



Kentucky Academy of Science

The Voice of Science in Kentucky

NEWSLETTER

www.kyscience.org Susan Templeton, Editor January 2013

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

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- 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!

From the President...

I would like to begin by extending New Year's greetings and best wishes to all. It is indeed an honor to serve as President in this, the 99th year of the Kentucky Academy of Science. In 1914, a group of 60 individuals met in Lexington, Kentucky, to establish the KAS and approve our first constitution. A theme expressed at that first organizational meeting was the importance of mutualism between the diverse scientific disciplines represented in the academy. Next year, we will proudly celebrate our 100th year. The KAS has grown into a strong and active organization that encompasses numerous scientific disciplines and a membership that surpasses 2,000. The theme of mutualism expressed at that first organizational meeting is even more important today than it was in 1914. Many of our members today participate and give presentations in multiple disciplines, and the lines between scientific disciplines have become more fluid as we establish research collaborations and interdisciplinary programs that link institutions, investigators, and students from across the commonwealth. Many of the tremendous challenges that we are faced with today as a global society (climate change, energy security and sustainability, availability of food and fresh water, loss of biodiversity, ocean health, declining infrastructure for transportation, public health, etc.) will also require the greatest scientific minds of today and tomorrow, working together with determination, innovation, and cooperation.

This past year has been a great year for the KAS. Our highly successful annual meeting at Eastern Kentucky University in October 2012 was one of the largest on record, with over 700 individuals in attendance and just over 400 oral and poster presentations. I would like to give my sincerest thanks to our Executive Director, Jeanne Harris, Past-President, Dawn Anderson, our out-going Program Officer, Robert Creek, the out-going editor of the journal of the KAS, Martin Matisoff, officers and members of our Governing Board, committee chairs and committee members, and all sectional officers for all of your hard work and dedication this year.

As we look ahead to the coming months, there are several key positions within the KAS that must be filled. If you have ever thought about becoming more involved, now is your time! After sixteen years of dedicated service, Robert Creek has stepped down as our program coordinator. We are all so very grateful to Robert for his years of service to the KAS, and we wish him the very best. The role of program officer is a key position within the KAS, and is vital to the success of our annual meeting. Additional information about this position can be found within the newsletter if you think you might be interested. *(Continued on page 6.)*

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2012 Annual Meeting Report

The 98th meeting of the Kentucky Academy of Science was held at Eastern Kentucky University on October 19-20, 2012. The meeting was very well attended with a total of 741 individuals in attendance which included the all-important speakers, exhibitors and sponsors.

The meeting started on Friday evening with the Symposium. The well received Symposium was a panel discussion entitled “Engaging Students in Global Health Research.” The Symposium was presided over by Dr. Cheryl Davis with the three member panel consisting of Dr. Dan Colley, Dr. Nancy Rice and Ms. Carol A. Etherington.

Saturday had a full day of presentations, both oral and posters, with the well attended afternoon Plenary Session being the final presentation. The President, Dr. Dawn Anderson, presented the welcome with Dr. Cheryl Davis presiding at the Plenary Session. The speaker was Dr. Dan Colley whose topic was “Human Schistosomiasis – A Journey from Immune Responses to Mass Drug Administration.”

The Kentucky Society of Professional Geologists held their 16th Annual Fall Conference in conjunction with the Kentucky Academy of Science. In addition to presentations they sponsored a field trip Saturday afternoon.

The Kentucky Association of Physics Teachers sponsored a workshop on Math Machines Saturday afternoon.

Dr. Walter Borowski presented a “Walk through Geologic Time.” This involved a walk along geologic time outside the NSB which traced the antiquity of Earth and key events during its history.

Saturday afternoon Dr. Alice Jones, ECU Sustainability Coordinator, provided a walking tour that highlighted many of the architecturally innovative features of the NSB which allows it to meet the US Green Building Council’s Leadership in Energy and Environmental Design (LEED certification requirements).

Mr. Steve Hume, Director of Process Science at Kentucky Bioprocessing, Owensboro was invited to present Saturday afternoon a lecture entitled “Cytokines: Expression, Purification, and Evaluation of its Secretion Mechanism.

The meeting concluded with the Awards Banquet. The winners of the Superlative Awards, the URCs and GRCs are provided elsewhere in this Newsletter.

The meeting concluded with the Awards Banquet. The winners of the Superlative Awards, the URCs and GRCs are provided elsewhere in this Newsletter.

There were 202 oral presentations with 78 entering the URC and 51 in the GRC. There were 198 posters with 105 entered in the URC. The total breakdown by section is as follows.

Presentation by Section	Total PowerPoint	URC	GRC	Total Posters	URC
Agricultural Sciences	24	5	7	12	4
Anthropology & Sociology	11	4	0	0	0
Botany	14	4	1	0	0
Cellular & Molecular Biol.	12	5	6	14	9
Chemistry	24	15	6	42	32
Computer & Information Sciences	2	0	2	0	1
Ecology & Environ. Sciences	10	1	7	23	15
Engineering	6	2	1	1	1
Geography	7	2	2	3	1
Geology	12	6	3	6	1
Health Sciences	7	5	1	4	1
Mathematics	4	0	0	0	0
Microbiology	6	2	2	5	3
Physics	12	3	1	20	9
Physiology & Biochemistry	13	11	1	22	10
Psychology	14	10	3	10	3
Science Ed.	11	2	0	4	2
Zoology	13	1	4	24	12

Submitted by Robert Creek, Program Coordinator

Messages from the Executive Director

It was fun seeing everyone at the 2012/98th Annual Meeting. Thank you to all who helped in the making of a very successful meeting. I would like give a special thanks to our wonderful sponsors and exhibitors who made this event possible:

2012 KAS Annual Meeting Sponsors

Platinum Level

Agilent Technologies
EKU Graduate School

Gold Level

American Synthetic Rubber Company (sponsors since 2007)
Kentucky Society of Professional Geologists
Süd-Chemie Inc a Clariant Group Company (sponsors since 2007)

Silver

MPD, Inc.

Friend

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Warren Rural Electric Cooperative Corporation

2012 Meeting Exhibitors

B&B Microscopes, Ltd
Eastern Kentucky University CRAFT (Center for Renewable and Alternate Fuel Technologies)
Eastern Kentucky University Graduate School
i>clicker
John Wiley & Sons
KBRIN (Kentucky Biomedical Research Infrastructure Network)
Kentucky Institute of International Studies at WKU
Kentucky Paleontological Society
KSU Masters in Environmental Studies (MES) and the Agriculture, Food, and Environment Program
Murray State College of Science, Engineering and Technology
Sapling Systems, Inc.
Sud-Chemie a Clariant Group Co.
University of Kentucky Biology Department Graduate Program
University of Kentucky Integrated Biomedical Sciences
University of Kentucky PhD Program in Pharmaceutical Sciences
University of Charleston School of Pharmacy
University of Kentucky Center for Applied Energy Research
University of Louisville Integrated Programs in Biomedical Sciences
University of Louisville School of Interdisciplinary and Graduate Studies
Western Kentucky University Ogden College of Science and Engineering

I also wanted to express our gratitude to the EKU Local Arrangement Committee for all of their hard work! Darrin Smith served as chair of the committee and orchestrated the event with ease and enthusiasm. Many thanks to the entire committee: Walter Borowski, Benjamin Freed, Cassie Green, Jessica Lair, Doughiu Quan, and Jing Wang.

