

KAS BULLETIN



NEWSLETTER OF THE KANSAS ACADEMY OF SCIENCE

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150th ANNUAL MEETING OF THE KANSAS ACADEMY OF SCIENCE

April 6th-7th, 2018
Washburn University
1700 SW College Avenue
Topeka, Kansas 66621



The sesquicentennial (150th) Meeting of the Kansas Academy of Science will be held jointly with the Kansas Entomological Society on April 6th and 7th, 2018, at Washburn University. The schedule will be posted by March 12th, 2018.

We reminisce by hosting the conference at the site of the first meeting of the Kansas Academy of Science at Washburn University, then known as Lincoln College, in Topeka, Kansas.

This two-day meeting provides an excellent opportunity for scientists of many disciplines and at all levels, especially including undergraduates, to formally share scientific discoveries with one another in both poster and oral presentations, as well as informally during our field trips and social time.

The Saturday session will include oral and poster presentations, with special sessions on entomology and behavior along with the 19th Annual KAS Paleontology Symposium.

The registration form, abstract submission guidelines, lodging information, map, directions, and entertainment opportunities can be found on the KAS website.

Participants presenting papers must register online by March 2nd, 2018, through Eventbrite.com. Instructions and links can be found on the [Annual Meeting](#) tab of the KAS website. Abstracts must be 250 words or less and can be submitted online through Eventbrite or emailed using the abstract submission form on the KAS website.

The early bird registration deadline is **March 5th, 2018,** through Eventbrite.

**WE LOOK FORWARD TO SEEING YOU
IN TOPEKA!**

2017 KAS Fall Field Trip to Emporia State University's Ross Natural History Reserve by Hank Guarisco

We convened on the picturesque, 200-acre Ross Natural History Reserve on October 7, 2017. It was a sunny warm autumn day – perfect for a field trip. The Abers demonstrated their aerial photography and the equipment they use: a special Japanese kite with a long tail as a stabilizer, a large, wooden reel resembling deep-sea fishing tackle, and a camera. It was very interesting to see this in operation.

We then convened at the second station where three drones of different sizes stood ready to take to the sky. The sound of the first one resembled a giant Paleozoic mosquito as it gained altitude and checked out the adjoining field. I wondered what was going through the mind of the hawk that was lazily gliding nearby. A flock of blue jays was startled and flew directly in front of us to the trees beyond. The second drone was dark, with spindly legs. It was programmed to rise up and visit each of several predetermined stations in the field, then return to rest where it began. A slightly different sound, that of giant wasps, filled the air. The third drone was large, able to carry several kilos of equipment, and was not as noisy as the others. As it left the ground, the legs folded up out of the way. The uses of the drones are myriad. Aerial views of crops could yield valuable information on their condition. Pipelines could be to be monitored for leaks. The status of wildlife could also be monitored, although the drone's noise may hinder this application under certain conditions.

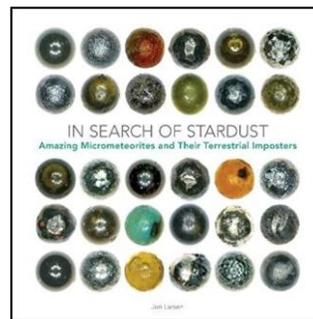
We ambled down to the lake, where David Edds seined up several largemouth bass and green sunfish, along with a fishing spider and nursery web weaver. He checked the turtle traps and discovered a large largemouth bass and several red-eared sliders and western painted turtles. Several of the turtles had leeches in their armpits and inguinal regions. It is common for the turtle leech to overwinter on turtles. A plankton net hauled in a myriad of interesting small aquatic creatures: a damselfly larva recognized by its three terminal, leaf-like gills, amphipods aka "scuds," and a host of smaller planktonic organisms. The shore was lined with old seed pods of the American lotus. Most were tilted downward and only a few still contained seeds. Some of the cavities contained spider resting sacs.

We reconvened at the picnic shelter and shared some paw paws before returning home. It was truly a wonderful day spent in nature.

BOOK REVIEW: In Search of Stardust Amazing Micrometeorites and Their Terrestrial Impostors

by Jon Larsen. 2017. Quarto Publishing Group, Voyager Press, Minneapolis, 150 p.

