Barbara Schaal’s First PCAST Meeting

The President’s Council of Advisors on Science and Technology (PCAST) met with Barack Obama to present a report at the White House for the first time in August. The committee of 19 members includes Washington University’s own Biology Professor Barbara Schaal. The committee presented a list of about 15 topics to gauge the President’s interest in different areas of scientific importance and get his response to the ideas and recommendations of the Council.

The Council focuses on topics that include climate change, energy issues and health care information technology. The centralization of health records is a particularly important priority on the President’s agenda. Currently, doctors and health care providers often are not nationally or even locally connected and health records are often incomplete. A national healthcare database would prove beneficial for the purposes of efficient record-keeping and research. The database would eliminate redundancies in patient care and for research purposes be more cost efficient, for example research that determines the most effective treatment would normally be expensive. Double-blind studies can instead be achieved by cross referencing information in the national database. Scientists could analyze statistics and make predictions on categories —cont’d on page 2
committees meet in between the meetings in Washington in person, electronically and on the phone. Schaal specifically studies carbon offsets, international science issues, energy and science education. Topics discussed by PCAST are public record but must be approved by the White House before any official announcements or implementations.

The Schaal Lab researches the diversity of rice in Southeast Asia and Thailand, often through indigenous farmers. Barbara Schaal also teaches a class with Anthropology Professor Gayle Fritz entitled Plants and American People: Past and Present. The course covers the history of plant/people relationships from the time of the American Indian through the development of modern agriculture and the impact of technology. —Erin Gerrity

HERZOG LAB

You might have noticed that Alexis Webb and Christian Beaulé are looking pretty buff these days (See photo above). They trained for and kicked butt in a couple of triathlons and the MS150 bike ride this fall. Note their massive muscles make it appear as if they are always smiling. Alexis also published a paper in PNAS on sloppy circadian oscillators in the mammalian hypothalamus. The paper is recommended reading by the Faculty of 1000. She has also accepted a postdoc position in the lab of Dr. Andrew Oates at the Max Planck Institute in Dresden, Germany starting next summer. Sungwon An, Becca Krock, and Daniel Sun presented 15-minute talks and Daniel Granados-Fuentes and Christian presented posters at the Society for Neuroscience meeting in Chicago last month —cont’d on page 3

Schaal’s First PCAST cont’d

of people at risk for certain diseases, how people react to different medications and more.

Presidential science advisory committees began with Franklin D. Roosevelt. Throughout history some have been stronger than others. After several years of having a committee consisting of 35 members with many members in the business sector, the new PCAST is a more focused group of 19 members including scientists, Nobel laureates, university presidents and academics along with industrialists. Obama’s Council is more strongly based in the fields of scientific research and education than the Council for the previous administration. PCAST has some very powerful people on the committee including Eric Schmidt, CEO of Google, and Craig Mundie, Chief Research and Strategy Officer at Microsoft. Barbara Schaal was selected for her association with the National Academy of Sciences (NAS). While the NAS provides hands off advice to the federal government, PCAST plays a much bigger role, actually making policy recommendations and having ongoing interaction with government agencies. PCAST meets every 2 months for 2 days with John Holdren, Scientific Advisor to Obama, before presenting reports to the President. Sub-

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Schaal’s First PCAST cont’d

of people at risk for certain diseases, how people react to different medications and more.
HASWELL LAB

New people: Since the last Biologue, we’ve welcomed some new lab members—Maggie Wilson (graduate student), Dylan Cockson (undergraduate), and Anu Vijayaraghavan (research technician); while saying goodbye to postdoc Ellen Martin-Tryon. Greg Jensen (research technician), Silvano Ciani (graduate student), Cara Clure (undergraduate) and Michael Bonafiel (undergraduate) continue to contribute to the great science and the great atmosphere in the lab.

Funding.: In September we were delighted to receive some stimulus funding from NIH, which should allow us to purchase state-of-the-art patch-clamping equipment and to support a postdoctoral fellow with the electrophysiology skills needed to use that equipment.

