KAS BULLETIN

NEWSLETTER OF THE KANSAS ACADEMY OF SCIENCE

VOL. 42 NO 1 http://www.KansasAcademyScience.org/ February, 2017

149th ANNUAL MEETING OF THE KANSAS ACADEMY OF SCIENCE

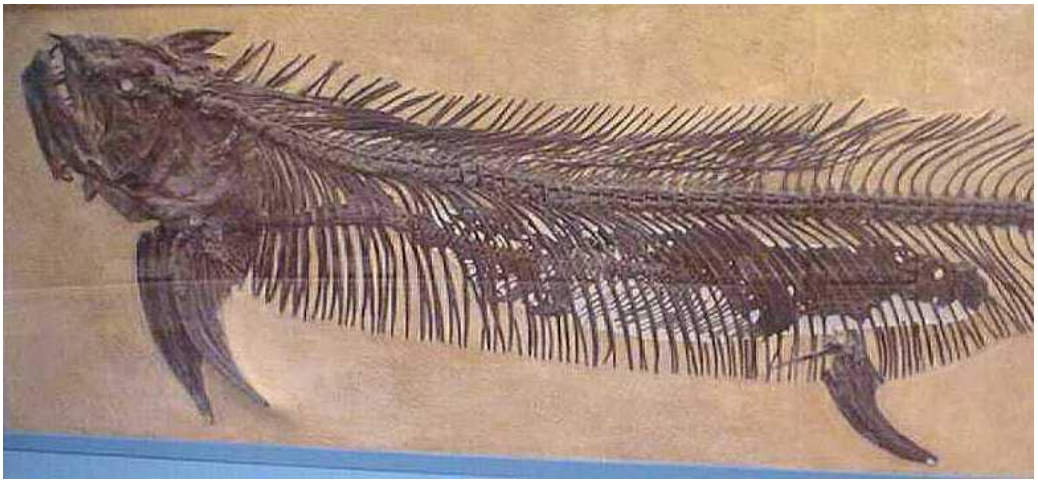
April 7th & 8th, 2017
Tomanek Hall, Fort Hays State University
Hays, Kansas

Conference details and the online registration form can be found at:
http://www.kansasacademyscience.org/meeting.html
Note, meeting registration must be completed online this year.

Four field trips are offered this year in Hays:

- Collections Tours of the Sternberg Museum of Natural History 4:00-6:00pm
- Bird Watching at Cheyenne Bottoms 2:30-4:00pm
- Water Issues in Hays 3:00-5:00pm
- Historic Fish-Within-a-Fish Site 11:00am-5:00pm

The keynote speaker has yet to be announced.



SWORDFISH OIL BOOSTS SPEED IN WATER

By Laurel Hamers, Science News Magazine Vol. 190, No. 4, August 20, 2016

Olympic swimmers shave their bodies before a big race to break records. Swordfish use a different trick a new study suggests: They grease their heads. The fish (*Xiphias gladius*) are among the fastest in the ocean — their streamlined bodies can cut through the water at about 90 kilometers per hour.

A newly discovered oil-producing organ in the fish's head gives it slick skin that could boost its speed, scientists report in the July 6 *Journal of Experimental Biology*. MRI scans show that the organ links to tiny pores on the head that ooze the oil, creating a thin layer of lubrication on the skin's surface.

Photo by Angel Fitor

Tiny ridged structures called denticles surround the pores. Denticles look like scales but are made of dentine and enamel, like teeth. The scientists, a team from the Netherlands, think the lubrication and the textured denticles might work together, making a water-repelling surface that lets swordfish glide through the water with minimal drag.

Be sure to "opt-in" if you want to receive a paper copy of the KAS Bulletin! All other members will receive the Bulletin by email.

