THE UNIVERSITY OF ARIZONA®

ECOLOGY & EVOLUTIONARY BIOLOGY

Desert News and Views:

An EEB Alumni Newsletter

Issue 1, Spring 2003

Photo: View from the Desert Museum

Greetings from the Department Head

This is the first issue of EEB's new newsletter. Our main goal is to build a better EEB community through improved communication with our past members, as well as interested members of the broader community.

Founded in 1975, EEB was the first department of its kind in the world and our way of studying biology is increasingly being used as a model for the organization of biology at universities. We have grown into one of the leading EEB programs in the world and our goal is to maintain our excellence both in terms of research and in terms of undergraduate and graduate education.

Our teaching and research missions are mutually supportive; good teachers must be good learners and research is how we learn. We study the diversity of life in an integrative ecological and evolutionary framework, considering all levels in the biological hierarchy, including genes, cells, organisms, populations, communities and whole ecosystems. Our methods involve mathematical and computer models, lab work, field work, comparative analyses, and the use of museums and collections.

We study a range of habitats, including deserts (especially the local Sonoran desert), oceans, islands, and mountains. We also study a range of taxonomic groups, including microbes, protists, fungi, plants, and animals. Our program is organized around the core areas of genetics and ecology in an evolutionary context, but we are a diverse group and appreciate diverse approaches to biological problems.

These past few years have been difficult for EEB. The untimely deaths of Bill Calder and Art Winfree have stunned us; they were brilliant colleagues and dear friends. We will miss them. The ongoing budget cuts in the University continue to challenge us. Still, many good things have been happening. Creative faculty are the best way to build a program and we have welcomed a number of them into the department in recent years, including Brian Enquist, Travis Huxman, Regis Ferriere, Alex Badyaev, Carlos Machado, and John Pepper. Several of these new hires are featured in this issue of the newsletter, while others will be featured in future issues.

We continue to focus on improving our teaching and training programs, and we now host a new graduate training program. The U of A was recently awarded one of the coveted NSF IGERT Program Grants, entitled "Evolutionary, computational, and molecular approaches to genome structure and function," with EEB professor Michael Nachman as director and EEB as the home department. This training grant includes 23 faculty (9 are from EEB) from 9 departments and will fund 20 graduate students per year for 5 years.

Our graduate students continue to amaze us. Past graduate students occupy key positions in EEB science around the country and are making fundamental contributions to the field. In our current students, through their many accomplishments and awards, we can see a bright future for EEB. These are just a few of the many things that have been going on. As you can see it is an exciting time to be in EEB. I hope this newsletter will serve EEB by expanding and better integrating our diverse community. If you have suggestions for the content and format of this newsletter, please let us know.

Desert News and Views

Department Head: Rick Michod
Newsletter Advisor: Judith Bronstein
Editor: Laura Carsten

We welcome your input for future issues.
Please direct inquires to:
carsten@email.arizona.edu

News and Achievements

Don Falk: Hoshaw Award Winner

My research focuses on ecological disturbance, specifically forest fire.

Fire exerts a profound shaping influence in forested ecosystems worldwide, regulating demography, growth, and interactions of many species. In forests of southwestern North America dominated by Ponderosa pine (*Pinus ponderosa*), the historic fire regime consisted of relatively frequent, low-intensity, spatially heterogeneous surface fires.

Beginning in the late 19th century and continuing into the present, the combined effects of grazing, fire exclusion, and habitat fragmentation have dramatically reduced fire frequencies in most forests. The result has been a profound shift in the ecology and type of these ecosystems.

My dissertation explores spatial and temporal variation in the natural fire regime. I study spatial dimensions of the fire record, including the existence of "event-area" relationships analogous to the species-area relationships that have been so widely studied.

I am also interested in modeling probability functions for fire intervals over time. Correct scaling of the fire regime is essential to interpret its effects on demography and growth, so probability analysis allows me to ask how often an individual tree (and its progeny) experienced fire at the ecologically relevant scale.

