Greetings from Walter Hall, where we have had another productive and busy semester. We continue to grow in size and reputation. This fall the denizens of EEB, faculty, staff, postdocs and graduate students passed 100 - pretty amazing for us old-timers.

To accommodate this growth, plans are being made for a major renovation of Hunter Laboratory (the old psychology building on Waterman Street), including adding windows (!), to house our conservation biology group, the Earth Lab and other environmental science groups on campus to facilitate our growing strength in environmental and conservation science. This could happen as early as 2013 thanks to the hard work of Annie Schmitt.

Our curriculum is also getting a face-lift. This fall we admitted the first cohort of students for our reverse ecology NSF IGERT led by David Rand and NSF PIRE on land use and ecosystem service change in Africa led by Chris Neill. This spring we are also finally adding a long overdue biostatistics course to the EEB curriculum taught by Sohini Ramachandran, our newest star junior faculty member.

Our faculty continues to excel on and off campus. Currently every EEB faculty member is well funded. Marc Tatar was awarded an NIH MERIT award. The Method to Extend Research in Time (MERIT) Award program was initiated to recognize and symbolize top scientific achievement in the research community and guarantees NIH funding for Marc’s lab for the next decade. Well done, Marc! Other notable achievements this semester by our faculty include Erika Edwards being named the Richard Salomon Assistant Professor of Ecology and Evolutionary Biology, Casey Dunn being invited to participate in the 2012 Davos Conference and David Rand being elected a fellow of the AAAS.

To cap off the year, EEB’s newest graduate students accompanied by Erika Edwards, Stephen Porder, Andrew Altieri and I participated in a successful tropical biology course this fall, capped off by a December field trip to the Smithsonian Tropical Research Institute in Panama.

Here’s to an even more successful and prosperous 2012.

New to EEB in 2011

**Maya Almaraz:**  
Graduate Student from University of California Berkeley, Porder Lab

**Galina Karashchuk:**  
Postdoc: PhD, Russian Academy of Science, Tatar Lab

**Radika Bhaskar:**  
Postdoc: PhD, Stanford  
Porder and Edwards Lab

**Chen Chiu:**  
Postdoc: PhD, University of Maryland  
Swartz Lab

**Terry Dial:**  
Graduate Student from University of Utah Salt Lake City, Brainerd Lab

**Christopher Graves:**  
Graduate Student from University of Vermont, Weinreich Lab

**Philip LoGerfo:**  
Programmer/Bioinformatician  
Ramachandran Lab

**Lianne Mendonca:**  
Administrative Assistant  
Walter Hall

**Andrew Migneault:**  
Research Assistant  
Schmitt Lab

**Sabine Mortiz:**  
Postdoc: PhD, University of Jena  
Brainerd Lab

**Michaeline Nelson:**  
Research Assistant  
Rich Lab

**Victor Schmidt:**  
Graduate Student from University of North Carolina Wilmington, Smith Lab

**Laura Schreeg:**  
Postdoc: PhD, University of Florida  
Porder Lab

**Nancy Terry:**  
IGERT Administrative Coordinator  
Walter Hall
People once thought the soils of the tropics couldn’t sustain crops. Slash-and-burn practices defined agriculture in the Brazilian Amazon for many years. However, with industrial-scale agricultural inputs like lime, fertilizers, and pesticides, tropical soils produce yields comparable to those of the Midwest. With the help of these inputs and new crop varieties, soy agriculture has rapidly expanded into Amazônia. Brazil is now the world’s second largest soybean exporter, second only to the US. But all of these agricultural inputs may bring with them environmental costs. I’m interested in all of these costs, but my dissertation is focused mostly on the fates of water and phosphorus in tropical agriculture.

Our field site is an 800 km² farm in Mato Grosso, the state that has often seen the highest rates of deforestation in Brazil. Since I began as part of the Brown/MBL joint program in 2007, I have focused on the biogeochemistry of streams and soils following the conversion of Amazonian forest to soy agriculture.

Our first sampling campaign focused on streams. We took regular water and sediment samples to characterize base-flows and used automatic samplers set to trigger with rainfall to characterize storm-flows. One of the great things about our field site is that it has a number of headwater streams that drain only one land-use type: soy or forest. This has allowed us to compare export of water, sediment, nutrients, and other solutes from intact primary forest and agricultural watersheds. The chemistry of all streams is quite similar, with low concentrations of essentially all solutes and sediment. The amount of water in a stream, however, varies with land-use.

Tropical forests depend on evapotranspiration by trees to return water to the atmosphere. Some estimates suggest that up to half of the precipitation in the Amazon is recycled by the forest itself. When forest is cleared, much of the rainwater remains in soil rather than being recycled and is eventually exported through streams. Almost four times as much water flows through soy streams as through forest streams. Thus although the solute and sediment concentrations of the streams are comparable, more of everything is exported from soy watersheds through increased water volumes.