A long-term project: Liz (PI) and Greg have started their most comprehensive collaborative project yet: they are expecting their first child at the end of January. Liz is grateful to still fit behind the confocal—and she has enjoyed teaching Bio4028 this semester, where she can use her personal experience to compare plant and animal embryogenesis.

—Liz Haswell

TIMBONI FEEDER SCHOOL IN KENYA

We donated books from the Biology Dept to a local school, called Timboni Feeder School in Kenya, that is supported by our local safari company (Tropical Ice). You can see that, though the students and teachers were full of energy and enthusiasm, the schoolrooms have no chairs, desks, or even floors.

I wanted to give you an update on the Timboni Feeder School, the small rural school in Kenya that I visited last summer. The collection of biology books that we donated have arrived and are being put to use by the headmaster! A volunteer with the Friends of Timboni, Lori Stasukelis, was there this summer on a walking tour, and sent the attached photos. In the first two pictures, you can see the founder of Timboni, Iain Duncan, and Timboni’s headmaster. The third picture shows Lori with some of the Timboni students, and the last two show the children and the school.

My sincere gratitude to everyone who donated books and resources, and special thanks to Vicki and Paula in Outreach, who packaged the books and footed the bill for shipping. If you want to know more about the school and ongoing programs there, go to https://www.friendsoftimboni.org/. —Liz Haswell
Stan Braude and Alan Templeton’s analysis of inbreeding and effective size in African rhinoceros populations appeared in the most recent issue of The African Journal of Ecology (2009, Vol 47: 546-555). The good news: they found little evidence of inbreeding depression in captive populations. The bad news: in the time since the manuscript was submitted, the last wild population of Northern White rhino may have been completely destroyed.

Comparing hairless African mammals

A team of students earned international recognition for their design of an efficient light-harvesting bacterium with the potential to improve biofuel production. Ten students comprised Washington University’s first-ever team to enter the premier undergraduate competition in synthetic biology, the International Genetically Engineered Machine competition (iGEM). They spent the summer working together to create a photosynthetic bacterium that would vary its productivity based on the amount of light available.

For their efforts, they came home from the annual iGEM conference, held at the Massachusetts Institute of Technology at the end of October, with a gold medal.

Synthetic biology is a blossoming field that takes advantage of the wealth of genetics and molecular biology expertise that scientists have amassed in the last few decades. The goals of synthetic biologists are to manipulate existing organisms to do new tricks or work more efficiently, or even create totally novel organisms.

“What I like most about it was the applicability… I’ve done research before, but it’s all been very basic science,” senior Stephanie Chang said.

The tools and methods used in synthetic biology are run-of-the-mill, but the implications are major. Synthetic biology may be used to produce biofuels and medicines, but in theory, it could also be used to make more potent biological weapons.

Current applications range from the efficient sunlight harvester the iGEM team is creating, to entirely new organisms, such as the synthetic bacterial genome designed by J. Craig Venter in 2006.

Senior Jacob Rubens, a biology major, initiated the project while he was doing research in the laboratory of biology professor Robert Blankenship.

“I really want to study this stuff in grad school, and I didn’t really have a name for my interests… until I discovered synthetic biology, so iGEM really presented me with the opportunity to really go farther with that and try my hand at bioengineering,” Rubens said.

Other team members are biology majors and biomedical and chemical engineering students. Blankenship advised the students, along with professors Yinjie Tang and Chris Kirmaier, as well as several graduate students and postdoctoral fellows.

The team started out with the goal of doing something with bioenergy applications and a library of genetic parts at their disposal.

“We decided to work with an organism that is relatively simple, Rhodobacter sphaeroides. And that was a bit of a challenge for us because it has never been worked with before in synthetic biology or iGEM,” Rubens said.

Their project depended on the fact that many photosynthetic bacteria and algae put out light-harvesting antennae to collect sunlight more efficiently. These organisms have evolved to grow large antennae, but this is actually a problem for humans who want to use them to make biofuels: in low light, the antennae are longer than they need to be, so some cells absorb more light than they can turn into energy, resulting in lower efficiency overall.

