



Kentucky Academy of Science

*The Voice of Science in
Kentucky*

NEWSLETTER

www.kyscience.org

Susan Templeton, Editor

May 2014

Enhanced Affiliates

Alice Lloyd College
Bellarmine University
Berea College
Brescia University
Campbellsville University
Centre College
Eastern Kentucky University
Georgetown College
Kentucky Community &
Technical College System
Kentucky State University
Midway College
Morehead State University
Murray State University
Northern Kentucky University
Spalding University
Transylvania University
University of Kentucky
University of Louisville
University of Pikeville
Western Kentucky University

Honorary Patron

Kentucky Science Center
Lumins Associates

Sustaining Member - \$500 level

Member - \$250 level

Asbury University
Kentucky Wesleyan College
Lindsey Wilson College
Thomas More College
University of the Cumberlands
Wood Hudson Cancer Research
Laboratory

Associate Member - \$100 level

WKU Crawford Hydrology Lab

*Faculty, staff and students at
Enhanced Affiliate member
organizations receive:*

- free KAS membership
- online access to KAS Journal
- KAS Newsletter via e-mail

The KAS Newsletter is published in January, May and August. Current and archived issues are available at www.kyscience.org. You may contact the Editor of the KAS Newsletter via e-mail at susan.templeton@kysu.edu.

Editor's Note: When viewing the Newsletter in Acrobat Reader the Table of Contents (TOC) contains live links to each article; at the bottom right of each page is a link back to the TOC!

The Centennial has arrived!

The Committee on Organization appointed by the Kentucky Association of Colleges and Universities, and actively supported by 46 scientists and laymen, called the first meeting of the Academy on May 8, 1914 at the Physics Building, University of Kentucky, Lexington. At the conclusion of the meeting, a constitution and by-laws were read, modified, and adopted unanimously. The membership list for 1914 included the names of 60 persons.

At the organizational meeting, it was pointed out that... *"Science is essentially mutualistic – Successes in one branch are hailed with delight by those interested in other branches. A discovery made in one may be the stepping stone to future achievement in another. At present it is difficult for one person to keep abreast with the discoveries and achievements in one branch of science alone. Thus you obtain, from the diversified program, the grain from the chaff."* (Trans. Ky. Acad. Sci., 1:21). Although made in 1914, those statements are just as true today.

The 100th Annual Meeting will be held at the Lexington Convention Center November 14-16, 2014. The expanded 3-day format will feature oral and poster presentations by students and scientists, a symposium on scientific communication, a workshop on publishing, and exciting speakers at both Friday and Saturday plenary sessions and the Awards Banquet on Saturday. A KBRIN workshop on proposal development will be held in conjunction with the Annual Meeting on Friday, November 14, and special Centennial Meeting Field Trips are planned for Sunday, November 16. Check out what some of your KAS colleagues are working on and see some interesting science-based attractions after the Academic program is over. Here's a *tentative* lineup of post-meeting expeditions:

- Lower Howard's Creek, Clark County (A KY Heritage Land Conservation Fund property & research site) – Organized by KHLCF & KAS Ecology & Environmental Science Section (see page 12)
- Red River Gorge/Natural Bridge or "Evidence for Ancient Earthquakes in Central Kentucky" – organized by the KAS Geology Section
- A Tour of Kentucky Horse Country with Kentucky's State Geographer
- West Sixth Brewery, Lexington
- Food Chain Fish Farm, Lexington



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Messages from the Executive Director

Connecting to KAS Members

Please welcome our 2 new Enhanced Affiliates, **Alice Lloyd College** and **Campbellsville University**!

I have enjoyed getting out of the office these past several months to meet some of our members and student scientists around Kentucky!

In February, I spent the day in Frankfort for **Posters at the Capitol**, with talented university students from all discipline, including many student members of KAS; in March, I visited Somerset Community and Technical College to give a presentation about KAS - we signed up new members and now have 35 from Somerset!

In April I visited Campbellsville University to encourage more of their students and faculty to take advantage of their new Enhanced Affiliate membership – We signed up new members and now have 21 from Campbellsville!

In May I'll be visiting Spalding and I'll visit Murray in the fall semester.

If you'd like to invite me for a 30 minute presentation and Q&A about KAS for a group at your institution or company, I would be delighted to visit. Please get in touch at 859-227-2837 or email executivedirector@kyscience.org.

Kentucky Science Center Partnership for Science Education

On March 22, KAS members presented for students at the first-ever Paducah Youth Science Summit. Big cheers go out to 2 KAS Members at West Kentucky Community & Technical College in Paducah - **Victor Taveras** taught a hair-raising Energy and Magnetism lab (right) and **Rebecca Brown** did Speed Mentoring in Chemistry, and some hefty volunteer recruitment. Thank you!!



KAS Members made DNA Day a smashing success at the Kentucky Science Center on April 25(left). Dr. Debbie Yoder-Himes and her lab showed off their DNA preparations and talked about their research investigating pathogens involved in Cystic

Fibrosis. They talked to about 200 Science Center visitors and walked away with passes to visit the Science Center! Thank you! See more pictures at the KAS Facebook page.

Another big cheer goes to KAS volunteer **Dr. Sanjay Singh** who has been helping KY Science Center staff with specialized chemistry instruction- thank you!

On May 10 we are calling on our members to help with **Space Day** – come set up a table for a couple hours, or Skype in from your own lab, and show off your Space-related research for Science Center visitors! Volunteers get a pass to visit the Science Center. There will also be a sneak preview of the U of L's new Mobile Planetarium!

Youth Science Summits are coming up June 14 in Louisville, June 28 in Lexington, and in northern Kentucky! If you'd like to present a hands-on lab experience, or just show up to serve as a speed mentor for an hour or two, check out the photos from Paducah at our facebook page, then email Amanda Fuller at executivedirector@kyscience.org. Thank you!

Calling new Business Members and Centennial Sponsors

We'd like to share our centennial celebration with you! If you would like to become a sponsor for KAS' Centennial meeting in Lexington, November 14-16, or if you would like to become a Business member with membership privileges for your employees, now is a great time to support the Academy to promote science and science education in the Commonwealth! Please call Executive Director Amanda Fuller at 859-227-2837 or email executivedirector@kyscience.org.