Contact secretary Sam Leung at Sam.Leung@Washburn.edu

JUPITER'S GREAT RED SPOT IS HOT

By Christopher Crockett, Science News Magazine Vol. 190, No. 4, August 20, 2016

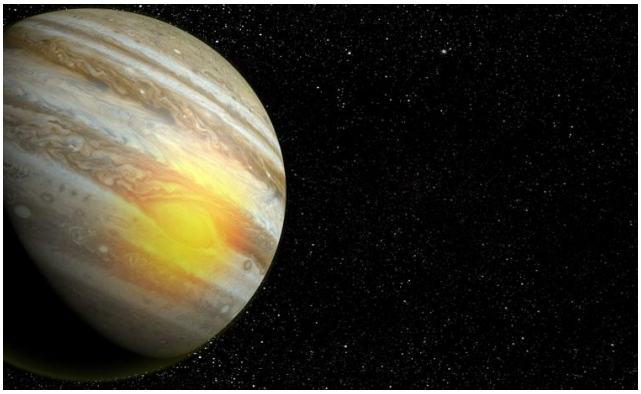


Illustration by Dillon Yothers & Luke Moore

On Jupiter, the Great Red Spot is the hottest thing going. Temperatures over the ruddy oval, a storm large enough to engulf Earth, are hundreds of degrees warmer than anywhere else on the planet, researchers report online July 27 in *Nature*. Heat from the storm might help explain why Jupiter is unusually toasty given its distance from the sun.

Astronomers have known for over 40 years that Jupiter's upper atmosphere is surprisingly hot. Midlatitude temperatures are about 530° Celsius, roughly 600 degrees warmer than they would be if the sun were the planet's only source of heat. Warmth must also be coming from the planet, but until now, researchers had not come up with a satisfactory explanation for how.

Active storms all around Jupiter could be injecting heat into the atmosphere, suggest James O'Donoghue, an astrophysicist at Boston University, and colleagues. Using observations from NASA's Infrared Telescope Facility in Hawaii, the researchers found that the temperature over the Great Red Spot is about 1,300 °C. Sound waves generated by turbulence might be heating the air above the storm, the researchers suggest. Similar heating (on a much smaller scale) has been seen on Earth, as air ripples over the Andes Mountains in South America.

WHY SOME SUNFLOWERS TRACK THE SUN AND OTHERS DON'T

From Science News Magazine Vol. 231, No. 3086, August 13, 2016

Here comes the sun. The dance of the sunflower reveals a sophisticated ability to exploit its environment.

The heads of young sunflower plants follow the sun during the day, then reverse course at night so they're ready to face the dawn. But no one knew how much of an advantage the plants gain from their daily routine, or why they cease to track the sun once they have bloomed.

To find out, Stacey Harmer at the University of California, Davis, and her colleagues tethered some young plants so they couldn't move, and rotated the pots of others so they were facing the wrong way in the morning, away from the sunrise. They found that leaves of both groups of sunflowers were about 10% smaller than leaves from plants that were allowed to follow the sun. "They're less efficient if they can't track," says Harmer.

To understand why sunflowers in bloom stop moving and face the rising sun, the researchers rotated some sunflowers so they were facing west, then recorded how many bees and other insects visited the plants.

The east-facing flowers received about five times as many pollinators as the west-facing ones, probably because they were warmer, which attracts pollinators (Science, doi.org/bngk). "You can see the bees going crazy over the east-facing flowers and mostly ignoring the west-facing flowers," says Harmer.

