BROWN

Ecology & Evolutionary Biology

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Letter from the Chair

By Mark Bertness

It has been an exciting few months since our last newsletter. Over the summer with the Department of Molecular and Cell Biology (MCB) we hired Yoav Gilad as part of Brown's new Genetics and Genomics Initiative. Yoav will complete a postdoc at Yale before joining us in January 2005. Yoav will have his primary appointment in MCB with a secondary appointment in EEB. Molly Przeworski, our new computational biologist, is finishing a postdoc at the Max Planck Institute this fall and will join us next month. Our new evolutionary morphologist, Tom Roberts, will join us in August 2004.

The Environmental Change Initiative (ECI) and Brown/MBL Institutional collaboration are also gaining momentum and positively impacting EEB as they get started this fall. We are currently running a search with Geological Sciences and the Center for Environmental Studies for a senior faculty leader to direct the Environmental Change Initiative and The Center for Environmental Studies. Annie Schmitt is chairing the search, and we will interview candidates in early 2004. Spring semester we will also run a Wayland Collegium entitled "The Environmental Future of the Planet Earth" to bring leading environmental scientists to Brown as we develop and promote the ECI. Jon Witman is leading this effort, which kicks off in February with a visit by Peter Kareiva, a former denizen of Walter Hall and now lead scientist for The Nature Conservancy. Next fall we will admit the first graduate students into the new Brown/MBL joint graduate program, and MBL faculty will begin teaching courses at Brown. Also beginning next fall, the Semester in Environmental Science at MBL, a highly successful, 7-year old intensive undergraduate ecosystem science program, will become part of Brown's curriculum. These are all exciting developments for environmental science at Brown.

More positive developments: Jen Hughes was awarded a highly competitive Woodrow Wilson Junior Faculty Fellowship for this academic year and Annie Schmitt was given the Stephen T. Olney Chair of Natural History at Brown and made an AAAS Fellow (both in the same semester!). We are proud of both of you. Last, but not least, David Rand has taken the reins of the Graduate Program. Finally, competent leadership in this important job! [MB was formerly Director - ed.] Even better, our founder and spiritual leader, Doug Morse, is taking the lead in helping Bonnie Horta get this newsletter out, with Marc Tatar on sabbatical.

New to EEB in 2003

- **Afton Bentle**: research assistant in the Tatar lab.
- **Devon Bradley**: graduate student in the Hughes lab from UC-Santa Cruz.
- **Bruce Bryan**: graduate student in the Rand lab from Marlboro College.
- **Keryn Brombeck**: research assistant in the Bertness lab.
- **Andrew Clifford**: graduate student in the Gatesy lab from Ohio University.
- **Jonathan Duke**: graduate student in the Bertness lab from the Univ. of Arizona.
- **Manuel Mendoza**: postdoctoral research associate in the Janis lab from the University of Malaga (Spain).
- **Melissa Zerofsky**: research assistant (Brown '03) in the Tatar lab.

News Update

Andrew Altieri received a best student paper award at the November meeting of the Western Society of Naturalists.

Julie Ellis was coauthor of a successful Earthwatch grant for gull exclusion studies on the Isles of Shoals next summer.

Adam Fry completed his Ph. D. and will be off to Woods Hole on a postdoc to commence in January at the Marine Biological Lab's (MBL) Bay Paul Center.

Steven Hamburg was elected co-chair of the International Committee of the US Long Term Ecological Research Network.

Back Row (left to right): ***Dan Warren, Kevin Middleton, John Stinchcombe, Mark, David Baier, Tony Breu****.*
Front Row (left to right): ***Yoni Gail, Kristin Bishop, Liz Boyd, Faye Lemieux, Rich Heine.***

The EEB softball team, the **Sacrifice Flies**, celebrated their first winning season in the team's three-year history in the Brown Summer League. Not pictured, but deserving credit: **Eric von Wettberg, Jeff Cheng**, **Chris Jue** and **Judy Nee**.