New! Member Discounts at Newport Aquarium and KY Science Center

KAS Members can now enjoy discounts on regular and child admission at Newport Aquarium, and on Annual Membership at the Ky Science Center. For details, visit our Member Benefits page at www.kyscience.org

Job Postings at KAS website

Remember that KAS will post job openings at our website- please send us any you'd like to share, to executivedirector@kyscience.org

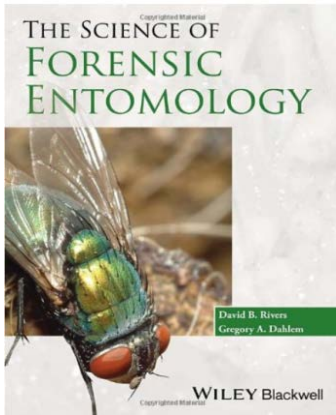
KAS 2014 Membership Survey

We want to know how we can serve you better. Please answer 16 questions about what KAS can do for you, and you will be entered in a drawing August 1 to win a complimentary registration and banquet ticket at the Centennial meeting, November 14-16 in Lexington.

<https://www.surveymonkey.com/s/WK38GPL>

*Amanda Fuller, Executive Director
Kentucky Academy of Science
executivedirector@kyscience.org*

KAS Author's Corner



David B. Rivers, Gregory A. Dahlem, *The Science of Forensic Entomology*: Wiley, 2014, ISBN-13: 9781119940371.

Dr. Gregory A. Dahlem, Department of Biological Sciences at Northern Kentucky University, coauthored this textbook designed to meet the growing needs of colleges, universities, and forensic

investigative agencies in training undergraduates, graduate students, and criminal investigators in the principles, concepts and methodologies necessary to use insects and other arthropods in legal matters.

The book offers an advanced introduction to the field but also provides in depth discussion of biological concepts associated with insect biology, ecology, physiology and chemical communication.

Dr. Dahlem received his bachelor's and master's degrees at The Ohio State University in Columbus, and his doctorate from Michigan State University. The research that he began at graduate school on the identification and biology of a group of flies known as the "flesh flies" continues to this day. He also serves as the Adjunct Curator of Entomology for the Cincinnati Museum Center (formerly the Cincinnati Museum of Natural History).

The first author is David Rivers, a professor at Loyola University in Maryland.

Available in hardcover and paperback at Amazon.com:
<http://www.amazon.com/Science-Forensic-Entomology-David-Rivers/dp/1119940362>

Author Information Wanted!

If you are a KAS member and have recently published a science focused book please forward this information to the KAS newsletter editor (susan.templeton@kysu.edu) so that your accomplishment can be shared with other scientists in Kentucky. KAS promotes the dissemination of the scientific interests of the Commonwealth of Kentucky. We look forward to hearing from you!

Abstract Submission Update

The deadline for Annual Meeting abstract submissions will be September 22; the KAS website should be open for both registration and abstract submission by August 1. Changes to the abstract submission process will include the use of a field for entering the body of your abstract. While copying and pasting text into this block may be allowed, you will no longer be able to upload your text as a separate Word document.

*Submitted by Melony Stambaugh,
KAS Program Coordinator*

New KAS Webpage

The KAS website (www.kyscience.org) has undergone a major overhaul appearance, layout, and functionality. Take a few minutes to visit the website and review its various features. Please report any problems you encounter to me at executivedirector@kyscience.org.

*Submitted by Amanda Fuller, Executive Director
Kentucky Academy of Science*

KAS on Facebook



Are you a friend of the Kentucky Academy of Science? Click on the link below to see what is going on, to post your comments and photos, and to **Like** this page:

<https://www.facebook.com/kyscience>



Call for Nominations for Superlative Awards

The Kentucky Academy of Science seeks nominations of individuals who have made outstanding contributions to scientific research and education in the Commonwealth in the six areas designated below.

- *Outstanding Academy Service*
- *Distinguished College/University Scientist*
- *Outstanding College/University Teacher*
- *Outstanding Early Career in Post Secondary Education*
- *Outstanding Secondary School Science Teacher*
- *Distinguished Professional Scientist (non-academic)*

Detailed criteria for each category are available online at www.kyscience.org/content/nominations.php. Nomination packets for all awards should include an abbreviated curriculum vitae (5 pages or less) containing information pertinent to the award as well as a list of publications, and letters of recommendation from two to three professional colleagues well acquainted with the candidate's qualifications for the award

Outstanding Academy Service Award nomination packets should include documentation of special contribution to the Academy.

Outstanding Secondary School and College/University Teacher awards nomination packets should include documentation of special accomplishment as a teacher of science, especially measures of student success, participation in student development beyond the classroom, and science curriculum development. Letters of recommendation for secondary school teachers may also come from an administrator or supervisor, a teaching colleague, a student, or a parent.

Nominators who submit complete nomination packets early are eligible for a complimentary registration for the 2014 Annual Meeting, including one banquet ticket. The deadline for nominations is August 1, 2014. All nominations and supporting materials should be sent in electronic format; e-mail attachments must be in MS Word format. Send to:

Dr. Eric Jerde
Morehead State University
Department of Earth & Space Sciences
e.jerde@moreheadstate.edu

Call for KAS Governing Board Nominations

The Kentucky Academy of Science Nominations and Elections Committee is seeking assistance from the KAS membership in our effort to identify a ballot of quality candidates to assume leadership roles within the Academy for 2015. KAS members interested in nominating colleagues for these vacant positions (or individuals willing to volunteer to be placed on the ballot) should forward the name, e-mail address/phone number for each candidate, and indicate the leadership position of interest. The Nominations and Elections Committee will contact each candidate to request the necessary information to be included on the ballot. This is an extremely important responsibility for the members of KAS and the committee needs your assistance in identifying candidates for these vacancies. The membership is being contacted at this time for nominations for the following offices:

- Secretary
- Physical Sciences Representative
- Social and Behavioral Sciences Representative

Any member may nominate another member for Secretary. However, for Physical Sciences and Social & Behavioral Sciences/Science Education representatives, the nominators must identify with the Division for which they are nominating. Please send nominations by August 1, 2014 to:

Cheryl Davis, Chair of Nominating Committee
Western Kentucky University
Department of Biology
cheryl.davis@wku.edu

Call for JKAS Articles

As part of the Kentucky Academy of Science's centennial commemoration, the Journal of the KAS is planning to publish a special section with articles related to the mission and history of the Academy. A selection of these articles will be published in Volume 75, in addition to regular full papers and notes. All articles will be reviewed using the JKAS editorial process.

