Kentucky Academy of Science

NEWSLETTER

www.kyscience.org | Susan Templeton, Editor | August 2013

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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!

(TENTATIVE PROGRAM)

KAS 99th ANNUAL MEETING

Hosted by Morehead State University

FRIDAY, November 8, 2013

9:00 a.m. - 4:30 p.m.	KBRIN - NIH Proposal Development Workshop
2:00 p.m. – 4:00 p.m.	KAS Governing Board Meeting
4:00 p.m. - 8:00 p.m.	Registration
5:30 p.m. – 6:50 p.m.	Social
7:00 p.m. - 8:00 p.m.	SYMPOSIUM *Topic to be announced*
8:15 p.m. - 9:15 p.m.	KAS Sectional Officers Meeting

SATURDAY, November 9, 2013

7:00 a.m. - 5:00 p.m.	Registration
8:00 a.m. - 4:00 p.m.	Exhibitors
8:00 a.m. - 9:30 a.m.	Oral Presentations
8:00 a.m. - 4:00 p.m.	Scientific Posters on Display
9:30 a.m. - 9:45 a.m.	Refreshment Break
9:45 a.m. - 11:30 a.m.	Oral Presentations
10:00 a.m. - 11:30 a.m.	Kentucky Community & Technical College Meetings
11:30 a.m. - 12:45 p.m.	Lunch
11:30 a.m. - 12:45 p.m.	KAS Past President's Luncheon
1:00 p.m. - 2:15 p.m.	Oral Presentations
2:15 p.m. - 2:30 p.m.	Refreshment Break
2:30 p.m. - 4:00 p.m.	Oral Presentations
4:15 p.m. - 5:15 p.m.	PLENARY SESSION *Speaker: Dr. Chris Groves, Distinguished Professor of Hydrogeology at Western Kentucky University*
5:30 p.m. - 6:30 p.m.	Annual KAS Business Meeting & Reception
6:45 p.m. - 8:00 p.m.	ANNUAL AWARDS BANQUET

Pre-registration is open now through September 28th at www.kyscience.org!

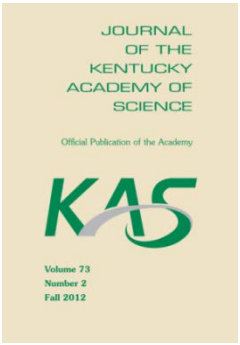
Inside this issue

Executive Director News

It is indeed a pleasure to introduce the KAS membership to our new Executive Director, Amanda Fuller. Amanda has a B.S. in Environmental Science from Denison University and an M.S. in Land Resources from the University of Wisconsin-Madison. She has 8 years' experience in non-profit management and a diverse set of volunteer experiences. Amanda also has a strong interest in efforts related to sustainability. We are very excited to welcome her, and I know that she will be looking forward to meeting all of you at our annual meeting in November.

Submitted by Cheryl Davis, KAS President

Updates on the KAS Journal



Dr. Jerzy W. Jaromczyk, the new KAS Journal Editor, reported at the August KAS Board Meeting that a new online manuscript submission and review process will be launched soon. Articles which have previously been submitted will be converted for the new process by the editor; he expressed his apology for any delays the transition period has caused. Dr. Jaromczyk also requested individuals interested in serving as reviewers please contact him at jurek@cs.engr.uky.edu.

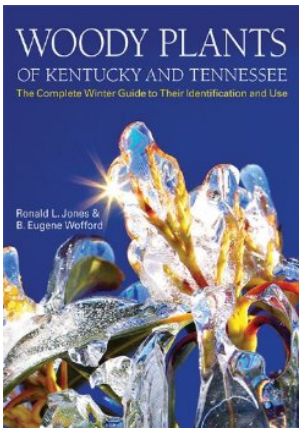
Dr. Neil Moore, also in the Department of Computer Science at the University of Kentucky, was approved by the Board to serve as an Associate Editor for the Journal.

The Board also approved a new policy concerning the publication of abstracts in the Journal. The 2012 Annual Meeting abstracts which were previously submitted for publication will be included in the next issue of the Journal. However, beginning with the Fall 2013 Annual Meeting, poster/presentation abstracts will no longer be eligible for publication in the Journal. Instead, the announcement of winning presentations in the Newsletter will include links to the associated abstracts online. Section chairs will be asked to review all the professional and student presentations in their section and encourage those showing potential to submit full manuscripts for consideration by the Journal.