Sarah Kingan's ('02), paper based on her Honors research on polymorphism of chimp semen (see page 7) was featured in Sciencenow, *Science*'s on-line service for 28 Nov.

Annie Schmitt was awarded the Stephen T. Olney Professorship and was elected a fellow of AAAS.

Chris Siddon defended his thesis in September and was immediately off on a postdoc to the University of Alaska at Fairbanks Juneau Center, School of Fisheries and Ocean Sciences.

Brian Silliman's new PNAS paper on fungal farming by salt-marsh snails (see page 7) was featured in Sciencenow for 6 Dec. He was also interviewed by *Nature* on-line and BBC.

Marc Tatar was a participant at the European Union Workshop on development and aging in Brussels in December.

Jon Witman attended the First Census of Marine Life US Workshop in July and participated in the RI Marathon.

Research Abroad

Where can you find puffin, guillemot and foal on a restaurant menu? Mark Bertness, David Rand and Jon Witman discovered that it was Iceland during their trip to participate in the 2nd CORONA meeting held in Reykjavik in August. A brainchild of Cliff Cunningham at Duke, the goals of the program are to foster parallel ecological and evolutionary research on both sides of the North Atlantic. In addition to hearing fascinating presentations on the history of the North Atlantic, the group discussed collaborations with their European colleagues while soaking in the hot springs of the Blue Lagoon. Jon and his wife Morgan stayed on after the meeting to sample marine biodiversity and go bird watching in the Westmann Islands off the south coast where they met up with Ph.D. student Jonna Hamilton, who is studying puffin flight behavior on the towering cliffs.

Editor's Note

By Doug Morse

We've been asked, can't we do it in living color? The answer is, in a few words, it would be exorbitant. But if you log on to http://www.brown.edu/Departments/EEB/newsletters.htm you can see these pictures in living color. Who knows, the resolution might even be good enough to make a wall-hanging of the Chair. And by the way, if you would rather receive this newsletter on line, please let us know.

EEB Graduate News

By John Bruno

Update from the Bruno lab

Since leaving Brown in May 2000, I spent about a year in Mexico, started a faculty position, got married, and drastically increased the size of my family (two new daughters, no new pets–yet). All three of the graduate students in my lab are Brown EEB alumni! Sarah Lee ('02), of Georgia salt marsh snail fame, arrived last summer after spending a week underwater as a NOAA aquanaut. Sarah spends the winter months in Jamaica working on a variety of projects, including the role of coral-generated structure in facilitating the recovery of the keystone herbivore *Diadema antillarum*. Her dissertation will likely be on spatial ecology and fragmentation. The two newest arrivals are Liz Selig ('99) and Mary O'Connor ('00). Since graduating, Liz spent four years working as a conservation GIS analyst and for her dissertation plans to identify the environmental stressors driving the global decline of reef-building corals. Mary worked at Environmental Defense on climate change outreach and recently wrapped up a stint as a research technician for Bob Paine and other University of Washington faculty.

Our lab research seems broader than ever. I am still investigating the metapopulation dynamics of cobble beach plants in Rhode Island, but now mainly work out of the University of North Carolina, Chapel Hill's marine lab, the Institute of Marine Sciences (IMS), in Morehead City. North Carolina's barrier islands conveniently create a giant experimental playground (and windsurfing paradise) and just north of IMS they are uninhabited and largely pristine. Most of our current research at IMS is geared towards understanding the role of species diversity in the functioning of marine ecosystems. Last summer we teamed up with Emmett Duffy from Virginia Institute of Marine Sciences, and his students, to perform the first factorial manipulations of plant and herbivore diversity using macroalgae, fish, urchins, and amphipods. Our outdoor mesocosm and field experiments suggest that primary production is largely controlled by algal identity (rather than diversity), but because herbivore prey preferences are largely complementary, herbivore diversity is inversely related to algal biomass.