To help with planning and coordination of this special section of JKAS Volume 75, interested authors are invited to contact the Editor with a notification of intention to submit their work, with a brief description of the subject matter, in order to discuss the potential articles prior to their submission. All questions and inquiries should be directed to the Editor.

To ensure timely publication please note the following deadlines.

- Submission Date: July 15, 2014
- Final version Date: September 15, 2014
- Anticipated Publication Date: November 2014

Inquiries, proposals and manuscripts should be submitted for review by email to "Journal of Kentucky Academy of Science" JournalOfKAS@cs.uky.edu with the subject matter "JKAS – 100th Anniversary Issue".

The JKAS also encourages submissions of all regular full papers and notes for possible publication in Volume 75 and following volumes of the journal.

*Submitted by J W Jaromczyk, Editor
Journal of the Kentucky Academy of Science*

Partners Needed for the Youth Science Summit Series



**Saturday June 14, Louisville,
9:00-4:30, GE Appliance Park**

**Saturday June 28, Lexington,
9:00-4:30, Lexmark Campus**

Youth Science Summits engage motivated teens around the commonwealth in a day of Science, Technology, Engineering, and Math (STEM) programming. Students will find out about a variety of potential careers in STEM fields that meet their interests and strengths. STEM professionals interact with approximately 150 Middle and High School students. Throughout the day, professional scientists share lab and experiment demonstrations, informational displays, and answer questions about their own careers in the sciences. We are excited to offer a girls-only middle school track in Lexington this year!

Please consider helping in one or more of the categories:

STEM Demonstrations/Lab Experiences – hands-on demonstrations that last 5-10 or 25 minutes, or 1 hour or more.

The 5-10 minute demonstrations will be part of a “Reverse Science Fair” where adults will present and youth will explore a variety of posters and presentations.

The 25-minute and 1 hour+ demonstrations will be held morning or afternoon. We welcome virtual presentations via SKYPE if you are in a faraway, exotic, or unique location.

Speed Mentoring (60-90 minutes) - Groups of 4-5 teens talk with a professional or student scientist to simply chat about higher education, career paths, STEM advice, etc. Every few minutes a timer sounds and participants rotate to another table.

Informational Displays - This is ideal for those that have information to present, but not necessarily hands-on activities for the students. The main conference room will be lined with these projects, and students can browse and interact during registration and lunch. While it is ideal for presenters to share their information in person, these can be left unstaffed.

General Volunteers - We need help coordinating 6 tracks of students and several activities taking place at once. Volunteer time slots are available throughout the day for 2 hour or longer commitments.

Please contact us with questions and to sign up for the time and age level that works out best for you. We will be providing lunch to all of the STEM professionals and volunteers. Thank you!

Sincerely,

Andrew Spence, Visitor Experience Coordinator,
(502) 560-7129, Andrew.spence@louisvilleky.gov

Northern Kentucky Youth Science Summit Venue Needed

Kentucky Science Center’s Youth Science Summit events host more than 100 middle and high school students for a single day event meant to inspire them about higher education and careers in STEM fields. Kentucky Science Center hosted the inaugural Louisville Youth Science Summit in 2010 and has since expanded to host Youth Science Summit events in Lexington and Paducah annually. The Center is currently looking for a space to host a Northern Kentucky Youth Science Summit, tentatively scheduled for fall 2014. The ideal space will have a large meeting room that can host at minimum 100 students, as well as 4-5 adjacent classroom spaces for hands-on labs and industry presentations. For more information on the Youth Science Summit, contact Mark Sieckman, Kentucky Science Center Senior Manager of Advancement and Stakeholder Engagement, at 502-561-6110 or Mark.Sieckman@LouisvilleKY.gov.



*Paducah Youth
Science Summit
participants.*



KAS Scientist to Present Idea Festival University Class

The Kentucky Academy of Science, with Sigma Xi’s Louisville Chapter, and the Kentucky Science Center, is pleased to present Dr. Chris Groves who will give a class about Kentucky’s karst geology. The event is Friday May 23, 7:30 pm, at the Kentucky Science Center at 727 W. Main St. in Louisville. Space is limited so reserve your ticket soon <http://www.ideafestival.com/about-if-university>.



Watch for more KAS Scientists on the Idea Festival University Calendar over the next couple of months!

Science Across the Commonwealth

U of L Science Camps

The Micro/Nano Technology Center at the University of Louisville is hosting two brand new summer camps for folks ages 14 and over to fabricate a solar cell with a 4-inch silicon wafer. The week will be packed full of learning micro-fabrication techniques and the physics behind how a solar cell functions. Students will take home their solar cell wafer at the end of the camp, along with wafer tweezers, cleanroom notebook and a shirt. Last day to sign up: May 30th

Additional information and registration: (502) 852-1572.

<http://louisville.edu/micronano/summer-camp-2014-1>

The Gheens Science Hall and Rauch Planetarium summer camps offer stimulating, engaging, educational projects that incorporate scientific inquiry to spark a lifelong love of science, as well build problem-solving and collaboration skills that translate to success in all areas of life. Cost: \$200 for non-members, \$150 for family members and \$180 for U of L affiliates.

Additional Information: (502) 852-6665.

<http://louisville.edu/planetarium/kids/summercamps>

Idea State U Business Plan Competition

The Kentucky Cabinet for Economic Development awarded nearly \$100,000 in prize money to some of Kentucky's most-promising college entrepreneurs during the seventh-annual Idea State U event, a two-day student competition that identifies and supports the next generation of Kentucky innovators and entrepreneurs. The event was held at the Lexington Center, in Lexington, April 11-12.

