KAS BULLETIN

NEWSLETTER OF THE KANSAS ACADEMY OF SCIENCE

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147th Annual Meeting of the Kansas Academy of Science in Pittsburg March 27-28, 2015

The 147th annual meeting was held in the new Bicknell Family Performing Center on the Pittsburg State University campus on March 27 and 28, 2015. On Friday afternoon, we began our field trip with a visit to the humongous steam shovel, known as "Big Brutus," in Cherokee County. It was truly an awesome sight. Our entire group easily occupied the giant scoop at the front end of the machine, which was used to remove the overburden from the coal seams. I kept looking around for giant ants, like in the movie, "Honey I Shrunk the Kids." After experiencing this mega-machine, we went to the Kansas Mined Lands Wildlife Area – an intricate series of small lakes that occupy the reclaimed coal strip mines. There is an ongoing process of mitigation to make the area safe for human activities. Although the evening temperatures were slightly above freezing, it was warm enough to entice a western painted turtle to sun itself on the dirt road near one of the small lakes.

We returned to the Bicknell Center to register and enjoy the banquet dinner with friends and colleagues from across Kansas and Oklahoma. Following diner, we had the pleasure of going along on a journey of discovery with our guest speaker, Dr. Albert Yu-Min Lin, who is a National Geographic explorer par excellence. After completing his PhD, instead of following a more common path like getting a job in a lab, he decided to pursue a personal adventure of discovery. His father, who came from China, told him the family originated in the north, so Lin decided to visit Mongolia and attempt to locate the tomb of Genghis Khan. With very few resources, except a contagious passion, a winning personality, and good friends and professional connections, he took a train to Mongolia and was befriended by a local family who helped make his dream come true. Everything fell into place when he contacted the National Geographic Society for funding, the evening before his appointment with Mongolian government officials. Detailed satellite imagery of a special area in Mongolia that had been strictly off-limits to outsiders (the Forbidden Zone) for the past 800 years, revealed some interesting anomalies. He gained permission to enter this zone and convincing officials that the site would not be disturbed, i.e. no digging. He would use various forms of remote sensing to detect what was buried in the ground. Marshaling computer skills and a belief in the power of many eyes to detect anomalies, our intrepid explorer posted detailed satellite images on-line so that the public could examine them and flag any suspicious sites. When he compiled the results, a map appeared which clearly indicated areas of interest. So he and his companions travelled to these sites to explore the anomalies. While camping on the side of a small mountain, a group of seven shamans appeared and told them it was a very sacred site, and that they wanted to interview him. While chanting and beating a drum, which sounded like a heart beat, for 5 hours,

the shamans decided he was actually a reincarnation of a member of a friendly tribe who had helped Genghis Khan years ago. So they gave him their blessing. That evening, a terrible storm passed across the mountain, with strong winds that toppled rows of trees. However, this event proved to be a blessing instead of a disaster, since the roots of the downed trees brought up some of the surface soil. Lin immediately noticed a small, clay disc with the face of a lion staring at him from the between the tree roots. Subsequent analysis indicated it was about 800 years old – the time period during which Genghis Khan lived. The immediate area contained remains of a temple. The personal journey of discovery was over. Lin continues his archaeological explorations using remote sensing in Guatemala.

Genghis Khan is an intriguing historical figure for many reasons. He successfully united the many, small, warring Mongolian tribes and became their leader, after surviving many hardships in his early life. His father was killed when he was about twelve years old. His mother tried to rally the people around her, but failed. The family, consisting of Temujin (Genghis Khan), his half brother, and mother eked out a meager living on the Mongolian Steppes. He eventually received aid from his betrothed's father, and began to gain the trust of the people. He instituted a series of laws of behavior, and rewarded those who merited it, instead of rewarding blood relatives. Although ruthless in battle, Genghis Khan was wise in many ways. His battle tactics are still studied in modern war colleges. Once his enemies succumbed to his rule, he often kept their system in tact and only charged a tax, instead of destroying everything in his path.

Our history studies seldom include the exploits of ancient African and Asian nations. We know of Alexander the Great, the Roman Empire, the Trojan and Punic Wars etc., but few are aware that Genghis Khan's empire was the largest of all. At the time of his death at age 62 from a hunting accident, his empire stretched from Korea to Poland. He had conquered China, Persia, Tibet, Afghanistan, and yes, even Russia, by invading on horseback during the winter. Several attempts were made to conquer Japan, but fate and the weather turned against him, so Genghis decided not to pursue the matter. I wonder how large his empire would have grown if he had lived longer. The only reason his trusted general, Ogatai, returned from Hungary to Mongolia was to elect a new Khan.

