BEACON
An NSF Center for the Study of Evolution in Action

BEACON BUZZ

Bi-Monthly Newsletter
May 2013

Do your Friends and Family Make You Sick?

Sociality and Immunity in Hyenas

Katy Califf and colleagues' recent paper in *The Journal of Mammalogy* examined how sociality affects the variation and evolution of immunity in hyena populations.

Hyenas are an important large carnivore in the ecosystems they inhabit and are exposed to many diseases, however different hyena species show different degrees of sociality. This makes them ideal for studying how sociality impacts the level of variation or the rate of evolution of immune gene families, specifically the major histocompatibility complex (MHC).

"More social animals [are likely to] have more opportunities to pick up pathogens [from other members of their species]," Califf says, and previous studies have some found evidence to support this. Therefore, it was expected that these two hyena species would differ in the amount of variation in their immune system genes. However, when comparing the diversity of 3 MHC genes in spotted (social) & striped hyenas (solitary), Califf and colleagues found both species to be equally diverse in genes within the MHC and that variation also changes, or evolves, quickly within each species. Furthermore, at each MHC locus, the team found several instances of shared versions of the genes between the species.

These findings suggest that the same evolutionary pressures, "including a common ancestral pattern of carrion-feeding," has influenced MHC diversity more strongly in these hyena species than have more recent pressures like sociality.

Read more here: Califf K, Ratzloff EL, Wagner A, Holekamp KE, Williams BL, "Pervasive gene duplication and positive selection at MHC loci in two hyena species", *Journal of Mammalogy* 2013 94(2): 282-294.

Photo courtesy of Katy Califf.

EVOLVE THE BEACON LOGO!

There is still time to enter the BEACON Logo evolved art competition! Running from March 1st through May 31st, 2013, the goal of this competition is to evolve an alternative lighthouse to the BEACON lighthouse (at top) on the collaborative art evolution web site Picbreeder (http://picbreeder.org/). The top three lighthouses submitted will receive Visa giftcards of $200, $100, and $50 (1st, 2nd, and 3rd place, respectively). With the creative power of evolution, can you evolve BEACON's new logo?

You can join the competition by creating an account on Picbreeder (http://picbreeder.org/user/register.php). Make sure to provide a valid email address on your Picbreeder profile. We will be contacting the winners via the email address provided on their Picbreeder profile.

After you have created a profile, start evolving art! Picbreeder provides thorough instructions for how to evolve art here: http://picbreeder.org/gettingstarted.php

Once you are ready to make a submission to the competition, use the Publish feature (http://picbreeder.org/gettingstarted.php#publishing) to make the image publicly available. Tag the image with the text "BEACON." If you do not publish the image with the "BEACON" tag, it will not be considered for the competition!

On June 1st, we will collect all of the images submitted to the competition and organize a committee of BEACON scientists to select the top three images. Only images published on or before May 31st will be considered for the competition. We will publicly announce the winners and present awards by June 14th.

Good luck! We're looking forward to seeing everyone's creativity, so please enter as many times as you want and share widely!

Peace on the Plain

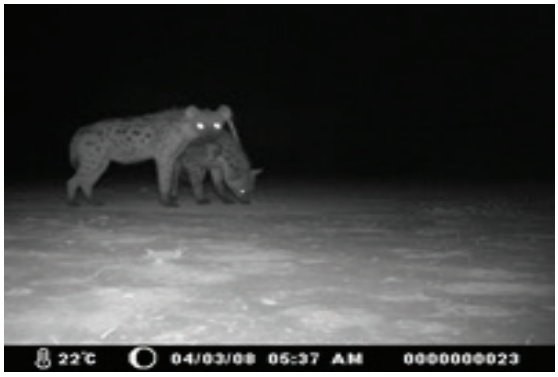
Imagine you're in the southern Rift Valley of Kenya, and suddenly you spot a predator—a hyena to be exact. Can you coexist, or does the hyena need protection from you?

Some research has shown that people and carnivores can coexist, but "there is a large body of thought that believes carnivores need their own protected space to survive," said Meredith Evans Wagner, a visiting scholar from the University of Florida in MSU's Center for Systems Integration and Sustainability.

Wagner set out to test this in the Rift Valley as a part of a research team, which included Paul Schuette (first author) and Scott Creel, of Montana State University, and Aaron Wagner, postdoctoral researcher at MSU's BEACON Center for the Study of Evolution in Action. The team spent over two years documenting the region's carnivores, using motion-detecting camera traps to capture images of the animals and people using four different areas of land with varying levels of human use.

"We found that while there were more striped hyenas in the conservation area, there also were striped hyenas in the buffer zone, close to the human settlement area," said M. E. Wagner. Additionally, as expected, the majority of carnivore photos were taken after dark, and most of the larger predators, such as lions and spotted hyenas, tended to be found in the conservation area that didn't include any human settlements.

Intriguingly, co-author A. Wagner found that "[t]he hyenas weren't avoiding [the buffer zone areas]; they were using the settlement area as a resource in addition to hunting." When the Maasai people in the area slaughter an animal for food, they throw the scraps out their back doors.