Middle Marsh, Rachel Carson Reserve, NC

I am continuing work in the tropics I began as a post doc with Drew Harvell (Cornell), identifying the environmental causes and demographic effects of marine disease epizootics. We recently published the results of field experiments in Akumal, Mexico that demonstrated the striking effects of nutrient enrichment on coral disease severity. The next step will be to test for synergisms with elevated seawater temperature. We are also collaborating with Steve Ellner (Cornell) on modeling studies of spatial disease dynamics and their dependence on host and pathogen life history characteristics. Our work keeps us pretty busy, but we try to take time to enjoy the good food, rich music scene, and outdoor activities in Chapel Hill and to reminisce about the good old days at Brown, working/gossiping in the basement of Walter Hall.

In the Lab

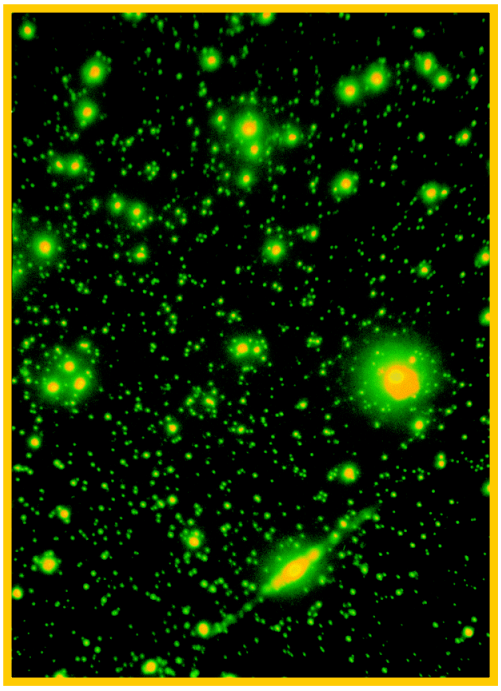
By Jennifer Hughes

Deep in the basement of the Biomed Center at Brown University, mutant life forms arise daily. Sounds like a bad horror movie, but it's just undergraduate and graduate students hard at work. We, including former EEB students Rebecca Lutzy, Edgar Leighton, Ian Carroll, Lexi Weintraub, and I, have been using laboratory strains of *Escherichia coli* (the lab rat of the bacteria world) to study the evolution of biodiversity. Some cousins of this organism have received a lot of bad press (for example, the 'Jack-in-the-box strain'), but there are many good reasons to use this homely bacterium to study general ecological and evolutionary principles. Most importantly for us, *E. coli* has a fast generation time – as fast as 30 minutes – so that in only a few weeks our experiments can track hundreds of generations. The bacterium is also very small, so that we can work with population sizes in the millions in small glass test tubes. Genetic mutations that provide the variety for new types of organisms to diversify happen at very low rates, but the combination of high population sizes and many generations allow us to witness this diversification up-close in just a few days.

One of the questions we are interested in is whether viruses that infect bacteria can promote the diversification of new types of bacteria. If we put one type of virus in a test tube with *E. coli*, one quickly sees an arms race between the virus and the bacterium; a strain of bacteria evolves to be resistant to the virus, a new virus then evolves that can overcome this resistance, a new bacterial strain evolves resistance to the new virus, and so on and so forth…

With my colleague Marcia Marston at Roger Williams University in Bristol, RI, I am studying how these simple lab experiments relate to the global carbon cycle. How can a test tube of viruses and bacteria have anything to do with global nutrient cycling? In fact, in the past few decades researchers have discovered that there are billions of viruses in just a liter of surface seawater. These viruses infect bacteria, including those that photosynthesize, using sunlight for energy and converting carbon dioxide into their cellular material. One group of these marine bacteria (the easily-pronounced *Synechococcus* and *Prochlorococcus* bacteria) account for about 25% of all carbon fixation in the oceans. We are now performing experiments with these bacteria and their viruses (similar to the *E. coli* experiments) to try to understand how viral mortality affects the diversity and abundance of these bacteria in the oceans.

