KAS Newsletter

May 2016

Kentucky Academy of Science

www.kyscience.org

Fostering Scientific Discovery and Understanding in Kentucky

From the KAS Executive Director

Amanda Fuller, executivedirector@kyscience.org
(859) 227-2837

2016 KAS Affiliates

Enhanced Affiliates :
Alice Lloyd College, Bellarmine University, Berea College, Brescia University, Campbellsville University, Centre College, Eastern Kentucky University, Kentucky Science Center, Kentucky State University, Kentucky Community & Technical College System (KCTCS), Midway University, Morehead State University , Murray State University, Northern Kentucky University , University of Pikeville, Spalding University, Thomas More College, University of Kentucky, University of Louisville, Western Kentucky University and Transylvania University

Regular Affiliates:
Asbury University, Kentucky Wesleyan College, Lindsey Wilson College, University of the Cumberlands, Wood Hudson Cancer Research Laboratory

Is your institution not listed here? Please encourage your administration to renew their dues payment for 2016 so that you can keep your KAS membership.

KAS Membership:
3426; 43% are students

KAS seeks an Historian

KAS is still looking for an Historian to help update the KAS archives at EKU. If you are at EKU, and could spend some time this summer helping KAS, we need someone to visit the archives, make some notes about what needs to be added, and help assemble some items from 1993 forward. (particularly journals, meeting programs, and newsletters

Description of the KAS Archives collection at EKU is here:

http://library-old.eku.edu/archon/index.php?p=creators/creator&id=129

If you can lend a hand in the (air-conditioned!) archives this summer, please contact Darrin Smith, Darrin.smith@eku.edu

Inside This Issue

2016 KAS Governing Board Members

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At-Large Representative

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Journal Editor

Check our website (*kyscience.org*) for updates on science events around Kentucky and send your event announcements to:

executivedirector@kyscience.org

Journal of the Kentucky Academy of Science

Deadlines: September 1 and March 1

All manuscripts and correspondence concerning manuscripts should be addressed to the Editor: Dr. Jerzy W. Jaromczyk, *jurek@cs.engr.uky.edu*

Guidelines for submission are at:

http://kyacademyofscience.net/publishing-in-the-journal/

Communicating Science:
Some Suggestions from the Experts at AAAS

- Learn how to speak to shared values & the "why" of science
- Listen more
- Embrace, and remind others, of the public service mission of universities

See more inspiring tips & resources for the public communication of science from the AAAS Conference in the Executive Director's report on page 4.

Kentucky Science Speakers Bureau

Coming Soon!

KAS is assembling a list of members who are interested in serving as speakers and presenters on a variety of science topics all over the state.

If you'd like to serve as a speaker in the Kentucky Science Speakers Bureau, WATCH YOUR EMAIL and please take a few minutes to complete a questionnaire about your field of expertise, availability, location, and preferred audiences. Graduate students are encouraged to participate too.Thank you for being a voice for science!

Summer Plans?

How about showing off your research for KAS?

Spend a couple days in the hammock recovering from your semester, then why not come out and inspire some of your fellow Kentuckians to get excited about science? We have a long list of events that YOU can help with:

Discovery Festival at Lake Barkley State Resort Park Saturday May 21. We invite STEM -related activities, indoors or out, for visitors of all ages. Flyer here: DiscoveryFestival_PartnerFlyer 2016

GAMEology: May 19. A 21+ evening event at the Kentucky Science Center in Louisville. We need game theorists/ scientists that can speak to a 21+ audience, live or by SKYPE. More at: http://kysciencecenter.org/grownups/adult-series/

Discovery Festival in Owensboro June 4: We invite STEM -related activities for visitors of all ages. Bring your DNA extraction, homemade compasses, or make a mess with DIY meteor craters! Flyer here: DiscoveryFestival_PartnerFlyer 2016

Louisville Youth Science Summit: June 11. Looking for lab presenters with 60-90 minute activities on any topic; and a diverse array of Speed Mentors of all ages & experience to answer questions about science careers. Photos from past event: www.flickr.com/photos/kyscience/sets/72157645205058134/ More info & ticket sales: http://kysciencecenter.org/kids/youth-science-summit/

megaBITE: June 16. A 21+ evening event at the Kentucky Science Center in Louisville. We need scientists to share demos or activities related to the science of food or beverages. Food and drink samples from local restaurants will be available. http://kysciencecenter.org/grownups/adult-series/

New location : Natural Bridge State Park

Discovery Festival in Prestonsburg at Jenny Wiley State Park, Saturday June 18. We invite STEM -related activities, indoors or out, for visitors of all ages. Bring your STEM expertise, activities, games, bird calls, marshmallow launchers, banana pianos, or whatever! The State Park land & surrounding forest is available to you! Flyer here: DiscoveryFestival_PartnerFlyer 2016

Lexington Youth Science Summit: June 25. An Annual event at Lexmark – if you'd like to share a program or activity with youth, or serve as a Speed Mentor, let us know! http://kysciencecenter.org/kids/youth-science-summit/

Healthworks Science Celebration: August 4-6. A 3-day festival at the Kentucky Science Center in Louisville – Calling biologists & health scientists! Please share an activity or a demo live or by SKYPE.

Science on Tap Speakers are needed for this monthly event from Aug 9 onward. Hosted at Goodwood Taproom 636 E Main in Louisville, every second Tuesday at 6:00pm. They welcome any topic to titillate a 21+ audience, and are particularly interested in debunking pseudoscience. Are you an astronomer that can comment on UFOS or a biologist that can talk about cryptids? View the current lineup here: http://kysciencecenter.org/grownups/scientific-proofs/

If you can help with any of these events, or if you'd like more information, please email KAS Executive Director Amanda Fuller . View and share this list: http://kyacademyofscience.net/share-your-scientific-expertise-with-others/

p.s. Need help with an idea for an activity? There are DOZENS here:

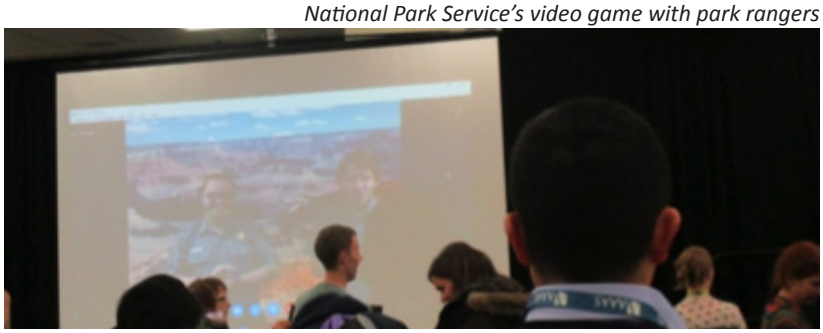
http://www.scientificamerican.com/education/bring-science-home