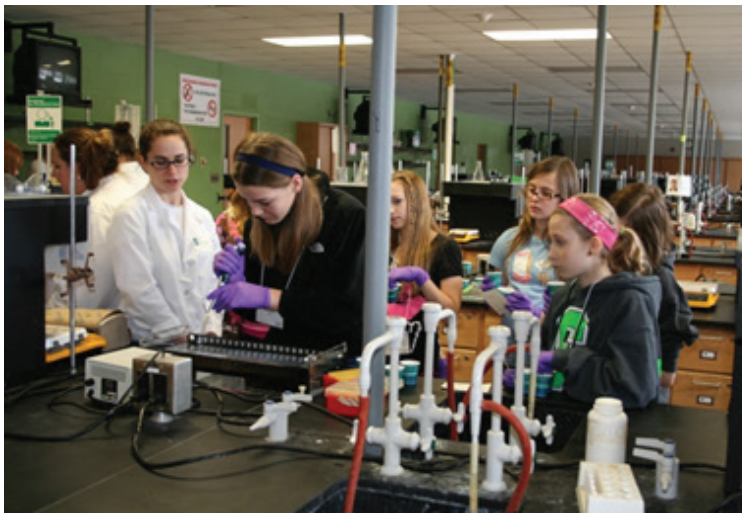
Because these doors form the edge of the buffer zone, hyenas come to feast on these scraps, yet interestingly, rarely killed Maasai livestock.

"Wildlife is clearly driven away from the permanent settlement areas... but the seasonal human migration out of the buffer zone keeps that area viable for wildlife," said A. Wagner. "Numbers drop when the cattle and people move in, but the striped hyenas seem to have habits that allow them to compensate. They do scavenge around Maasai settlements when the pickings are good, but they hunt, too."

Read more here: Paul Schuette, Aaron P. Wagner, Meredith E. Wagnerc Scott Creel. Occupancy patterns and niche partitioning within a diverse carnivore community exposed to anthropogenic pressures. *Biological Conservation* Volume 158, February 2013, Pages 301–312

Girls Math and Science Day

Keeping and Recruiting Girls in STEM Fields



It's a sad reality that most girls begin to write off careers in Science, Technnology, Engineering, and Mathematics (STEM) fields as early as their middle school years. In an effort to combat this phenomenon, BEACONite and MSU Graduate Women in Science (GWIS) Outreach Committee chair Michelle Vogel hosted Middle School Girls Math and Science Day on March 2nd on MSU's campus.

Michelle and her team of 25 dedicated GWIS volunteers spent many hours in January and February planning events, contacting presenters, and procuring sponsors, including our very own BEACON, as well as the MSU Council of Graduate Students, MSU Center for Service-Learning, and MSUFCU.

GWIS hosted this program for the second year after school district funds were cut for the 22-year program. Now in its 24th year, we're happy to say it is still a success.

About 100 girls and their chaperones attended a keynote lecture by a female MSU professor and four STEM activities of their choice. Volunteers from across 11 STEM departments at MSU presented hands-on activities ranging from wildlife forensics, to pi and probability, to vitals and heart rate during exercise. The day ended with an ice cream social, and we received wonderful feedback from chaperones on how much their girls enjoyed this event and are now more interested pursuing STEM careers!

Ancestry.*cow*?

Building Family Trees Isn't Just for Humans

What if we had family trees…for cows?

A genetic study of Longhorn and related breeds tells a fascinating global history of human and cattle migration.

To reconstruct the genetic history of Texas Longhorns, BEACONites Emily Jane McTavish and her advisor David Hillis at the University of Texas at Austin, along with colleagues from the University of Missouri-Columbia, analyzed almost 50,000 'genetic markers' from 58 different cattle breeds.

"It was known on some level that Longhorns are descendants from cattle brought over by early Spanish settlers, but they look so different from the cattle you see in Spain and Portugal today. So there was speculation that there had been interbreeding with later imports from Europe. But their genetic signature is completely consistent with being direct descendants of the cattle Columbus brought over," said Hillis, the Alfred W. Roark Centennial Professor in the College of Natural Sciences at University of Texas at Austin.

The study reveals that approximately 85 percent of the Longhorn genome is "taurine," or from domesticated wild aurochs in the Middle East around 8,000-10,000 years ago. The remaining 15 percent is "indicine," or from aurochs originally domesticated in India. As a result, Longhorns look more similar to purer taurine breeds such as Holstein, Hereford and Angus, which came to Europe from the Middle East, than they do to indicine cattle, which often have a characteristic hump at the back of the neck.

The Texas Longhorn breed are direct descendants of the first cattle in the New World brought over by Columbus and to the rest of the continent through later Spanish colonists, the paper suggests. As the Spanish moved northward into Texas at the end of the 17th century, the cattle escaped or were turned loose on the open range, where they remained mostly wild until being rounded up for beef after the Civil War. During this time, under the pressures of natural selection, Longhorns were selected for survival traits that had been artificially bred out of

their European ancestors, such as longer horns for defense and better heat and drought tolerance. Their hybrid ancestry likely contributed important genetic variation for selection to act on.