Twenty-six teams, comprised of more than 80 undergraduate and graduate students from eight Kentucky public universities, the University of Pikeville and the Kentucky Community and Technical College System, participated in Idea State U. With the help of faculty advisors, students spent months developing business concepts or formal business plans, which were presented to panels of business experts serving as volunteer judges.

"I was impressed by the professionalism and the seriousness of the students and their advisors" said judge and local angel investor David Goodnight. "Every single student that I engaged was passionate about his or her ideas. Each one of the business plans and concepts can work—and many of them will—which will produce meaningful products, jobs and money."

The top award of \$21,619 was presented to *Trifecta Cooking Equipment*, a graduate student team from the University of Louisville. Trifecta unveiled plans for its patented "FutureFry," an energy-efficient deep fryer for restaurants. The FutureFry uses less cooking oil and is easier to clean than a traditional deep fryer.

The judges also awarded \$20,333 to *Southern Shine Company*, an undergraduate team from Jefferson Community and Technical College that plans to create a distilled spirits company. Southern Shine Co. plans to sell Amendment 21 Moonshine, a high-end premium 80 proof flavored moonshine liqueur product line.

Other prizes for the top-rated proposed ventures included:

- University of Kentucky: *Mosquito Tech* received \$11,079 to develop a technology that tackles the

mosquito population by preventing reproduction through sterilization.

- University of Louisville: *Jockey Analytics* received \$11,079 to develop the first Jockey Rating System for the horse racing industry. The system will provide handicappers and bettors with an individual jockey rating on a race-by-race basis.
- University of Kentucky: *Shouter* received \$5,540 for a mobile application company that allows a person to connect with nearby people, events and businesses.
- University of Louisville: *Cyprus MD* received \$3,810 to develop innovative anesthesia technology. The technology will save patient time, decrease hospital costs, and improve patient safety.
- University of Louisville: *PocketParkU* received \$3,810 to develop a mobile application that will provide students, faculty and staff with real-time campus parking information.
- University of Kentucky: *Arymza Technologies* received \$2,540 for a business concept to produce Cylozymes, enzymes that assist in the processing of starch, and are used as food ingredients or as feedstock for microbes in the production of bioethanol.
- Northern Kentucky University: *Veggie Magic* received \$2,540 to develop a spray solution that can be applied to vegetables to block bitter flavors.
- University of Pikeville: *Gruentech Heating Systems* received \$1,270 for a business concept to replace air-cooled swimming pool circulating pump motors with water-cooled pump motors.
- Morehead State University: *BambooRF* received \$1,270 for a business concept to manufacture radio frequency instruments.

In addition, *BambooRF* also received the Governor's Innovation Award, presented each year to the team that best demonstrates innovative and "out of the box" thinking.

For more information, visit www.IdeaStateU.com.

Submitted by John Mateja, Director
Murray State University McNair Scholars Grant Program

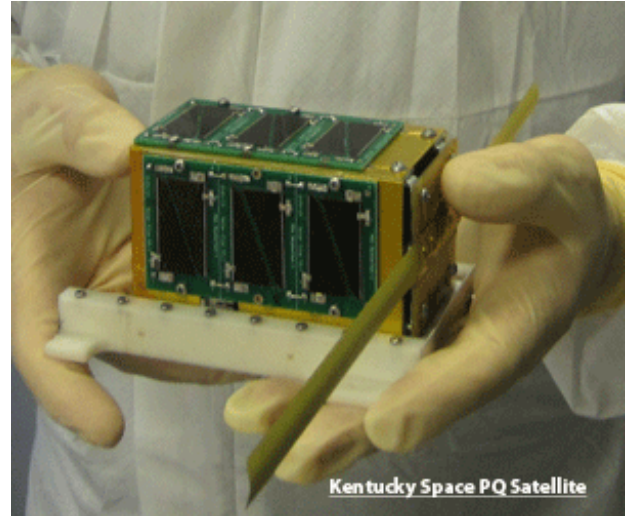
PocketQube 1.0 Workshop

In recent months, Kentucky Space successfully launched three experimental satellites from two different continents. The largest satellite is the size of a tissue box, and all are orbiting about 380 miles above the Earth at 5 miles per second, sending data to ground stations in Kentucky.

The PocketQube 1.0 Workshop to be held May 14, 2014, at Cape Canaveral, FL, will bring together spacecraft designers, innovators, makers, entrepreneurs and educators to discuss and explore the range of possible uses and applications for these novel spacecraft.

This hands-on workshop will discuss:

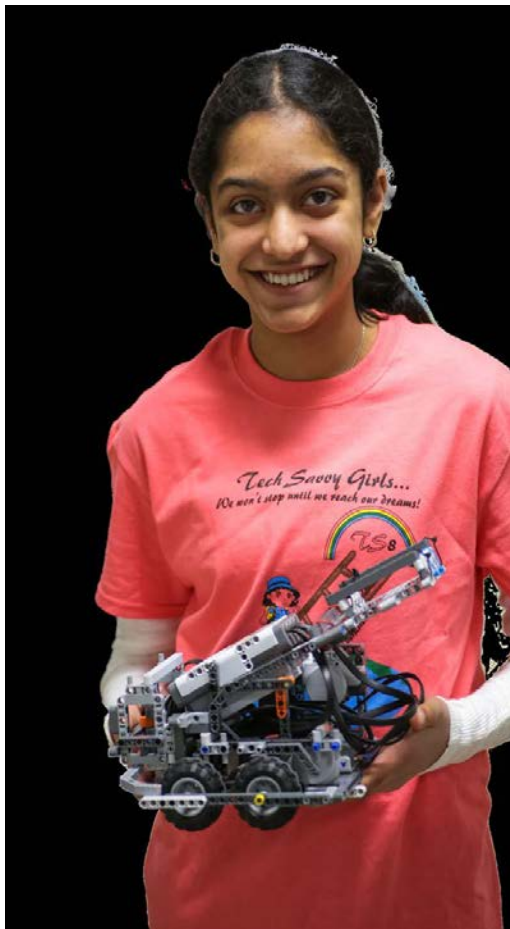
- PocketQube™ (PQ) Class Satellites 1.0: Current Capabilities and Functions
- PocketQube Class Standard
- PocketQube Satellites Currently On-Orbit
- Designing and Building PQ Micro Spacecraft (Power Systems, C&DH, Payloads and Cost, etc.)
- Licensing and Regulations (FCC, ITU, IARU, NOAA)
- On-Orbit Ops and Analyses
- Launch Options
- Future Opportunities, Applications and Challenges



Workshop space is limited so register early.