Returning to the recent past – the KAS annual meeting in March 2015 – Saturday began with coffee and cookies and a series of interesting oral and poster presentations. There were four simultaneous sessions, including the Paleontology Symposium. A broad range of subjects from numerous disciplines was represented at the meeting. Everything from small-format aerial photography of Civil War sites to avian urban conservation, identifying invasive scarab beetles in Hawaii, new dinosaur material from the Niobrara Formation, and solvent-free synthesis of biologically active stilbene derivatives were discussed.

Randy Miller of Baker University regaled us once again with beautiful images of those cute creatures of the moss, "water bears," also known as tardigrades. They appear to be most abundant in forest canopies. He has created a learning experience for all students, including physically handicapped individuals in wheel chairs. They use rope-climbing techniques to ascent into the canopy.

We also learned about red snow. Several species of green algae colonize persistent snow fields in the mountains around the world. Species with protective red pigments produce large patches of red snow. Each patch is apparently a clone. There is a whole community of microbes and fungi that are associated with the snow algae.

In 2004, a large, accidental spill of anhydrous ammonia into Smoots Creek, a prairie stream in south-central Kansas, effectively sterilized a large portion of the creek. The resulting massive fish kill eliminated a population of

the threatened Arkansas darter, Etheostoma cragini. Sampling in subsequent years revealed the population recovered rather quickly, presumably due to recruitment from the unaffected spring and creek section above the spill.

Before the Saturday luncheon, Dr. Gabe Bever of the American Museum of Natural History gave an in-depth presentation on the tree of life, focusing on nodes at which major groups split from each other. Recent research has uncovered several important fossils which are most likely the precursors of turtles.

The meeting ended with first, second and third place monetary awards for undergraduate and graduate oral and poster presentations.

Possible Fall Fieldtrip

Saturday, October 24th, 2015
Bat Cave in the Red Hills

See www.KansasAcademyScience.org For Details

Sunken Strawberries

Scientific American Sept. 2015
By Sabrina Imbler

In transparent plastic bubbles 20 feet beneath the surface of the Mediterranean Sea, an experimental garden grows. The strawberries, basil, beans and tomatoes within these air-filled biospheres thrive in their submerged homes. Surrounding water provides the constant temperature and humidity elusive at most terrestrial farms, and freshwater trickles down the spheres' interiors after the seawater below evaporates and then condenses.

These marine greenhouses, located off the coast of Italy, represent a foray into underwater farming by Ocean Reef Group, a diving and scuba gear company. Company president Sergio Gamberini chose to grow his crops hydroponically after noticing, during an early trial, that soil brought along stowaway insect pests. He hopes to introduce this gardening approach to coastal developing countries with arid lands. In fact, Gamberini has received requests for biospheres from nations ranging from the Maldives to Saudi Arabia. His son, Luca Gamberini, admits a long path lies ahead: “Our dream is, on a large scale, utopic.”

The air temperature inside the underwater greenhouses stays close to a balmy 84ºF, with a humidity of 90.5 %.

Photos by Robbie Gonzalez

Recipe for Success

Finding A Better Way To Grow Cells

Discover Oct. 2015, By Lacy Schley

For years, a mystery known as "the great plate count anomaly" has plagued microbiologists: Counts of living cells grown on plates in the lab aren't as high as counts from the original sample, and no one knows why. To grow these microorganism cultures in the lab, researchers house samples in petri dishes lined with a nourishing gel mixture derived from algae called agar growth media. But despite the nourishment, just 0.1 to 10 percent of cells make it.

It turns out the agar is a problem, says microbiologist Yoichi Kamagata at Hokkaido University in Japan. The standard recipes require mixing agar and phosphate solution before sterilizing them via intense heat. But Kamagata and his team realized this sequence creates hydrogen peroxide, which destroys most of the cells. Sterilize the ingredients separately, and voila, a roughly tenfold increase in cell survival rates.

"I was thinking someone else would have this kind of experiment, as we have 120 years of agar media history," Kamagata says. "Nonetheless, nobody cared about the media recipe."