In other parts of the lab, graduate students Melissa Lage and Ben Nomann have been investigating the role of bacteria in salt marshes in Narragansett Bay (and so actually taking our lab out into the field!). First-year student Devon Bradley is setting up an experiment in the greenhouse to study the role of plant pathogens in maintaining plant community diversity. More from them in the near future.



A stained, magnified drop of seawater. All the small dots are viruses, the larger ones are bacteria.

Graduate Student Research

By Julie Ellis

My dissertation research has focused on the influence of seabirds as "cross-ecosystem" links between marine and terrestrial habitats in the Gulf of Maine. In particular, I have investigated two species of gull, Great Black-backed and Herring gull, whose populations have changed dramatically during the past century throughout the North Atlantic. Shifting patterns of distribution and abundance of these species have important consequences for both marine and terrestrial communities. In terrestrial habitats, guano, derived largely from marine sources, increases soil nitrogen concentrations, leading to the dominance of nitrophilic plant species. Additionally, gulls trample and pluck plants (as part of a behavioral display), a disturbance that results in an early successional community. Our results from studies conducted with Jose Miguel Farina show that cormorants have even more dramatic effects on plants; where cormorants nest densely, plants are absent! Moreover, my results from a collaborative study with National Audubon suggest that cover of grasses increases and plant diversity decreases on small islands where gulls have been removed and populations of breeding terns have increased. Overall, these studies indicate that changes in seabird communities presently occurring in New England may have significant effects on terrestrial habitats. Great Black-backed and Herring gulls also forage along coastal shores and are important predators of a marine invertebrates. Our studies in the Isles of Shoals have shown that gulls can remove between 20% and 100% of Jonah crabs present in the intertidal at low tide. Similar rates of predation by gulls on Jonah crabs have been found at eight other sites throughout the Gulf of Maine. Reduction of Jonah crab populations by gulls potentially has cascading effects on intertidal and subtidal communities, since crabs are abundant and mobile predators on mussels, gastropods, and a variety of other benthic invertebrates. To test for cascading effects, we conducted gull-exclusion experiments in the intertidal, using large cages with open sides to mimic the natural subtidal-intertidal flux of crabs. However, our results from these experiments suggest that gull predation on crabs does not affect abundance of the snail, *Littorina littorea*, an important prey of Jonah crabs. This finding results from an extremely large subtidal source of Jonah crabs that migrates into the intertidal during high tides, thereby replacing crabs removed by gulls during low tide.

In the Greenhouse

By Fred Jackson

The fall semester has started off very busily with laboratories for the seed plant and ethnobotany courses being held in the greenhouse teaching laboratory. They both require plant material from the greenhouse conservatory and local field areas. The greenhouse staff, mainly Brian Leib, forces plants to flower and searches for new specimens to add to the teaching collection, providing students with living plants for their studies.

This spider lily flowered in the conservatory in November.

Recently, the greenhouse facility took on the responsibility for the Brown University Herbarium, currently housed in the basement of Arnold Laboratory. Future plans are under way to find a permanent site for it that will permit expansion. We presently are working with Adella Francis to place the 100,000-specimen collection on a database to facilitate more effective management.

The principal researcher in the greenhouse this semester is Carrie Wessinger from the Schmitt laboratory, who is pursuing her senior thesis work with the plant drosophila, *Arabidopsis thaliana*. She is growing mutant lines under different temperature and nutrient regimes to evaluate the effect of mutations on the genetic pathway for flowering.

Fall 2003 Seminars

The Graduate Program in Ecology and Evolutionary Biology sponsors two weekly seminar series: Brown Bag Seminars for catching up on research and work in progress within EEB, and a more formal colloquium series featuring speakers from outside the University.