AAAS Conference Offers Inspiration & Resources

Amanda Fuller, KAS Executive Director

The American Association for the Advancement of Science's annual conference in February offered great ideas and resources around communicating science, being involved in policy, and engaging the public to create a more scientifically literate society. Here are just a few of my favorites:

National Park Service's video game with park rangers



Engaging the Public
How many of you have, or edit, a **Wikipedia** page? Some AAAS folks say Wikipedia may be the most important social media for scientists to use, because it is such an easily accessible source of scientific information for any internet user. The Wikipedia Year of Science 2016 is an unprecedented initiative to improve Wikipedia's potential for communicating science to the public.
Check it out at: https://en.wikipedia.org/wiki/Wikipedia:Year_of_Science/Resources
Find out how to edit pages, or assign your students to edit pages: https://en.wikipedia.org/wiki/Wikipedia:FAQ/Editing

Weighing Hershey bars

Family Science Days – Dozens of science organizations/ businesses set up with activities and demos, free and open to the public—could this be a component of our annual meeting or junior academy?

Electrostatic demonstration

I'm a Scientist - http://imascientist.us/ A free online program where school students meet and interact with scientists. Sign up to chat, or encourage a classroom to sign up for a chat session!

Science in Unexpected Places highlighted "guerrilla science" embedded in fun public initiatives, such as a climate change awareness campaign in Boston featuring ostriches in parks and signs on subways:
http://sciencetogo.org/

EurekAlert! is AAAS' own news service, where universities, medical centers, journals, government agencies, corporations and other organizations engaged in research can bring their news to the media and to the public. EurekAlert! features news and resources focused on all areas of science, medicine and technology. Share it with your local media: www.eurekalert.org

Career resources for Scientists
AAAS' website has an international science jobs database and career advice
http://www.sciencemag.org/careers

AAAS Fellowships
Open to people of all ages who hold a PhD and are US Citizens
http://www.aaas.org/general-process

Announcements

KAS establishing a monthly column in *Kentucky Teacher* newsletter
Thank you to Ashley Richards Best for stepping up! KAS will now have a monthly column in Kentucky Teacher, that goes out to every public school teacher in Kentucky. See Ashley's spring 2016 column with a great lesson plan about infectious disease: http://www.kentuckyteacher.org/subjects/science/2016/04/real-science-for-real-life/

Environmental Education Connections

Did you know that Kentucky has an Environmental Literacy Plan? http://keec.ky.gov/Publications/Pages/KELP.aspx

Would you like to find out more about the Literacy Plan, and about how educators can incorporate Next Generation Science Standards into environmental education?

Register by May 11 for the "Kentucky Academic Standards and Environmental Education Connections" workshop series: http://keec.ky.gov/

Bridge to a Biomedical Doctorate recruiting new students
The EKU-UK Collaborative Kentucky's Bridge to a Biomedical Doctorate M.S. degree program is currently recruiting students for Fall 2016. This is a fully funded program for underrepresented students including Appalachian and minority students, who will hold a bachelor's degree in a biomedical sciences-related field such as Biology or Chemistry by Fall 2016. Application deadline is June 1st. More at: http://kyacademyofscience.net/bridge-to-a-biomedical-doctorate-recruiting-new-students/

Kentucky Heritage Land Conservation Fund spared some cuts..

Thanks to many KAS members who spoke up about this issue. The State budget is still cutting $2.5 million per year from the KHLCF budget, but Kentucky Nature license plate revenue will be again going into the Fund. KAS has 2 representatives on the board of the KHLCF and many of our members, and member institutions have benefited from the land acquisition fund that provides for conservation and research opportunities. Read more at http://www.courier-journal.com/story/tech/science/environment/2016/04/28/kentucky-nature-plate-revenue-protected/83650412/

Professional Environmental Educator Certification
The Kentucky Environmental Education Council http://keec.ky.gov offers an Environmental Educator Certification course information http://keec.ky.gov/eecertification. KEEC has achieved national accreditation of the program, is enrollment is open for the 2016-17 cohort. **Deadline is July 15.**

OPPORTUNITIES

Wood Hudson Cancer Research Laboratory, a non-profit cancer research institute located in Newport, KY, is currently accepting applications for a Staff Scientist. Responsibilities for this position include conducting research, writing manuscripts and grant applications pertaining to cancer research, and supervising students in our laboratories who are enrolled in our Undergraduate Research Education Program. The successful candidate should have prior experience in publications in the field of cancer research. This scientist is expected to act independently in developing their own ideas and to successfully complete research that will result in peer reviewed publications. The expectation is that the scientist will exert leadership in obtaining funding for research projects, as well as leadership in guiding young scientists. Education Requirements: Ph.D. in Cancer Biology or a closely related field and post-doctoral training. Applicants with diligent work habits, significant research and teaching experience, and demonstrated work in laboratory settings, as well as excellent communication skills are invited to email a resume/CV and two letters of recommendation to Dr. Julia Carter at jcarter@woodhudson.org.

For more details and to see other science job announcements & resources, visit http://kyacademyofscience.net/membership/job-postings/

Announcements

Eight New High Schools Join AdvanceKentucky

Eight (8) more public high schools will participate in the **ninth cohort of AdvanceKentucky**, which supports schools in implementing the National Math and Science Initiative College Readiness Program. Today the **Cohort 9** high schools being recognized before the Kentucky Board of Education are: **Boyd County, Campbellsville Independent, Central (Jefferson County), Elizabethtown Independent, Fleming County, Mason County, Nelson County and Thomas Nelson (Nelson County)**. Among their 6,200 students, **53 percent** are eligible for free/reduced lunch and **21 percent** are minority (African American and Hispanic).

AdvanceKentucky provides content-rich teacher training and extensive support and incentives for students to achieve scores on Advanced Placement (AP)* exams in math, science and English (MSE) that can qualify for college credit. The AP MSE subjects served are Calculus, Computer Science, Statistics, Biology, Chemistry, Environmental Science, Physics, English Language and English Literature. Cohort 9 schools are projecting **2,400** AP MSE enrollments for 2016-17, representing a **109 percent** increase above the previous year.

Since 2009, every AdvanceKentucky cohort of high schools has experienced dramatic first-year increases that have well outpaced national rates. AdvanceKentucky students have earned significantly higher ACT scores. Upon high school graduation, they have gone to college at higher rates and earned higher GPAs each year in college. Significantly fewer AdvanceKentucky students have taken remedial classes in college. These patterns hold true among low income and minority students who traditionally have been underrepresented in AP.