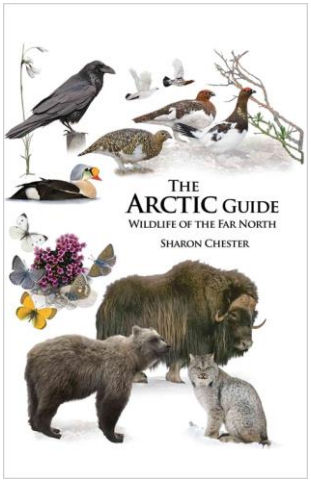
NEONICOTINOIDS ARE INADVERTENT PARTIAL CONTRACEPTIVES FOR HONEYBEES

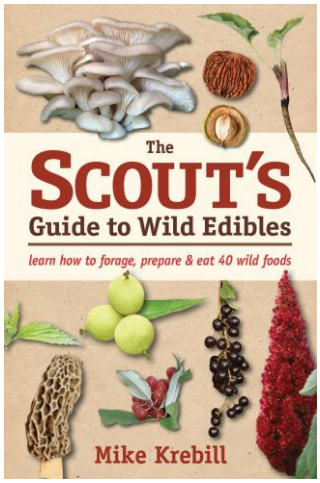
By Susan Milius, Science News Magazine Vol. 190, No. 4, August 20 2016

Pollen tainted with neonicotinoid pesticides could interfere with male honeybee reproduction, a new study finds.

After bee colonies fed on pollen spiked with the pesticides thiamethoxam and clothianidin, male bees, or drones, produced almost 40 percent fewer living sperm than did males from colonies fed clean pollen, researchers report July 27 in *Proceedings of the Royal Society B*. The concentrations of the pesticides, 4.5 parts per billion and 1.5 parts per billion, respectively, were in the range of what free-living bees encounter when foraging around crops, study coauthor Lars Straub of the University of Bern, Switzerland, says.

Pollinator conservationists have raised concerns that chronic exposure to neonicotinoids widely used on crops is inadvertently weakening honeybee colonies working the fields. The amount of sperm males produce might affect how well a colony sustains itself because young queens mate (with about 15 males on average) during one or two early frenzies and then depend on that stored sperm for the rest of their egg-laying years. The new study is the first to examine neonicotinoid effects on honeybee sperm, Straub says.





BOOK REVIEW: The Arctic Guide, Wildlife Of The Far North By Sharon Chester

2016. Princeton University Press, Princeton, NJ. 542 p.

This soft covered field guide is the monumental achievement of a very ambitious vision - to depict all wildlife of the circumpolar region. Besides providing the requisite species descriptions and ranges, it is beautifully illustrated and provides interesting information on the natural history and habits of each species.

The majority of the book deals with the numerous mammals, birds, and fish that inhabit this region. Herpetologists may be somewhat disappointed, however. There is only one reptile, the Eurasian viviparous lizard, and three species of frogs: the wood frog, the boreal chorus frog, and the moor frog. The following 24 pages are devoted to flies, bees, and butterflies. The rest of the book deals with the seaweeds, lichens, mushrooms, mosses, trees, and plants. Ninety percent of the arctic flora is composed of flowering plants. I was also impressed to find an extensive treatment of the baleen, toothed, and beaked whales, seals, sea lions, and other marine mammals.

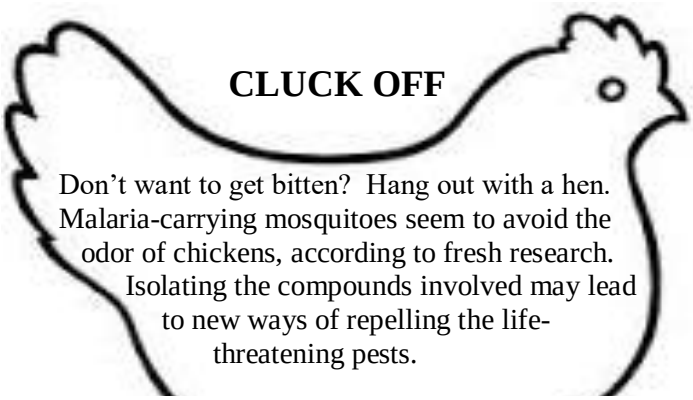
This field guide is one of best I have encountered. It would be wonderful if there were a complimentary field guide to wildlife of the Antarctic region. Of course, it would be nigh impossible to create a comparable work for the tropics, where biodiversity approaches its zenith.