CLICK [HERE](#) FOR DETAILS.

*Submitted by John Mateja, Director
Murray State University McNair Scholars Grant Program*



KY Girls STEM Collaborative

Are You a Tech Savvy Girl? You will be after a day of hands-on fun with science, technology, engineering, and mathematics!

Tech Savvy prepares you to be a scientist, engineer, or technology expert. A special session for your parents and families shows them how to help you on your path to college and a career.

- Who: Girls in grades 6-9
- Where: Kentucky University Exum Center, 400 East Main Street, Frankfort KY 40601
- Date: Saturday, May 17
- Doors open at 8:15 am for breakfast
- Program begins at 9:00 am
- Box Lunch provided
- Program ends at 3:00 pm
- Cost: \$5.00
- Sponsor: AAUW Bluegrass Central Branch

In partnership with Kentucky State University College of Agriculture, Food Science, and Sustainable Systems and with grants from Praxair, KCTCS, Toyota, and Kentucky Association of Manufacturers.

REGISTRATION REQUIRED BY MAY 6th:

<http://bluegrass-ky.aauw.net/ky-tech-savvy/>

*Shared by Amanda Fuller, Executive Director
Kentucky Academy of Science*

Kentucky Junior Academy of Science



The 2014 meeting of the Kentucky Junior Academy of Science was held on Saturday April 19th on the campus of the University of Kentucky. Over 141 students participated in the event. Many thanks are due to all the judges who gave of their time on April 19th.

The following officers were elected:

President: Katie Adams
Vice-President: Sam Wycoff
Secretary: Ellen Kendall



MIDDLE SCHOOL WINNERS

Middle School Group 1

1st Place Jack Hummel
2nd Place Sophia Fronmeyer
3rd Place Arah Crain

Middle School Group 2

1st Place Henry Robbins & Spencer Streltsov
2nd Place Bhavana Pavuluri
3rd Place Anisha Polimati

Middle School Group 3

1st Place Elizabeth Schrenger
2nd Place Deev Talati
3rd Place Vaubhav Vinukonda



HIGH SCHOOL WINNERS

Behavioral and Social Sciences

1st Place Ben Green
2nd Place Monica McGrath
3rd Place Diya Mathur & Sophia Korner

Biological Topics 1

1st Place Kevin Tien
2nd Place Urooj Nasim
3rd Place Ruhi Kulkarni

Biological Topics 2

1st Place Kate Adams
2nd Place Lekha Devara
3rd Place Rebecca Guan

Botany, Microbiology and Zoology

1st Place Samuel Wycoff
2nd Place Caleb Bridgewater
3rd Place Manasaa Kannan
3rd Place Szofia Komaromy-Hiller



Left to right: Grand Prize Winners Allen Jiang, Susmita Chennareddy (Physical Sciences), Kate Adams, Kevin Tien (Life Sciences) and KAS President KC Russell.

Chemistry, Earth and Space

1st Place Shravan Ravishankar
2nd Place Uma Subrayan

Computer Science and Mathematics 1

1st Place Susmita Chennareddy
2nd Place Sasank Vishnubhatla
3rd Place Avani Kabra

Engineering/ Physics 1

1st Place Hannah Ziegelmeyer
2nd Place Henry Owen
3rd Place Vincent Liu

Engineering/ Physics 2

1st Place Allen Jiang
2nd Place Rashmi Bharadwaj
3rd Place Poonum Haldankar

Environmental Science –1

1st Place Chien Yun Yu
2nd Place Sanjana Rane
3rd Place Dinja Sharma

Environmental Science 2

1st Place Ellen Kendall
2nd Place Shreya Barde
3rd Place Akanksha Gupta

Submitted by Ruth Beattie
Director, Junior Academy of Science

2014 KY-Science and Engineering Fair Awards

The Kentucky Science & Engineering Fair (KY-SEF) competition was held Friday, March 28, 2014, at the Eastern Kentucky University Alumni Coliseum. Top winners attend the Intel® International Science and Engineering Fair® (Intel ISEF) which annually provides a forum for more than 1,600 high school students from over 70 countries, regions, and territories to showcase their independent research and compete for more than \$4 million in awards. The 2014 Intel SEF will be held in Los Angeles, California from May 11-16. The KY-SEF *Best of Fair Winners* are listed below. Visit <http://kysciencefair.org/> for information on other special award winners. *Right:* Longtime KAS members Dr. Barbara Ramey and Dr. Robert Creek were recognized for their long service as Directors of the KY-SEF.