Click here for the list of the 109 AdvanceKentucky schools to date. Schools interested in applying to AdvanceKentucky for **Cohort 10** starting in 2017-18 may access **application materials** online.

For more information, contact:
Joanne Lang | cell 859.576.3282 | **jlang@kstc.com**
Follow us on Twitter **@advancekentucky**

AdvanceKentucky is an initiative of the **Kentucky Science and Technology Corporation**, in partnership with the **Kentucky Department of Education** and its Race to the Top program, **National Math and Science Initiative (NMSI)**, Appalachian Regional Commission, Berea College Outreach Programs and others. KSTC is the state's affiliate of NMSI, whose mission is to replicate proven strategies for students' success in AP math, science and English programs, particularly among populations traditionally underrepresented in AP. Open enrollment strategies under the **NMSI College Readiness Program** dramatically expand preparation for, access to and success in AP Math, Science, English.

* Advanced Placement and AP are registered trademarks of the College Board.

The 2016 meeting of the Eastern Section, American Association of Petroleum Geologists, is set for September 25-27, in Lexington, Kentucky.

The meeting, themed "Basins to Barrels 2016," will be hosted by the Geological Society of Kentucky and the Kentucky Geological Survey at the University of Kentucky. Contact Mike Lynch, Communications and Outreach, Kentucky Geological Survey, Univesity of Kentucky. Mike.lynch@uky.edu

KAS GRANT WINNERS

Marcia Athey Grants

Jarrett Johnson: Western Kentucky University
Adaptive Variation in Tiger Salamander Populations in Response to Environmental Change

Jennifer McKenzie: University of Kentucky
Effects of snake fungal disease on populations of natricine snakes across an urban-rural gradient

Stephen Richter: Eastern Kentucky University
Fine-scale and Microhabitat Factors Influencing Terrestrial Amphibian Occupancy and Diversity in a low-elevation Old Growth Forest in Central Appalachia

Botany Funds Grants

Jacob Adler: Brescia University
Altered Transcriptional Growth Control Signaling in Rosa hybrid Infected with the Rose Rosette Virus in Kentucky

Special Research Program Awards

Judy Jenkins: Eastern Kentucky University
Cation exchange to controllably dope ZnS nanocrystals for solar fuel generation

Undergraduate Research Program Awards

Carly Winn: Bellarmine University
Effect of Caffeine on the Tardigrade Metabolism

Amber Onorato: Northern Kentucky University
Synthesis of naturally occurring diarylheptanoid analogues and their potential anti-inflammatory activity

SHOUT OUT TO KAS VOLUNTEERS

Thanks to 2 members in our Engineering Section who visited schools during Engineers week: Aaron Daley & Gabe Draper (U of L)

Science on Tap speakers at Goodwood Brewery:
March 8 Casey Steadman (U of L) : **Sexual Function & Spinal Cord Injury**

April 12 Sarah Emery (U of L): **Intimate Relationships: Plants and their Friendly Fungi**

Junior Academy April 16:

Thank you to our co-chairs, Ruth Beattie (UK) and Bruce Griffis (KSU)

Thank you Junior Academy judges:
Kristy Allen, Ibukun Amusan, Bala Appakalai, Adriana Bankston,, Emily Bradford, Robin Cooper, Aaron Daley, Pamela Feldhoff, Maheteme Gebremedhin, Marie Gutierrez, Eric Jerde, Ann Kingsolver, Alexander Lai, Ai-Ling Lin, Li Lu, Nancy Martin, Andrew Martin, Sajad Mir, Suzette Polson, Kirk Pomper, Madushi Raththagala, Andrew Ray, Leryn Reynolds, Jeremy Sandifer, Rita Sharma, Darrin Smith, Avinash Tope, Sri V, Haoyue Weng, Ilsun White, Maggie Whitson, Frederique Yiannikouris

Thank you Robotics Festival volunteers (May 13) at the Kentucky Science Center: Troy Stafford and Armin Maraghehmoghaddam (both from Morehead State)

Thank you KAS Science Education & Advocacy team for following Kentucky legislation this 2016 season, and working on a new partnership with the Ky Department of Education: Kerrie McDaniel (chair), Nancy Martin , Akhtar Mahmood, Kim Hunter, Blaine Ferrell, Cate Webb, Blaine Early, J Scott Miller, Paul J. Kiser, Victor Taveras, Naomi Charambalakis, Ashley Richards Best, Leonard Demoranville. (See report elsewhere in the newsletter about what they're up to.)

Thank you KAS Public Engagement team: Richard Gelderman (chair), John Starnes, Victor Taveras, Leonard Demoranville, Ashley Richards Best, Jennifer Birriel, Ignacio Birriel, Marilyn Akins, J Scott Miller, Akhtar Mahmood. (See report elsewhere in the newsletter about what they're up to.)

Kentucky Junior Academy of Science Annual Meeting Saturday April 16, 2016, Kentucky State University

The 2016 Annual Meeting of the Kentucky Junior Academy of science was held on Saturday 16th April on the campus of Kentucky State University. 78 middle and high school students from 8 schools participated in the event.

WINNERS

Middle School Group 1
First Place — Anisha Polimati
Second Place — Sanya Dronawat
Third Place — Pranav Senthilvel

Middle School Group 2
First Place — Shreeya Arora
Second Place — Ellie Hummel
Third Place — Mark Schrenger

Middle School Group 3
First Place — Pranav Kanmadikar
Second Place — Manya Tiwari
Third Place — Mina Ryumae

High School Behavioral and Social Science
First Place — J.P. Gahwyler
Second Place — Diya Mathur and Sophia Korner
Third Place — Emma Kronenberg

High School Biological Topics and Botany Group 1
First Place — Lavanya Kanneganti
Second Place — Anuj Chhabra
Third Place — Agharnan Gandhi

High School Biological Topics and Botany Group 2
First Place — Sophie Lai
Second Place — Camille Rougier
Third Place — Sanjana Kothari

High School Biological Topics and Botany Group 3
First Place — Allison Tu
Second Place — Akanksha Gupta
Third Place — Annie Zhang

High School Chemistry
First Place — Matthew Raj
Second Place — Govind Krishna
Third Place — Eduardo Machado

High School Computer Science & Mathematics Group 1
First Place — David Blincoe
Second Place — Vishal Polepalli, Mark Gomonuk and Prajwal Vermireddy
Third Place — Joshua Ashley and Abraham Riedel-Mishaan

High School Computer Science & Mathematics Group 2
First Place — Sasank Vishnubhatla
Second Place — Henry Robbins
Third Place — Rishi Talati and Deev Talati

High School Engineering and Physics
First Place — Manasa Sunkara and Danielle Graves
Second Place — Joshua Jacob
Third Place — Mark Raj and Ruchira Sumanasekera