I am looking forward to 2013 and working with Incoming President Dr. Cheryl Davis. We are only one year away from the KAS Centennial Celebration! With the start of the New Year, KAS will be sending annual dues notices to our affiliates and regular members. If you are currently an enhanced member of KAS and are remaining affiliated with a KAS Enhanced Affiliate no action is needed by you to retain your KAS annual membership. Please encourage your colleagues to join KAS. Membership for faculty, staff and students at KAS Enhanced Affiliates (list on page one of Newsletter) is complimentary. If you need a KAS brochure or information to share with your co-workers/students, or assistance in any KAS matter, feel free to contact me.

Best wishes,

Jeanne Harris, KAS Executive Director

859-227-2837; executivedirector@kyscience.org

Annual Meeting Program Coordinator Needed

As most of you are aware, after sixteen years of service, Dr. Robert Creek has stepped down as the KAS Program Coordinator.

Thank you, Dr. Creek, for your outstanding service and dedication to KAS!

With Dr. Creek's departure, KAS is now searching for a new volunteer Program Coordinator. This is a key position within KAS. The KAS Program Coordinator is responsible for all aspects of the research presentation and competition process at the KAS annual meetings. This includes monitoring and answering questions regarding online submissions, securing and assigning rooms for the oral and poster presentations at the host facility, working with sectional officers regarding judges, and editing the meeting program for publication. The Program Coordinator also works with the Local Arrangement Committee of the host institution and the Executive Director to coordinate the logistical aspects of meeting.

If you have questions or are interested in this position, please contact President Cheryl Davis (cheryl.davis@wku.edu) or Jeanne Harris, Executive Director (executivedirector@kyscience.org).



2012 Undergraduate Research Competition Winners

Congratulations to these students and their mentors, and thanks to those who devoted their time to judge the presentations. Photos of winners from the 2012 Annual Meeting Awards Banquet on can be viewed at <http://www.kyacademyofscience.org/gallery/g10/>.

Agricultural Sciences

- Oral 1st: Stephanie Rexing, Murray State University
- Oral 2nd: McKenzie Johnson, Kentucky State University
- Oral 3rd: Lydia Kronmaah, Kentucky State University
- Poster 1st: Dallas Cook, Berea College
- Poster 1st: Jennifer Rominger, Berea College
- Poster 2nd: Amanda Benitez, Berea College
- Poster 2nd: Makala Settlege, Berea College
- Poster 3rd: Sabrina Barnes, Berea College

Anthropology and Sociology

- Oral 1st: Alex Ivers, Northern Ky University
- Oral 2nd: Lindsay Hays, Eastern Ky University
- Oral 3rd: Michelle Kroger, Northern Ky University

Botany

- Oral 1st: Erica Eldridge, Morehead State University
- Oral 2nd: Kelly Modaff, Morehead State University
- Oral 3rd: Kate Bomar, Morehead State University

Cell and Molecular Biology

- Oral 1st: Mark Althoff, Murray State University
- Oral 2nd: Franceska Mehmeti, Berea College
- Oral 3rd: Charles A. Coomer, Western Ky University
- Poster 1st: Aung Soe Lin, Berea College
- Poster 2nd: Alyssa Quiray, Berea College
- Poster 3rd: Daniel Speer, Kentucky Wesleyan College

Chemistry

- Oral 1st: Yang (Vanessa) Song, Centre College
- Oral 2nd: Ivan Titaley, Berea College
- Oral 3rd: Derek Gibbs, Northern Ky University
- Poster 1st: Cameron Campbell, Campbellsville University
- Poster 2nd: Cody Nance, Georgetown College
- Poster 3rd: Marienette Ngambou, Berea College

Computer and Information Sciences

- Poster 1st: Eugene W. Hinderer, Bellarmine University

Ecology and Environmental Science

- Oral 1st: Nadia A. Karkenny, Berea College
- Poster 1st: Melissa D. Smith, Western Ky University
- Poster 2nd: Mary M. McKenna, University of Kentucky
- Poster 3rd: Brittany Schroeder, Berea College

Geography

- Oral 1st: Ryan Difani, Western Ky University
- Oral 2nd: Emily Yates, Western Ky University
- Oral 3rd: Ellen Green, Western Ky University
- Poster 1st: Jeremiah Nieves, University of Louisville

Geology

- Oral 1st: Michael Powers, Western Ky University
- Oral 2nd: Charles Hancock, Western Ky University
- Poster 1st: Nathaniel Hall, Northern Ky University

Health Sciences

- Oral 1st: Helena Pett, Berea College
- Oral 2nd: Shelby Kozlowski, Northern Ky University
- Oral 3rd: Horton Li, Berea College
- Poster 1st: Katherine Webb, Berea College
- Poster 2nd: Beris Dizdar, Northern Ky University
- Poster 3rd: Abbey Bailes, Northern Ky University

Mathematics

- Oral 1st: Lindsay Grayson, Northern Ky University

Microbiology

- Oral 1st: Dipendra Sharma Chapagain, Berea College
- Poster 1st: Donna Williams, Western Ky University
- Poster 2nd: Travis A. Witkowski, Morehead State University
- Poster 3rd: Joshua C. Ferrell, Morehead State University

Physics and Astronomy

- Oral 1st: Rohan Isaac, Berea College
- Oral 2nd: Hannah Mabry, Morehead State University
- Oral 3rd: Marissa Brown, Berea College
- Poster 1st: Adam Stewart, University of Louisville
- Poster 2nd: Mackenzie Endres, Berea College
- Poster 3rd: Kelsey Whitaker, Morehead State University

Physiology and Biochemistry

- Oral 1st: M. R. Stephens, Thomas More College
- Oral 2nd: Austin Brown, Northern Ky University
- Oral 3rd: Andrea N. Frost, Centre College
- Poster 1st: Moses Henderson, Eastern Ky University
- Poster 2nd: Rebecca K. Oliver, Transylvania University
- Poster 3rd: Carli Whittington, Murray State University

Psychology

- Oral 1st: Kary Stivers/Emily Robbins, Centre College
- Oral 2nd: Chelsea Benham/Gwynne Rose, Centre College
- Oral 3rd: Sara Dean, Berea College
- Poster 1st: Gianni P. Maione, Morehead State University
- Poster 2nd: Amy Stamates, Northern Ky University
- Poster 3rd: Julia Fleming, Centre College
- Poster 3rd: Annie Wigginton, Centre College

Science Education

- Oral 1st: Kevin Beers, Northern Ky University
- Oral 2nd: Meghan Allen, Bellarmine University
- Poster 1st: Alexis Rice, Northern Kentucky University
- Poster 2nd: David Scrivener, Berea College

Zoology

- Oral 1st: Carol-Rose Gingras, Morehead State University
- Oral 2nd: Christine Spear, Kentucky Wesleyan College
- Poster 1st: Emily Madden, Centre College
- Poster 2nd: Brenna Burkhart, Wittenberg University
- Poster 3rd: Brooke Washburn, Morehead State University

Submitted by Robert Creek, Program Coordinator

2012 Graduate Research Competition Winners

Congratulations to these students and their mentors, and thanks to those who devoted their time to judge these oral presentations. Photos of winners from the 2012 Annual Meeting Awards Banquet can be viewed at <http://www.kyacademyofscience.org/gallery/g10/>.