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!

KAS Author's Corner



Woody Plants of Kentucky and Tennessee: The Complete Winter Guide to Their Identification and Use. Ronald L. Jones, B. Eugene Wofford. University Press of Kentucky. October 2013, 224 pages, ISBN-13: 978-0813142500.

For centuries people have used trees, shrubs, and woody vines for food, clothing, ritual, construction, scientific study, and more. However, these important plants are easy to overlook during the winter months, when the absence of leaves, fruit, and other distinguishing characteristics makes them difficult to recognize.

This comprehensive volume is the essential guide to woody plants in Kentucky, Tennessee, and surrounding states during the winter season. Featuring color images of more than four hundred species, this detailed botanical resource provides keys to the genera and species, as well as descriptions of the genera. The species accounts include useful information on Latin meanings, common names, habitats and distributions, and notes on toxicity, nativity, rarity, and wetland status. In addition, authors Ronald L. Jones and B. Eugene Wofford provide notes on practical uses for the plants, including food, medicine, fiber, and weapons.

Winter identification of woody plants can be a daunting exercise, but Jones and Wofford present clear and authoritative information that can help anyone spot these species in the wild. Whether taken into the field or enjoyed at home, Woody Plants of Kentucky and Tennessee: The Complete Winter Guide to Their Identification and Use is a comprehensive and accessible resource for professional and amateur botanists, students, commercial landscapers, homeowners, and outdoor enthusiasts.

Changes on Kentucky Heritage Land Conservation Fund Board

Dr. Albert Meier (Professor of Biology, WKU) has been appointed by Governor Beshear to serve on the Kentucky Heritage Land Conservation Fund Board as a representative from the Kentucky Academy of Science. His term will expire July 15, 2016. Dr. Meier will be replacing Dr. William (Bill) Martin, who is leaving the Board this year after many years of outstanding service as a member and Chair. Dr. Richard K. Kessler (also representing KAS), will continue to serve as a member of the Board.

You can learn more about the Kentucky Heritage Land Conservation Fund Board at http://heritageland.ky.gov.

Guidelines for Presentations

Oral: All presentations should be compatible with Power Point version 2007 for Windows and brought on a USB drive as the computers will not have a CD drive. You must be in your assigned room 15 minutes before your session is scheduled to start in order to load your presentation.

Poster: Each presenter will be provided with an easel and a 4x4 ft. poster board identified with a number that matches the presenter's number in the program booklet. This year the poster presentations will be divided into a morning (AM) session and an afternoon (PM) session. The week prior to the meeting the program will be listed on the KAS website and will show the AM and PM sections.

	Morning Session	Afternoon Session
Set up	7:30 - 8:00 a.m.	12:00 - 1:00 p.m.
Judging	9:00 a.m. until done	2:00 p.m. until done
Removal	11:30 a.m. - Noon	4:00 p.m.

If you have any questions, please contact Melony Stambaugh, Program Coordinator, at stambaughm1@nku.edu.

Abstract Submission Guidelines

The DEADLINE for submitting an abstract for presentation is **September 28, 2013**. Forms will not be available after this date. There are a limited number of positions available for Oral presentations so submit as soon as possible. If a position is not available upon receiving your abstract you will be notified and given the opportunity to present a poster.

To submit an abstract for presentation, either Oral or Poster, go to the KAS website at http://www.kyscience.org. On the left side of the page click on ANNUAL MEETING and then select SUBMIT AN ABSTRACT. This page will allow you to log on as a member or non-member and then go to the form for Submitting an Abstract. YOU MUST BE PRE-REGISTERED in order to submit an abstract. If you have not there will be a link to the pre-registration page that will allow you to do so after which you will return to the Abstract Submission Form to submit your abstract. It is recommended that you go to the GUIDELINES FOR PREPARATION OF ABSTRACTS to make sure your abstract is in the proper format. Your abstract needs to be submitted in one of the following: Word 2007 (.doc), Rich Text Format (.rtf) or Acrobat PDF (.pdf). You will receive a notice via e-mail that your abstract has been received. The program, upon completion, will be placed on the website at which time you will be able to determine the time and location of your presentation. All presentations will be on Saturday, November 9. If you have any questions, please contact Melony Stambaugh, Program Coordinator, at stambaughm1@nku.edu.