High School Environmental Science
First Place — Will Drury
Second Place — Emma Cammack
Third Place — Nivedha Loganathan

GRAND PRIZE WINNERS

Life Sciences
First Place — Sophie Lai
Second Place — J.P. Gahwyler
Third Place — Allison Tu

Physical and Mathematical Sciences
First Place — Sasank Vishnubhatla
Second Place — David Blincoe
Third Place — Will Drury

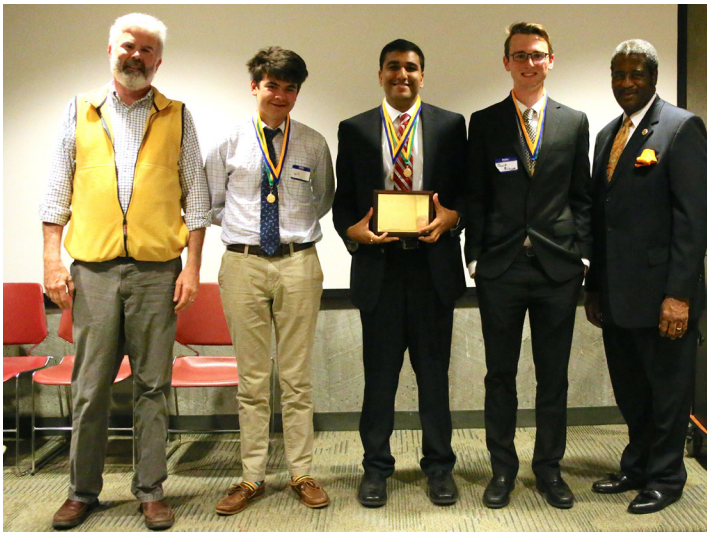
Many thanks to all of the judges who participated and to Kentucky State University and Dr. Bruce Griffis for hosting the meeting.

Kentucky Junior Academy of Science Annual Meeting

Saturday April 16, 2016
Kentucky State University

2016 Junior Academy officers: Secretary Mark Schrenger, President Joshua Jacobs, Vice President Sophia Korner

Life Sciences overall winners: Allison Tu, Sophie Lai, JP Gahwyler



Physical Sciences overall winners: Will Drury, Sasank Vishnubhatla, David Blincoe

Junior Academy field trip to the KSU Aquaculture facility

"State Capitol in Frankfort, Kentucky" by J. Stephen Conn, CC-BY-NC

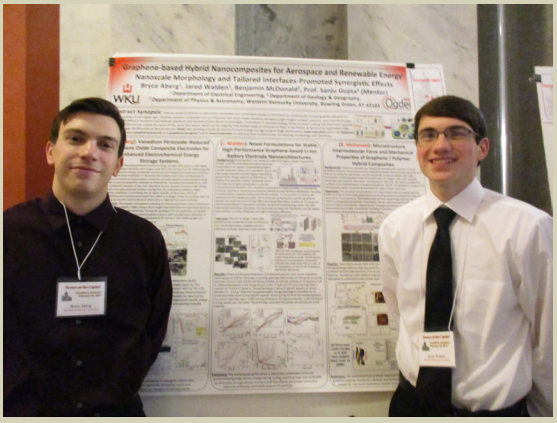
Posters-at-the-Capitol

Undergraduates presented results of their research in science areas at Posters@Capitol, the annual exhibition of undergraduate research from Kentucky state-supported universities and colleges, and KCTCS. Themes of science research included sustainable farming and agriculture, environmental pollution monitoring, nanomaterials, and biochemical and molecular factors in cancers.

Alexander Antonious and Thomas Trivette, under the direction of mentors Buddhi Gyawali and George Antonious of Kentucky State University, planted and harvested four species of hot pepper (*Capsicum*) to assess their antioxident content for possible commercial production by small farmers. They found the highest beta-carotene content in orange and red peppers. These two researchers with mentors George Antonious, Eric Turley, and Regina Hill, also contributed research comparing levels of glucosinolates that suppress soil-borne pests in collards grown in a mixture of sewage sludge or chicken manure and native soil, or no-mulch native soil. They found that leaves of collard plants grown in soil containing sewage sludge contained the greatest amounts of glucosinolates. The impact of soil amendment with sewage sludge or chicken manure on concentrations of capsaicins in fruit of hot peppers was assessed by Catherine Croft with mentors George Antonious and Eric Turley of Kentucky State University. Strains of hot peppers with the greatest amount of capsaicins and greatest pungency, as well as higher fruit weight for marketable yield, were grown in soil amended with sewage sludge or chicken manure, compared to soil mixed with yard waste or no-mulch bare soil.

Aquaponics is a means to produce both fish and vegetables, but water in fish culture is high in microbial load. Kelly Yufeh and mentors Lingyu Huang and Cecil Butler, of Kentucky State University, determined effects of rinsing vegetables in acidic electrolyzed water to reduce microbial load. Basil and lettuce were grown on a floating foam raft, and samples rinsed with tap water or electrolyzed water. Electrolyzed water was more effective than tap water in reducing microbial load. Electrolyzed water also reduced microbial load but did not delay deterioration of harvested paw-paw fruit in research reported by Gidgett Taylor, with mentors Lingyu Huang, Cecil Butler, and Changzheng Wang of Kentucky State University.

Monitoring climate change and water quality were themes of environmental research. Janie Knell and Joshua Fugate, under the guidance of Wilson Gonzales- Espada of Morehead State University, noted that the predicted effects of greenhouse gases emissions may vary locally. They applied statistical analyses of automated climate monitoring stations in the Kentucky Mesoscale Network, to use predictions of global climate and weather change to identify local climate changes within the data.

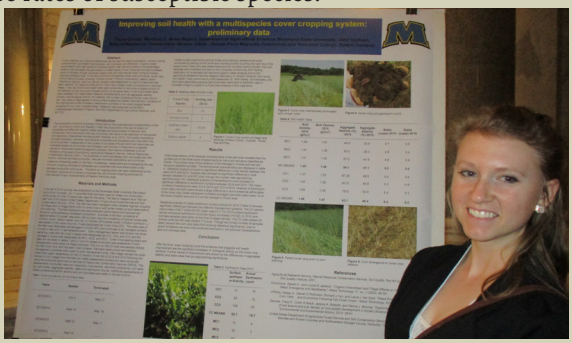


Bryce Aberg and Jared Walden, WKU

Catherine Croft, KSU

The Kentucky River watershed was the target of water quality tests based on presence of nitrates, dissolved oxygen, pH, and water conductivity by Jean Branttie, with mentors George Antonious and Eric Turley of Kentucky State University. Variability in water quality was correlated with changes in land cover vegetation by D'Andre Garrison, with mentors Buddhi Gyawali and Jeremy Sandifer of Kentucky State University.