Other researchers have tried to solve this problem by making cells with smaller antennae. But the iGEM team thought they could do better. They designed a set of genes that would allow bacteria to expand and retract their antennae according to how much light is available. They are the first people ever to do so, according to Blankenship.

“The thing I thought was unique, and that was the brainchild of the iGEM team, was the fact that they were engineering in this dynamic response,” Blankenship said. “I don’t know of any scientists doing anything quite like that.”

To accomplish this, they relied on the Registry of Standard Biological Parts, a catalogue of gene sequences with known functions, or “biological Lego pieces,” that they could mix and match with standard techniques, Chang said. The parts they cobbled together constitute a genetic...
Since joining the Washington University faculty in 1989, Professor Kathryn G. Miller has dedicated herself to innovation in teaching. Miller teaches undergraduate and graduate courses in biology, and she is currently the Chair of the Biology Department. She is a National Academy of Sciences Teaching Fellow and a participant in the recent National Science Foundation meeting: Vision and Change in Undergraduate Biology Education.

Miller’s excellence in teaching is exemplified by her approach to teaching her upper-division, writing-intensive course: Biology 3191, Molecular Mechanisms in Development. Miller’s approach is a model for faculty teaching writing-intensive courses, in which instruction in the content must be carefully balanced with instruction in writing. As she teaches her students how to write papers reviewing recent laboratory research, Miller teaches them the conceptual knowledge and critical-thinking skills that they will need as practicing scientists.

In Biology 3191, Kathy Miller utilizes technological tools that prompt active student learning. For example, she uses the SMART Board to annotate figures, explain molecular mechanisms, and record her students’ contributions to class discussions. In addition, her students utilize tablet PCs to take notes and to develop their own explanations of the material, often in collaboration with peers. Miller is a popular teacher among undergraduates and well known among graduate students for her active role in mentoring Teaching Assistants as they develop their own teaching skills.

Kathy Miller is a leader in the development of scholarly approaches to teaching. She is the Principal Investigator on a four-year $1.6 million dollar HHMI (Howard Hughes Medical Institute) undergraduate education grant to Washington University; a grant that has run continuously since the early 1990’s to support improvements in undergraduate science education. A founding member of the Educational Research Group at Washington University, Miller is currently undertaking a study of the effectiveness of her approach to teaching Biology 3191.

Kathy Miller’s Teaching Commentary videos, in which she describes the development and teaching of her Bio 3191 course, can now be found online at http://teachingcenter.wustl.edu/teaching-commentaries/teaching-with-writing. The videos illustrate Miller’s innovative and effective approach to teaching.

The entire Teaching Commentaries series is accessible at http://teachingcenter.wustl.edu/teaching-strategies/commentaries. —Dr. Beth Fisher, Associate Director of Academic Services at The Teaching Center

Don’t Miss It! Kathy Miller Presents at ITeach Faculty Symposium: January 14, 2010

Washington University faculty members are invited to the fifth biannual ITeach Symposium on Teaching and Technology. The symposium will take place on January 14 in Seigle Hall, on the Danforth Campus. ITeach features discussions, presentations, and demonstrations that provide opportunities for faculty from across disciplines to share ideas and research on teaching.

To register for ITeach, go to http://library.wustl.edu/iteach/.

Team of Students Ventures into Synthetic Biology cont’d—machine. Any cell expressing this DNA sequence would respond to high levels of light by building a larger light-harvesting antenna. Their project is still underway, and they are hoping to publish a paper with their results in the future.

The bacterium they chose is not used in commercial biofuel research and development, but they took advantage of its simplicity to show that their idea works. In the future, people could adapt their genetic construct to work in other species.