BOOK REVIEW: The Scout's Guide to Wild Edibles by Mike Krebill

2016. St. Lynn's Press, Pittsburgh, PA. 191p.

This is a good field guide to the most common wild edible plants and mushrooms. It is liberally strewn with good color images that accompany informative species accounts. In addition to providing ranges, habitats, and definitive descriptions, there are sections on which parts are edible, how to prepare them, when to harvest, as well as how to preserve the harvest. Because many mushrooms may be very difficult to identify, the author has restricted his treatment to easily recognizable species, such as giant puffballs, morels, oyster mushrooms, hen of the woods, and sulfur mushrooms.

The latter two sections of the book are truly delightful. One recounts interesting projects and activities for all ages, such as how to crack hickory nuts and black walnuts, processing acorns, making fruit leather, learning when persimmons are ripe, making sumac lemonade, mushroom foraging, and, preparing dandelions for cooking and baking. Then there are a bunch of off-beat recipes. Winged silver maple seeds are tossed in peanut oil, then toasted in an oven. Brown cattail seed heads are used in a recipe for "Cattail Vegetarian Pulled-Pork Barbeque." Dandelion flowers are used to make "Dandy Burgers" and "Dandelion Donuts." I can't wait to try some of these recipes, and maybe invent a few of my own this spring.



(Malaria, DOI:10.1186/s12936-016-1386-3)

BOOK REVIEW: Venomous by Christie Wilcox

2016. Scientific American/Farrar, Straus and Giroux. New York. 236 p.

This delightfully written, hardbound, book presents a survey of the venomous animals of the world, the composition of their unique venoms, and visceral descriptions of their effects on human physiology. Starting "down under" with the platypus - a unique aquatic, egg-laying mammal - the author describes the excruciatingly painful experience of being stabbed by the inch-long, venomous spur on the hind leg of a male. "There are eighty-three different toxin genes expressed in the platypus venom gland, some of whose products closely resemble proteins from spiders, sea stars, anemones, snakes, fish, and lizards, as if someone cut and pasted genes from the entire diversity of venomous life into the platypus's genome." However, the venomous nature of the platypus reported by the indigenous people was long scoffed at by white society, who attributed these reports to superstition.

A detailed discussion of the most venomous animals on the planet is followed by a good synopsis of mammalian immunological responses to being envenomated, and the new field of "antivenomics," "which uses cutting-edge immunological and molecular methods to clean up antivenoms. The basic idea is that antivenoms are mixtures of antibodies, many of which aren't actually targeting the most deadly toxins in the venom. Scientists estimate that less than 5 percent of antivenom proteins actually do the job intended: neutralizing venom components. By creating filtering protocols that require antivenoms to bind to toxins, scientists are able to separate out that vital 5 percent from the rest, thereby removing a large number of the molecules that might cause side effects."

A survey of animals that can resist potentially lethal snake bites can be divided into two groups: those having immune systems that can deactivate venom components, and those who have evolved slightly different physiologies that are not affected by the venom. Both opossums and hedgehogs "have special components in their blood that tackle snake venom toxins. These include macroglobulins - proteins structurally related to antibodies (which are *immuno*globulins) - that can completely halt the hemorrhagic activity of viper venoms, as well as metalloprotease inhibitors..."

Then she explores the diversity of hemotoxic components that distrupt blood coagulation. Fleas, ticks, leeches, mosquitoes and vampire bats possess unique proteins of pharmacological use. "...an anticoagulant used during modern surgeries like angioplasty - Angiomax (Bivalirudin) - is a small peptide based on a venom compound from *Hirudo medicinalis*, the medicinal leech."