Agricultural Sciences

- 1st: Alex Squadrito, Kentucky State University
- 2nd: Joni Nelson, Kentucky State University
- 3rd: Dan Sandor, Western Kentucky University

Botany

- 1st: Tanner Morris, Eastern Kentucky University

Cell and Molecular Biology

- 1st: Hannah M. Flood, Murray State University
- 2nd: Kelsey R. Nelson, Murray State University
- 3rd: Julia C. Freeman, Western Kentucky University

Chemistry

- 1st: Lin Wu, Eastern Kentucky University
- 2nd: Jason Young, Western Kentucky University
- 3rd: Xiaoning Zhang, University of Kentucky

Computer and Information Sciences

- 1st: Elizabeth Tyrie, Western Kentucky University
- 2nd: Vijaykant Nadadur, University of Kentucky

Ecology and Environmental Science

- 1st: Carl Cloyed, University of Louisville
- 2nd: Jeffery A. Masters, University of Louisville
- 3rd: Kevin J. Tewell, Western Kentucky University

Geography

- 1st: Gilman Ouellette, Western Kentucky University
- 2nd: Jeremy Young, Western Kentucky University

Geology

- 1st: Susan Leib, University of Kentucky
- 2nd: Rachel E. Bowles, Western Kentucky University
- 3rd: Ann Harris, University of Kentucky

Health Sciences

- 1st: Pranav Chandra, Western Kentucky University

Microbiology

- 1st: Shawn Smiley, Western Kentucky University

Physiology and Biochemistry

- 1st: Zana R. Majeed, University of Kentucky
- 2nd: Zach Sellers, Eastern Kentucky University

Psychology

- 1st: Katy R. Hauris, Morehead State University
- 2nd: Tara Holaday, Western Kentucky University
- 3rd: Quantá D. Taylor, The Ohio State University

Zoology

- 1st: Piyumika S. Suriyampola, University of Louisville
- 2nd: Cory Stringfield, Eastern Kentucky University
- 3rd: Emily M. McIntire, Western Kentucky University

Submitted by Robert Creek, Program Coordinator

KAS Governing Board Updates

The Nominations and Elections Committee congratulates those who were elected to office and expresses sincere appreciation to all those willing to serve the Academy by allowing their names to be placed into nomination.

Newly elected Board Members:

- Vice President David White (Murray)
- Physical Sciences Rep. Douglas Chatham (Morehead)
- Social & Behavioral Sciences Rep. David Butz (Morehead)

Continuing Board Members:

- President Cheryl Davis (Western)
- Past President Dawn Anderson (Berea College)
- President Elect K. C. Russell (Northern)
- Secretary Robert Kingsolver (Bellarmine)
- Treasurer Ken Crawford (Western)
- At-Large Rep. Mary Jansen (KCTCS)
- At-Large Rep. KatieAnn Skogsberg (Centre)
- Biological Sciences Rep. Ron Jones (Eastern)
- Biological Sciences Rep. Pamela Feldhoff (U of L)
- Physical Sciences Rep. Eric Jerde (Morehead)
- Social & Behavioral Sci. Rep. Judy Voelker (Northern)

Ex-officio Board Members:

- Executive Director Jeanne Harris
- Junior Academy of Science Director Ruth Beattie (UK)
- AAAS/NAAS Representative Nancy Martin (U of L)
- Webpage Editor Claire Rinehart (Western)
- Newsletter Editor Susan Templeton (Kentucky State)
- Executive Secretary Emeritus Don Frasier (UK)

Retiring Board Members:

- Past President Barbara Ramey (Eastern)
- Program Coordinator Robert Creek (Eastern)
- Social & Behavioral Sci. Rep. Sean Reilley (Morehead)
- Physical Sciences Rep. Ted Porter (Murray)
- Journal Editor Martin Matisoff (Kentucky State)

Retiring board members were recognized for their service to KAS by President Dawn Anderson at the Kentucky Academy of Science Annual Business Meeting on October 20, 2012.

*Submitted by Sean Reilley, Chair,
Nominations and Elections Committee
and Jeanne Harris, Executive Director*

2013 KAS Sectional Officers

Section	Chair	Secretary
Agricultural Sciences	Iin Handayani iin.handayani@murraystate.edu	Hideka Kobayashi hideka.kobayashi@kysu.edu
Anthropology and Sociology	Benjamin Freed Benjamin.Freed@eku.edu	Changzheng Wang changzheng.wang@kysu.edu
Botany	Allen Risk a.risk@moreheadstate.edu	Brad Ruhfel brad.ruhfel@eku.edu
Cellular and Molecular Biology	Alexey Arkov aarkov@murraystate.edu	Chris Trzepacz ctrzepacz@murraystate.edu
Chemistry	David Cunningham david.cunningham@eku.edu	Jennifer Muzyka jennifer.muzyka@centre.edu
Computer and Information Sciences	Jerzy Jaromczyk jurek@cs.uky.edu	Sherif Rashad s.rashad@moreheadstate.edu
Ecology and Environmental Science	John Starnes john.starnes@kctcs.edu	Stephen Yanoviak steve.yanoviak@louisville.edu
Engineering	Nilesh Joshi n.joshi@moreheadstate.edu	Sanjeev Adhikari s.adhikari@moreheadstate.edu
Geography	Demetrio Zourarakis demetrio.zourarakis@ky.gov	Leslie North leslie.north@wku.edu
Geology	Robert Lierman tom.lierman@eku.edu	Charles Mason c.mason@moreheadstate.edu
Health Sciences	Bruce Branan bbranan@asbury.edu	Lingyu Huang lingyu.huang@kysu.edu
Mathematics	John Porter ted.porter@murraystate.edu	R. Douglas Chatham d.chatham@moreheadstate.edu
Microbiology	Tim Johnston tim.johnston@murraystate.edu	Cangliang Shen cangliang.shen@wku.edu
Physics and Astronomy	Akhtar Mahmood amahmood@bellarmine.edu	
Physiology and Biochemistry	Tracy Livingston Tracy_Livingston@georgetowncollege.edu	Michael Fultz m.fultz@moreheadstate.edu
Psychology	Jennifer Goetz jennifer.goetz@centre.edu	Brian Cusato b.cusato@centre.edu
Science Education	Brent Eldridge brent.eldridge@kctcs.edu	Bill Staddon bill.staddon@eku.edu
Zoology	Lindsey Walters waltersl3@nku.edu	

Submitted by Robert Creek, Program Coordinator

From the President... *(continued)*

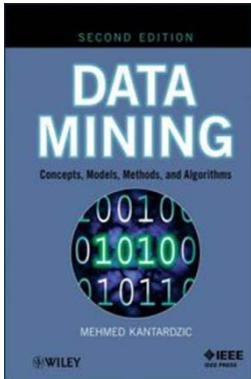
There are also open positions on many KAS committees including; the Committee on Membership, Committee on Legislation, Committee on Publications, Committee on Science Education, Committee on Nominations, and the Planning Committee. If you think you may have an interest in serving on any of these committees, please do not hesitate to contact me for more information at cheryl.davis@wku.edu.

The newest KAS committee – the AD HOC Natural History Survey/Museum – begins its work this year, with Judy Voelker and Ron Jones serving as Co-Chairs. Many thanks to Albert Meier from Western Kentucky University and John Pickering from the University of Georgia for their presentation on the Kentucky Natural History Survey at the November 2012 meeting of the KAS Governing Board. Watch for news from this new committee in upcoming KAS newsletters.