Micrometeorites are some of the oldest materials in the universe, and may contain stardust older than the planets and the sun. These small particles, a fraction of a millimeter in diameter, are hard to distinguish from small particles of human origin. Therefore, most people believed it was impossible to find them in cities, and that only field trips to remote locations on the globe would result in their discovery. The author, however, has done a meticulous job of creating a photographic catalog of cosmic spherules (micrometeorites) and a host of industrially created impostors. The unique cover of the book is covered with examples of microspheres with different textures.



The author has traveled to all the continents in search of them, and detailed investigations have revealed the reason for their unique structure. Unlike most particles of human origin, cosmic spherules have “chondritic chemistry.” When a tiny meteorite enters the earth's atmosphere at a steep angle, it melts, differentiates and recrystallizes, creating a dendritic pattern of magnetite crystals or a partial magnetic rim, and possibly nickel-bearing iron beads. Detailed photographs of a host of micrometeorites and particles of earth origin, from asphalt, roof tiles etc., make this book a field guide to stardust on earth. The page of beautiful crystals found in road dust was particularly revealing. They resemble fine gems of all colors.

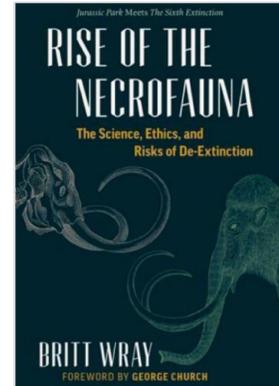
Other unique classes of small particles that resemble micrometeorites are formed when lightning strikes rock or desert sand. It melts a hole in the substrate and splashes droplets called exogenic fulgurites. There is even a rarer occurrence – lightning striking a dust plume of an erupting volcano. These particles are called volcano-fulgurites.

This is an enjoyable book that sheds light on some little-known geological processes, and provides beautiful images of stardust that has fallen to earth.

BOOK REVIEW: Rise of the Necrofauna the Science, Ethics, and Risks of De-Extinction

by Britt Wray, 2017, Greystone Books, Ltd, Canada, 293 p.

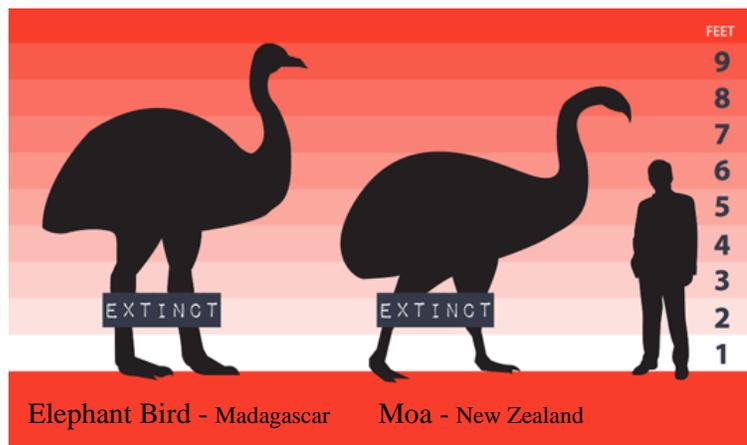
Anyone who has lamented the loss, even briefly, of the amazing fauna that has been diminished over the last hundreds and thousands of years, since the rise of humankind and its emergence from the ice sheets of the Pleistocene, will enjoy reading this book. The author discusses the scientific possibility of bringing back such iconic species as the woolly mammoth and the passenger pigeon, just to name a few. I have always been saddened by the loss of the giant elephant birds, *Aegyptornis* and the moas, from islands in the South Pacific. These were truly amazing, gigantic creatures that survived until Columbus sought a new trade route to Asia. The ten-foot tall, one-ton, flightless *Aegyptornis* on Madagascar is believed to have fueled Sinbad’s legend of the Roc, a giant predaceous bird that carried off elephants.