	<u>HIGH SCHOOL</u>	<u>MIDDLE SCHOOL</u>
BEST OF FAIR Life Sciences	1st: Kate Adams , DuPont Manual 2nd: Caroline Bush , P.L. Dunbar 3rd: Samuel Wycoff , P.L. Dunbar	1st: Grace Jacobs , Lex. Christian Academy 2nd: Sam Belza , St. Francis of Assisi
BEST OF FAIR Physical Science	1st: Sarah Schwartz , DuPont Manual 2nd: Sasank Vishnubhatla , DuPont Manual 3rd: R.Gunasena, M. Raj/M. Subheeswar , DuPont Manual	1st: Benjamin Jiang , North Oldham 2nd: David Ma , Winburn
Animal Sciences	1st: Samuel Wycoff , P.L. Dunbar 2nd: Sarah Duggan , DuPont Manual	1st: Nina Jazdzewski , Christ the King 2nd: Jim Creamer , Turkeyfoot
Behavioral and Social Sciences	1st: Diya Mathur/Sophia Korner , DuPont Manual 2nd: Xiaowan Chu , P.L. Dunbar	1st: Madison Fleischaker , Meyzeek 2nd: David Clapper , Turkeyfoot
Biochemistry	1st: Kate Adams , DuPont Manual 2nd: Clara de Castro , Sayre	1st: Elizabeth Schrenger , St. Francis of Assisi 2nd: Ruthie Belza , St. Francis of Assisi
Cellular/Molecular Biology	1st: Hiba Abbas , Ballard 2nd: Caleb Bridgwater , DuPont Manual	1st: Sam Belza , St. Francis of Assisi 2nd: Ruchira Sumanasekera , Meyzeek
Environmental Management	1st: Ellen Kendall , Notre Dame Academy 2nd: Derris Stanland , Lexington Christian Academy	1st: Nivedha Loganathan , Meyzeek 2nd: Natasha Gupta , Anchorage Independent
Medicine and Health Sciences	1st: Rena Ryumae , Gatton Academy 2nd: Karla Ladino , P.L. Dunbar	1st: Pranav Senthilvel , Meyzeek 2nd: Molly McGuire , St. Francis of Assisi
Microbiology	1st: Monisha Rekhraj , P.L. Dunbar 2nd: Paige Montfort , Notre Dame Academy	1st: Allison Tu , Meyzeek 2nd: Daniel Yacek , Model Laboratory School
Plant Sciences	1st: Caroline Bush , P.L. Dunbar 2nd: Emily Walter , Notre Dame Academy	1st: Grace Jacobs , Lexington Christian Acad. 2nd: Claire Russell , Home Schooled
Chemistry	1st: Nelson Ng , P.L. Dunbar 2nd: Eric Xiong , P.L. Dunbar	1st: Joshua Jacob , St. Francis of Assisi 2nd: Akhil Kesaraju , Winburn
Computer Science	1st: Sarah Schwartz , DuPont Manual 2nd: Will Kimmerer , Sayre	1st: Greg Schwartz , Meyzeek 2nd: Ken Ryumae , Other
Earth Science	1st: Alexis Sachleben , Ballard 2nd: Josie Hammon , Notre Dame Academy	1st: Meghana Anand , Meyzeek 2nd: Isabella Squire , Sandersville Elementary
Electrical/Mechanical Engineering	1st: Matthew Russell , Home Schooled 2nd: Brandon Young , DuPont Manual	1st: Benjamin Jiang , North Oldham 2nd: Vaibhav Vinukonda , Meyzeek
Materials/Bio-Engineering	1st: R. Gunasena, M.Raj/M. Subheeswar , DuPont Manual 2nd: Dylan Rowe , P.L. Dunbar	1st: Tyler MacKnight , St. Pius X 2nd: Suhas Medam , Beaumont
Energy and Transportation	1st: Shankar Miller-Murthy , P.L. Dunbar, 2nd: Hannah Ziegelmeyer , Notre Dame Academy	1st: John James , Beechwood 2nd: Caroline O'Neill , E.J. Hayes
Environmental Sciences	1st: Sanjana Rane , DuPont Manual 2nd: Shreya Barde , DuPont Manual	1st: David Ma , Winburn 2nd: Mark Raj , Meyzeek
Mathematical Sciences	1st: Sasank Vishnubhatla , DuPont Manual 2nd: Dimitri Leggas , Lafayette	1st: Tess Whitfield , St. Francis of Assisi 2nd: David Vulakh , Tates Creek
Physics and Astronomy	1st: Vincent Cao , P.L. Dunbar 2nd: Allen Jiang , DuPont Manual	1st: David Yi , Meyzeek 2nd: Brenna Wallin , Lexington Traditional Magnet

Posters at the Capitol 2014

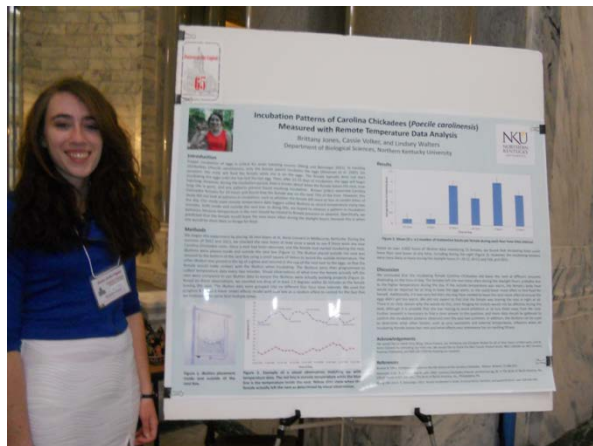
Posters-at-the-Capitol (Posters@Capitol), the annual exhibition of undergraduate research from all Kentucky state-supported colleges and universities, took place in February 2014 in Frankfort.

Several project themes converged on prevention of side-effects of some commonly-used drugs in therapy, and in nanotechnology, the fabrication of silver and gold nanoparticles. Ecological themes included monitoring environmental habitats and populations, assessing species' population dynamics, measuring pollution by waste and antibiotics, and developing natural pesticides to control crop and pasture pests. Evolutionary themes included studies on the primate brain, and crawfish frog population genetics.

Several studies centered on investigating effects of drugs already in use against HIV and cancers. Priyanka Barve and mentor Craig McClain, of the University of Louisville, investigated mechanisms of the side effects of antiretroviral drugs. The major components of drugs used in the treatment of HIV, HIV protease inhibitors (HIV-PIs), have deleterious side effects on blood and liver. The researchers studied mechanisms underlying liver toxicity and the pathogenic phosphodiesterase 4 (PDE4) family of enzymes. Inhibition of PDE4 pathogenic enzymes associated with drug therapy attenuated hepatocyte cell death. Suhaib Mahmood with faculty supervisor Kevin Williams, of Western Kentucky University, studied the faster reaction rates and cytotoxic side effects of platinum-based anti-cancer compounds when combined with methionine compared to combinations with guanosine monophosphate (5' GMP). Using platinum analogs, they demonstrated retardation of the rate of reaction to methionine.

Payton Malone and mentor Rebekah Waikel, of Eastern Kentucky University, studied estrogen prevention of the development of hypertrophy in cardiocytes. The transforming growth factor beta (TGF-3) pathway promotes cardiac hypertrophy; estrogen treatment attenuates TGF-3 signaling. These researchers proposed that estrogen exerts its effects through functioning microRNAs (miRNAs) which target TGF- β transcription, inhibiting expression, and determined which miRNAs likely inhibit transcription.