Brown Bag Seminars

September 5. **Christopher Siddon,** Brown University, Ph.D. Defense. *Behavioral indirect interactions: multiple predator effects and prey switching in the shallow rocky subtidal zone.*

September 19. **Douglass Morse**, EEB, Brown University. *The Kimberley and the Top End: across northwestern Australia by 4-wd.*

September 26. **Brad Marston**, Physics Department, Brown University. *The quantum mechanics of global warming.*

October 3. **David Rand**, EEB, Brown University. *The effects of chocolate and skiing on the study of coevolution between nuclear and mitochondrial genomes.*

October 10. **Andrew Clifford**, Graduate Student, Brown University. *Narial novelty in mammals: case studies and rules of construction.*

October 17. **Denise Guillot**, Boston University. *A comparative analysis of ateline functional anatomy and locomotor performance.*

October 24. **Lora Harris**, University of Rhode Island. *The virtual eelgrass meadow: agent-based modeling and allometry of* Zostera marina.

October 31. **Johan van de Koppel**, Spatial Ecology Department, Netherlands Institute of Ecology, Centre for Estuarine and Coastal Ecology. *Using models to understand shoreline community patterns.*

November 7. **John Stinchcombe**, Postdoctoral Research Associate, Brown University. *Ecological genomics and microevolution of development in plants.*

November 14. **James Cypser**, Postdoctoral Research Associate, Brown University. *Costs of reducing late-life mortality via reduced insulin signaling in* Drosophila.

November 21. **Adam Fry**, Brown University, Ph.D. Defense. *The evolution of* Wolbachia pipientis *in* Drosophila melanogaste*r: fitness effects and population genetics of an endosymbiotic bacterium.*

December 5. **Dae Sung Hwangbo**, Graduate Student, Brown University. *Life-span extension by spatio-temporally controlled expression of FOXO in* Drosophila*. Head-fat rules!!*

Monday Seminars

September 15. **Barry Costa-Pierce**, RI Seagrant College Program. *Human dominated costal ecosystems: the role of the National Sea Grant College Program.*

September 22. **Jonathan Kingdon**, University of Oxford. *Lowly origin: where, when and why our ancestors first stood up.*

September 29. **John H. Costello**, Providence College. *Emergent patterns of form and function within cnidarian medusae.*

October 6. **Brian Helmuth**, University of South Carolina. *How do we measure the environment? Linking ecology and physiology through biophysics.*

October 20. **Jacob Weiner**, Royal Veterinary & Agricultural University, Denmark. *Applying plant population ecology: increasing the suppression of weeds by cereal crops.*

October 27. **Roger T. Hanlon**, Marine Biological Laboratory, Woods Hole, MA. *Color blind camouflage: the anatomy, physiology and behavioral ecology of nature's best system of adaptive coloration.*

November 3. **William K. Smith**, Wake Forest University. *Photosynthetic adaptation from the cell to the landscape.*

November 10. **Stephen McGarvey**, International Health Institute, Brown University. *Ecology and transmission of* Schistosoma japonicum *in the Phillippines.*

November 17. **Taylor H. Ricketts**, World Wildlife Fund. *Ecology and economics of tropical forest fragments: do wild pollinators enhance yields in surrounding coffee crops?*

New Publications

Altieri, A.H. 2003. *Settlement cues in the locally dispersing temperate cup coral* Balanophyllia elegans. Biological Bulletin 204:241-245.

Bruno, J.F., J.J. Stachowicz and M.D. Bertness. 2003. *Inclusion of facilitation into ecological theory.* Trends in Ecology and Evolution 18:119-125.

Byrnes, J. and J.D. Witman. 2003. *Impact assessment of an invasive flatworm,* Convoluta convoluta*, in the Southern Gulf of Maine.* Journal of Experimental Marine Biology and Ecology 293:173-191.

Cypser, J.R. and T.E. Johnson. 2003. *Hormesis in* Caenorhabditis elegans *dauer-defective mutants*. Biogerontology 2003:203-214.

Ewanchuk, P.J. and M.D. Bertness. 2003. *Recovery of a northern New England salt marsh plant community from winter icing.* Oecologia 136:616-626.