These idle musings have led a small group of scientists to forge ahead and make their dreams come true – to bring back extinct species. With the recent advances in DNA research, a path to this end result has been formulated. The author examines several methods, some traditional, such as back-breeding, and others on the cutting edge, such as cloning and CRISPR. Some of the techniques that have been developed can also be used to assist endangered species. For example, the endangered black-footed ferret faces several problems: a genetic bottleneck and susceptibility to the plague, which also threatens their favorite food, prairie dogs. Two ferrets in cold storage in San Diego’s Frozen Zoo had higher genetic diversity than some in captivity. The genes from the frozen animals could be introduced into the living population to increase its genetic diversity. Further research could eventually result in ferrets immune to the plague or to other parasites and diseases.

A large part of the discussion is centered around the ethical considerations involved in bringing back extinct species. Will this effort enforce the idea that technology can solve all of our problems? Therefore, we may not be as motivated to save endangered species and their habitats. If we can bring them back, should we? Will these animals become just zoo curiosities, or will they be recovered enough to resume their ecological roles in the wild? Others claim that it is unethical not to bring them back, especially if humans have brought about their extinction in the first place.

Although somewhat whimsical, I found this book to be very interesting. The author explains the steps involved with each method. So, if you need to brush up on basic cell biology, cloning, or DNA manipulation, this book is informative. It was written in a journalistic style for the general public and will capture your imagination.

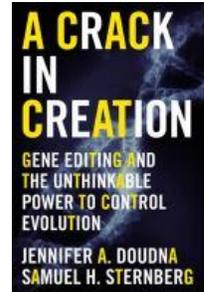


BOOK REVIEW: A Crack in Creation

by Jennifer Doudna and Samuel Sternberg. 2017. Houghton Mifflin Harcourt, Boston, 281p.

This hard-bound, 280-page book reveals the amazing advances in genetics over the past 10 years, especially the discovery, implementation, and implications of a new technique named, “CRISPR.” The authors do a great job in communicating a rather complex subject to someone like me, who hasn’t taken a genetics course since the late 1960’s. The power of CRISPR, clustered regularly inter-spaced short palindromic repeats, may usher in the dawning of a new age in medicine, agriculture, animal husbandry, and possibly human evolution itself.

The initial discovery involved the observation that diverse bacteria and archaea had small pieces of DNA that were identical to one another, equally spaced, and were clustered in one section of the entire DNA molecule. Further studies proved that this part of the DNA code made bacteria and archaea immune from viral infection. The researchers then figured out exactly how this immunity was conferred. This system, which involved RNA and “helper” genes, was able to detect foreign viral DNA, snip it out and destroy it, using various enzymes created for these purposes. Once this system was thoroughly understood, researchers were able to modify the components to target specific DNA of their choosing.



This has profound implications, such as correcting DNA sequences that are responsible for a variety of medical conditions, such as hemophilia. Since viruses have a particular knack of successfully invading cells, researchers can start with a virus, scoop out its DNA or RNA, replace it with their own creations, insert it into a virus, then send it on its merry way to “infect” various body systems. The technology is easier to use and cheaper than former genetic editing techniques. The only limit to the application of this method is human imagination, and hopefully ethical standards which can be translated into appropriate legislation.

As we all know, mosquitoes are major vectors for a number of debilitating and lethal human diseases, including yellow fever, dengue, zika, and malaria. Wouldn’t it be great if we could introduce a sterility gene into wild populations and eliminate mosquitoes from the planet? Maybe. What are the ecological implications of no mosquitoes, and more importantly, no mosquito larvae and pupae which are major food sources of small fish.

Genetic alterations in plants and animals are already being undertaken. Pigs are being altered to provide suitable organs for human transplant. Other pigs called micro-pigs, have the genes responsible for growth turned off so that they become the “ideal” small household pet. Do you want to resurrect, or at least genetically reconstruct, a reasonable facsimile of a woolly mammoth?

Perhaps the applications that give us most pause involve altering the human germ line. The specter of a new age of eugenics may be on the horizon. Do you want a baby with Downs Syndrome? We can test for this and give prospective parents the option. Do you want your baby to be a super athlete of Mensa intelligence? No problem! These changes will permanently alter the genetics of future generations. So, instead of natural selection, we will have the power to control, or at least greatly influence, our own evolution.

The authors quickly became aware of the significant societal implications of their research and formed worldwide committees of scientists, religious leaders, and other segments of society to tackle these questions. Will governments use CRISPR to make bioweapons? Paranoid factions in governments may decide they have no choice but to develop them, just as a deterrent, or have this program up and running before some hostile nation or terrorist cell does.