Last Call for Nominations for the KAS Governing Board

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 2014. 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:

- Vice President
- Biological Sciences Representative
- At large Representative

Any member may nominate another member for Vice President. 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 **September 1, 2013** to:

Dawn Anderson
Dawn_Anderson@berea.edu

Last 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.

September 1, 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
dwhite@murraystate.edu

KBRIN NIH Grant Writing Workshop at KAS Meeting

Friday, November 8th, 2013, Morehead State University Adron Doran University Center, Room 312

The Kentucky Biomedical Research Infrastructure Network (KBRIN) will again offer an intensive workshop on the development of National Institutes of Health (NIH) R15-Academic Research Enhancement Award (AREA) proposals. AREA grants are specifically designed to support research projects (three years- $300,000) in the biomedical and behavioral sciences conducted by faculty and students in colleges/universities and health professional schools that have not received more than $6 million in NIH research grants in four of the last seven fiscal years. Thus, faculty at nearly all colleges/universities in Kentucky are eligible.

The three main goals of the AREA program are: (1) to support meritorious research; (2) to strengthen the research environment of the institution; and (3) to expose students to research.

The workshop will be led by faculty at KBRIN institutions that have been successful in competing for AREA grants. The morning session is designed for faculty with little of no NIH grant writing experience, whereas the afternoon session is designed to enhance the competitiveness of faculty with some NIH grant writing experience. Depending upon level of experience with the NIH, registrations will be accepted for the either the full day workshop or the afternoon session only.

Past attendees at this workshop have been successful in obtaining NIH funding and this workshop is required to be eligible for KBRIN research grants (see http://louisville.edu/research/kbrin/kbrin-cores/research-core)

The morning workshop will begin at 9:00 am EST and the afternoon session will begin at 1:00 pm EST. Lunch will be provided at noon.

The workshop is free and open to interested faculty at all Kentucky public and private institutions.

As space is limited, please register online by Thursday, October 31st at:

https://kbrin1.redcap.louisville.edu/redcap/surveys/?s=C9cagC

Registration deadline is Thursday, October 31st.

For registration information contact, Ms.Whitney Rogers, KBRIN UBM at whitney.rogers@louisville.edu or 502-852-3045.

For additional workshop information, contact Dr. Nigel Cooper, KBRIN PI (nigel.cooper@louisville.edu) or Dr. Bruce Mattingly, KBRIN program coordinator (b.mattingly@moreheadstate.edu).

This workshop is sponsored by the Kentucky Biomedical Research Infrastructure Network (KBRIN), which is supported by a grant from the National Institute of General Medical Sciences (8 P20 GM103436-13) from the National Institutes of Health.

Annual Meeting Plenary Speaker

Dr. Chris Groves (right) is a Distinguished Professor of Hydrogeology in the Geography and Geology Department at Western Kentucky University and is the Director of the Hoffman Environmental Research Institute. He has been interested in caves since childhood, a passion that has taken him to study caves in China. He has made over 25 trips to China since 1995 and was a finalist for the 2012 People's Republic of China Friendship Award, the country's highest honor for foreign experts who work in China.

Last year Dr. Groves presented the invited keynote lecture "Karst Hydrology Research in Show Caves of the Mammoth Cave International Biosphere Reserve, Kentucky, USA" at the International Congress on Scientific Research in Show Caves.

Hotel Options for the 2013 KAS Annual Meeting

Several Morehead hotels have room blocks that will be held at special Kentucky Academy of Science rates.

Hampton Inn – 606-780-0601 ($89/night)
- 15 rooms with 2 Queen Beds (non-smoking) – 7 blocked for Nov 9 also
- 10 rooms with 1 King Bed (non-smoking) – 5 blocked for Nov 9 also

Holiday Inn Express – 606-784-5796 ($89.99/night)
- 20 rooms with 2 Full size Beds (non-smoking)
- 5 rooms with 1 King Bed (non-smoking)

Comfort Inn & Suites – 606-780-7378 (Exit 133 – 4 miles west of Morehead)
- 24 rooms with 2 Queen Beds (non-smoking) - $75
- 6 rooms with 1 King Bed (non-smoking) - $75
- 2 rooms with 2 Queen Beds (smoking) - $75
- 7 Suites with 2 Queen Beds (non-smoking) - $85
- 5 Suites with 1 King Bed (non-smoking) - $85
- 2 Suites with 2 Queen Beds (smoking) - $85

Callers should mention they are attending the KY Academy of Sciences Conference. The room blocks will be released October 25th.

