those programs are located. The students won't have to look for them. They are front and center near the main common space. At the end of the day, we also want the building to raise student achievement. So that's been a

continued on p40



continued from p39

very direct response to the need for larger, better learning centers.

Other features, of course, are the two lecture halls. I don't think it's a stretch to say that when we're done these will be the best, most high-tech, largest learning spaces on campus. We have a 300-seat and a 200-seat, double row lecture halls that will have video capture and AV support – it will be state-of-the-art.

On the non-academic side – the building will have a café on the ground level. We want to support students in every way we know how. We've even talked about little things like charging stations and outlets in the lounging areas where the students will gather. We're going to load it up with power for laptops and wireless.

&: We understand there will be the possibility of some exciting outdoor space that will be incorporated into the design as well?

RD: We've had several meetings that have helped to program the desires for some of the outdoor space. So yes, there is space for outdoor classrooms, there's space for what we call an "eco-pod," but it's a space for research and the area can be changed out if needed. We have kind of a rain garden and wetlands basin feature that will help the ecological group, but we also have to deal with storm water as well, so we're trying to figure out a way to incorporate our storm water management that comes off the roof into this rain garden area as well.

We have an axolotl terrarium on the inside right by the café so you can have your lunch and look at them. And we're still trying to figure out where each of those goes, but I think it goes back to the theme of science on display and student-engagement. From the terrarium to the display cases that will be three-dimensional and interactive – from building directory to green information about the building – all of it can be interactive and provide learning opportunities. It's not static, there's always something going on.

&: You've talked a little about the building and what it means to UK's campus. Can you talk a little bit about what having this type of buidling at UK will mean nationally?

RD: The reality is that UK is competing for the same students as others – there's a lot of competition locally with places like Eastern and regionally with Ohio State, Tennessee, other big institutions equal to UK, the SEC, and Big 10. Everybody wants the best and brightest.

The reality is you have to have the faculty of that caliber to teach those students and lure them – and you need the infrastructure in place, and the building plays a big part in that. So it's all very circular. You can get the best faculty if you have research opportunities, but you also have to have the best facilities. So I would anticipate with this building that the best and brightest faculty get on board, that the best and brightest students come to UK and are excited to be a part of the sciences at UK. I do think it's that important.

Although, it's not just about scientists or people going into the sciences. It is also about the nursing student that has to get through general chemistry to go off to nursing school. It has that kind of impact in other programs across other disciplines. We've done the math, and on an annual level, I think it was over 35,000 students that would be touched by the building. It's a staggering number just looking at section sizes and throughput of how many students it will affect.

&: What does it mean to you to be the head project manager on this? What does it mean to have such an important footprint on campus when you're looking into the future and that legacy?

It's an honor is all I can really say. I think at a certain level architecture is fairly self-indulgent. The best day any architect ever has is on dedication ceremony day where you open the building and cut a ribbon. We get one day out of a lot of work to step back and watch people appreciate our efforts. I am very much aware of the importance that this building will have on campus and how impactful it will be, and I'm honored and glad to be a part of it. It's nice to be associated with something that important.&

View a live construction feed:
ampersand.as.uky.edu/asb

UNIVERSITY OF KENTUCKY
College of Arts and Sciences

202 Patterson Office Tower
Lexington, Kentucky 40506-0027

Visit the A&S website:
www.as.uky.edu

Non-Profit Org.
US Postage PAID
Permit 51
Lexington, KY