Sarah Kelsey, with the guidance of Tanea Reed of Eastern Kentucky University, studied protection from the oxidative stress that damages proteins after moderate traumatic brain injury. Glutathione (GSH), an antioxidant, protects through a protein modification that is reversed through an inhibitory feedback mechanism after damaging free radical oxidants fall below threshold. Gamma-glutamylcysteine ethyl ester (GCEE) is a potential treatment to reduce inhibition function of this feedback system. The amount of GCEE in brain tissue with moderate injury was quantified. Esther Zusstone, P.K. Patibandla, and B.K. Abeyweera, under the guidance of Palaniappan Sethu of the University of Louisville, examined the efficacy of immunoaffinity capture techniques by stretching and relaxing a polydimethylsiloxane (PDMS) membrane to isolate circulating tumor cells in the bloodstream.



Brittany Jones from Northern Kentucky University (faculty mentor Lindsey Walters) presented on incubation behavior of Carolina Chickadees.

Gold and silver nanoparticles have wide applications in medical and pharmacological areas. Their fabrication and uses were explored in several projects. William Hamilton with faculty director Rajalingam Dakshinamurthy, of Western Kentucky University, capped gold nanoparticles (AuNPs) with an antibiotic ceftazidime and analyzed their antibacterial efficacy. Another student of Rajalingam Dakshinamurthy, Fenil Chavda, developed a process for the synthesis of fructose, sucrose, and raffinose-capped gold nanoparticles (GNPs) and examined the formation and catalytic reduction activity of sugars of various lengths. Hannah Rodgers, with faculty directors Rajalingam Dakshinamurthy and Rammohan Paripelly, of Western Kentucky University, used a single step process to synthesize gold nanoparticles (GNPs) capped with Gentamicin, an aminoglycoside antibiotic that works by interrupting bacterial ribosome protein synthesis. Gentamicin-capped GNPs were more effective than Gentamicin alone in tests using bacteria. Jason Payne, with Rajalingam Dakshinamurthy, reported single-step synthesis of gold nanoparticles (AuNPs) in nanowires and nanospheres using varying concentrations of a fluorescent dye, rhodamin-6G. Ajit Deshpande with mentors Shivendra Sahi and Sneha Krishnamurthy, of Western Kentucky University, compared the inhibition of microbial growth by biologically-synthesized silver nanoparticles (SNPs) using yucca extract with effects of standard, chemically-synthesized SNPs. Biologically-synthesized SNPs showed more potent antimicrobial effects.

Environmental themes were represented in studies of wastewater and habitat quality, and effective use of natural resources. Brooke Johnson with faculty mentor Bill Staddon, of Eastern Kentucky University, measured amounts of antibiotic-resistant genes in streams near wastewater treatment plants. Heath Ward, with mentors Bill Staddon and Jason Marion, found that contamination from human fecal bacteria in well-water samples contained antibiotic-resistant genes. Tianna Lyles with faculty mentors George Antonious and Eric Turley, of Kentucky State University, measured water quality of the Kentucky River, which drains runoff wastes including human and animal wastes, grease, combustion by-products,

pesticides, herbicides from cities and farms. They found levels of several measures, including conductivity, dissolved oxygen, and pH, below Kentucky water quality standard limits. Bradley Hartman, with mentor Everett Weber of Murray State University, reported a cost-efficient method of detecting mercury in fish tissue, the biggest source of human mercury poisoning. Mercury levels were analyzed by emulsifying fish tissue using an acid solution to prevent mercury absorption, so that simple and inexpensive test strips could then be used.

Brittany Caldwell and faculty mentor Norman Strobel, of KCTCS Bluegrass Community and Technical College, investigated harmful effects of bis-phenol-A (BPA) in cash-register receipts by germinating wheat seedlings in contact with receipt papers. Incubation of seedlings on paper resulted in toxicity symptoms, and suggested the potential use of wheat seed for detection of BPA. In another study, Patrice Doyle, with mentor Norman Strobel, investigated the correlation of the presence of the enzyme polyphenol oxidase (PPO) and reactions to BPA in wheat seedlings. Germinating seedlings high in PPO were found to be less sensitive to the effects of BPA, suggesting that PPO may detoxify BPA.

Leticia Estill and faculty directors John Sedlacek and Karen Friley, of Kentucky State University, assessed abundance and diversity of grasses and flowering plants and insects in native perennial and pasture border rows. Sticky traps were used to catch insects which were identified in an on-going study to determine whether native borders promote beneficial insects. Rebecca Graves with mentors Jeremiah Lowe, Kirk Pomper, and Sheri Crabtree, of Kentucky State University, studied a possible natural pesticide in annonaceous acetogenins, long-chained fatty acids in pawpaw fruit and tissue. Pawpaw seedlings take 5 to 8 years to mature. Tests were conducted to determine whether there is a correlation in acetogenin levels in ripe fruit and twig tissue, and provide a means for early detection of acetogenin in pawpaw varieties.

Mark Woodberry with faculty mentor George Antonious, of Kentucky State University, obtained extracts from hot pepper fruits for development of a natural pesticide alternative to synthetic pesticides. Amounts of capsaicin in fruits were quantified, using several lines of hot peppers housed at the Kentucky State University Research Farm. These data allowed identification of genotypes with high levels of natural capsaicin for possible mass production.

Ecological and genetic factors in evolution provided a framework for several studies that reported habitat adaptation and morphology of animals. Quintin Bergman with faculty directors Howard Whiteman and Scot Peterson, of Murray State University, studied impacts of habitat degradation on biodiversity loss in a Colorado stream and found cattle usage of riparian zones negatively affected abundance of native large mammals to a greater extent than stream degradation. Christian Brown and Adam Kiser, with mentors Howard Whiteman and Christopher Mecklin, quantified the fitness consequences of the Arizona tiger salamander (*Ambystoma tigrinum nebulosum*) polyphenism, the presence of alternate phenotypes in a population in response to environmental variation. Using an on-going capture-recapture database, the

survival of salamanders based on size, sex, and adult form (metamorphic or paedomorphic) was assessed. Only size had an impact on survival, with medium-size class having lower survival than either larger- or smaller-size classes.

