



BEACON BUZZ

BI-MONTHLY NEWSLETTER
MARCH 2013

DARWIN DISCOVERY DAY

Celebrating Evolution with the Public

The Michigan State University Museum celebrated its 9th annual Darwin Discovery Day on February 10th. This year's theme, "Tails of Scales," gave special attention to Charles Darwin's study of reptiles, and featured hands-on activities, tours and collections for an afternoon of science, exploration and discovery.

Several BEACONites (some pictured below) were in attendance and donated their time to share the marvels of evolution. Within the BEACON exhibit in the West Gallery, for example, BEACON members shared about the evolutionary

paths of hyenas and bacteria, and how evolution can be applied to computation and robots.

The museum's preliminary numbers indicate 592 visitors (a new record!), and the Darwin Discovery Day planning committee is already planning for next year's festivities. For those of you who will be on MSU campus next year, save the date: February 9, 2014!

If you can't wait until next year, check out the MSU Museum's West Gallery. Exhibits entitled "Hyenas Rule!" and "50,000" are on display regularly as a part of a series featuring BEACON!



EVOLVE THE BEACON LOGO!

We are happy to announce that the BEACON is hosting an 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 If you do not publish the image with the "BEACON" tag, it will not be considered for the competition!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!

BEACON VIDEO HEATS UP THE WEB

Check in out at <https://www.youtube.com/watch?v=9dgCJ9wetql>

If you haven't seen it yet, you're missing out: BEACON's got a video!

The soon-to-be YouTube sensation aims to give a concise introduction to what BEACON is, why it was created, and how the fields of biology, computer science, and engineering can interact. This is especially important as it shows the human faces behind the collaborative work that we do at BEACON, and points to what we could possibly accomplish with these collaborations.

As most of the interviews for this video were scheduled during the annual BEACON congress, there is a good representation of BEACON members across all five partner universities and fields. See if you can spot yourself!

The creation of the video was a joint effort of Danielle Whittaker, Erik Goodman, and Amol Pavagandkar. Based on the success of this first video, this team is now discussing the possibility of making a longer video on the process of generating novel ideas.



MARVELING AT MARBLE

Teaching Elementary School Students About Evolution

Telling kids something is cool is one thing. Getting them interested in it themselves is another.

On January 29th, a group of BEACONites, led by postdoc Heather Goldsby, set out to expose 4th graders at Marble Elementary to the wonders of science and computers. The goal was to reach students close to the age where they begin to lose interest in science and computer science—a proactive alternative to waiting until they get to college.

Goldsby's BEACON group has successfully partnered with teachers on many occasions to bring "evolution in action" into schools. At each event, volunteers have students first brainstorm and recognize that computers that can be found everywhere—from phones to gaming systems, household electronics to cars. The hope is that kids realize how useful and integrated computers are in their daily lives and that they "are used for more than geeky things." From here, volunteers engage the students in how computers, as fast machines, can be used to study things that take a long time, such as evolution. With the focus on long-term processes like evolution, students can apply what they already know about environments and animals (eg. giraffes, whales, cheetahs, etc.) to understand general concepts like adaptation and natural selection in both natural and digital worlds.



Once the students have a general feel for evolution, the 'real' fun begins. In small groups, the students work with a scientist to evolve either pictures (using <http://picbreeder.org>; pictured at right) or 3D objects (using <http://endlessforms.com>). Within each of these programs, the students start with a photo (or object) and then collectively pick 'parents' from a panel of photos to 'breed'. This process repeats for as many generations as the students like (far more than can be done in the classroom visits!). During the photo picking and breeding process, the scientists can explain processes like recombination and selection. The scientists also have the opportunity to insert mutation, that is, to point out the mutation rate button; using this, the scientists explain and explore with the students how similar or different the pictures are to their parents at low or high mutation rates.

"Because the kids themselves are interacting with the process by selecting the parents, the mutation rate, and letting things evolve, they gain a more intuitive feel for how evolution works," Goldsby notes. The volunteers have been uniformly excited and refreshed by the level of curiosity and intelligence these students have shown, as well as the amount of fun inherent in sharing the wonders of science and computers with youth.

MOVE OVER X-MEN: OTHER MUTANTS ARE SAVING SPECIES

Rapid environmental change is a worldwide phenomenon, and in order to survive, many species must biologically respond to changing environmental conditions, such as increased heavy metals or temperatures. Logically, previous studies have demonstrated that species respond best to gradual change in environmental conditions, as potentially-beneficial mutations are given more time to arise in a greater number of individuals still alive in the population. Now, biologists at the University of Washington have demonstrated another reason: many beneficial mutations are dependent on prior mutations that may only emerge as conditions slowly worsen.

Using populations of a species of bacteria, *E. coli*, researchers evolved hundreds of populations under environments with a lethal antibiotic which was increased at gradual, moderate and rapid rates. Researchers then examined the genes in surviving populations and found multiple mutations. Then, using genetic engineering, the scientists isolated each mutation and found that some mutations were only able to ‘protect’ the population at low antibiotic concentrations. However, those mutants “predispose the lineage to gain other mutations that allow it to escape extinction at high stress,” the study’s authors wrote.

“That two-step path leading to the double mutant is not available if a population is immersed abruptly into the high-concentration environment,” Ben Kerr, the study’s corresponding author, said. Such populations under rapid environmental change must then rely on single mutations for protection against the antibiotic, thus environmental change can significantly impact evolutionary trajectories. In this system in particular, the authors have found that

“rapid environmental change closes off paths that are accessible under gradual change.”