Rock of Ages

Discover Oct. 2015, By Dan Ferber

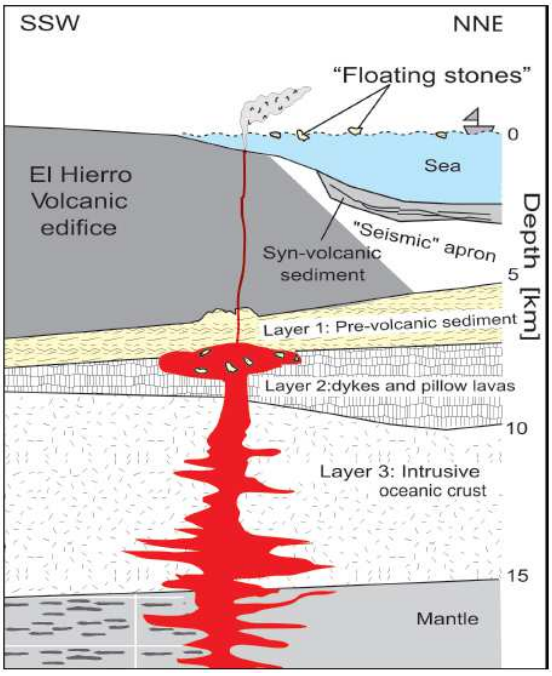
The Canary Islands, an autonomous community of Spain west of Morocco, spreads more than 300 miles across the Atlantic in an archipelago akin to Hawaii. Like the Aloha State, the Canaries were born from volcanoes - but researchers had debated exactly how.

When magma erupted from a crack in the ocean floor off El Hierro, the youngest, westernmost island, local volcanologist Vicente Soler headed out to sea, looking for answers. He found strange black rocks, some as large as soccer balls, floating in the bubbling sulfurous seawater. He scooped them up with a fishing net.

It's rare, but not unprecedented, for frothy magma to harden into rock so light it floats. But trapped inside the floating rocks was something even more unusual: quartz minerals and banding patterns found in sedimentary rock, which magma typically melts.

The banded sediments contained tiny fossils of single-celled creatures, say Uppsala University volcanologist Valentin Troll, part of the team that published its findings in January in *Scientific Reports*. Those fossils helped solve a question that's dogged geologists for decades. How did the Canary Islands arise from the ocean depths?

The rocks' sedimentary interior contained fossils of single-celled algae called coccolithophores. Researchers dated the fossils based on different patterns of tiny plates that each species had evolved. Based on the youngest coccolithophore present, it was determined that volcanic activity formed El Hierro in the last 2.5 million years. By contrast, the easternmost island has sediment that's 20 million years old. Since the island "birth order" moves from east to west, the Canaries must have formed as the continental plate drifted eastward over a stationary periodically erupting plume of hot magma deep in Earth's mantle.



Neaderthal Epigenome

Archaeology July/Aug. 2014
By Zach Zorich

Modern humans share some 99.7 percent of our DNA with Neanderthals. They are our closest evolutionary cousins, but the differences between us run deeper than that 0.3 percent. Much of what distinguishes the two groups is actually the result of how and when genes are expressed and regulated-essentially, turned on and off. Similar, or even identical, stretches of DNA can produce vastly different traits, such as longer limbs or smaller brains, depending on how and when certain genes are actively producing protein. The study of these processes is known as epigenetics.

Scientists at the Max Planck Institute for Evolutionary Anthropology sequenced Neanderthal DNA in 2010, and now researchers there and at the Hebrew University of Jerusalem are beginning to understand some of the epigenetic differences between humans and Neanderthals. “Studying this is of equal importance to studying the genetic differences,” says Liran Carmel of the Hebrew University.

By looking at the way that Neanderthal DNA chemically degraded over millennia in the ground, the researchers were able to reconstruct how certain molecules, called methyl groups, were attached to the DNA. Methyl groups can help determine how much of a particular protein a gene creates. The research showed that certain Neanderthal genes had different patterns of attached methyl groups, compared with corresponding portions of the modern human genome. As a result, strikingly similar stretches of DNA could produce two very different hominids.

For example, two genes involved in limb development have different patterns of methyl groups, which may be why we have longer arms and legs than Neanderthals did. Similar differences were observed in genes associated with brain development and susceptibility to certain diseases. Carmel believes that as more Neanderthal DNA is analyzed, we will begin to understand the evolutionary changes that created the modern human. “There is a huge potential,” he says. “Studying epigenetic characteristics could be of great importance for zooming in on the properties that have shaped what we are today.”

Comparison of Modern Human and Neanderthal skulls from the Cleveland Museum of Natural History

KAS Student Grants Available

Do you have a student project that could use a financial boost? KAS awards up to seven research grants each year to undergraduate and graduate students.

Past winners have come from all over the state, from small colleges and large universities. Recent awards have supported projects focused on prairie ecology, geology, paleontology, molecular biology, and zoology.

The application deadline for Undergraduate Grants is OCTOBER 17th, 2015, and the deadline for Graduate Grants is FEBRUARY 1st, 2016. Grant funds will be awarded up to $1000 for undergraduate projects and $1500 for masters and Ph.D. level projects.

Application form, guidelines, and submission instructions can be found at the KAS website. http://www.kansasacademyscience.org/research-grants.html

- Erin Morris, KAS President Elect

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

MAIL TO:

The 148th KAS Annual Meeting will be held at McPherson College on April 1 - 2, 2016.