I address these and related problems at the world renowned UA Laboratory of Tree-Ring Research. Surface fires kill a portion of the cambium (which eventually forms a "scar"). If the tree survives, multiple scars may be formed from successive fire events. It is not unusual for a single pine to record more than 20 fire events, and our collections establish a spatially explicit fire record more than 500 years long. Each fire can be dated to year (and often to season), allowing precise reconstruction of the spatial and temporal distribution of fire events.

These questions are intended to illuminate a more general problem, namely the role of variability in ecological processes. For example, there is evidence that tree establishment occurs primarily during longer fire-free intervals, not under mean conditions. If so, then these forest trees depend on temporal variation to complete their life cycle. Such "mean-extreme" interactions are of increasing interest in ecological research.

-Don Falk

Photo: Don Falk with daughter Luna

The Benton-White Shell Collection and Endowment

The Benton Shell Collection was created by Dolores Quintero and Hugh S. Benton. This collection, built over a period of forty years, was denoted to the University of Arizona in 1988. Work on the collection is supported by a fund started by their daughter, Dr. Lola Benton White, EdD, and her husband, Dr. Thomas White, PhD.

In 2002, the Whites increased their support for the Benton Collection and for graduate student support. The Benton endowment is targeted for students interested in educational, outreach and research opportunities that build on the Benton shell collection. Funds are available as Research Assistantships to support graduate students using the collection.

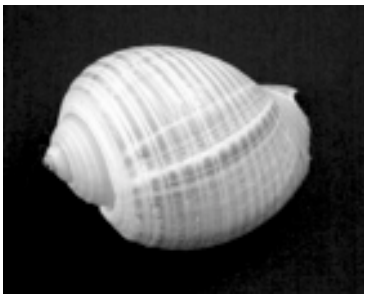
If interested, contact Peter Reinthal at: pnr@u.arizona.edu for more information. A series of shell kits developed by Dr. Katrina Mangin are also available for outreach activities.

For more information about the Benton Shell Collection, including an engaging history of Dolores Quintero and Hugh S. Benton written by Dr. Lola Benton White, beautiful photographs of Benton shells and live invertebrate animals and all the EEB Collections, visit the EEB Collections link at the EEB home page: http://eebweb.arizona.edu.

-Peter Reinthal

About the Hoshaw Award...

The Hoshaw Memorial Award was established in memory of Robert W. Hoshaw, a longtime EEB faculty member. The Hoshaw family established this award to recognize EEB graduate students that demonstrate excellence in their field. Students are nominated for this award based on their academic record and their potential contribution to the field of ecology and evolutionary biology. Preference is given to those students who show excellence in a particular undertaking, such as outstanding performance in preliminary exams, publishing a manuscript, or preparing a paper for a national or international conference.



Profiles of New Faculty

Photo: Alex Badyaev

Alex Badyaev

Alex joined the EEB faculty as an Assistant Professor in August 2002.

I have been fascinated with biology and science and specifically with the biology of birds for as long as I can remember.

I grew up in Moscow, spending most of my childhood and teenage years keeping hundreds of species of birds in my tiny room, volunteering in the bird section of the Moscow Zoo, and spending many hours at Moscow's famous outdoor bird market. That's where, at the age of twelve, that I met Professor R.L. Boehme, my childhood hero, the author of many books, and the world's authority on Palearctic birds. He invited me to join the expeditions of his Ornithology Lab at Moscow University and I went on my first expedition - to the Kamchatka Peninsula in the Pacific Ocean - the following summer.

Several years later, upon formal enrollment at Moscow University and to the Lab of Ornithology, I initiated what eventually became a seven-year study of birds in a remote and only recently discovered mountain range in the eastern Himalayan Mountains - a region along the border of Pakistan and Afghanistan.