Science Across the Commonwealth

Adoption of the Next Generation Science Standards (NGSS)

The following statement of endorsement of the Next Generation Science Standards was prepared by the Science Education Committee of the KAS (Chaired by Dr. Nancy Martin) and approved by our Governing Board. Dr. Blaine Ferrell, Chair of the KAS Legislative Committee, read the statement at the July 23 public hearing of the Kentucky Department of Education. Dr. Ferrell also appeared in a panel discussion of the NGSS on KET's "Kentucky Tonight" (see link below).

Kentucky Academy of Sciences (KAS) Endorsement Regarding the Adoption of Next Generation Science Standards (NGSS)

The Kentucky Academy of Sciences supports the adoption of the Next Generation Science Standards (NGSS) for the benefit of Kentucky because students in the Commonwealth both need and deserve a 21st century science education, grounded in inquiry, rich in content and internationally benchmarked. The standards, to replace those adopted in 1996, rely on modern research on science and learning science to identify science that all K-12 students should know. Further, they provide performance standards stating what students at all grade levels should be able to do to demonstrate their knowledge. Because the standards give proper attention to physical sciences, life sciences, earth and space sciences and engineering, technology and application of sciences and integrating expectations across disciplines and grade levels, the Academy is confident that these standards will lead to scientifically literate graduates ready for college and career armed with an understanding of how science impacts their lives.

The Kentucky Academy of Sciences has confidence in the inclusive, two-step process that led to the Next Generation Science Standards. First, the National Research Council, relying on modern research on science and learning science, developed a framework for K-12 Science Education that identified science that all K-12 students should know. Second, scientists, science educators, representatives from higher education and industry from 26 states, including Kentucky, worked together to develop performance expectations of students stating what they should be able to do to demonstrate they have met the standards. Advisory committees and many stakeholders reviewed drafts of the standards and provided valuable input. The strength of the standards is a result of this inclusive process. After review and recommendation by members of the Kentucky Academy of Sciences Education Committee, the Board of the Kentucky Academy of Sciences endorses the Next Generation Science Standards for the Commonwealth.

If you wish to voice your support of the NGSS for Kentucky individually, The House of Representatives Education Committee membership can be found at www.lrc.ky.gov/committee/standing/Ed(H)/members.htm. The district they serve can be found by clicking their name. Also, by clicking their email there is a form to submit information for them to consider. The Senate Education Committee membership can be found at www.lrc.ky.gov/committee/standing/Ed(S)/members.htm. The same applies for contacting them in support of the NGSS.

KAS Board Member Blaine Ferrell Discusses NGSS on KET

Kentucky Tonight is an Emmy Award-winning public affairs television program featuring weekly discussions that focus on issues confronting Kentuckians. In the episode which originally aired on August 19, 2013 (#2034 K-12 Science Standards), host Bill Goodman's guests were State Sen. Mike Wilson, R-Bowling Green, chair of the Senate Education Committee; State Rep. Derrick Graham, D-Frankfort, chair of the House Education Committee; Martin Cothran, senior policy analyst for The Family Foundation of Kentucky; and Blaine Ferrell, chair of the committee on legislation for the Kentucky Academy of Science. The group discussed the K-12 science standards currently under review.

You can watch the KET broadcast of the panel discussion on the K-12 Science Standards at the link below.

http://www.ket.org/cgi-bin/cheetah/watch_video.pl?nola=KKYTO+002034&altdir=&template

Themes in Evolution IV: The Sea Lamprey (*Petromyzon marinus*) Genome & Vertebrate Evolution

The lamprey (photo at right) is a jawless, cartilagenous fish, eel-like in appearance, derived from an ancestor species having a notochord, true vertebrae, and a rudimentary brain. Lampreys can inhabit both fresh and salt water. The eggs of the sea lamprey (*Petromyzon marinus*) are laid on gravel beds of freshwater streams and hatch into larvae that eventually undergo metamorphosis into adults, and migrate to the ocean (or large lakes). After spending one to two years as parasitic adults, lampreys return to fresh water streams to spawn.

Lampreys are living members of a group that traces its ancestry to the earliest of the history of vertebrates, over 550 million years ago (mya). The split between the lamprey lineage and the lineage that gave rise to the jawed vertebrates (gnathostomes), the lineage to which humans belong, occurred somewhere around 500 to 550 mya.