Above: Small wells contain individual populations of *E. coli* either prospering or perishing under different levels of a red-orange colored antibiotic (Credit: S Hammarlund/ University of Washington)

Please congratulate these authors on excellent work in understanding how evolution can work!

Read more here: Lindsey, HA, Gallie, J, Taylor S, and Kerr, B. Evolutionary rescue from extinction is contingent on a lower rate of environmental change. *Nature* 2013. DOI: 10.1038/nature11879

UNCOVERING I-PYTHON NOTEBOOK

The January–February BEACON Student/Postdoc group event highlighted IPython Notebook. Randy Olson, a graduate student at MSU, walked us through a hands-on workshop on using IPython Notebook to record and expedite research.

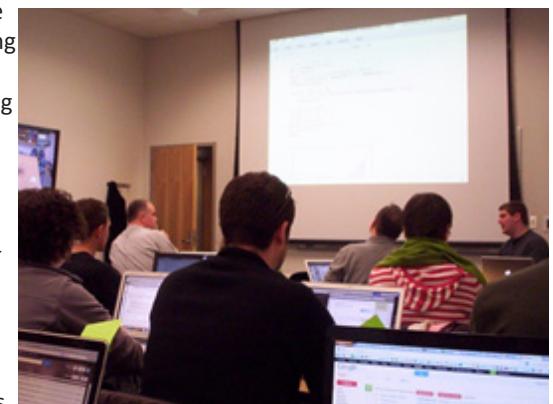
With the goal of this workshop being running IPython Notebook for research, attendees were helped to install IPython Notebook on their own machines and introduced to the current (and forthcoming) features that IPython Notebook has to offer. A few attendees were also able to quickly log and run an experiment and analyze the results!

Olson, the workshop leader, is very much a proponent of IPython Notebook. So why IPython? “I quickly learned in grad school how important it is to log your research progress. It helps you guide your work, measure your daily progress, and most importantly, not repeat the same experiments and analyses over and over again. I originally started doing this in RTF (rich text files), but it lacked the interactive coding portion of it, e.g., what if I wanted to change the range of a graph real quick?”

After his introduction to IPython Notebook, Olson has found it is everything he wanted and more. “IPython Notebook integrates research logging, data exploration, data analysis, graph generation, and soon presentations as well -- streamlining the entire research workload into a single, user-friendly product.” And it’s completely free!

Beyond IPython Notebook for logging research, it can be a great teaching tool, too. Teachers of Computer Science used IPython Notebook’s interface to teach fundamental programming skills with interactive, image-focused tutorials, such as IPythonBlocks notebook. Additionally, “organizations like Software Carpentry are using it to teach scientists the computing skills they require to complete their research.”

The IPython Notebook workshop was well received by both on- and off-site attendees. The workshop was



“simple and easy to follow” and “an informative introduction to using IPython Notebook,” says Janet Williams (University of Idaho). She also notes that there is “sufficient documentation online so you could participate from anywhere,” so please be on the lookout for another one of Olson’s helpful workshops!

For more info, please contact Olson at olsonran@msu.edu.

BETTER RESEARCH MEANS STIFFER COMPETITION

2013-2014 Budget Requests Have Been Reviewed

This year, BEACONites were again given the difficult task of proposing and reviewing annual funding requests to support the Center's novel research.

To give an overview of the process this year, a total of 93 requests were received. Each submitted request consisted of an abstract (a short overview of the project), two-page project narrative, Curriculum Vitae for each author of the proposal, and short descriptions of how the request addresses various BEACON criteria. Once submitted, requests were then assigned to anonymous reviewers by either Thrust Group (research area 'concentration') Leaders or the Education or Diversity Steering Committees. These reviewers then evaluated the project proposals, noting weaknesses or problems along with suggestions for improvement. These proposal reviews and comments, as well as the ranking and comments it received by leaders within each group, were then passed to BEACON's Executive Committee. Here the committee assigned the overall ranking of proposals, which included prioritizing proposals across

thrust groups and committees and considering other factors (available institutional budgets, amount of transfer, type of project, etc.).

From the original 93 proposals, a total of 55 projects, ranging in size from about \$7,000 to nearly \$200,000, were funded. Despite the best funding rate yet (59%), the high overall quality of the requests submitted this year made decisions tough. Unfortunately, many worthwhile projects could not be funded—this year. There is always next year to revise and submit requests, so keep up the good work, BEACONites! Thanks also to the many BEACONites who contributed time to review the proposals. The process would not work without good peer review, and we are grateful to have so many dependable reviewers!

As always, BEACON is looking for ways to improve the process. If you have feedback or suggestions, please forward them to Danielle Whittaker and Erik Goodman. We will also have a session at the BEACON Congress to discuss ways to make the process smoother.

WANT TO IMPROVE YOUR COMMUNICATION?

Interested in being a part of the BEACON Graduate/Postdoc Communication and Media Group?

The focus of this group includes professional writing feedback and discussion, as well as critique of other forms of professional communication (writing, presentations, etc.) and media (video blog posts, etc.). The overall goal is to improve how we communicate our research interests to both other scientists and the public.

Please contact Matt Rupp if you are interested in participating at ruppmatt@msu.edu



CURIOS 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.