"Living wild on the range, [Longhorns] had to become very self-sufficient. Having that genetic reservoir from those wild ancestors, made it possible for a lot of those traits to be selected for once again," said McTavish. As the Earth warms, these genes may prove valuable to ranchers looking to breed the Longhorns' toughness into other breeds of cattle.

So, in the face of global change, we can rest assured knowing that these hearty cows have taken a long journey and that their family history will live on.

Watch the video (QR code, right) or-read more here: Emily Jane McTavish, Jared E. Decker, Robert D. Schnabel, Jeremy F. Taylor, and David M. Hillis New World cattle show ancestry from multiple independent domestication events *PNAS* 2013 : 1303367110v1-201303367.

Photo of McTavish courtesy of Liz Milano.

Engineering Better Teachers

C3-PO, Optimus Prime, and Bender: These are 3 robots that have captivated our imagination. But could robots be used to help make better science teachers?

This summer, middle- and high-school science teachers from around Michigan will gather at MSU for a very real robotics-themed program: Engineering's Research Experiences for Teachers Program. Here, teachers have the opportunity to refine and infuse excitement in teaching STEM – science, technology, engineering and mathematics. This program recently received a $500,000 grant from the National Science Foundation to train 10 to 12 teachers yearly for the next three years.

"These days, robots are something everyone can relate to," said Xiaobo Tan, an associate professor of electrical and computer engineering, BEACONite, and project co-director. "And it works well for us because as a discipline, in terms of research and education, robotics is very multidisciplinary, covering physics, biology, chemistry, mathematics and others."

The teachers will be working side-by-side in labs with eleven MSU faculty members and their graduate students from four College of Engineering departments. They will learn research methods and develop innovative curricula for their own classes, with the ultimate goal of inspiring students to pursue STEM careers.

"Many of the teachers in our schools are teaching the same way they've done it in the past," said Drew Kim, assistant to the dean of the MSU College of Engineering and co-director of the project. "The STEM field is constantly evolving and students need to be better prepared for their careers."

We hope these robots will help them do just that.

BEACON Congress: Summer 2013

Register:
Don't forget to register for this year's Congress (August 12-15) at Michigan State. Please register by June 15th here: http://goo.gl/Okxt4

Attendance at the conference is free for all BEACON members, and for those traveling from partner institutions, BEACON Headquarters will make your hotel reservations and book flights.

Help Plan:
This is YOUR Congress - help us make it the Congress you want! Provide your input on the BEACON Wiki in two different ways:

1. Suggest Sandbox Sessions: These are brainstorming, networking, and research planning sessions, designed to bring together people with overlapping interests who are nterested in working on a problem together.

2. Suggest Tutorials/Workshops: These are sessions designed to teach something, often in a hands-on way.

To access the Wiki, log into the intranet and select "Wiki" in the top menu. Under "Events" you will see Congress 2013 - follow that link. Please feel free to provide as much or as little detail as you like. If you would like to lead a session (or suggest someone else to lead a session!), this is the place to do it!

Communicate with BEACON: Wiki and Talks

New BEACON Wiki: The BEACON Wiki has been redesigned. Log into the BEACON intranet and you will receive an email with instructions on how to complete the activation of your wiki account (check your spam folder!). Complete those steps and you're ready to use our Wiki!

Give a BEACON talk this summer!: BEACON talks are fun, and if you are involved in a BEACON-funded project, you are expected to give a presentation on your work. All BEACON members are welcome to give talks - we want to hear from you. Email Danielle Whittaker (djwhitta@msu.edu) for details.

Congratulations, BEACONites!

External Advisory Committee:

Joan Strassmann (Washington University in St. Louis), Elected National Academy of Sciences Member

Judy Scotchmoor (University of California, Berkeley), 2013 winner of the Society for the Study of Evolution's Stephen Jay Gould Prize

Faculty:

Jeffrey Conner, Distinguished Sabbatical Scholar, NESCent

Kay E. Holekamp, Elected AAAS Fellow

Students:

Sara Garnett, *Jeopardy!* Champion (pictured right)

Nora Lewin, MSU Zoology John R. Shaver Graduate Research Award

Emily Weigel, MSU College of Natural Science Tracy Hammer Professional Development Award

Anna-Reh Gingerich, 2013 Midwest Ecology and Evolution Conference: Best Undergraduate Poster

And of course, special congrats to our graduates! Best of luck!

Curious About Submitting Content?

New to BEACON? Veteran BEACONite? Here's how to submit possible content to the newsletter:

1. Do what you're already doing: Log into the BEACON Intranet (accessible through the BEACON site: http://beacon-center.org, at the "For Current Members" tab.) Then go to the "Outputs and Activities" tab at the top banner, and fill in information about your papers published, grants received, etc. New entries will be flagged automatically.

2. Tweet about it. Tweet about what you'd like to cover as it happens to @BEACON_Center with the hashtag #news. We'll see it, and so will others!

3. Email content directly. Please email weigelem@msu.edu if you've got content you'd like to highlight that doesn't fit into the website categories.