2009-2011 National Science Foundation: How structural heterogeneity and connectivity of landscapes affect wind dispersal ($140,323, Co-PIs: Jay Turner, Washington University, Department of Energy, Environmental, and Chemical Engineering, Dirk Baker (postdoc), Department of Biology, Washington University; Gil Bohrer, The Ohio State University)

2009-2013 Strategic Environmental Research and Development Program (SERDP): How historical legacies, management, and military activities affect connectivity for rare, threatened, and endangered plants on military bases in the southeastern United States ($1,984,820, Lead PIs: John Orrock* and Ellen Damschen*; Co-PIs: Lars Brudvig, Washington University and Joan Walker, USDA Forest Service Southern Research Station; *=order of lead PIs determined by coin toss because of equal contributions)

2009-2010 International-Center for Advanced Renewable Energy and Sustainability (I-CARES), Washington University: Wind dynamics in heterogeneous landscapes and the consequences for sustainable ecosystems ($30,000, Co-PIs: Jay Turner, Washington University, Department of Energy, Environmental, and Chemical Engineering, Dirk Baker (postdoc), Department of Biology; Gil Bohrer, The Ohio State University; Ran Nathan, Hebrew University in Jerusalem; Gaby Katul, Duke University)

2009-2010 Center for Programs, Washington University: Interdisciplinary Research Grant: Wind dynamics in heterogeneous landscapes and the consequences for sustainable ecosystems ($11,000, Co-PIs: Jay Turner, Washington University, Department of Energy, Environmental, and Chemical Engineering, Dirk Baker (postdoc), Department of Biology)

2009-2011 USDA Forest Service: Integration of savanna restoration processes at various scales to create a comprehensive strategy for landscape restoration ($299,510, Co-PIs: John Orrock and Lars Brudvig, Washington University). —Ellen Damschen

MORE GRANTS

Kathy Miller: “Myosin VI Function and Mechanism,” 9/09, NIH—$285,238


Sally Elgin: “Formation, Structure and Function in Heterochromatin,” 8/09, NIH—$201,488


Barbara Schaal, Mulugheta Teferi, & Vicki May: “Washington University Life Sciences Teacher Institute: Education for a Global Community,” 8/09, NSF—$4,512,154

Petra Levin: “Temporal and Spatial Control of B Subtilis Cytokinesis,” 7/09, NIH—$321,480

Ursula Goodenough, in collaboration with Alexandra Worden of The Monterey Bay Aquarium Research Institute: “Collaborative Research: Development of Sexual Cycles in Marine Picoprasinophytes Based on Molecular Homologies with Chlamydomonas Sexual Cycles,” 6/09, NSF—$430,000

Joe Je z: “Molecular Basis and Redox-Regulation of Plant Glutathione Biosynthesis,” 6/09, NIH Grant and Supplement totaling—$325,973


Doug Chalker: “RNA-Guided Genome Rearrangement of Tetrahymena,” 5/09, NSF Grant and Supplement totaling—$370,500

**GEMINID METEOR SHOWER PEAK - DECEMBER 13, 2009**

If it’s clear and you’re outside on the evening of December 13 and happen to see any "shooting stars", don’t be surprised - that’s when one of the best meteor showers of the year peaks. The annual Geminids meteor shower’s maximum is predicted to happen sometime within 2.5 hours before or after 11 pm CT on the night of December 13 under a moonless night sky. If you’re far from city lights you may see 60-120 per hour under ideal conditions. In an urban location, you might see one tenth of that number due to the effects of "light pollution" under the best of circumstances.

Whatever your location, no equipment will be needed to see them - all you need is an unobstructed view of as much of the night sky as possible, warm clothing, something to sit or recline on comfortably and a little patience. Reclining lawn chairs are good since they enable you to see much of the sky, which is important since they may appear anywhere. Simply relax with your favorite hot beverage and watch the skies - with a little luck you should be able to see at least a couple of meteors per hour, even in urban locations.

They’ll seem to emanate from the eastern part of the sky where the constellation Gemini is located in mid-evening hours. Starting about 8pm you may begin to see with the unaided eye as very short-lived streaks of light. As the evening progresses Gemini will get higher above the horizon which usually means more meteors will be seen. The Geminids is one of the most reliable meteor showers of the year and may be the best one of the year - in the past I’ve seen up to 140 + per hour under dark country skies. In urban settings avoid local lights as much as possible - the glare of nearby lights will prevent you from seeing much of anything. Whatever your location, avoiding local lights and letting your eyes adjust to the low light conditions of the night sky helps.