Please let me know if you have any questions, concerns, or suggestions. As President, I am looking forward to the opportunity to work together with all of you to make this an outstanding year for the KAS.

Best Wishes – Cheryl D. Davis

KAS Author's Corner



Mehmed Kantardzic, *Data Mining: Concepts, Models, Methods, and Algorithms*, IEEE Press & John Wiley, Second Edition, August 2011, 552 pages, ISBN: 978-0-470-89045-5.

Mehmed Kantardzic, PhD, is a Professor in the Department of Computer Science and Computer Engineering (CECS), Speed School of Engineering at the University of Louisville. He is Director of CECS Graduate Studies, as well as Director

of the Data Mining Lab. His current research focuses on data mining & knowledge discovery, machine learning, soft computing, click fraud detection and prevention, mining streaming data from social networks, and distributed intelligent systems. His recent research projects are supported by NSF, KSTC, US Treasury Department, and NASA.

The book reviews state-of-the-art methodologies and techniques for analyzing enormous quantities of raw data in high-dimensional data spaces, to extract new information for decision making. The goal of this book is to provide a single introductory source, organized in a systematic way, in which we could direct the readers in analysis of large data sets, through the explanation of basic concepts, models and methodologies developed in recent decades. The book is accepted as the textbook for data mining courses at universities in USA and abroad. First edition of the book is translated into Simplified Chinese, and published by Tsinghua University Press of the People's Republic of China, and also translated and published in Japan by Morikita Shupp Publ. Co. Second edition of the book will be translated into Chinese in 2014, and also Spanish and Korean translations are in preparation. The book is selected and reviewed as a book of interest in the June 2012 issue of the IEEE Institute magazine, and it is presented in Top 100 Bestsellers in Engineering & Technology for 2011:

(www.wiley.co.jp/electronic/engineering_top100_201206.xls).

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. Please include the title of the book, your name/other authors and affiliation, and a brief synopsis regarding the subject matter of the book. KAS promotes the dissemination of the scientific interests of the Commonwealth of Kentucky. We look forward to hearing from you!

Environmental Issues Event

3RD CONFERENCE ON INVASION
BIOLOGY, ECOLOGY, AND
MANAGEMENT

University of Kentucky

April 2-4, 2013



Sponsored by the College of Agriculture's Environmental and Natural Resource Initiative; abstracts accepted until Feb 15; featured speaker: Charles Mann, author of *1491* and *1493*.

http://www2.ca.uky.edu/environment/enviro_event_2013

Updates on the KAS Journal

The KAS Governing Board distributed a survey regarding the *Journal of the Kentucky Academy of Science (JKAS)* at the Annual Meeting and via Survey Monkey; 112 responses were received. The feedback from this survey will be discussed at the February Board meeting to help in determining the future path of the JKAS.

The Fall 2012 issue should be out in February 2013. It will contain the following articles.

Evaluation of the Tooth-wear and Replacement Method for Aging White-tailed Deer (*Odocoileus virginianus*) on the Blue Grass Army Depot, Madison County, Kentucky. Charles L. Elliott and Thomas Edwards.

Occurrence of Three Leech Species (Annelida: Hirudinida) on Fishes in the Kentucky River. Joseph E. Flotemersch, Donald J. Klemm and William E. Moser.

Size Structure of *Fagus grandifolia*, *Liriodendron tulipifera*, and *Celtis occidentalis* Populations in a Wetland Forest in Campbell County, Kentucky. Richard L. Boyce

Evaluation of Cultivars of Sunflower (*Helianthus annuus* L.) and Selected Environments for Production of Cut Flowers. Christopher G. Ferguson, Pavani G. Vuppapapati, Martin J. Stone, and Elmer Gray.

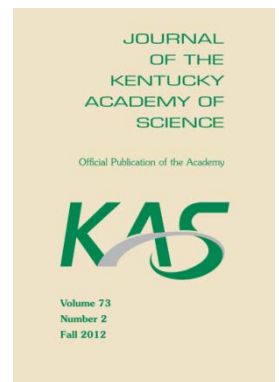
Lady Beetle Composition and Abundance in Sweet Corn Bordered by Pasture, Buckwheat or Sunflower Companion Plantings. John D. Sedlacek, Karen L. Friley, and Kirk W. Pomper.

Genetic Diversity in Kentucky Spicebush Populations using Simple Sequence Repeat Markers. Re'Gie Smith, Kirk W. Pomper, Jeremiah D. Lowe, Jacob Botkins, and Sheri B. Crabtree.

The Pawpaw Peduncle Borer, *Talponia plummeriana* Busck (Lepidoptera: Tortricidae): A Pest of Pawpaw Fruit. John D. Sedlacek, Jeremiah D. Lowe, Kirk W. Pomper, Karen L. Friley, and Sheri B. Crabtree.

Pawpaw Patch Genetic Diversity, and Clonality, and its Impact on the Establishment of Invasive Species in the Forest Understory. Jacob Botkins, Kirk W. Pomper, Jeremiah D. Lowe, and Sheri B. Crabtree.

*Submitted by Jeanne Harris, Executive Director,
and Martin Matisoff, Journal Editor*



2012 Superlative Awards

OUTSTANDING COLLEGE/UNIVERSITY TEACHER



President Dawn Anderson presented the award plaque to Dr. Robin Cooper of UK.

The recipient of the 2012 Outstanding College/University Teaching Awards is Dr. Robin Cooper, Associate Professor of Neurobiology and Neurophysiology at The University of Kentucky. Dr. Cooper received his bachelor's in chemistry and zoology as well as his Ph.D. in physiology, from Texas Tech. He followed his Ph.D. with post-doctoral positions at the University of Basel and the University of Toronto Schools of Medicine. He joined the faculty at the University of Kentucky in 2001. In 2005, Dr. Cooper received the University of Kentucky Provost's Award for Outstanding Teaching. He has been involved student research at all levels. His extensive portfolio of more than 150 peer reviewed publications includes seven publications with high school students as authors and 47 papers with undergraduate authorship.

As a nominator commented, "Another example of his commitment to meet the needs of his students was completing a nursing degree (BSN and RN) this past year alongside his teaching and research responsibilities. He shared that his reason for completing this degree was so he could better respond and meet the needs of his students who are pursuing health care degrees." A student letter of support stated, "Dr. Cooper over the past years has served as an exemplary role model for what I strive to be in both personal

and professional life. His dedication to teaching, inquiring mind, humbling personality, and overwhelming commitment and concern for the betterment of students speaks volumes for the character of my nominee."

Dr. Cooper's passion for teaching extends beyond the University and into the commonwealth. He has received numerous grants to improve science instruction on the elementary and high school level through supported workshops and in-service presentations. Not only has Dr. Cooper used this expertise to improve his classes at UK, but also to educate the community. In his spare time he lectures on health related issues at venues ranging from grade schools to nursing homes.