I highly recommend these book to anyone who wants to understand the modern advances of molecular genetics and their overwhelming implications.

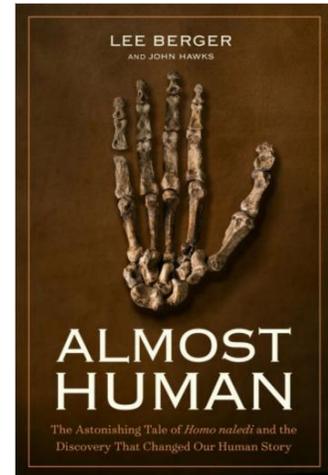
BOOK REVIEW: Almost Human

by Lee Berger and John Hawks. 2017. National Geographic Partners, LLC, Washington D.C., 239p.

This well written book bursts with the wonder and energy of exploration. The author takes us on his journey through caves in South Africa and provides a detailed account of the remarkable discovery of two ancient hominins, *Australopithecus sediba* and *Homo naledi*. Unlike many older researchers who can be very guarded about their discoveries, the author engaged professionals around the globe to work on fossils and make their ongoing investigations available to the public on-line. He discusses the discoveries made over the last 100 years in eastern Africa, and indicates how new information has changed our understanding of hominin evolution.

It is a complex story, the stage filled with many old and new actors: *Ardipithecus ramidus*, *Paranthropus boisei*, *P. robustus*, *Australopithecus afarensis* aka “Lucy,” *A. africanus*, *Homo erectus*, *Homo floresiensis* aka “The Hobbit,” *Homo habilis*, *Homo rudolfensis*, Neanderthals, and *Homo sapiens*. Within the last 10 years, the author uncovered the existence of two more species, *Australopithecus sediba* and *Homo naledi*.

Serendipity often plays a role in major scientific discoveries. The author’s son, Matthew, noticed a fossil embedded in a piece of composite rock. It turned out to be a clavicle of an undescribed australopithecine. Further field work uncovered many bones belonging to two individuals, and after much deliberation it was determined to be a new species christened: *Australopithecus sediba*. It possessed some ancient and modern features, and could well have been the ancestor of our genus, *Homo*.



Cavers who had managed to access an extremely remote and difficult chamber in a cave system in the Sterkfontein Valley, found the floor littered with bones. This exciting find prompted the author to mobilize a major campaign to document and retrieve the fossil remains. He assembled an exploration team, consisting of six, small, well-qualified women who could access the chamber, a support team of photojournalists, technicians, and safety personnel. Over a period of 21 days, they recovered more than 1,300 bones, far more than the number found at any single site in Africa.

A team of researchers from around the world examined the material over the next two years and again discovered both ancient and modern features. However, most were modern, including a human-like skull, hands, and feet. The species was about 5 feet tall and weighed 90 to 120 pounds. Therefore, it was classified as a species of *Homo*.

The next mystery to solve was how did all these bones get into the remote chamber? There were virtually no animal remains and the geology suggested that flowing water had never entered the chamber. The only plausible explanation was intentional burial. Individuals of all ages were represented in the collection of bones. Eventually, the bones were dated at 200,000 years of age, far more recent than expected.

The author ends this fascinating tale by bringing two fellow researchers to a new cave to examine a fossil he had recently discovered. It was a jaw bone with several teeth, each the size of a nickel. The book ends with: “I said what we were all thinking: ‘Here we go again.’ “



KANSAS ACADEMY OF SCIENCE
ATTN: Sam Leung
Stoffer Science Hall Rm 312C
1700 SW College Ave,
Topeka, KS 66621-1117

This year's keynote speakers:



Friday Night: Dr. Stan Hawley

Investigator and American Cancer Society Research Professor, Dean of the Graduate School of the Stowers Institute, Professor of Molecular and Integrative Physiology at the University of Kansas Medical Center's School of Medicine

and



Saturday Afternoon: Dr. Rebecca Schmidt-Jeffris

Assistant Professor in the Plant and Environmental Sciences Department, Coastal Research and Education Center at Clemson University, specializing in Vegetable and Strawberry Entomology