Molecular comparison of the individual genomes of modern species has made possible inferences about the course of evolutionary history. Jeramiah J. Smith, of the University of Kentucky, with a group of researchers, has presented the first fully-sequenced genome of a wild-caught female lamprey (*P. marinus*). Smith and colleagues generated genomic scaffolds, assemblies of nuclear structures defining portions of DNA, that allowed the annotation of protein-coding and non-coding gene sequences, repetitive elements in the sequences of base-pairs, and the analysis of conserved features across genes and non-coding elements. The lamprey genome was compared to genomes of some modern vertebrates and invertebrates, to look for evidence of timing of events in the evolution of the vertebrate lineage. Vertebrate genomes included chicken and human, two lineages that diverged about 310 mya. Invertebrate genomes compared included sea urchin, echinoderm, amphioxus (the lancet, a chordate with notochord but no vertebral column, a small swelling on the end of the neural tube but no brain), and protostomes, including fruit fly and the human parasite *Schistosoma mansoni (S. mansoni*).

The lamprey genome is highly repetitive, with several distinct families of repeated sequences. The number of protein-coding genes was found to be similar to that in other vertebrate species.

Both protein-coding genes and conserved non-coding sequences of lamprey DNA have homologous regions in the genomes of jawed vertebrates. The genomic content of G-C pairs varies with species. The lamprey genome shows high G-C base pair content and pattern heterogeneity, as do the genomes of chicken and other species that develop their young in protective terrestrially-adapted environments of eggs or uterus. However, in the lamprey genome, these G-C patterns in protein-coding sequences are unlike other vertebrate and invertebrate genomes. The differences imply different processes of derivation of the patterns and a different adaptive or biological role for the G-C base pair patterns in the lamprey genome.

Changes in protein-coding and regulatory genes may affect developmental processes with resulting physiological features that can be acted on by natural selection. The genome is enriched by gene duplication that provides the raw material for adaptive changes. Existing genes adapted for new uses may result in an organism better suited to its environment. In either case, evolution proceeds by reorganizing already-present material, redirecting it to serve new functions. It has been proposed that two rounds of whole-genome duplication occurred in the ancestral vertebrate genome, providing the raw material for vertebrate evolution. A whole-genome duplication event in the past would be indicated by similarity of the locations of homologous genes in the genomes of modern vertebrates.

To discover evidence of whole-genome duplication events that might have occurred in evolutionary time, Smith and colleagues analyzed patterns of gene duplication within regions of sequence similarity in the lamprey genome and within the genomes of jawed vertebrates (gnathostomes). Owing to the loss over time of some duplicated genes, modern lamprey and gnathostome genomes have not retained all of the genes that were originally duplicated. It was reasoned that evidence for genome duplication might reside not only in the existing duplicated genes, but might also be suggested by the presence of specific configurations of gene copies. Cases of a single lamprey genetic scaffold containing genetic material similar to that from two different gene regions of a gnathostome genome would be considered signatures of a duplication event.

Smith looked for cases of interdigitated homologies, or examples of genetic material from two distinct regions of a gnathostome genome contained in a single scaffold of the lamprey genome, implying the duplication event and subsequent loss of duplicated genes in the gnathostome lineage. Almost all the lamprey genome scaffolds showed the interleaved homologous genes, combining similar versions of lamprey genes and genes from different regions of the genomes of jawed vertebrates. Smith interpreted these conserved similar patterns as indicative of large-scale gene duplication events that shaped the lineages of jawed vertebrates. Within-genome duplications indicated the effects of large-scale, or whole genome duplication events in the lamprey lineage as well.

A phylogenetic tree analysis measures similarities between genomes of different species, often on the basis of similarity between sequences of base pairs, to construct a familial relationship among species and their relative relatedness to a common ancestor. Smith and colleagues used a phylogenetic tree analysis to compare similar gene clusters across the genomes of

lamprey and 50 vertebrate species, 2 chordates, and 3 outgroups. Protein-coding genes in the lamprey genome are included in trees encompassing several species, even though the lamprey genome is highly divergent from all jawed vertebrate lineages. Without the lamprey genome, the most recent common ancestor of all other sequenced vertebrates is Eutelestomi (ray-finned fish, amphibians, reptiles, and mammals; that is, all other vertebrates except cartilaginous fish: sharks, rays, skates). Adding the lamprey genome enables tracking of about a third of genes common to Eutelestomi to an ancient vertebrate ancestor, and provides evidence that these genes existed in the vertebrate ancestor.

