

The Bulletin

Science Engineering & Technology Gateway Ohio



The Art of Science Community

SETGO hosts practicing professionals in a wide range of fields associated with STEM careers in research and innovation, from Astrophysicists to Zoologists and everything in between. Attend these events to find out how STEM research fields contribute to increasing our knowledge of the social and ecological environments in which we live. Talks centered on a common theme 'Building a Better Environment,' demonstrate how we can make positive contributions towards a better society while pursuing careers in the STEM field of our choice.

Events are free and open to faculty, staff, students, and the general public - so bring your family and friends. These gatherings attract an average audience of 55 guests (and up to 110) including high school students and local community professionals in related STEM fields.

Start times and locations can be found on the website at <http://www.bgsu.edu/setgo/asc.html> or call the SETGO office at 419-372-4238.

Right: Dr. Ed Kravitz, George Packer Berry Professor of Neuroscience, Harvard Medical School, presenting the April 2010 Art of Science talk. He shared his scientific journey from the founding of neurobiology and discovery of GABA at Harvard in the 60's to current studies of aggression in the "Fruit Fly Fight Club."

Upcoming ASC's...

2/15/11 - Dr. Craig Zirbel, Dept. of Math & Statistics, BGSU, *Bioinformatics*

3/22/11 - Dr. Ken Street, Materials Research Engineer, NASA, *Living on a Dusty Moon*

4/12/11 - Dr. Arnold Caplan, Professor & Director of Skeletal Research Center, Case Western Reserve University, *Stem Cell Research*



Dr. George Bullerjahn
9/21 - Great Lakes Microbes

In case you missed it...



Katie McKibben
10/19 - Ohio Water Quality



Dr. Rupali Chandar
11/16 - Space Archaeology

... past Art of Science Community presentations are available for viewing on the ASC page of the SETGO website at www.bgsu.edu/setgo. Fall 2010 videos available now.

Owens Ready Bridge (IDS 290, ORB)

With some minor changes to the 2010 ORB program, Owens faculty Anne Bullerjahn (genetics), Joanne Roehrs (ecology), Erika Scheufler (chemistry), Pam Krompak (math), with the help of two peer mentors, Jean Adelpheia-Long and Wendy Obradovich, prepared a cohort of 29 students to meet the academic challenges of their upcoming fall semester. Along with incoming OCC or BGSU freshman and newly-decided STEM majors entering their second year at Owens, a welcome adjustment was the extension of the Owens Ready Bridge opportunity to include rising high school seniors. A popular feature of ORB was offering a choice of morning or afternoon sections to allow students to participate in the ORB while also maintaining a part time job and enjoying some of their usual summer vacation activities.

GRAMS...

Student who begin their STEM studies at Owens and plan to transfer to BGSU to complete a 4-year STEM degree are eligible for the SETGO

2010 OWENS READY BRIDGE



Above: Led by instructor, Joanne Roehrs, participants collected data analyzing water quality and biodiversity along the Maumee River as part of the Scenic Rivers Water Quality Monitoring Program.

Below: Penta High School Senior, Jon Stone, hard at work in the Owens Ready Bridge Chemistry Laboratory.



GRAMS Scholarship. Participating in the Owens Ready Bridge is a great way to jumpstart your STEM career. Following up with SETGO Summer Research and the GRAMS scholarship opportunity can help achieve your goals. Additional requirements and application information can be found on our website.

Housing options for ORB participants...

Although SETGO provides no direct funding for housing during the 4 weeks of ORB, many affordable housing options are available for students who live beyond the usual college commute to Owens. Contact the Program Manager, Liz Ross at 419-372-4238 or <setgo.bgsu.occ@gmail.com> for further information and help in locating local accommodations.

GRAMS 2010-2011 (GRANTING ACCESS TO MATH AND SCIENCE) SCHOLARSHIP AWARDED TO FOUR SETGO STUDENTS



Brittany Rayford:
ORB '10



Amanda Ramirez:
SSR '09



Timothy Speegle:
ORB '09 & SSR '10



Joshua Bittner:
ORB '09

GRAMS scholarships are supported by funding from the National Science Foundation (S-STEM #DUE-0850026) grant awarded to partner institutions BGSU, Owens and Terra Community Colleges. Scholarship recipients receive two-years of tuition for unmet financial need at their community college, and a further two years when they transfer to BGSU to complete a 4-year degree in STEM. SETGO recipients for 2010-11 are Brittany Rayford, ORB '10 scholar, along with Amanda Ramirez SSR'09 scholar, Timothy Speegle ORB'09 & SSR'10 scholar, and Josh Bittner ORB'09 scholar. See our website www.bgsu.edu/setgo for eligibility requirements and application forms for GRAMS scholarships.

Summer Research 2010



Above: Dr. Sheryl Coombs and her SSR students getting to know one another at the orientation event on the first day of the 10-week program

The second year of SETGO Summer Research (SSR) saw 40 student participants partner with 24 dedicated BGSU faculty mentors to attack a wide range of research questions from reverse engineering of wind turbines, to the action of glycosaminoglycans in the blood clotting cascade.

The SSR objective...

This SETGO Summer Research experience at BGSU provides students an opportunity to gain the kind of research experience that they ordinarily might not see until graduate school. A stipend of \$3,500 approximates what students could earn in an average summer job and frees them from such work obligations to instead gain a more meaningful experience contributing to their long term career goals.

SSR Weekly group meetings...

These group meetings expose students to the collaborative nature of science, broaden their perspectives in STEM areas other than their speciality, and increase awareness and expectations with respect to professional behavior. Presentations from BGSU's Environmental Health & Safety, the Career Center, and Library Services describe available campus resources to ensure best practice in data collection, reporting, and presentation at research symposia. Practicing scientists, BGSU's Dr. Andrew Layden (Physics and Astronomy) and Peter Gorsevski (Geology) among others shared their stories, career paths, and research advice from academic and business perspectives.