Farina, J.M., S. Salazar, K.P. Wallem, J.D. Witman and J.C. Ellis. 2003. *Nutrient exchanges between marine and terrestrial ecosystems: the case of the Galapagos sea lion* Zalophus wollebacki. Journal of Animal Ecology 72:873-887.

Gravuer, K., E.J. von Wettberg, and J. Schmitt. 2003. *Dispersal biology of* Liatris scariosa var. novae-angliae *(Asteraceae), a rare New England grassland perennial.* American Journal of Botany 90:1159-1167.

Hamburg, S.P., R.D. Yanai, M.A. Arthur, J.D. Blum and T.G. Siccama. 2003. *Biotic control of calcium cycling in northern hardwood forests: acid rain and aging forests***.** Ecosystems 6:399-406.

Hane, E.N., S.P. Hamburg, J. Plaut and A. Barber. 2003. *Phytotoxicity of American beech* Fagus grandifolia *leaf leachage to sugar maple* Acer saccharum *seedlings in a greenhouse experiment.* Canadian Journal of Forest Research 33:814-821.

Kingan, S.B., M. Tatar, and D.M. Rand. 2003. *Reduced polymorphism in the chimpanzee semen coagulating protein, semenogelin I*. Journal of Molecular Evolution 57:159-169.

Korves, T.M. and J. Bergelson. 2003. *A developmental response to pathogen infection in* Arabidopsis. Plant Physiology 133:339-347.

Pennings, S.C., E. Selig, L. Houser, and M.D. Bertness. 2003. *Geographic variation in positive and negative interactions among marsh plants*. Ecology 84:1527-1538.

Richards, M.H., E.J. von Wettberg and A. Rutgers. 2003. *A novel social polymorphism in a primitively eusocial hymenopteran.* Proceedings of the National Academy of Sciences 100:7175-7180.

Sackton, T.B., R. Haney, and D.M. Rand. 2003. *Cytonuclear coadaptation in* Drosophila*: disruptions of cytochrome c oxidase activity in backcross genotypes.* Evolution 57:2315-2325.

Sheldahl, L.S., D.M. Weinreich, and D.M. Rand. 2003. *Recombination, dominance and selection on amino acid polymorphisms in the* Drosophila *genome.* Genetics 165:1195-1208.

Siddon, C.E. and J.D. Witman. 2003. *Influence of chronic, low-level hydrodynamic forces on subtidal community structure.* Marine Ecology Progress Series 261:99-110.

Silliman, B.R., C.A. Layman, and A.H. Altieri. 2003. *Symbiosis between an alpheid shrimp and xanthoid crab in salt marshes of mid-Atlantic states, U.S.A.* Journal of Crustacean Biology 23:876-879.

Silliman, B.R. and S.Y. Newell. 2003. *Fungal-farming in a snail.* Proceedings of the National Academy of Sciences 100:15643-15648.

Tu M.-P. and M. Tatar. 2003. *Juvenile diet restriction and the aging and reproduction of adult* Drosophila melanogaster. Aging Cell 2:327-333.

von Wettberg, E.J. and J. Weiner. 2003. *Nutrient heterogeneity does not make belowground competition size-asymmetric in glasshouse populations of* Triticum aestivum. Plant Ecology 169:85-92.

Weinig, C., J.R. Stinchcombe, and J. Schmitt. 2003. *Evolutionary genetics of resistance and tolerance to herbivory in* Arabidopsis thaliana. Evolution 57:1270-1280.

Weinig, C., L.A. Dorn, N.C. Kane, M.C. Ungerer, S.S. Halldorsdottir, Z.M. German, Y. Toyonaga, T.F.C. Mackay, M.D. Purugganan, and J. Schmitt. 2003. *Heterogeneous selection at specific loci in natural environments in* Arabidopsis thaliana. Genetics 165:321-329.

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Feedback to the EEB Newsletter

We would like to hear from you!

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Can we contact you for further information about your activities in Biology? ___yes ___no