Reptile afficionadoes with undoubtedly be aware of the Komodo Dragon, the largest living lizard on earth. Contrary to earlier reports that the dragon subdues its large prey by having nasty oral bacteria, recent studies have debunked this claim. The Komodo Dragon is venomous! It has small venom glands in the lower jaw that have ducts releasing the complex venom between the teeth. The venom "...attacks the cardiovascular systems of mammals with a vengeance, causing blood pressure to plummet, inhibiting coagulation and inducing shock." Large animals, such as water buffalo, often will not succumb to the venom but will indeed die of septicemia many days later. However, the bacteria responsible do not originate in the mouth of the dragon, but rather in the fetid, warm waters of the local environment.

The author moves on to rattlesnakes, gila monsters, spiders, cone snails, and the blue-ringed octopus; relating her personal experiences, those of others, and a synopsis of current knowledge of their venoms and modes of action. There is an interesting depiction of a motor syapse and the myriad ways different venoms interfere with nerve transmission. Two important drugs manufactured from venoms are Prialt, which "completely shuts down the calcium channels at the ends of our pain-sensing neurons, blocking the transmission of the pain signal to the spinal cord," and Byetta, which "mimics a hormone, the glucagon-like peptide 1..., that encourages digestion and the production of insulin. The peptide stimulates insulin release only in the presence of high blood sugar, so unlike with regular insulin injections, there's no accidental hypoglycemia or "insulin coma" from too much insulin." The former was derived from a cone snail, and the latter, from gila monster venom.

This is an informative, well-written book that belongs on the shelf of every biologist, naturalist, and people interested in gaining a deeper understanding of venomous creatures and the venoms they possess.

BOOK REVIEW: Virus, An Illustrated Guide To 101 Incredible Microbes By Marilyn Roossinck

2016. Princeton University Press, Princeton, NJ. 256 p.

This hardbound book shines a bright light upon viruses, enigmatic entities that are the cause of many of the world's dreaded diseases, from yellow fever to Ebola. After a brief introductory chapters on the definition, classification, and history of viruses, the author provides detailed explanations of the seven major classes of viruses and how they reproduce. The rest of the book is a rogue's gallery of major viruses that infect humans, other animals, plants, and invertebrates. Beautiful transmission electron microscope (TEM) images accompany the treatment of each virus.

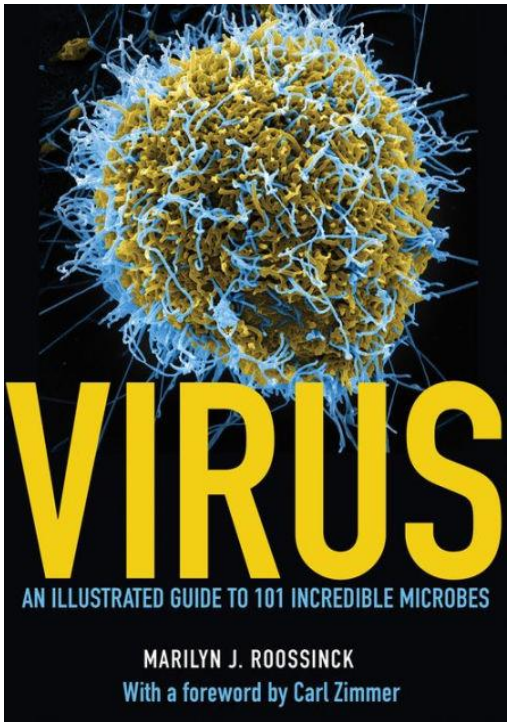
The yellow fever virus is the first human virus that was discovered. Sir Walter Reed proved that it was transmitted by mosquitoes. Before the sixteenth century, this disease was endemic to eastern Africa, where the local population had acquired some resistance. The slave trade spread yellow fever to both North and South America. It is transmitted by mosquitoes in the genus Aedes and the Asian tiger mosquito.

Other viruses featured are: the human rhinovirus A (common cold), measles, mumps, herpes, hepatitis C, HIV, ebola, dengue, human papilloma, influenza, polio, sars, west nile, and zeka. Many plant viruses affect agricultural crops, including tomatoes, potatoes, peas, rice, beans, barley, bananas, melons, plums, and tobacco.