Studies of plants included circadian cycles in plant-virus interactions by Timothy Hoey, with the guidance of Pradeep Kachroo of the University of Kentucky. Light patterns affect plant defenses. Red/far red photoreceptors, phytochromes, and blue-light photoreceptors, cryptochromes or phototropins, participate in circadian cycles, and also in defense against microbial pathogens. Blue-light photoreceptors cryptochromes and phototropins stabilize plant resistance (R) proteins, which act to recognize pathogens. Since the photoreceptors act on circadian cycles, the researchers showed effects of circadian cycles on plant-viral interactions. In another study dealing with plant pests, Katelyn Welch, with the direction of David Brown of Eastern Kentucky University, collected baseline data from ash trees at Taylor Fork Ecological Area, in preparation for the arrival of the emerald ash borer (*Agrilus planipennis*) in that region. Jordan Robbins, with direction from Terry Derting of Murray State University, measured the decline in bat populations due to *Pseudogymnoascus descructans*, the causative agent in white-nose syndrome at Land Between the Lakes. These researchers compared data on capture rates of susceptible and non-susceptible species, and found substantial declines in capture rates of susceptible species.



Tessa Combs

John Bertram, WKU

Research on salamanders by Andrew Knight, with mentors Richard Feldhoff and Pamela Feldhoff of the University of Louisville, focused on the role of a protein in tissue remodeling of pheromone glands in the model animal, the red-legged salamander (*Plethodon shermani*). A protein active in pheromone production, Plethodintid TIMP-like Protein (PTP) is similar to protease inhibitors of Metallo Proteinases, which regulate tissue remodeling. Seasonal secretion of PTP during the onset of salamander courtship may signal glandular development and its absence may signal that the tissue is no longer needed. The researchers characterized the function of PTP protein, in interaction with Matrix MetalloProteinases (MMPs). TPT partially inhibited MMPs. Low TPT levels may promote tissue changes associated with pheromone gland development.

Biomarkers of withdrawal from drugs of abuse were studied by Logan Fields, Hannah Howard, and Jason McClung, under the direction of Wesley White of Morehead State University. Amphetamine and morphine may produce long-term withdrawal effects that may be prevented by a dopamine D1 receptor antagonist. Groups of rats were given amphetamine or morphine, with or without an accompanying D1 antagonist. Acute withdrawal was indicated by reduced activity of functional behaviors such as eating, drinking, and exploring. D1 antagonists prevented reduction of activity. The study identified new potential biomarkers for susceptibility to drug abuse.

Research into cancer included studies in biology, etiology and therapy of cancer. Thomas Packer, with mentor La Creis Kidd of the University of Louisville, studied the impact of the chemopreventative agent quercetin, which inhibits cell invasion and modulates cell expression of some oncogenetic microRNAs. They examined cancer behavior in African-American cell lines and found only a modest decrease in proliferation of cells treated with quercetin. They concluded that the impact of quercetin on cell proliferation is not through a reduction in microRNAs studied.

Maya McFrazier, Xiaoxian Duan,Diane Renaud, Richard Lamont, and Huizhi Wang, under the direction of David Scott of the University of Louisville, investigated links between periodontitis, *Porphyromonas gingivalis*, and esophageal cancer. *P. gingivalis* was shown to promote cell survival by preventing cell apoptosis in esophageal cancer cells. The researchers hypothesized the mechanism to be a gene. They induced apoptosis in cells, and infected cells with *P.gingivalis* with or without the gene. Gene-deficient *P.gingivalis* mutants were less efficient in blocking drug-induced apoptosis in cancer cells, suggesting the *P.gingivalis* gene may be an inhibiting factor in cell apoptosis. Nolan Calhoun, with mentor Julia Carter of Western Kentucky University, studied genetic abnormalities in patients with more than one cancer. Two mutant variants on a single gene were investigated by extracting DNA and subjecting it to polymerase chain reaction (PCR) copying and electrophoresis analysis, then correlating it with DNA of patients with colorectal cancer tumors to determine patient genotype. The genomic and molecular basis of breast cancer biomarkers were studied by Zohair Hameed and Seth Sereff, with guidance from James Wittliff and Michael Daniels of the University of Louisville. Estrogen and progestin receptor proteins in breast carcinomas were quantified, and relations between combinations of biomarkers assessed to predict survival outcomes in breast cancer.

Neurogenerative disease was the target of research by Sabita Dumre, with mentor Luke Bradley of the University of Kentucky, who screened a library of proteins for their ability to bind with a glycolytic enzyme to mediate cell apoptosis. Screening of peptide sequences that interact with this enzyme to inhibit apoptosis provided potential candidates for future neuroprotective studies.

Research in nanomaterials was directed at compounds for anti-cancer drugs as well as basic research into graphene-based composites. Madison Heine and Taylor Billings, with the guidance of Michael Smith and David Monroe of Western Kentucky

University, used the platinum (II) compound, cisplatin, which shows anti-cancer activity but also reduces hearing by destroying sensory hair cells in the inner ear, as a control. These researchers investigated novel compounds that may show anti-cancer activity without accompanying hearing loss. Alexandra Wright, with mentor Kevin Williams of Western Kentucky University, investigated the reaction of a platinum complex with an amino acid and a nucleotide, to show behavioral interactions of these compounds that may improve drugs used in chemotherapy. Paula Stepp and Jacob Hubbuch, under the direction of Rajalingham Dakshinamurthy of Western Kentucky University, attempted to design effective antibacterial agents using gold nanoparticles conjugated to antibiotics. Paula Stepp found that antibacterial activity of these particles on Gram-positive and Gram-negative bacteria included perforation of cells, cell lysis, and apoptosis. Jacob Hubbuch synthesized an antidiabetic substance naturally found in fruit trees with gold nanoparticles and characterized it for its antineoplastic, anticancer mechanisms.

Benjamin McDonald, Jared Walden, and Bryce Aberg, with mentor Sanju Gupta of Western Kentucky University, studied hybrid nanoparticles constructed with one-atom-thick graphene sheets, which can result in novel materials having higher surface strength and electron mobility and conductivity. Their work centered on development of hybrid layered composites containing graphene-encapsulated silicon anodes for batteries, and hybrid supercapacitative cathodes.