OUTSTANDING EARLY CAREER IN POST SECONDARY EDUCATION

The recipient of the 2012 Outstanding Early Career in Post Secondary Education Award is Dr. Hunter Moseley, Assistant Professor of Biochemistry at University of Louisville. Dr. Moseley obtained bachelor's degrees in Chemistry, Computer Science and Mathematics at Huntingdon College. He received his Ph.D. in Biochemistry from the University of Alabama, Birmingham, and his post-doctoral training at Rutgers University. In 2008 he joined the faculty at the University of Louisville. Since then he has mentored 4 graduate students and 26 undergraduates, as well as eight high school students. He has published eight papers in peer reviewed journals, with more submitted. He has been a principle or co-investigator on grants totaling more than \$1M. In 2011 Dr. Moseley was appointed Associate Director for Bioinformatics in the Center for Regulatory and Environmental Analytical Metabolomics.

Dr. Moseley has been intimately involved in establishing a new interdisciplinary graduate degree in Informatics at the U of L. At the undergraduate level, he has participated in over 50 teaching and learning workshops. He has served as a peer advocate for Louisville's Ideas to Action initiative, which, in part, focuses on the critical thinking skills of undergraduates. His nomination materials made clear his commitment to using novel methods such as "explicit revision" in his courses to help student learning, and then publish these results. One letter of nomination stated, "Hunter's leadership in the area of education in chemical sciences, and his passionate commitment to teaching and learning, are laudable. As an early career faculty member, he has shown extraordinary energy and drive to not only to improve his own teaching, but to deepen, extend and share his knowledge and findings with other scholars."

In 2010 Dr. Moseley received the Kentuckiana Metroversity Award for Instructional Development; in the past year he joined the Inaugural Board of Reviewers for the journal Student Learning Through Mentored Scholarship.



President Dawn Anderson presented the award plaque to Dr. Hunter Moseley of U of L.

DISTINGUISHED COLLEGE/UNIVERSITY SCIENTIST



Dr. Thomas Pannuti of Morehead received the award from President Dawn Anderson..

The recipient of the 2012 Distinguished College or University Scientist Award is Dr. Thomas Pannuti, Associate Professor of Space Science at Morehead State University. Dr. Pannuti obtained his higher education in astrophysics, receiving a bachelor's degree in physics from Rensselaer Polytechnic Institute, and master's and Ph.D. in physics from the University of New Mexico. Following his Ph.D., Dr. Pannuti pursued postdoctoral studies at the Jet Propulsion Laboratory at Cal. Tech., followed by a stint at the Chandra X-ray Center at MIT. In 2006 he joined the faculty at Morehead State University.

In his relatively short, but distinguished, career he has had 22 peer reviewed publications in top academic journals, received 10 funded research grants, all of which include undergraduate researchers, been awarded a remarkable 7 of 11 observing proposals submitted to the world's major astronomical telescopes, and given 90 conference presentations.

Dr. Pannuti is an international, one might say universal, expert in the fields of high-energy and radio observations of supernova remnants. He has pursued a research program both with his students and with a variety of collaborators. He routinely collects data on some of the world's most well-known telescopes, including the ground based National Radio Astronomy Observatory's Expanded Very Large Array and the Chandra space telescope. In spite of the fact that Morehead state does not offer graduate degrees in astrophysics, Dr. Pannuti regularly serves internationally on Ph.D. thesis committees.

With his research funding Dr. Pannuti has been able to establish and maintain the "Institute for Stellar Necrology Laboratory" a computer laboratory dedicated to research projects conducted by undergraduate students in the Morehead's Space Science Center. His funding has helped him initiate a number of student-centered research programs which effectively utilize the university's telescopes. Borrowing from a letter of support, "One of the most important scholarly activities in which Dr. Pannuti has engaged since his arrival is the translation of his work to our research facilities. He has developed a viable long-term strategy to build collaboration and infrastructure in support of his research programs, and to effectively utilize [Morehead's telescopes] (in conjunction with other observatories, both on-orbit and ground-based). To that end, Tom has worked with other faculty to evolve and enhance the telescope systems, and indeed has financially supported these efforts through his grant activity."

OUTSTANDING SECONDARY SCHOOL SCIENCE TEACHER

The recipient of the 2012 Outstanding Secondary School Science Teacher Award is Ms. Heidi Anderson, a teacher at Dunbar High School in Lexington, Kentucky since 2000. Ms. Anderson received her bachelor's in biology from Kentucky Wesleyan College; she then moved to the University of Kentucky where she obtained a Master's of Science in Entomology followed by a second Master's in Secondary Education, and earned a Rank 2 certification in Chemistry and Biology. She later received a Rank 1 National Board Certification in Adolescent Biology.

Ms. Anderson has had an exemplary career as a high school science teacher. One letter in support of her nomination stated, "Whether teaching her AP level Biology students or Anatomy and Physiology students, Heidi has a drive and dedication aimed at seeing every single one of her students be successful and master the material of the course. Heidi has a passion for her topic and that passion comes through in her teaching and is picked up on by the students who then respond in a positive manner."

Her career has positively impacted not only the students at Dunbar High School, but also students and teachers across the Commonwealth. To highlight just a few examples, she has participated in numerous teacher workshops and is the go to person when AP biology teachers in the Lexington area need help. She has coordinated elementary school environmental camps and developed a recycling club and facilitated creation of Dunbar's Science Honor Society. Ms. Anderson has worked close with faculty at universities such as the University of Kentucky to provide research experiences for her students. She has been instrumental in preparing students for science fairs, ranging from local to international levels. She helped establish a Robotics team in Fayette County. In 2006 Ms. Anderson received the NSTA/Vernier Technology Award for Innovations in the Classroom.

One of her nominators summed it up this way, "Her dedication and the extremes that she goes to see that all of her students have the opportunity to be successful and participate in current authentic science in the classroom is truly awe inspiring. She has extremely high standards for herself as well as her students and she does everything in her power to see that she and her students both achieve the highest level they can possibly achieve. "



Ms. Heidi Anderson, Dunbar HS, received the award from President Dawn Anderson.

OUTSTANDING ACADEMY SERVICE



Dr. Jerzy Jaromczyk, UK, received the award from President Dawn Anderson.

The recipient of the 2012 Outstanding Academy Service Award is Dr. Jerzy Jaromczyk, Associate Professor of Computer Science at The University of Kentucky where he is also Director of Undergraduate Studies. Professor Jaromczyk received his master's and Ph.D. degrees in Computer Science from Warsaw University in Poland. Continuing at Warsaw University he started his academic career. From there he moved to the University of Kentucky, where he has been a member of the faculty since 1986.

He has been recognized with several college and university-wide teaching and advising awards including:

- The Ken Freedman Outstanding Advisor Award,
- The Provost's Outstanding Teaching Award, and
- The Henry Lutes Award for Excellence in Engineering Education.

Dr. Jaromczyk's contributions as a professor, scientist, and mentor have been outstanding— he has published numerous papers, secured an extraordinary amount of extramural funding, and mentored more than 40 graduate students. In 2011-2012 five of his students received MSc degrees, which was the highest number in the UK Department of Computer Sciences. Dr. Jaromczyk also has an exemplary record of professional service. He is a long time member of numerous scientific societies, and continues to serve on a plethora of local, regional and international Computer Science committees as well as serving on the editorial board of the International Journal of Intelligent Games and Simulation.

While the above accomplishments are noteworthy, this award recognizes Dr. Jaromczyk for his outstanding service to the Kentucky Academy of Science. Dr. Jaromczyk has continually served as a KAS Computer and Information Sciences Sectional Officer since 2007. He was the Sectional Secretary in 2007 and is currently serving as the Section Chair for the fifth consecutive year. While serving as a sectional officer the Computer and Information Sciences Section has seen its membership grow from only 11 members in 2007 to 74 members today.