Meteors are usually produced by vaporizing small bits of cometary debris. Comets are city-sized chunks of very old ice that orbit the sun in very elliptical orbits and as they get close to the sun and sublimate they release dust, ions and grit that were locked up in those ices. That material spreads out along the comet’s orbit and when the earth runs into that debris at several miles per second it produces a brief bright streak of light as these tiny pieces of cometary material vaporize in our atmosphere due to frictional effects. The Gemind meteors you see are typically caused by objects that are only the size of a small pebble or smaller vaporizing at 50-75 miles above the ground after entering the atmosphere at 18 miles per second.

The Geminids are unusual in that their parent body is asteroid 3200 Phaethon, not an active comet. It may be that 3200 Phaethon is a relatively inactive comet - there seems to be some overlap between these two types of bodies and you’re witnessing evidence of that when you see a Geminid meteor.

For more information see these websites:

Observing the Geminids

Basics of Meteor Observing

American Meteor Society

—K. Michael Malolepszy, St. Louis Astronomical Society
Summer and fall, 2009, were very busy times, much of it due to the Darwin Bicentennial year (Darwin was born in 1809) and the sesquicentennial of the publication of On the Origin of Species (1859). Events included talks at the Universities of Calgary and Oklahoma (March and April), the Brazilian Society of Genetics annual meeting (August), at Central Michigan University September) and at the Biblioteca Alexandrina in Alexandria, Egypt, sponsored by the British Council. The latter, especially, included a highly diverse international component, which provided an interesting international perspective on reactions to Darwin and evolutionary theory today. Although European nations have generally had little of the kind of opposition to evolutionary ideas that we have experienced in the United States, some Muslim countries have encountered a deeper kind of opposition than that found here. The discussions in this regard were quite eye-opening to a westerner (like myself). Science educators and evolutionary biologists in the Muslim world are facing their own serious problems in teaching evolutionary theory, especially as it refers to the origins of humans, that are in some ways more daunting than those faced in the U.S.

A highlight of the year was attending the meeting of the International Society for the History, Philosophy and Social Studies of Biology (also known from its acronym, ISHPSSB, as “Ishkabibble”) in Brisbane (July). Stepping down as Past President, it was a pleasure to enjoy the meeting for its intellectual, rather than administrative, components. The meeting itself was preceded by a magnificent 5-day camping trip to Fraser Island National Park (off the east coast of Australia, north of Brisbane), organized by colleague Carl Craver (Wash U Philosophy) and a colleague from the University of Utah. As the island has only sandy beach and inland roads, the five participants (see figure, grouped around one of the largest trees in the island’s interior rain forest) crammed into two 4-wheel drive vehicles, camping at a different campsite every night. The scenery was spectacular (see figure) and except for two days of more or less continual rain, the weather was delightful for mid-winter. Dubbed the “Wilderness Symposium” the trip also involved everyone having to give an informal presentation of their current research project(s) for discussion and critiquing. The hope was to encourage other groups to organize something similar in conjunction with the next meeting in Utah in 2011.

After the Brisbane meeting another unique experience involved spending four days at the Great Barrier Reef snorkeling above and through (with a good gulp of air) underwater coral canyons. It was a surprise to discover (what other people probably knew) that the reef itself is not a single entity, but hundreds of reefs stretching across the whole northeastern half of the continental shoreline. The reefs themselves barely protrude above the water even at low tide, but can be recognized at a distance by the azure blue of the water over them (in contrast to the deeper blue of the surrounding water, and the breaking of small waves as the sea rises and falls (see picture). It was exciting to see the same formations that Darwin had seen, and which provided some of the observations that led to his early theory of coral reef (especially atoll) formation.

