

# *The Signal*

Monthly newsletter of the W. M. Keck Center for Behavioral Biology  
at North Carolina State University  
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***This issue of The Signal contains the Announcement and Call for Abstracts of the Eighteenth Annual Graduate Student/Postdoc Symposium of the W. M. Keck Center for Behavioral Biology.***

## ***Publish with Success***



*From left to right: Editors Gregory Copenhaver, Hillary Sussman and Peter Johnson.*

The W. M. Keck Center for Behavioral Biology in conjunction with the Comparative Medicine Institute and the Program in Genetics co-sponsored a workshop on publishing for graduate students and postdocs. The workshop featured Hillary Sussman, Executive Editor of Genome Research, a high impact journal with focus on innovative research in “omics” areas, Gregory Copenhaver, Editor-in-Chief of PLoS Genetics, one of the leading open access journals in genetics research, and Peter Johnson, Editor-in-Chief of Tissue Engineering, which focuses on translational research that leads to engineering applications. Whereas the three journals have different perspectives, they converge on editorial procedures and criteria for publication. All three employ a two-step process for evaluation of submitted manuscripts, where editorial board members decide whether the submission is suitable for the journal prior to sending it for review. All three editors stressed the importance of a well-crafted abstract and cover letter in

facilitating this decision. Initial communication with the editors should emphasize the novelty, significance and appeal to a broad readership.

The discussion focused heavily on the review process and how editorial decisions are rendered sometimes in the face of contrasting reviewer opinions. The take-home message of these discussions is that the reviewers are advisory, that the editors have to weight their input, and that, yes, editors are human and, although mostly their decisions are correct, they are not infallible. Interactions with editors are encouraged, both prior to manuscript submission, or regarding revisions after a paper is reviewed. Often the editors can give advice of how to improve the manuscript to render it suitable for publication. The best quote of the day was “There is no manuscript that cannot be improved by shortening it.” Thanks to Alix Berglund for organizing this informative workshop and to Julie Nettifee for expert administrative assistance.

***Don't Miss Brain Awareness Night at the North Carolina Museum of Natural Sciences, March 16, 6:00-9:00 pm!***

# QTL and Gene Regulatory Networks for Seeing through the Eyes of a Fish

by Kate Coyle

On February 9<sup>th</sup>, Dr. Karen Carleton from the Department of Biology at the University of Maryland, College Park, visited NC State and gave a seminar entitled “QTL and gene regulatory networks for seeing through the eyes of a fish.” Carleton’s lab uses Lake Malawi cichlid fishes as a model for studying the genetic basis and evolution of visual systems. Different species of cichlids have evolved incredibly variable pigmentation patterns during their invasion into the East African rift lakes, and it is thought that their various vision systems may help these fish identify like individuals and reinforce species boundaries. Carleton’s work seeks to elucidate the molecular mechanisms underlying this variation in visual systems and determine the effect this variation has on organismal fitness.

Cichlid retinas are composed of three types of cone cells in a highly organized pattern. The cone cells in a particular fish are determined by a suite of seven cone opsin genes, all of which, when expressed, allow the fish to see a different wavelength of light. Carleton presented four perspectives used to explore the underlying mechanisms that allow tuning of visual sensitivity in this system: variation in opsin gene sequence, individual opsin gene expression, co-expression of different opsin genes, and temporal patterns in opsin expression.

To investigate the effects of opsin gene sequence variation on visual sensitivity, Carleton worked with collaborator Ole Seehausen and studied cichlids from Lake Victoria. Cichlids in Lake Victoria have evolved in parallel with those of Lake Malawi, exhibiting many of the same adaptive traits. Lake Victoria is more turbid than Lake Malawi, though, creating slightly different selective pressures on its resident fishes, because shorter wavelengths of light cannot permeate murky water. Indeed, Carleton found coding sequence changes which correlated with mate choice, because they caused different wavelengths of light to be detected by fishes in shallow versus deep water. The genotype of the female affected choice of a mate, thus influencing the evolution of male pigmentation.

In Malawi cichlids, Carleton further explored the relationship between vision and foraging behavior, finding correlations between expression of UV opsins, food source, and foraging depth. Additionally, her group sought to identify patterns in co-expression of different opsin proteins. They found opsin proteins to absorb different wavelengths of light in a particular pattern along the dorsal-ventral axis of the retina. While the dorsal



*Dr. Karen Carleton*

cones were specialized for the wavelengths of light shining directly down into the water, the ventral cones were tuned to absorb the wavelengths reflecting off the substrate on the bottom of the lake. Carleton’s group has also worked to identify opsin expression changes throughout development and to test plasticity in these patterns in laboratory conditions.

Moving forward, Carleton’s lab is using hybrids between different Malawi species to find opsin-controlling trans-QTL. This, combined with association mapping of traits across about 50 species, should allow for fine mapping of factors involved in control of opsin expression. Several candidate regions are currently being investigated as potential trans-acting regulatory regions for particular opsin genes. The group is also working with a dataset of 27 retinal transcriptomes to build a weighted gene correlation network in hopes of further improving their understanding of opsin expression regulation and, more broadly, the mechanism behind the tuning of the cichlid visual palette.



## Seminars

On **March 9**, 3:30 pm, Dr. Marlene Zuk from the College of Biological Sciences at the University of Minnesota, will present a seminar, titled “Rapid evolution in silence: adaptive signal loss in the Pacific field cricket.”

The seminar will be in 3503 Thomas Hall.

On **March 16**, 3:30 pm, Dr. Jon Kaas from the Department of Psychology at Vanderbilt University, will present a seminar, titled “Evolution of the Human Brain.” The seminar will be in 3503 Thomas Hall.