As one of his nominators stated “When asked to help with KAS programs or events, Dr. Jaromczyk always puts forth an overwhelming positive response such as, ‘anyway I can help please let me know’.” He is always supportive and works to advance KAS programs.

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.

April 15, 2013, is the deadline for nominations. All nominations and supporting materials should be sent in electronic format; e-mail attachments must be in MS Word format. Send to:

David White
561 Emma Drive
Hancock Biological Station
Murray, KY 42071
270-474-2272
dwhite@murraystate.edu

Science Across the Commonwealth

Themes in Evolution III: Primate Diet & Anatomy

Primate evolution is closely connected with foraging preferences and behavior, and is reflected in anatomy. The lemurs of Madagascar have a special evolutionary history because of their geographical location. In addition to feeding on leaves, fruit, and insects, like most primates, some Malagasy primates are also nectar-feeders. Elsewhere in the world other mammals such as nectivorous bats have supplanted primates as nectar-feeders.

In her research, Magdalena Muchlinski of the University of Kentucky investigates how dietary habits and environment shaped early primate evolution. She investigates relationships between living and extinct lemur skull and facial anatomy and diet, and compares findings from diet and skull anatomy of living lemur species with extinct species. Anatomical correlates between living and extinct lemur species may indicate evolution along the avenue of niche-filling according to dietary items present in the environment.

The infraorbital foramen (IOF) is a hole in the primate skull under the eye socket, through which the infra-orbital nerve carries sensory touch information from receptors in the muzzle or cheek area, including the upper lip, to the brain. Size of the IOF has been studied as one indicator of feeding habits, as well as a criterion for the evolutionary classification of species. A larger infraorbital foramen reflects a larger area taken by the infraorbital nerve, and greater touch sensitivity from receptors in facial areas of snout, whiskers, and upper lip.

In her study of IOF size and diet among extinct subfossil and living Malagasy lemurs, Muchlinski has shown that differences in IOF size between groups of strepsirrhines can be correlated with diet. She established a continuum describing extant lemur species as folivorous (leaf-eating) or frugivorous (fruit-eating), and differentiated frugivorous lemurs depending on whether a diet of fruit was supplemented with leaves (frugivorous-folivorous) or animal protein (frugivorous-omnivore). Lemur species were categorized as frugivores (fruit-eaters) if 60% of their diet consisted of fruit; and if not, as either folivorous (leaves making up most of the non-fruit portion of the diet) or omnivorous (with other animal protein prominent in the diet).

The IOF sizes of 5 families of living lemurs (Cheirogaleidae, Daubentoniidae, Indriidae, Lemuridae, and Lepilemuridae) and of extinct species belonging to 4 families of lemurs (Megadapidae, Lemuridae, Archaeolemuridae, and Palaeopropithecidae) were measured. Verification of IOF size as reflecting diet in living lemurs was obtained by comparing IOF size with the categories of diet established for each group; that is, folivorous, frugivorous-folivorous, and frugivorous-omnivorous. Differences in IOF area accompanied diets of fruit or foliage. In extant lemurs, folivorous species were shown to have smaller IOF sizes than frugivores, while frugivores supplementing their diet with insect protein were found to have larger IOF sizes.

Finally, comparisons between IOF sizes in extinct and living lemurs allowed interpretation of dietary habits of extinct lemur

species from their anatomy. Muchlinski showed that several lemur species (*Archaeolemur*) had large IOFs that indicate these were frugivorous-omnivorous species. Other extinct lemur species (*Pachylemur*) showed IOF sizes in the frugivore-folivore continuum; still others (*Palaeopropithecus*) had small IOF sizes suggesting a folivorous diet.

Malagasy frugivorous-omnivorous lemurs that feed on fruit and animal protein differ from other primates that feed on insects in having relatively larger IOF sizes, suggesting that while other primates transferred touch sensation from face to hands in evolutionary history, lemurs retained the large area IOFs that support more nerves for facial touch sensory capacity. Facial structure and internal neuroanatomy may have evolved alongside dietary habits, and anatomy may be influenced by diet.

Strepsirrhines have long faces, which even if not evolved in a context of fruit-eating, are adaptive for feeding on fruit. Another source of food is nectar, and so an environmental context in which both fruit and nectar were available may have provided the ecology in which the long face of strepsirrhines evolved. Muchlinski has proposed that the nectar-feeding diet is important in the evolution of these primates.

Fossils and modern primates are distinguished from other mammals by traits that include orbital convergence, forward-looking eyes, divergent first digits, opposable thumb, and flattened nails. While these traits are considered adaptations evolved to see and hunt insects, they are also adapted for feeding on flowers, seeds, and nectar. Some nectar-feeders may also be cross-pollinators of the plants they feed on. The angiosperm co-evolution hypothesis involves mutually favorable and beneficial interactions between plants and animal feeders and is proposed to account for evolution together of flowering plants and strepsirrhine primates (lemurs) in locations where flowers have recessed nectaries and there are no bats.

A requirement for the function of cross-pollination and therefore a requirement for the co-evolution of nectar-feeders with plants is non-destructive feeding. The animal must not destroy the flower on which it feeds. Muchlinski has investigated whether the hypothesis that flowering plants co-evolved with non-destructive nectar-feeding primates can be supported by anatomical features of primates that feed on flower nectar while not preventing the flowering plants from germinating. Primate nectivores have cranial modifications which include narrow, long palates, long skulls, and reduced jaw strength with smaller teeth than fruit-eaters. Some flowers have deeply-recessed nectaries that require long muzzles and a long cranium for non-destructive feeding. In contrast, other types of flowers with nectaries close to the external flower parts may be food sources for primates with different facial configurations.

Four families of strepsirrhines (Lemuridae, Cheirogaleidae, Lepilemuridae, Indriidae), typically nectar-feeders, were classified as destructive or non-destructive feeders, depending on whether the flower is destroyed by the animal in feeding. Among



these, several species, including *Eulemur*, *Lepilemur*, *Microcebus*, *Phaner*, and *Varecia*, were proposed to be non-destructive nectar-feeders and thus potential cross-pollinators for the plants they feed on. Their anatomy was compared with other lemur species considered to be destructive feeders. Non-destructive nectar-feeders were distinguished by five features associated with muzzle elongation: skull length, palate length and width, dentary length, and maximum tooth row. Non-destructive feeders were found to have longer crania and longer but wider, not narrower, palates, and longer dentaries. Longer tooth rows, rather than a reduction in teeth, were shown to be an accompaniment of muzzle elongation. The elongated cranium allows insertion of the muzzle into a flower without destroying it, and permits cross-pollination. Based on these traits associated with muzzle elongation, non-destructive nectivores (e.g. *Varecia* and *Eulemur*) could be separated from destructive nectivores (members of the families Indridae and Lepilemuridae).

These lemurs show changes in anatomy associated with nectar feeding, a convergent evolutionary adaptation with nectar-feeding bats. Muzzle and skull elongations may have allowed bats, also primate nectivores, to evolve anatomical features and strategies to forage on flowers. Convergent features of strepsirrhine lemurs with nectar-feeding bats include tongues with ridges or ribbons for holding nectar on the tongue, and muzzle hair potentially adapted for collecting and holding pollen. At the same time, flowers may have evolved structures that take advantage of nectivorous primates by ensuring pollen is collected on the muzzle hairs while feeding, thus conscripting the primate nectar-feeder into service as a cross-pollinator.