So why do all streams have low concentrations of sediments and solutes? And why do streams draining soy fields that are heavily fertilized, have the same concentrations of most nutrients as forested streams? The results are at least in part explained by the soils I described earlier. These soils have a high infiltration capacity, absorbing up to a meter of rain an hour without generating overland flow, making contributions of sediments and nutrients through runoff unlikely. These soils and their unique properties, particularly when it comes to phosphorus, have become the second focus of my dissertation.

Phosphorus (P) is an essential input for crops. Unlike nitrogen, we can’t pull it out of the atmosphere and turn it into fertilizer. Essentially all P fertilizer is mined, and it has no known substitute. It is also one of the main drivers of eutrophication. So, we need it, its supplies are limited, and too much of it causes pollution. P must be managed carefully.

Old highly-weathered soils have lost most of the P with which they began. Thus these soils are very good at holding onto added P. In fact, they bind much of the added P in forms that plants can’t access, so more P must be added each year than a crop will remove. Thus, a soil surplus is built. Building soil surpluses of P has been a huge contributor to eutrophication in temperate agricultural areas (think the Mississippi River). But with soils like those of much of the Amazon, the consequences are likely different. Just like much of the P is not available to plants, neither is it available to leach out of soils into streams. So far with about a decade of heavy farming we continue to see streams with low levels of nutrients and sediments. But with continuous agricultural inputs, we don’t know how these soils will respond. We are using soil samples along a chronosequence of agricultural fields to look at where the huge inputs go and how long it will be before the capacity of these soils to hang on to added P is overwhelmed.

Some of this suggests that the tropics are great for large-scale agriculture: you can dump on all of the fertilizer you want and it won’t leach or run off into surface waters or cause eutrophication. But, the inputs required to maintain yields here are large and expensive, making successful farming most available to large multi-national corporations. And our supplies of P are ultimately limited, so continued agricultural expansion in the tropics may exacerbate the pressures on (and the prices of) the global P supply. With our work we are learning about the consequences of soy agriculture in the Amazon and more generally about those of tropical agriculture – we know it can be high-yielding over many years, but I hope we contribute to thinking about its downstream (both literal and metaphorical) consequences.
Andrew Altieri will be taking a position as a staff scientist at the Smithsonian Tropical Research Institute (STRI) in Panama, beginning in January.

Mark Bertness received an honorary chair in ecology and gave a two day workshop at Sassari University, Sardina, in October.

Margarita Brandt-Sanchez was awarded a Senesyt Fellowship from the "Secretaría Nacional de Educación Superior, Ciencia, Tecnología e Innovación del Ecuador" (equivalent to NSF of USA) to conduct postdoctoral studies abroad for two years.

Elizabeth Brainerd received an NSF grant to study rib kinematics and intercostal muscle function in amniotes.

At the 2011 Coastal and Estuarine Research Federation conference in November, current EEB/Brown-MBL graduate student Sarah Corman received an award for her poster on latitudinal variation in salt marsh productivity, and former Leslie Lab RA and EEB undergraduate Joey Bernhardt (now at University of British Columbia) took home an award in the oral presentation category.

Tyler Coverdale (Bertness Lab) received a grant from the Nature Conservancy to study salt marsh die-off in Long Island Sound.

Erika Edwards was named the Richard and Edna Salomon Assistant Professor of Ecology and Evolutionary Biology. She was also elected to the council of the Systematics Society.

Christine Janis has been elected a Fellow of the Paleontological Society.

Kristin Hultgren (Brown ’99) gave one of the Departmental Colloquia this fall (see P. 5). Kristin went on from Brown to receive her Ph.D. from UC-Davis and then did a postdoc at the Smithsonian. She’s now a visiting assistant professor at Bard College. Her work has concentrated on ecological and phylogenetic relationships, focusing on various marine Crustacea and featuring such topics as crypticity and sociality.

Leslie Lab undergraduate Emily Lamb (Brown Class of 2011) will travel to the marine station of the Pontificia Universidad Católica de Chile as a 2012 Fulbright Scholar.

Heather Leslie and former EEB/ECI postdoc Sheila Walsh were awarded a NSF Coupled Natural and Human Systems grant to support their work on small scale fisheries in Mexico. Walsh is now a senior scientist working on ecosystem services with The Nature Conservancy in Arlington, VA. Leslie had the opportunity to share this work with colleagues in a National Academies-sponsored meeting on Ecosystem Services in Irvine, CA in November 2011.

Heather Leslie led a workshop on Marine Conservation Success through Synthesis and Story, at University of Washington’s Helen R. Whiteley Center, Friday Harbor Laboratories in August 2011.