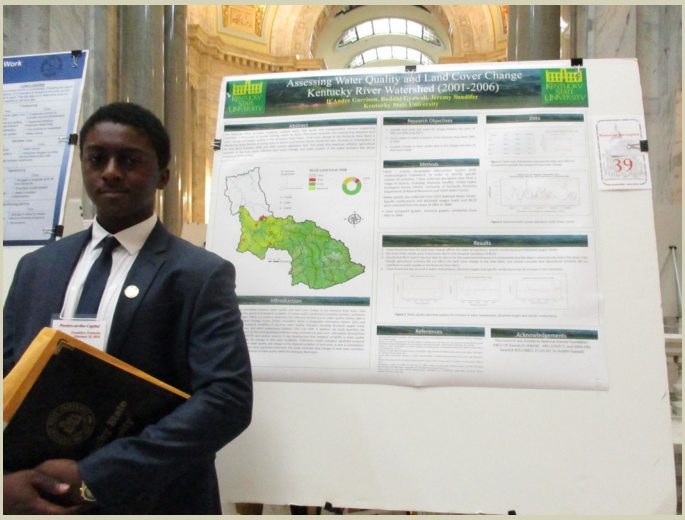
Basic research into intestinal yeast microogranisms was carried out by Amanda Coffman, Jennifer Rowland, Pamela Tackett, and Matthew Warren, with guidance of Joe Wolf of Elizabethtown Community and Technical College. These researchers isolated and identified a variety of recurring species from the gastrointestinal tracts of the Bess beetle, *Odontotaenius disjunctus*.

Rickey Cupp, David Langner, Dawson McDonald, and Erica Palowitch, with mentors Scott Bain and James Hunter of Hopkinsville Community College, launched a near-space balloon satellite with experiments designed to measure battery performance in a low-temperature, low-pressure environment, and yeast efficacy after exposure to the radiation of near-space.

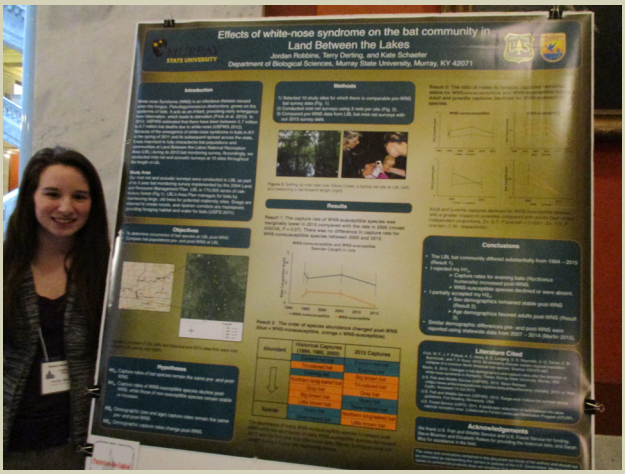
These researchers include some who will continue in scientific studies. Posters@Capitol gives them a first opportunity to present their work, and to see the work of others. The faculty mentors who give their time and expertise to these young researchers make it possible.

Submitted by:

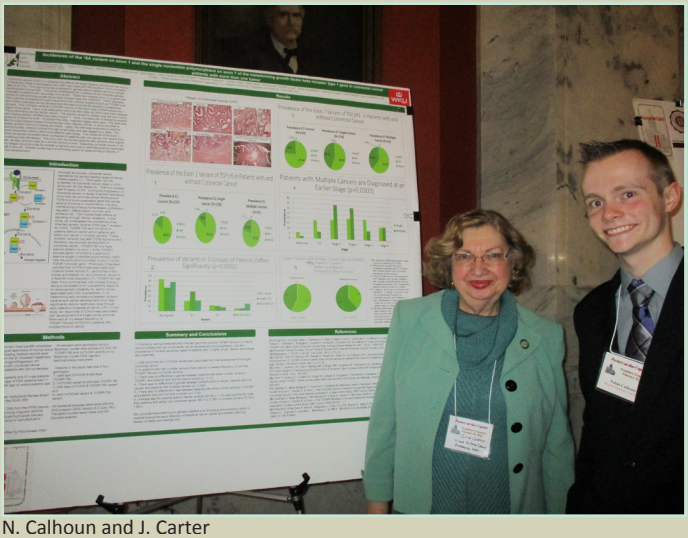
Mary Janssen, Ph.D.
Member-at-Large
Governing Board, Kentucky Academy of Science



DAndre Garrison, KSU



Jordan Robbins Murray


N. Calhoun and J. Carter

Hancock Biological Station at 50

The Value of Field Stations

www.murraystate.edu/hbs

"For over a century, field stations have been important entryways for scientists to study and make important discoveries about the natural world. They are centers of research, conservation, education, and public outreach often embedded in natural environments that range from remote to densely populated urban locations. Field stations vary greatly in size and sophistication of infrastructure. Long-term research at field stations produces baseline and sentinel data that can be used to study ecosystems when human activities are altering nature at an unprecedented rate." The quote above is from the 2014 National Research Council of the National Academies report on Enhancing the Value and Sustainability of Field Stations.

A just published article in BioScience (Tydecks et al. 2016) titled Biological Field Stations: A Global Infrastructure for Research, Education, and Public Engagement noted that worldwide there are at least 1268 stations of one type or another located in 120 countries. The article emphasized that field stations constitute "a strategic infrastructure of global relevance for environmental research and monitoring…."

Field stations in North America vary greatly in size, facilities, and mission. Many are little plots of land with perhaps a barn or small house while others are quite large, such as the University of Michigan's that covers 10,000 acres and can house 250 students and researchers. Many serve a single college or university, often for education, while others are established research centers. No matter how big or small, all field stations have the common goals of enhancing understanding about the natural world.

So many of our field stations arose serendipitously from a gift of land, the vision of one or two people, and luck. Hancock Biological Station on Kentucky Lake undoubtedly fits all three of those categories. There certainly are few other reasons for a small, regional university such as Murray State to have a major field station now celebrating its 50th year of operation.

50 Years and Counting

Unfortunately a lot of the beginning history of Hancock was not written down so much of the early information might be somewhat apocryphal. We can trace our existence back to some time around 1966 when Hunter M. Hancock, a Professor of Biology at Murray State University, began looking for a place to park a small research boat near the shoreline of Kentucky Lake. Murray State did have a gifted piece of property just off the lake that had potential. Hunter then began to lobby the university administration to build a field station on the property. Needing to spend some money, the university decided to grant Hunter's request in the late 1960s and allocated funds for a research building, boat dock, and boat shed. The 15,000 ft^2, two-story main building (Figure 1) was completed in 1972 on property leased from the Tennessee Valley Authority. It contained several well-designed laboratories, classrooms, dormitories, and a kitchen. The total land increased to nearly 70 acres with approximately half a mile of shoreline. Kenlake State Park is directly to the north and the Land-Between-the-Lakes National Recreation area is to the east across Kentucky Lake providing numerous additional research and education sites.