Fruit and nectar-eating may have evolved together, or one may have preceded the other. A possible mechanism for co-evolution of flowering plants and non-destructive nectar feeding primates exists in the theory of frequency-dependent selection. If a nectar-feeder has more to lose by destroying than by preserving the nectar-containing flower, selection may favor a primate anatomy that enables feeding while preserving the flower. The modern study of molecular genetics has shown that some genes are very

old and govern the same processes in distantly-related species. Many genes are regulatory, instructing development by influencing other, protein-coding genes. Huge genetic variability means that the same gene may not always have the same phenotypic outcome, but may change its effects in the phenotype through the interactions with the environment. Among the genetic material may be genes with potentially useful effects on survival, which are not presently favored by natural selection. With no selection pressure, there is a great amount of variability at these loci, and under the right circumstances genes might be adapted to co-evolve.

Muchlinski's results suggest co-evolutionary trends between nectar-feeding lemurs and angiosperms (flowering plants). Primates with similar anatomy have similar diets, and primates pollinate specific flowers that they feed on to the extent that some flowers are pollinated only by these animals. Thus primates and flowering plants may each have factors in their evolutionary history that depend on each other, and that affected the course of the other's evolutionary history.

Further Reading

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- Muchlinski, M.N. & Perry, J.M.G. (2011). Anatomical correlates to nectar feeding among the strepsirrhines of Madagascar: Implications for interpreting the fossil record. *Anatomy Research International*, 2011.

*Submitted by Mary Janssen, Ph.D.,
Member-at-Large, Governing Board, KAS*

Kentucky Space in the News

An article entitled "Kentucky Space Wants Financial Stardust" appeared December 11, 2012, in *The Lane Report*, a news publication focusing on business and economic development across Kentucky. According to Lane Editorial Director Mark Green, Kentucky Space has a goal of "spinning off high-tech businesses that offer the commonwealth's best and brightest job options in their home state rather than Southern California, Texas or Florida", and is "earning global notice, gaining the state a foothold in the entrepreneurial aerospace industry." The article, available at <http://www.lanereport.com/16693/2012/12/kentucky-space/>, highlights individuals and events involved in the development of Kentucky Space and the academic program in space science at Morehead State University. The article details the resources and products of Kentucky Space, and notes that the organization has won grants and contracts from the U.S. Department of Defense, NASA, the University of Rome (Italy), Honeywell International, Lockheed Martin, Radiance

Technologies, and Tethers LLC among others. Kentucky Space spinoffs, including the current non-profit Exomedicine Institute as well as soon-to-be-launched e10 Space, a for-profit sales and marketing company, are also featured.

On September 13, 2012, the CubeSat class satellite, "Unbridled Spirit" (UB), was launched into orbit from Vandenberg Air Force Base in California. This was the first successful launch, on-orbit deployment and operation of a satellite built entirely in Kentucky. Now you can track the orbital path of UB through a just released iPhone® app. Download the "Unbridled Spirit" app at the App Store.

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

Eastern Kentucky University Acquires Meteorite from Northeast Tennessee

From the EKU News website

For many years, long before its true nature was known, it served as a doorstep and flower bed ornament. It was even painted green for a time. Now at Eastern Kentucky University, it will be an object of scientific wonder for students of all ages for generations to come.

“It” is a 33-pound meteorite discovered in a cow pasture near Tazewell, Tenn., in the 1930s by Tilmon Brooks, the late grandfather of Donna Lewis, a school secretary in Pineville, Ky. It wasn’t until Lewis’ husband, George, received a strong signal from his metal detector that the Lewises realized maybe this was no ordinary rock.

When the Lewises brought the meteorite to EKU in July, Dr. Jerry Cook, chair of the Department of Physics and Astronomy, was certain he was looking at an historic showpiece. Tests at the University of Tennessee confirmed the object’s origins: it was probably part of a known meteorite strike that had first turned up evidence in Tazewell in 1853. Its actual age might be more than 4½ billion years.

“We’re extremely lucky to find something like this,” Cook said, “and to find one locally is a real plus for us.” Cook said the meteorite, which the University purchased from the Lewises, will be used for educational and outreach purposes, a fact that pleases the former owners most of all.

“We don’t want to lock it up somewhere,” Cook said. “We want kids to be able to touch it, lift it, and understand what it is. Part of our job is to get kids interested in science, and this ... will stir their curiosity.”

The first opportunity to showcase the meteorite will be at the Kentucky Academy of Science annual conference on the EKU campus Oct. 19-20.

“I saw how excited kids at our school got when they saw it,” said Ms. Lewis, who works for Pineville Independent Schools. “It’s good to know that Eastern will keep it in one piece and students will be able to study it.”

A Knott County native whose love for learning first flourished in a one-room schoolhouse, Cook received the 2008 Acorn Award, the highest honor for teaching excellence presented by the Kentucky Advocates for Higher Education.

Contact Information:

Dr. Jerry Cook
jerry.cook@eku.edu
859-622-1521



Donna Lewis, left, and EKU's Dr. Jerry Cook with the 33-pound meteorite

Next-Generation Science Standards Available for Review

The second draft of the Next-Generation Science Standards (NGSS) is now available for public review online at <http://www.nextgenscience.org/next-generation-science-standards>.

This draft resulted from thousands of comments submitted during the public review in May 2011 and subsequent state review; it includes guidelines for how NGSS aligns to college and career readiness goals. The Kentucky Department of Education encourages educators, parents, business people, scientists, engineers and all others interested in science education to review the draft standards and submit their comments online. This public review period continues through January 29 and is an important opportunity for Kentucky residents to influence the standards that will guide how our nation's students will learn science for years to come.

Senate Bill 1, passed by the Kentucky General Assembly in 2009, required that subject-area standards taught in the public school system be revised. The standards must be aligned with entry-level college course requirements and be developed with input from teachers, postsecondary faculty and others. In

2011, Kentucky, along with 25 other states, was chosen as a lead state in the development of the NGSS. The process is directed by Achieve, Inc., a non-partisan education non-profit organization.

The NGSS are rigorous and internationally benchmarked standards designed to prepare students for college and/or careers and enable them to pursue expanding employment opportunities in science-related fields. They have been developed based on a vision for science education established by the Framework for K-12 Science Education published by the National Research Council in 2011.

Information about the framework and the NGSS is available from <http://education.ky.gov/curriculum/sci/pages/next-generation-science-standards.aspx>.

*Submitted by Sean Elkins, Science Academic Program Consultant, Kentucky Department of Education
(sean.elkins@education.ky.gov)
via KAS Executive Director Jeanne Harris*

Posters-at-the-Capitol 2013



Posters-at-the-Capitol 2013 will be held on Thursday, February 21st. Providing undergraduates with the opportunity to engage in scholarly research, and creative work is important to our students' educational experience and professional development. Viewing the presentations at Posters-at-the-Capitol helps those in Kentucky who fund higher education understand why these experiences are so important, so that other Kentucky students can enjoy and benefit from this kind of experience. The 2013 Program Booklet containing 120 abstracts summarizing their presentations is now available at the P@C website at <http://campus.murraystate.edu/services/URSA/>.