Matthew Ogburn won the Society of Systematic Biologists Ernst Mayr award for outstanding student talk at the Evolution 2011 conference in Norman, OK.


David Rand is now the Director of the Center for Computational Molecular Biology (CCMB). He was also recently elected a fellow of the American Association for the Advancement of Science.

Jeremy Rich received an NSF grant on in situ measurement of rates of chemosynthetic carbon production at deep-sea hydrothermal vents.

Dov Sax: The Early and Sax paper (Ecol Lett 14:1125-1133) has received a lot of press. It was listed by the "Faculty of 1000" as a recent notable paper and was covered in the Research Highlights section of Nature. It has received coverage on line at the BBC, Scientific American, MSNBC and many others.

Marc Tatar has received a MERIT award from the National Institute of Aging (NIH). This award recognizes a principal investigator for outstanding scientific achievement and leadership in the field. It also provides Marc the opportunity to extend his recently renewed R01 grant through to 2021!

Daniel Weinreich received NIH grant on developing and testing a novel geometric model of protein adaptation: dissecting the mechanisms of antibiotic resistance.

Congratulations to Patrick Flight (Sept. 8th), Matthew Heard (Sept. 19th), and Margarita Brandt-Sanchez (Dec. 2) for completing their dissertations!
Departmental research has recently received a lot of exposure on the Brown web page. On November 9, graduate student Ryan Carney was written up in the New Scientist for work he reported at the annual meeting of the Society of Vertebrate Paleontologists. This study involved a single, but famous feather, a fossilized wing feather of Archaeopteryx first described in 1861. Archaeopteryx has often been illustrated in color, even though no one had a clue about its real color. Ryan and colleagues subjected the feather to SEM and x-ray analyses and were able to establish the presence of melanosomes in the feather. Combining this information with studies of modern bird feathers led them to the conclusion that the feather was most likely black.

On November 15, the news bureau caught up with grad student Henry Astley and Tom Roberts’ fabulous jumping frogs, the result of a paper in Biology Letters, still only on line <doi:10.1098/rsl.2011.0982>, but due out shortly in hard copy. The key to the frogs’ remarkable skill lies in their stretchy tendons, which serve as a site for elastic energy storage, so that the tendons subsequently recoil like a spring. The frogs could never match their performance by their large muscles alone. They worked with the common lab frog Rana pipiens; the famous jumping frogs of Calaveras County probably do much better. Many members of the department will recall a memorable lunch-time talk by Tom, who recounted a trip to the Calaveras County Fair to see those frogs and their handlers (even more interesting!) in action.

Earlier in the autumn Science Nation reported on current work conducted by the Bertness lab on the disappearance of salt-march cordgrass, a foundation species for the maintenance and health of these valuable salt-marsh communities on Cape Cod. Where recreational fishing is heavy, predatory species are removed, providing the opportunity for the herbivorous purple marsh crab Sesarma reticulatum (a.k.a. heavy marsh crab) to feed on the grasses unchallenged. Their burrowing activities in the salt marsh have become so intense in the absence of their usual fin fish or blue crab predators that the border of the marsh is progressively washed away. Marshes distant from marinas, and consequently are lightly exploited, aren’t suffering this die-back.

Discovery News picked up post-doc Nocolai Konow’s work on the remarkable jaws of angelfishes (PLoS ONE 6 (9):e24113). Not only do they have protrusible jaws, allowing them to forage for food items in crevices of the reef inaccessible to most other species, but an additional joint in the lower jaw that allows them to tug and pull food out of these crevices. Combined with an extra set of bristle-like teeth that provides them a firm grasp of food items, they have an unusual grab-and-tear combination of traits that allows them to exploit parts of a reef unavailable to others. Different angelfish species exhibit a remarkable similarity in feeding kinematics, combined with a high diversity of gut morphology and a broad range of size. Angelfishes thus provide an example of a group that combines broad trophic diversity with low structural and functional disparity of the feeding apparatus.

And only hitting the Brown web page on 22 December, a PNAS paper by Borja Figueirido, Christine Janis and Spanish collaborators evaluates the role of climatic change on the diversity patterns of large, terrestrial North American mammals over the past 65 million years (the Cenozoic era). They found that mammalian diversity over that time can be partitioned into six successive faunal associations, whose diversity shifts with sustained climatic trends of warming or cooling, moving to a new association in response to a temperature peak or other rapid change. Four of these periods fit nicely with independent proxies of climatic change (the oxygen isotope curve derived from deep-sea sediments), and the other two also coincide with major immigration events associated with drops in the sea level. Such analyses provide important insights for our current issue of climate change, which, however, is a unique consequence of anthropogenic change. Borja Figueirido is a post doc from the University of Malaga, Spain, working in the Janis lab. This paper is not yet in hard copy, it can be viewed on the Web at <doi/10.1073/pnas.1110246108>.