Figure 1: Main building dedicated 1972

Although a number of faculty and graduate students took advantage of the facilities for research and education, it was not until 1988 that the Station really took off. Joe King, then Chair of the Department of Biology, proposed competing for one of the Centers of Excellence that were being established by the then Kentucky Council of Higher Education. Joe's idea was to combine the Mid-America Remote Sensing Center (Department of Geosciences), the Chemical Services Laboratory (Department of Chemistry), and the Station to create a Center for Ecosystem Studies focused on Kentucky Lake and its environment. The proposal was awarded giving the Station and Center, now the Watershed Studies Institute, a significant continuing funding base. The first major activity was the creation of a long-term monitoring program on Kentucky Lake through the guidance of G. Richard Marzolf. Twelve lake sites were established to be sampled every 16 days corresponding with LandSat flyovers. Each sampling effort, termed a cruise, was designed to measure a wide variety of physical, chemical, and biological parameters. More than 540 cruises have been completed over the past 27 years, and more than 300 students and faculty have participated in one or more of the cruises. This amazing long-term database has been at the heart of many theses and dozens of publications. The long-term monitoring period has seen floods and droughts, the invasion of exotic zooplankton, and now the coming of silver carp. Without the database, we would not be able to understand the fast moving effects of invasive species nor the slow effects of climate change. To give some idea of the extensiveness of the database, we have now counted and identified zooplankton from more than 19,000 samples and have run an equal number of C^{14} primary productivity analyses. The data are made available to scientists around

Figure 2. Researcher cabin

the world. Much of this would not be possible without the full-time staff of six dedicated specialists whose primary responsibilities are to serve research and educational activities of the Station and Center.

Spring 2005 saw the beginnings of a new type of monitoring based on real-time sensors. An NSF infrastructure grant allowed us to place water quality instrumentation on a navigation light near the middle of Kentucky Lake. Data began to be captured every 15 minutes, radioed back to the Station, and stored on our servers. A weather station on the roof of the main building was added to the data base also with data capture every 15 minutes. Information from both data sets is available in real time on the Station's website. Our initial goal was purely scientific: to understand lake processes when they were happening and to fill in the gabs between the 16-day intervals of the long-term monitoring program. We did not expect that we were about launch an extremely important outreach activity. Because we have the only lake temperature data with easy access, the response by fishermen was almost immediate. The website was receiving hundreds of hits, particularly during fishing tournaments, and our data were appearing on marina websites as well. When the monitoring site is down for one reason or another, we get lots of emails and phone calls letting us know. The real-time data also allowed us to become part of the Global Lake Ecological Observatory Network (GLEON), a world-wide network of lake sites with similar sensor systems that is answering important scientific questions, many of which are linked to climate change issues.

An NSF partnership in 2011 between our station and the Flathead Biological Station at the University of Montana took real-time monitoring to the next level. We instrumented two mobile buoy platforms (Figure 3) that could be moved to any site of interest on Kentucky Lake. Presently the buoys are located in a cove with agricultural inputs and a cove with forest inputs. Data again come back every 15 minutes via radio or cell phone. The partnership gave us access to greater data storage along with enhanced visualization capabilities. It also provided us with an optical fiber network.

Over the past 20 years, we have received a number of National Science Foundation facilities and equipment grants that has greatly increased the potential for research and education. New buildings have included a 3,400 ft^2 "mesocosm/glasshouse" facility for population and experimental ecology studies and a 5,000 ft^2 "resource" building that added classroom, storage, and fabrication spaces. We now have constructed 18 student cabins and 4 year round faculty houses (Figure 2) that are heavily used by graduate students, visiting classes, and visiting researchers. We have three 28-ft pontoon boats, a cabin boat with laboratory space, and several small boats that are available for research and class use. We may be one of only a few field stations that can claim having 2 scanning electron microscopes largely dedicated to environmental research. A listing of other available facilities can be found on our website.

Field classes have been a major component of the Station since it origins. There has been a formal summer class program since the late 1980s. Today that has evolved to a regular 5 week session from late May through June. Classes range from Ecology, to Limnology, to Field Botany, to Conservation Biology, to Wetland Ecology, to Ornithology, to Scanning Electron Microscopy. Each class meets two days per week for eight hours on each day, a schedule that allows for intensive field experiences. Scholarships are available through the Station and the Ecological Consortium of Mid-America. Course offerings for this summer also are listed on the Station website.

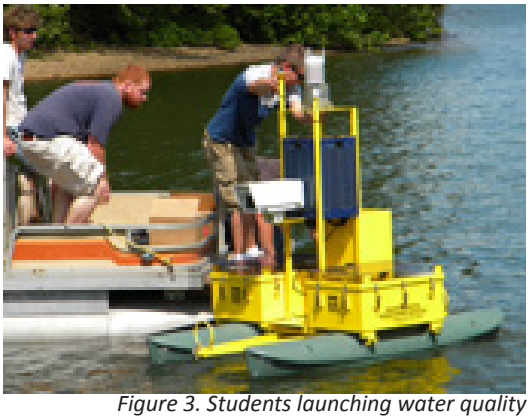


Figure 3. Students launching water quality monitoring buoy

The Station and the Center of Excellence (now the Watershed Studies Institute) are members of the Kentucky Organization of Field Stations (KOFS), the Organization of Biological Field Station (OBFS), the Association of Ecological Research Centers (AERC), the National Ecological Observatory Network (NEON), the Consortium of Universities Allied for Hydrological Studies (CUAHSI), and the International Association for Great Lakes Research (IAGLR). From the early visions of Hunter Hancock to Joe King to G. Richard Marzolf, we feel that the past 50 years truly have allowed us to become "….a strategic infrastructure of global relevance for environmental research and monitoring…." and one of the Midwest's leading "….centers of research, conservation, education, and public outreach…."

David S. White

Director, Hancock Biological Station
Endowed Chair for Ecosystem Studies
Professor, Department of Biological Sciences

Update from KAS Public Engagement Committee

May 2016

Members of the KAS Public Engagement committee are taking science to the people!

Here are some of the things on our calendar- let us know if you'd like to help, or let us know about your own science Public engagement activity!