Savannah Bell, Kayla Stringfield, and Victoria Darling with mentor Claire Fuller, of Murray State University, examined effects of climate change on tropical termite resistance to a pathogenic fungus and the survival of termite colonies in the U.S. Virgin Islands. Termites from warm, dry areas and their colonies had higher survival rates. A model for nest growth rates incorporating temperature variation and wet mangrove or dry habitats was constructed.

Dana Leigh and mentor Stephen Richter, of Eastern Kentucky University, studied populations of recently-discovered crawfish frogs (*Lithobates areolatus*) in the Big Oaks National Wildlife Refuge in Indiana, to determine how landscape features and distance affect gene flow among crawfish frog populations. Heidi Vollrath with faculty director Magdalena Muchlinski, of the University of Kentucky, examined the evolution of brain size without accompanying higher metabolic costs in primates by possible trade-offs between large brain size and reduced size of other metabolically-expensive tissue such as skeletal muscle. A significant negative correlation was found between muscle mass weights and endocranial volumes of 15 primate species.

Small machines were the focus of Tyler Flynn with faculty directors Christine Trinkle and L.S. Stephens, of the University of Kentucky, who presented fabrication methods for uniform magnetic composite and uniform electrostatic composite microforms, as well as novel hybrid microstructures that can be independently activated by magnetic or electrostatic forces to function as microrobotic systems.

The Chandra X-Ray Observatory, the orbiting satellite telescope of the National Aeronautics and Space Administration (NASA), provided data for studies by Biswas Sharma with faculty director Thomas Pannuti, of Morehead State University, who used X-ray and optical data to analyze the dynamical status of cluster cores in galaxy clusters, gravitationally-bound objects dominated by dark matter and containing intracluster gas and galaxies. In another study, Jared Napier, with mentor Thomas Pannuti, searched for discrete X-ray sources that show time variability detected by the Chandra X-Ray Observatory, and found one source that may be an X-ray binary associated with a nearby galaxy and another source that may be a background galaxy.

These research studies were carried out with the expert guidance of faculty at Kentucky public colleges and universities, giving undergraduates the opportunity to gain experience in fields of science using the objective methods and processes of laboratory and field. Their work displayed at P@C gives visitors the opportunity to view current research pursued in these institutions across the Commonwealth.

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

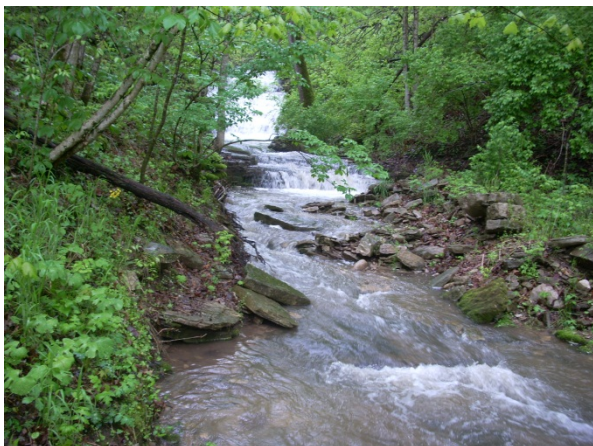


Kentucky Heritage Land Conservation Fund

Clark County's Lower Howard's Creek Nature and Heritage Preserve: One of KHLCF's most significant natural areas will host a KAS field trip in November

Dr. Richard K. Kessler (Chair) and Zeb Weese (KHLCF Biologist)

The Lower Howard's Creek Nature and Heritage Preserve in Clark County is approximately 400 acres of riparian forest on a significant tributary of the Kentucky River, protected in perpetuity by Kentucky Heritage Land Conservation Fund conservation easements. Clark County Fiscal Court owns and manages the preserve with substantial help from a local nonprofit organization, the Friends of Lower Howard's Creek. While the local community was initially drawn to protect the area because of the important archeological and historic resources dating back to the 1780s, the ecological significance is what primarily interested the KHLCF Board.



Lower Howard's Creek

At least two federally endangered species are documented on the site, running buffalo clover and the gray bat, as well as several species listed by the Kentucky State Nature Preserves Commission as rare in the state, including water stitchwort, Missouri arrow-wood, and the evening bat. The diverse second growth forest includes green, white and blue ash, white and chinquapin oak, red elm, hackberry, sugar maple, Ohio buckeye, pignut hickory, tulip tree,

sassafras, beech, American basswood, black walnut, red mulberry, black cherry, elderberry, American sycamore, and sweet gum. The mid-story includes honey locust, persimmon, lanceleaf buckthorn, paw paw, witch hazel, and spicebush. The site is well known for its native wildflower display, which include stonecrop, rue anemone, fire pink, bloodroot, trout lily, wild blue phlox, sessile trillium, hepatica, Virginia bluebells, and columbine. Although invasive bush honeysuckles and privet are significant problems in the understory, dedicated volunteers have made serious efforts to remove them over the last decade to compliment KHLCF funding of invasive control. In recognition of the exemplary site management, Clark County Fiscal Court received the KHLCF Stewardship Award in 2011 for their work at Lower Howard's Creek.

Several researchers from the University of Kentucky, Eastern Kentucky University, and Transylvania University have conducted ecological studies on the site. Current research includes an assessment of the effects of exotic bush honeysuckle infestations on the foraging ability of forest bats by ECU's Dr. Luke Dodd and the KHLCF's Zeb Weese. The KAS field trip to the site in November will include a stop at their research plots and a discussion of habitat issues on the site.

For more information on Lower Howard's Creek go to <http://www.lowerhowardscreek.org>.

For more information on the KHLCF, visit the KHLCF website at <http://heritageland.ky.gov> or contact Zeb Weese at zeb.weese@ky.gov. The KHLCF is administrated by the Kentucky Department for Natural Resources and funded in part by the sale of "Nature's Finest" license plates. The KHLCF has now protected and conserved over 86,000 acres in 63 counties.

Don't forget to buy a nature license plate when you register your car, light truck or SUV!

Money from the sale of these plates goes into the Heritage Land Conservation Fund for purchasing natural areas to be left as wild places held in trust for future generations.