Maximum likelihood models of a phylogenetic tree without lamprey do not indicate large-scale duplication events. But best-fit gene tree reconstructions that add the putative genes lost after within-genome duplication from the lamprey genome to the genomes of chordates (including sea urchin) and vertebrates give the signature of large-scale duplication events in the ancient vertebrate lineage before the lamprey-gnathostome divergence. The duplication vertebrate lineage is thereby extended back in evolutionary history to its beginnings more than 0.5 billion years ago.

Smith and colleagues further compared the lamprey genome with genomes of jawed vertebrates for information about genetic changes in structure and content that contributed to the evolution of jaws, and other adaptations such as myelinated neurons, neuropeptide signaling pathways, adaptive immune system, and paired limbs, characteristic features of vertebrates. The researchers looked for lamprey gene families with homologs in jawed vertebrate genomes, but not in invertebrate deuterostome genomes (sea urchin, sea limpet, acorn worm, lancelet, sea squirt), and found genes that were previously considered to be tetrapod-specific.

Ancient gene families may have been enriched to myelinate neurons in vertebrates and to regulate neuropeptide and neurohormone signaling. All living jawed vertebrates have neurons wrapped in myelinating sheathing that speeds conduction of neural signals. Myelination-related genes in the lamprey genome suggest that components of myelin existed in the vertebrate ancestor, even though modern lampreys have no myelinated neurons. Lampreys also have immune cell types similar to the T-cell lymphocytes of gnathostomes, but immune receptors not related to the immunoglobins of jawed vertebrates. In addition to adaptive immunoglobins, jawed vertebrates maintain an extensive gene family for specific pattern-recognition receptors in the immune system. In the lamprey genome, genes for highly variable immune receptors along with the lack of immunoglobin genes suggests a functional relationship between the lymphocyte cells of lamprey and other vertebrates.

After the lamprey-gnathostome split, the development of paired limb appendages occurred in the evolution of vertebrates. This development was apparently facilitated by the presence of gene families in the lamprey genome that organize the outgrowth of limbs and production of growth factors in limb development. The absence of some limb-patterning genes in the lamprey, which lacks paired fins, suggests that these genes might have been retained in ancestors of limbed vertebrate species after the ancient genome duplication event.

Like a few species of flies, roundworms, and ciliates, in its early embryonic development the lamprey undergoes extensive programmed genomic rearrangement, with loss of genetic material from somatic cells. Work from a separate study suggested that since germline DNA must have the potential to undergo recombination during meiosis and also to develop into any cell type, germline DNA may have characteristics that are not desirable in somatic cells. Factors that promote recombination and the ability to change may be misexpressed in somatic cells with deleterious results, including origin of cell cancers. The response of the lamprey genome to the potentially damaging effects of misexpression of genetic material in body cells is the programmed rearrangement of the genome with accompanying genetic deletion.

In a separate study, Smith compared germline and somatic DNA for the absence of specific nucleotide sequences in somatic cells (blood) that are present in germline cells (sperm), a signature of genome rearrangement. Analyses showed evidence of somatic deletion of protein-coding DNA, perhaps facilitated by site-specific recombination events. Deletions of genes in somatic cells suggested deletion of specific functions and the ability to act on specific transcriptional programs, with resulting limitation of the functional capacity of somatic tissue relative to germline cells. Restriction of specific genes to the germline suggests that they are involved in processes that maintain the totipotency of the germline, and that they may be dangerous in the development of somatic cells. Both lineages of jawless vertebrates, lamprey and hagfish, undergo programmed genome rearrangement, suggesting that this strategy might represent an ancient adaptation to conflicting demands of somatic and germline tissue and might have been present in the ancient vertebrate ancestor of lamprey and gnathostome lineages.

Further Reading

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Dawkins, R. (2009). The greatest show on Earth; The evidence for evolution. New York: Free Press.