The stay in Australia (3 weeks in all) was capped by 4 days in Sydney, with a visit to a magnificent Darwin exhibit at the Sydney Maritime Museum (much of it centered appropriately around the Beagle voyage), and a performance at the architecturally-stunning Sydney Opera House).

The semester’s academic activities concluded with a seminar (my first ever) for the Wash U History Department, on “Culling the Herd: The Eugenics and Conservation Movements in the United States, 1880-1940.” — cont’d on page 10
As this is the early stage of work on this project it was very helpful to get some feedback from history, philosophy and biology colleagues. —Gar Allen

Beach road, Fraser Island

SAFETY SPOTLIGHT—Gerry Rohde

Welcome to "safety spotlight".

Thankfully, we have no recent chemical spills or laboratory fires to write about.

However, a few weeks ago, one of our labs did experience a moderate burn injury incident.

This happened as a consequence of insufficient thermal hand protection while attempting to retrieve a beaker from an autoclave immediately after the sterilization cycle was completed.

In response to the incident and related inquiries, this specially designed autoclave glove is now available in the stockroom. It is sold individually for approximately eight dollars and thirty-eight cents with the following features:

- ambidexterity
- heat resistance up to 400 degrees fahrenheit
- universal fit
- extra arm coverage with overall 18 inch length
- durable cotton and polyester blend

Please don’t forget that autoclaves are one of the most often overlooked and underestimated sources of potential danger in our department. Their safe operation requires lab and equipment specific training, mainly aimed at protecting users from accidental exposure to the very hot steam and internal temperatures of circa 250 to 260 degree fahrenheit.

General guidelines, among others, included in such training should be:

- to know which types of material(s) are autoclavable
- to stay with the autoclave until the sterilization cycle starts
- to allow a cool down period of about ten minutes before removing autoclaved items

Continue to be safe - and remember: "falling objects can be brutal if you don't protect your noodle"

CLIMATE CHANGE READING GROUP

Concurrent with the COP-15 in Copenhagen and the new Climate Change Research Funding at NSF/BIO, we thought it apropos to initiate a STL Climate Change study group. Many of us in different labs, departments, and institutions around STL are actively investigating aspects and effects of climate change but have no venue for interacting with others in the community. The easiest way to begin is with the tried and true interdisciplinary reading group: once a week one person sends out a scientific reading ahead of time, briefly introduces the reading at the meeting, and then moderates a discussion – total time 50 minutes. If we can get an interdisciplinary group, the subject matter should be diverse.

Please respond to robbie.hart@mobot.org (unpaid TA who will coordinate communications) if you are interested in participating in a Climate Change reading group starting next semester in January: indicate times you are available and venues you prefer. Please pass this message to others who might be interested. Once we have a group, we will define a convenient time and place.

Thanks for your interest,
Jan Salick and Peter Jorgensen
Missouri Botanical Garden

Gerry Rohde
This happened as a consequence of insufficient thermal hand protection while attempting to retrieve a beaker from an autoclave immediately after the sterilization cycle was completed.
On December 8th, Biology Department faculty and staff gathered together for a potluck party, sharing their kitchen talents and holiday cheer. Everyone enjoyed talking with old friends, getting to know new people and trying out some amazing dishes from cultures around the world.

Many people commented on how much they liked this year’s party because the casual setting and extended hours made it easier to mingle and come and go as you please. It was also nice getting to meet some of the children, spouses and significant others of friends in the department.

—cont’d on next page
Above and Below: Professors, postdocs, grad students, lab techs and many more Biology staff members and their families enjoy the variety of foods and beverages brought to the holiday potluck.

UPCOMING TEACHING SEMINARS & WORKSHOPS

Dr. Robin Wright, Associate Dean of Genetics, Cell Biology and Development at the University of Minnesota is coming to Washington University on January 25th, 2010 to discuss her method of teaching introductory biology in an active learning format.

Watch for more teaching seminars and workshops coming this spring featuring faculty demonstrating innovative methods of teaching at other institutions. —Kathy Miller

Do you have any exciting news to share? Please submit announcements, lab notes and photos to Erin Gerrity: gerrity@biology2.wustl.edu