At 7:00 pm, Dr. Kaas will present a Science Café talk in the Daily Planet Café of the North Carolina Museum of Natural Sciences as part of Brain Awareness Day.

### Don't Miss Brain Awareness Night at the North Carolina Museum of Natural Sciences

From flies to humans and every animal in between, brains make behavior happen. Come explore the brain/behavior connection at a special Science Café March 16! From 6-7 pm, meet local neuroscientists and interact with hands-on brains- and behavior-themed exhibits suitable for all ages. Short, accessible talks by neuroscientists in the SECU Daily Planet Theater will celebrate national Brain Awareness Week and tell you what local neuroscientists are discovering. At 7 pm, our special guest, prominent neuroscientist Dr. Jon Kaas from Vanderbilt University, will lead the Science Café “Evolution of the Human Brain.” Afterward, the exhibits will re-open for one final celebration of brains and behavior.

## Publications

Grau-Perez, M., Kuo, C. C., Spratlen, M., Thayer, K. A., Mendez, M. A., Hamman, R., Dabelea, D., Adgate, J. L., Knowler, W. C., Bell, R. A., Miller, F. W., Liese, A. D., Zhang, C., Douillet, C., Drobna, Z., Mayer-Davis, E., Styblo, M. and Navas-Acien, A. (2017) The association of arsenic exposure and metabolism with type 1 and type 2 diabetes in youth: the SEARCH case-control study. *Diabetes Care* **40**: 46-53.

Meunier, C. J., Roberts, J. G., McCarty, G. S. and Sombers, L. A. (2017) The background signal as an *in situ* predictor of dopamine oxidation potential:

improving interpretation of fast-scan cyclic voltammetry data. *ACS Chemical Neurosci.* **8**: 411-419.

Smith S. K., Lee, C. A., Dausch, M. E., Horman, B. M., Patisaul H. B., McCarty G. S. and Sombers L. A. (2017) Simultaneous voltammetric measurements of glucose and dopamine demonstrate the coupling of glucose availability with increased metabolic demand in the rat striatum. *ACS Chemical Neurosci.* **8**: 272-280.

Ko, A. E., Jensen, K., Schal, C. and Silverman, J. (2017) Effects of foraging distance on macronutrient balancing and performance in the German cockroach *Blattella germanica*. *J. Exp. Biol.* **220(Pt 2)**: 304-311.

Sierras, A. and Schal, C. (2017) Comparison of ingestion and topical application of insecticides against the common bed bug, *Cimex lectularius* (Hemiptera: Cimicidae). *Pest Manag. Sci.* **73**: 521-527.

Douros, J. D., Baltzegar, D. A., Mankiewicz, J., Taylor, J., Yamaguchi, Y., Lerner, D. T., Seale, A. P., Grau, E. G., Breves, J. P. and Borski, R. J. (2017) Control of leptin by metabolic state and its regulatory interactions with pituitary growth hormone and hepatic growth hormone receptors and insulin like growth factors in the tilapia (*Oreochromis mossambicus*). *Gen Comp Endocrinol.* **240**: 227-237.

## Of note...

**Hongmei Li-Byarlai** released a podcast interview with genetics seminar speaker Dr. William Jeffery, which can be accessed at <https://soundcloud.com/nnpodcast/eye-development-of-cave-fish-dr-bill-jeffery>.

**Saahj Gosrani**, an undergraduate research intern in the Sombers lab, was selected to represent NCSU at the ACC Meeting of the Minds Conference that will be held at Duke University March 31 - April 2, 2017.

**Leslie Sombers** gave a talk at the Winter Brain Research Conference in Big Sky, MT, on electrochemical measurements of real-time opioid peptide fluctuations in the midbrain and striatum. She also won first place at the snowboard competition at the Smitty Stevens Memorial Ski/Snowboard Race.

To contribute to The Signal, to be placed on our mailing list or for information about the W. M. Keck Center for Behavioral Biology, contact Dr. Robert Anholt, Department of Biological Sciences, Box 7614, North Carolina State University, Raleigh, NC 27695-7614, tel. (919) 515-1173, [anholt@ncsu.edu](mailto:anholt@ncsu.edu).

Visit our website: <http://keck.sciences.ncsu.edu>

# Symposium 2017

## Announcement and Call for Abstracts

**The Eighteenth Annual Student/Postdoc Symposium of the W. M. Keck Center for Behavioral Biology will be held on Friday, April 21, 2017, in the Stanley G. Stephens room, 3503 Thomas Hall, at North Carolina State University. Participation is open to all students, postdoctoral fellows and faculty, and is mandatory for students enrolled in the Concentration for Behavioral Biology.**

### Preliminary Program

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8:30	Breakfast
9:15	Welcome by Dr. Robert Anholt, Center Director
9:30	Symposium
10:45	Coffee break and group photograph
11:15	Symposium
12:30	Lunch
1:30	Symposium
3:00	Break
3:30	Symposium
5:00	Reception

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Presentations will be 12 minutes with 3 minutes for discussion. Participants should submit an abstract by e-mail to Andrea Vogel (arvogel@ncsu.edu) or Samantha Smith (sksmith4@ncsu.edu) no later than **April 7**. The abstract should contain no more than 300 words without figures or tables. It must provide a title and the name of the presenting author (without co-authors or affiliation).

Undergraduate students are invited to submit abstracts for poster presentations.

Trainees within their first year may present their future research objectives. Advanced trainees will present progress of their research. Computer-assisted projection and a PC-type laptop will be available for PowerPoint presentations. All presentations must be rehearsed with the mentor.

Breakfast, lunch and a reception with hors d'oeuvres will be provided.

**The W. M. Keck Center for Behavioral Biology gratefully acknowledges generous support from our corporate sponsors.**