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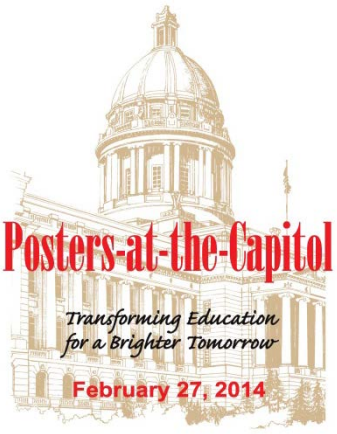
Submitted by Mary Janssen, Ph.D.
Member-at-Large, Governing Board, KAS

Posters-at-the-Capitol 2014

Posters-at-the-Capitol, an event hosted collaboratively by Eastern Kentucky University, Kentucky Community and Technical College System, Kentucky State University, Morehead State University, Murray State University, Northern Kentucky University, University of Kentucky, University of Louisville, and Western Kentucky University, is intended to help members of Kentucky's legislature and the Governor better understand the importance of involving undergraduates in research, scholarly, and creative work. The 13th Annual Posters-at-the-Capitol event will be held February 27, 2014. While the sphere of concentration was within the sciences, now undergraduates engaged in research and scholarly work can be found in all disciplines. A limited number of poster spaces are awarded to each institution; this number varies depending on the total number of abstracts submitted each year. Guidelines for abstracts and an abstract submission link can be found at http://campus.murraystate.edu/services/URSA/. The registration deadline is October 16, 2013.



***Posters-at-the-Capitol* Organizing Committee/Campus Contacts**

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Kentucky Heritage Land Conservation Fund

A Fund Milestone and Changes in KAS Representation

Drs. William H. Martin and Richard K. Kessler

This year, the KHLCF has reached a milestone of over 80,000 acres conserved and preserved by the program since the Board began providing grants in 1995. The Fund was created in 1994 but several months were used to develop the regulations and go through a long process to get them approved. Also, Board members appointed by the Governor for three-year terms had to be identified by organizations as required by statute.

The 80,000 acres are widely distributed across the state as over 120 sites in over 60 counties; we're now over half way in having a conserved site in every county. Although this is a significant amount of land that will not be developed, it is still a small amount when we consider that the total acreage of the state is over 25 million acres, that over 90 percent is privately owned, and that the acreage much less than the smallest of the 120 counties. The Fund has provided over $55 million for acquisition and management for these acres.

The state is a long way from conserving 10% of our lands for the public, for ecological and economic purposes, and for posterity—a rather modest amount of undeveloped land particularly when there will be continued demands by a growing population (now over 4 million people) and attending development in the years ahead. Further, larger tracts of natural landscapes are going to be necessary to successfully provide sustainable wildlife habitats; migratory corridors for plants and animals in the coming decades of climate change; watershed protection for streams, rivers, and communities; sources of unpolluted fresh water—under and above ground; and landscapes for recreational demand s of the growing urban population. They are already becoming available as corporations and individuals are increasingly interested in selling their agricultural and forest lands. An increase in substantial and sustained revenue for the Fund is needed to respond to these opportunities. Currently, the Fund has $4-6 million in revenue yearly. Acquisition of larger tracts can quickly deplete funds available. Fortunately, larger tracts (over 1000 acres) recently purchased by the Fund have had matching federal dollars or a landowner was willing to sell at a reduced price to realize a tax credit, but such support cannot be always be provided.

Conserving our natural landscapes is the major state-wide conservation issue that needs to be a higher priority with the scientific community represented by KAS, the general public in communities across Kentucky, and with all levels of government, particularly the state's executive and legislative branches. The rate of conversion of forests and fields to development in the form of new highways and expanding urban areas is currently well over 100 acres per day—a square mile per week! We, the citizens of Kentucky, must be able to respond to any opportunities to protect the natural heritage of this state and this section of the KAS Newsletter will continue to keep this issue before the membership.

A Personal Note:

The KAS representation on the Kentucky Heritage Land Conservation Fund Board has changed for the first time in several years. One of us (WHM) elected not to seek reappointment to the Board and as the Board's Chairman after serving from the beginning of the Fund and Board to this July. It has been a great honor and privilege to represent the Academy over these 6 terms and the continued support is greatly appreciated. However, RKK continues on the Board and has been appointed as the succeeding Chairman, continuing the leadership of the Board by a KAS representative. The second member of the Board now ably representing KAS is Dr. Albert Meijer of Western Kentucky University.

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Editor's Note: Five members of the Kentucky Heritage Land Conservation Fund Board are appointed from state government agencies, and seven members of the board are private citizens, selected by the governor from nominations by conservation groups, the Kentucky Academy of Science, agricultural interests and natural resources industries. These citizen members serve without pay and give their time for the quarterly board meetings and function on very active committees of the board. Visit http://heritageland.ky.gov for more information.

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.