2013 Kentucky Science and Engineering Fair (KY-SEF)

The Eleventh Annual Kentucky Science and Engineering Fair (KYSEF) will be held in Richmond, Kentucky, on Saturday, March 30, 2013. More than 200 of the finest young scientists from grades 5-12 from across the state will compete for awards and scholarships. The senior high school competition is affiliated with the Intel International Science and Engineering Fair (ISEF) and the best senior high projects from the statewide KY-SEF will be entered in the ISEF competition in Phoenix in May. This event represents an exciting milestone for the science and technical education community in Kentucky. The Fair's mission is to expand educational opportunities for all middle and high school students and to enhance the visibility and importance of science and engineering in Kentucky by providing annual statewide competitions that support, encourage and recognize student excellence in science and engineering research. The Fair also gives the public a chance to see the quality of science being done in Kentucky middle and high schools and to showcase what the students are capable of doing. The Kentucky Academy of Science has been a loyal supporter of KY-SEF by providing both financial support and judges each year. The commitment of KAS members to this event is very important and the organizers of the fair hope that they can rely on your continued support. Please consider judging and playing a very rewarding role in the academic development of our next generation of scientists. Reserve Saturday, March 30, 2013, on your calendar and sign up to be a judge by visiting the KYSEF website at the following website.

www.kysciencefair.eku.edu/judging.php

In these times of financial challenges, the Kentucky Science and Engineering Fair is no different from other organizations; we are looking for funds. Supporting the Fair will help the top high school winners to attend the INTEL International Science and Engineering Fair. Your tax-deductible contribution will be appreciated. No sum is too small! Please send your check made out to "KYSEF" to Dr. Robert Creek, Department of Biological Sciences, Moore 235, Eastern Kentucky University, Richmond, KY 40475. If any KAS member knows of a corporation or other group that would like to become involved with this worthy activity, please contact Barbara Ramey (barbara.ramey@eku.edu) or Bob Creek (robertcreek@bellsouth.net).

KJAS Kentucky Junior Academy of Science

The 2013 Annual Meeting of the Kentucky Junior Academy of Science will be held 8:30 am – 5 pm on Saturday, April 27, 2013, in the T. H. Morgan Building on the campus of the University of Kentucky, Lexington, KY. Any Kentucky high school or middle school student may present his or her research findings; to register for the meeting, a teacher, supervisor or principal from your school must return to the Director of KJAS, the requisite membership form and fee, abstracts and papers for all students entering from your school. **All forms, abstracts, papers and checks from the school must be submitted to KJAS by March 29, 2013.** Late submissions WILL NOT be accepted. Four overall winners are selected and these students represent Kentucky at the National American Junior Academies of Sciences (AmJAS) meeting held in February the following year. The Kentucky Academy of Science will provide needs-based funding for these students to attend this meeting, up to a limit of \$1,000 per person. Needs-based funding will also be available for chaperones, up to a limit of \$1,000/person. Checklist for presenting at the meeting:

- Paper Submission Form
- Membership Form and fee
- Abstract (hard copy only)
- 2 hard copies of word-processed Research Paper
- Signed copy of waiver

Additional information and parking directions will be mailed on receipt of above materials. All forms and instructions can be downloaded from the KAS webpage (click on KJAS link):

www.kyacademyofscience.org/members/jkas.html

Mail to: Dr. Ruth E. Beattie, Director, KJAS, Dept. of Biology, University of Kentucky, Lexington, KY 40506, rebeat1@uky.edu, 859-257-7647, by March 29, 2013.

Attention KAS Members

Judges are needed for the KJAS Spring Symposium. Please contact rebeat1@email.uky.edu to volunteer. Thanks.

Kentucky Heritage Land Conservation Fund

Invasive Species (Part III): Fungi

Drs. William H. Martin and Richard K. Kessler

Fungi are a distinct group of organisms that were once considered closely related to plants, but now comprise their own kingdom which includes yeasts, molds, and mushrooms. They are a diverse group that is probably comprised of over 1 million species. Many species are beneficial to humans and in nature but there are a substantial number that cause diseases that have spread from their points of origin to become labeled as exotic invaders that are very destructive. Fungi have long threatened food supplies internationally as such diseases as wheat stem rust, corn smut, soybean rust, and rice blast (1). One of the most famous diseases is the potato blight (*Phytophthora infestans*) which caused the Irish Famine of the 19th Century, the effects of which exist to this day. Today, an imported relative of that blight is killing oaks in California and it would be a potential disaster if it spreads eastward to our state-wide, oak-dominated forests.

One of the most devastating fungal blights affected Kentucky forests forever. Beginning in the early years of the 20th Century and continuing for several decades, the American chestnut tree was stricken throughout its range by a deadly fungal blight (*Cryphonectria parasitica*) imported from Asia. American chestnut was a major tree in Kentucky's forests, particularly in eastern Kentucky, often comprising 25-90 % of the mature trees depending on various environmental factors. It provided a major and dependable source of food and cover for wildlife in addition to being invaluable to Native Americans for thousands of years and to people and industries from the earliest days of settlement in the 1700s. An estimated 3-5 billion trees were killed, creating ecological and economic disasters that forever changed our forests and rivaling or exceeding such tragic events as the 1930s Dust Bowl and the 2010 oil spill in the Gulf of Mexico.

Other fungal diseases receiving recent attention are those affecting amphibians (frogs, toads, and salamanders) and North American bats. Amphibians are declining globally due to several causes including habitat loss and pollution, but recent waves of decline in Australia and Panama can be attributed to a chytrid fungus (*Batrachochytrium dendrobatidis*) that is rapidly spreading in Central America, North America and Europe. Kentucky has over 50 species of amphibians that appear to be in decline as a group but the relative harm done by this fungus is not known although it is present. Certain species of bats are being affected by a fungus-causing white-nose syndrome (named by the white growth on a bat's muzzle and ears) that has killed over 5 million bats in 7 species particularly in the northeastern U.S.. Bats in Kentucky have been identified with the syndrome, but the extent and impact are not known at this time. Presumably, the responsible fungus (*Geomyces destructans*) has been brought into the U.S. from Europe by spelunkers (cave explorers) (2).

Humans have been spreading fungi for millennia, but the more recent increases in trade, travel, and tourism are recognized as also increasing the spread of these organisms that have a high percentage of pathogens. Their ability to grow and spread rapidly, reproduce sexually and asexually, and exist as long-lasting spores are all traits that along with crop monocultures and a favorable climate (like Kentucky's) contribute to their success. It is very difficult to win any battles with fungi. The ecological and economic losses are difficult to imagine and express in meaningful terms.

We do need to recognize that there are also a number of fungi that are beneficial to natural ecosystems and humans. Some fungi and their close relatives are valuable to us as food and medicinal sources. Mycorrhizal fungi in soils are indispensable plant mutualists. These ancient organisms provide valuable nutrients to their plant hosts (about 80% of all higher plants) and serve to protect plants from heavy metals; provide drought resistance; and protection from pathogens, including emerging fungal diseases.

Unfortunately, the ability to separate enemies from friends is hampered by the limited number of fungi experts – mycologists - in Kentucky, the U.S. and the world. More attention needs to be given to training mycologists who can recognize and conduct research on members of this large kingdom.

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Bat with white-nose syndrome. Photo courtesy Ryan von Linden/New York Department of Environmental Conservation. <http://www.flickr.com/photos/usfwhsq/5765048289/>