We in EEB pride ourselves in sponsoring research that involves people ranging from undergraduates to graduate students and postdocs. Undergraduates play a large role in this work and in the process author a significant number of research papers, many of which are published in the leading Journals of their fields. A total of 44 under-graduates were sponsored by 16 EEB faculty members this summer through various sources of funding, including UTRA, Beckman, BEF, REU, Mellon, EPSCOR, and Brown International funds. As one might expect from our faculty, they ranged over a wide spectrum, with topics as diverse as genetic analysis of language evolution, bat flight mechanics and ecosystem Undergraduate Research in EEB health of the Atlantic rocky shore. Many of them involved Honors research, so you’ll be hearing more from them in the spring when they present the results of their research.
2011 Fall Seminars

Brown Bag Seminars
Talks that catch up on research and work within the department.

9/13 Cecelia Saccone, University of Bari. Molecular evolution of the mitochondrial genome in metazoans.

9/20 Chen Chiu, Postdoctoral Research Associate, Engineering Adaptive echolocation and flight behavior of paired bats.

9/27 David Arnold, Double Exposure.net. Climate Change.

10/4 Reena Sellamuthu, Postdoctoral Research Associate. Effect of genetic and environmental perturbation on life history transition in Arabidopsis thaliana.

10/11 Terry Dial, Graduate Student. Precocial hindlimbs and altricial forelimbs: Modulation of ontogenetic strategies in mallard ducks.

10/18 Laura Schregg, Postdoctoral Research Associate. Tropical forests and phosphorus: Making the most out of what they have.

10/25 Stephen Smith, Postdoctoral Research Associate. Large phylogenies and biogeography in flowering plants.

11/1 Christopher Graves, Graduate Student. The evolution of evolvability.

11/8 Erika Sudderth, Postdoctoral Research Associate Environmental Studies. Linking precipitation responses of soil and plant processes to changes in ecosystem function.

11/15 Victor Schmidt, Graduate Student. Pathogen pollution in the pet trade.

11/22 Rhea Von Busse, Postdoctoral Research Associate. The trinity of energy conversion-kinematics, aerodynamics and energetics of the lesser long-nosed bat leptonycteris yerbabuenae.


12/6 Sohini Ramachandran, Assistant Professor. Deep relationships between genes, peoples, and languages.

Friday Colloquia
A more formal colloquium that features speakers outside of the University.

9/16 Kristin Hultgren, Brown ‘99, Bard College. The role of body size in crustacean evolution and community ecology.

9/23 Sergey Nuzhdin, University of Southern Califorina. Genomic analysis of local adaptations.


10/7 Daniel Bolon, University of Massachusetts. Relating gene sequence to fitness through EMPIRIC mutant analyses.

10/14 Robert Pringle, Harvard University. Who ate the Sodom apple? (and other questions raised by manipulating large herbivores in African savannas.)

10/21 Michael Nachman, University of Arizona. The genetic basis of reproductive isolation in house mice.

10/28 David Skelly, Yale University. Amphibian metacommunities: dynamics and mechanisms.

11/4 Nancy Knowlton, Smithsonian Institution. Tropical marine biodiversity: how little we know and why it matters.

11/11 James Marden, Penn State University. Polymorphism in hypoxia signaling and oxygen-related life history traits in a butterfly.

11/18 Tyrone Hayes, University of California-Berkeley. From Silent Spring to Silent Night: A tale of toads and men.

12/2 Mark Hay, Georgia Tech. Chemical warfare in the sea: Killer seaweeds on coral reefs.


Carney RM + 9 others. 2011. Early warning system for West Nile virus risk areas, California, USA. Emerging Infectious Diseases. 17:1445-54.


This years’ graduate tropical field course went to Panama, where the Smithsonian Tropical Research Institute (STRI) hosted them. We decided to do the field component of the course in Panama this year since long time EEB denizen Andrew Altieri just accepted a staff scientist position at STRI. Andrew, Stephen Porder, Erika Edwards and Mark Bertness taught the course for nine new EEB graduate students.

After spending the semester reading about tropical biology, the history of Panama and its indigenous people {{we traveled to Panama for eight days in December.}} At our first stop at the Bocas Del Toro Marine Laboratory where Andrew will initially be stationed we were rained on hard all four days. Nonetheless, we successfully scouted field sites for Andrew, who is planning to work on distribution and abundance patterns of octocorals. We also assessed herbivore pressure at Bocas and interestingly found it to be an order of magnitude less than previous Brown students have found in Belize. It was also nice to see former Brown EEB undergraduate Rachel Collin ('01), the director of the Bocas del Toro field station.
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Or Email information to Amy_Lanoie@brown.edu

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