Above: Students Ryan Brown, Adrienne Snyder and their SSR colleagues listen attentively to Andrea Guitierrez describing resources available at the BGSU Career Center during a SSR weekly group meeting.

SETGO Summer Research Roundup...

On July 23, SETGO hosted its second research symposium in the Bowen Thompson Student Union. Over 100 family, friends, mentors, and administrators from BGSU and OCC gathered to share the students' research achievements. See their posters at <http://www.bgsu.edu/setgo/ssrscholar09.2.html>



Above: The SETGO Summer Research 2010 cohort gather for a group photo at the SSR Roundup.

Interested in participating in SSR next summer? Stop by the SETGO office (328 Life Sciences, BGSU) for application forms, or download them at <http://www.bgsu.edu/setgo/ssr.html> Deadline is March 1. Call Program Manager, Liz Ross at 419-372-4238 for additional information.

FACULTY MENTOR IN FOCUS:

Dr. Robert Huber

lobsterman.bgsu@gmail.com

Professor of Biological Sciences, and Associate Editor for *Acta Ethologica*.

RESEARCH AREAS

Neuroethological, pharmacological, and molecular approaches are used to unravel the neurochemical mechanisms underlying motivational states and behavior. Current research efforts focus on drug sensitive reward in crayfish and the behavioral genetics of hunting behavior in dogs.

TEACHING

Biol 4200/5430
Animal Behavior

Biol 6800
Advanced Statistics

FROM THE DIRECTOR

This bulletin provides highlights of SETGO's 2nd year, and we hope you find the updates informative and relevant. Science, technology, engineering, and math (STEM) education and workforce needs are a priority for us all. As SETGO moves into its third year, we plan to strengthen our connections to you, and we encourage you to contact us whenever you have a suggestion to help us reach our goals.

A handwritten signature in blue ink, likely belonging to the director mentioned in the text.

Crayfish and Drug Addicts: The Value of Evolutionary Thinking

by Paul Patton

Research Assistant
Indiana University, Bloomington

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WHAT DOES THE THEORY OF EVOLUTION TELL US ABOUT THE HUMAN PROPENSITY FOR DRUG ADDICTION...?

It tells us quite a bit, according to Dr. Robert Huber at Bowling Green State University. Huber found that the crayfish, a lobster-like crustacean, can become addicted to cocaine, nicotine, and amphetamine much as humans do. At first blush, this was a surprising finding, since it's hard to imagine two more different creatures. Crayfish are arthropods and humans are vertebrates. As members of different animal phyla, they have fundamentally different body plans that have been evolving independently for more than 600 million years. A crayfish's skeleton, for example, is on the outside of its body, whereas the human skeleton is on the inside. A human's nerve cord, the spinal cord, runs down its back. A crayfish's nerve cord runs down its belly. The brains of humans and other vertebrates are very differently organized from that of the crayfish and other arthropods. Yet underneath it all, Huber found that the two species have a strikingly similar weakness for addictive substances.

Huber tested crayfish with a technique called place conditioning. He gave them doses of either cocaine or saline when they were in a tank with a particular type of floor, such as a floor of sponge or a floor of tile. Later, when Huber gave the animals a choice of floor types, they preferred a floor like the one on which they received the drug. They were thus behaving much like human drug addicts. Most research on drug addiction has focused on

human beings and their close mammalian relatives, interpreted through the lens of human psychology. The crayfish research demonstrates instead that fundamental and widespread biological mechanisms are at work, mechanisms so ancient that they predate the 600 million years since the two species branched from their common ancestor.

The fundamental mechanisms involved appear to be the brain's reward systems. All animals learn from experience. They learn to repeat actions that result in a reward, and to avoid actions that yield bad consequences. Learning is thought to involve changes in the strengths of connections between brain cells. These strength changes appear to be under the control of reward systems that recognize when an action has yielded positive consequences. The reward system is grounded in the brain's fundamental toolkit of specialized molecules that brain cells use to signal one another. This neurochemical toolkit is very similar across the entire animal kingdom, and thus must be truly ancient, dating back to the last common ancestor of all modern animals.

The commonality of the brain's reward systems across the animal kingdom accounts for their common vulnerability to psychostimulants like cocaine, nicotine, and amphetamine. Cocaine comes from the coca plant, and nicotine from the tobacco plant. Both are members of the plant group Asteraceae. Amphetamines are synthetic substances that mimic chemicals found in this same group of plants. Why would these plants make such substances? According to Huber,

they do so as a fiendish defense system which protects them from being eaten by insects. Insects are typically shy and cautious in their behavior. The world is full of predators that find them delicious. Psychostimulants alter the behavior of insects causing them to throw caution to the wind and become somebody's lunch. Addiction causes the unfortunate insect to keep eating until it meets this fate. Insects that like to eat Asteraceae don't live to leave offspring with the genes for that trait. Insects that avoid the Asteraceae and eat something else live to pass on the genes encoding that other preference.

Crayfish never encounter the Asteraceae in their natural environment. Crayfish and people are vulnerable to psychostimulants because they share a common neurochemical toolkit with the insects that are the plants' real targets. Evolutionary theory tells us that all life on Earth is physically descended from a common ancestor and that we should therefore expect to share many traits in common with other animals. For some people, this kinship with other animals is troubling. They worry that the knowledge of it leads to moral decay and thus to problems like drug addiction. In fact, knowledge of our commonalities with other animals may prove essential for understanding and defeating this scourge.