The curvularia thermal tolerance virus is involved in a three-way symbiosis. *Curvularia* is a genus of ascomycete mushroom living inside the roots of certain grasses that tolerate soil temperatures over 122° F. However, only *Curvularia* that are infected with the curvularia thermal tolerance virus can confer thermal tolerance to the grasses. "When the fungus was cured of the virus it could no longer confer the thermal tolerance, but when it was re-infected with the virus, the thermal tolerance was restored. The fungus can be grown in culture, but without the plant it too cannot grow at high temperatures. All three - the virus, the fungus, and the plant- are required for thermal tolerance."

One of the most fascinating viruses discussed is *Pithovirus sibericum*. It is a large virus, about 1.5um long, that was recovered from 30,000-year-old ice cores in Siberia. When transferred to laboratory cultures, this ancient virus successfully infected, replicated, and killed an entire colony of amoebae within 20 hours. This raises the concern that perhaps global warming will release some ancient virus that may cause havoc in modern ecosystems.

This is a truly fascinating book that brings the rather esoteric study of viruses to life. It is also a good reference book on many of the world's most important viruses and the diseases they cause.



FIRST PROOF THAT BIRDS SNOOZE DURING FLIGHT

By Alice Klein, New Scientist Magazine Vol. 231, No. 3085
August 6, 2016

The debate has finally been put to bed. Wearable brainwave recorders confirm that birds do indeed sleep while flying, but only for brief periods and usually with one half of their brain.

We know several bird species can travel vast distances non-stop, prompting speculation that they must nap mid-flight. Great frigatebirds, for example, can fly continuously for up to two months. On the other hand, the male sandpiper, for one, can largely forgo sleep during the breeding season, hinting that it may also be possible for birds to stay awake during prolonged trips.

To settle this question, Niels Rattenborg at the Max Planck Institute for Ornithology in Seewiesen, Germany, and his colleagues fitted small brain activity monitors and movement trackers to 14 great frigatebirds.

During long flights, the birds slept for an average of 41 minutes per day, in short episodes of about 12 seconds each. By contrast, they slept for more than 12 hours per day on land. Frigatebirds in flight tend to use one hemisphere at a time to sleep, as do ducks and dolphins, but sometimes they used both.

"Some people thought that all their sleep would have to be unihemispheric otherwise they would drop from the sky," says Rattenborg. "But that's not the case – they can sleep with both hemispheres and they just continue soaring."

Sleep typically took place as the birds were circling in rising air currents, when they did not need to flap their wings.

Frigatebirds can't swim on the ocean, as they lack waterproof feathers, so the ability to dramatically cut down on sleep may have evolved out of necessity, says John Lesku at La Trobe University, Australia. "If you're a bird that spends your life at sea but can't land on it, this is really your only option," he says.

Photo by B. Voirin

Frigatebirds reaches a wingspan of over two meters. They are excellent gliders and can cover several hundred kilometers a day.

GOT MILK? ROACH MILK COULD BE A NEW SUPERFOOD

By Dinsa Sachan, Science News Magazine Vol. 190, No. 6,
September 17, 2016

Cows, buffalo, goats and sheep provide most of the world's milk today. But one day, people could be sipping milk from cockroaches, if some scientists get their way. Pacific beetle cockroach moms (molted shell of one of these roaches shown below) feed their developing young a milklike nutrient. Using crystallography on its proteins, chemists have shown that the roach milk is "three times more nutritious than cow's milk and four times more nutritious than buffalo's milk," says biologist Barbara Stay of the University of Iowa in Iowa City. The researchers would like to see cockroach milk turned into a protein supplement to feed hungry people.

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

MAIL TO:

Join us for the

149th ANNUAL MEETING OF THE KANSAS ACADEMY OF SCIENCE

April 7th & 8th, 2017

In Tomanek Hall
Fort Hays State University
Hays, Kansas