The committee is exploring the feasibility of a kit of activities, and perhaps a pop up tent, to travel to events & festivals and present science programs in a variety of settings. For more information, contact Richard Gelderman, richard.gelderman@wku.edu

May 19 is GAMEology night at the Kentucky Science Center. KAS members will be sharing demos on Game Theory, statistics, psychology or other science topics related to games! Event info here: http://kysciencecenter.org/grownups/adult-series/ To volunteer, contact Andrew.spence@louisvilleky.gov

May 21 - Tech Savvy workshop for Girls interested in STEM , hosted by KSU– we'd like a member in Frankfort to help with an activity table in the morning http://www.aauw.org/what-we-do/stem-education/tech-savvy/. Contact Marilyn Akins, Marilyn.akins@kctcs.edu

May 21 - Discovery Festival in Lake Barkley. KAS members will be presenting ecology programs and more: http://kyacademyofscience.net/wp-content/uploads/2016/04/DiscoveryFestival_PartnerFlyer-2016.pdf

June 4 - Discovery Festival in Owensboro at Kentucky Wesleyan University. KAS members are invited to present a variety of STEM activities or demos: http://kyacademyofscience.net/wp-content/uploads/2016/04/DiscoveryFestival_PartnerFlyer-2016.pdf

New location June 18: Natural Bridge State Park

June 18 - D[illegible]embers are invited to present a variety of STEM activities or demos: http://kyacademyofscience.net/wp-content/uploads/2016/04/DiscoveryFestival_PartnerFlyer-2016.pdf

June 22-25 - ROMP Bluegrass Festival in Owensboro. KAS members may be presenting a Science Tent at ROMPfest. Details TBA.

Friday, September 23 - Kentucky Association for Environmental Education (KAEE) at Lake Cumberland State Park. KAS members will present a workshop on "Well Designed Lighting to Protect the Night Sky Environment". Contact Richard Gelderman if you'd like to help: richard.gelderman@wku.edu

Kentucky Academy of Science Partners with the Kentucky Department of Education to Support the Implementation of the Next Generation Science Standards

A report from Kerrie McDaniel on behalf of the KAS Science Education & Advocacy committee

Kentucky has adopted the Next Generation Science Standards (NGSS) as have other states in the US, to insure that students are adequately prepared to meet the challenges of a global society. While the NGSS are not a curriculum, they do provide a set of science concepts that need to be mastered at various grade levels. The NGSS were developed by top scientists and educators in the US that want students to go beyond memorizing facts and experience the richness of science and apply scientific processes and skills. At the heart of the NGSS is the intention to move science education away from reading books and filling out worksheets to active engagement in scientific and engineering inquiry. The scientists who developed the standards also recognized the relationships between science and engineering practices and integrated these into the NGSS (http://www.nextgenscience.org/).

What resulted were three Dimensions in the NGSS:

- Disciplinary Core Ideas (the content)
- Scientific and Engineering Practices (how science is done)
- Cross-cutting Concepts (the unifying ideas in different science disciplines)

While these carefully constructed standards move science education in a positive direction, they can seem daunting to teachers.

To facilitate the implementation of the NGSS, the Kentucky Academy of Science has partnered with the Kentucky Department of Education (http://education.ky.gov) to provide resources for P-12 teachers with regard to the NGSS.

- All P-12 teachers will be offered a free membership to the KAS. Access to our Member Directory will offer connections with scientists and engineers across Kentucky who are experts in specific areas.
- KAS will provide a link to our Science Speakers Bureau with names and contact information for KAS scientists and engineers who are willing to come to a classroom to speak, host a field trip, or Skype into a classroom to enrich a unit. The scientists may also be called on by the KDE to assist with teacher trainings on science content and the NGSS.
- KAS is also going to provide resources like lessons and links at our website that teachers can use to teach the NGSS.

We cannot provide these resources without your help!

If you are willing to serve in the Science Speakers Bureau, or if you have NGSS specific lessons or links, please get in touch with Amanda Fuller, KAS Executive Director, executivedirector@kyscience.org or (859)-227-2837.

Watch your email for a link to the Speakers' Bureau Questionnaire and take a few minutes to fill it out for us if you would like to be a voice for science! Thank you.

The Kentucky Bridge to a Biomedical Doctorate for Appalachian and Minority students

www.bridgescholar.eku.edu

BRIDGE TO THE DOCTORATE

EKU UK

An Appalachian and Minority Service Program

Funded by the National Institutes of Health (Grant R25 GM102776)

BRIDGE PROGRAM BENEFITS

- **Obtain a research-intensive Masters Degree in Biology or Chemistry pertaining to areas of biomedical sciences**
- **Research mentorship at EKU & UK**
- **Preparation/transition to a doctoral program in the biomedical sciences**
- **Develop connections with faculty and students at UK's Integrated Biomedical Sciences Ph.D. program**
- **Enroll in a Graduate Course and gain other academic/professional experiences at UK**
- **Seminar series/workshops for specific information/skills needed for the biomedical field**
- **Tuition and stipend paid**
- **Summer research salary**
- **Travel funds to present at national science conferences**
- **Gain teaching experience**

Contact:

- **Dr. Brett Spear - Program Director**
  University of Kentucky
  Email - bspear@uky.edu
  Phone - 859-257-5167
- **Dr. Marcia Pierce - EKU Coordinator**
  Eastern Kentucky University
  Email - bridgescholar@eku.edu
  Phone - 859-622-1535

Appalachian Bridge Scholar

The goal of the *Kentucky Bridge to a Biomedical Doctorate for Appalachian Students* program is to provide students with training for success in doctoral programs and careers in biomedical research.

This joint initiative between Eastern Kentucky University (EKU) and the University of Kentucky (UK) targets students for funding from Appalachia and other under-represented groups in biomedical sciences.

Mentors at EKU and UK will work together to provide a research-intensive, rigorous masters-level educational experience which will include graduate courses, training in grantsmanship, oral/written presentation skills, ethical conduct of research, seminars, and opportunities for students to present their research at regional and national meetings. Students will be able to dedicate their attention to this program through the financial support provided for tuition and a salary. Upon successful completion of the masters degree program (biology or chemistry) at EKU, Kentucky Bridge students will be prepared to transtion to a doctoral program in biomedical sciences at UK or another research-intensive university.

APPLICATION REQUIREMENTS

- Students with a previously completed B.A./B.S. degree pertaining to biomedical science fields (biology, chemistry, biochemistry)
- Required GPA: 3.00*
- Students interested in biomedical sciences - biology, chemistry, and biochemistry
- Students must intend to pursue a Ph.D. or M.D./Ph.D.degree in biomedical sciences upon completion of the EKU-UK Bridge M.S. degree
- Underrepresented Students - native Appalachian (see website for specific identified counties), Hispanic, African American, Native American, Native Alaskan, Pacific Islander
- Completed Graduate Packet contains:
  - EKU Graduate School Application
  - EKU Bridge Program Application
- Application deadline is June 1st (for the academic year starting in late August. Early applications are highly recommended. Applications received after June 1st maybe considered if positions are available.

* Students who do not meet the minimum requirements maybe considered under special circumstances. Contact the Bridge Program for questions regarding eligibility.