For my Bachelor's thesis, I conducted the first inventory of the avifauna of this remote mountain range, describing previously unknown details of biology as well as taking the first photographs of endemic bird species there.

During my years at the lab of Ornithology I participated in and led numerous expeditions across much of the Palearctic, including a six-year study of birds of the Sea of Japan and the Korean Peninsula, much of Central Asia, and the Caucasus Mountains. Comparative studies of high elevation bird species that I initiated during that time laid a foundation for my long-term interest in the evolution of mating systems and sexual dimorphism.

I came to the U.S. to work at the Arctic National Wildlife Refuge on two projects that assessed the impact of proposed oil drilling on tundra ecosystems.

Eventually, I enrolled in graduate programs here, first at the University of Arkansas, then at the University of Montana. I received my PhD from the University of Montana for my studies of the evolution of sexual dimorphism in cardueline finches.

Nine years ago, I initiated a study of the evolutionary biology of the house finch - the fastest dispersing vertebrate that colonized most of North America in only a few decades. My colleagues and I discovered the mechanism that enables this species to adapt so rapidly to novel environments and I am currently conducting several projects that address the incredible adaptability of this species. Since joining the EEB faculty, I have started a study of these birds in Tucson - one of the few places in North America where the house finch is native and not introduced.

In addition to studies of morphological evolution in birds, my students and I are interested in the evolution of developmental plasticity, the evolution of behavior, and sexual selection. We study animals as diverse as bumblebees, polychaetes, shrews, grizzly bears, and, of course, many species of birds. The unifying theme of our work is the interest in the role of development in directing evolutionary change in morphology and behavior.

Brian Enquist

Brian joined the EEB faculty as an Assistant Professor in May 2000.

I am a broadly trained plant ecologist, interested in undertanding how the evolution of plant functional and structural diversity ramifies to influence larger scale macroecological and evolutionary patterns.

My research is based on the philosophy that our ability to tackle large scale problems in ecology and global climate change ultimately stems from the identification of general principles, which operate both within and across differing scales of biological organization.

By using a combination of fieldwork spanning both tropical and temperate sites, computer simulation, theory, and 'ecoinformatics' tools, my research has led to unique insights into the evolution of organismal form, function and diversity in biology.

After finishing my undergraduate degree in Biology from a small liberal arts college (Colorado College) I completed a MS degree and PhD from the Department of Biology at the University of New Mexico under the supervision of Dr. James H. Brown. My graduate degree focused on how numerous attributes of plants - including architecture, physiology, and growth are influenced (or scale) by the size of a plant.

How size influences attributes of organisms (allometry) has long been an important question in biology. My interest in plant allometry was driven by a long held passion to develop a deeper understanding of the biophysical principles that govern allometric and other scaling

Profiles of New Faculty

Photo: Brian Enquist

relationships in biology.

Upon completion of my PhD in 1998 I was fortunate to receive a NSF postdoctoral fellowship. I spent a year of this fellowship at the Santa Fe Institute - an interdisciplinary institute dedicated to understanding complex systems located in Santa Fe, New Mexico.

I completed my fellowship at the National Center for Ecological Analysis and Synthesis located in Santa Barbara, CA. NCEAS is an NSF funded center promoting integration within ecology. While at SFI and NCEAS I investigated how patterns of biomass production and allocation influence ontogenetic growth patterns across vascular plants and ultimately the structuring of plant communities across diverse environments including tropical and temperate communities.

To assess many of the biophysical and functional attributes of plants and plant communities, I maintain field projects here in SE Arizona, Colorado, and in Costa Rica. Over the past 10 years I have continued a long-term study of the dynamics of a diverse seasonally dry tropical forest in a permanent ~20ha forest plot in the Guanacaste Province, Costa Rica.

This project, initiated in 1976, is following the fates and changes in biometric attributes of approximately 40,000 individuals, ranging from saplings to large emergent trees within a local plant community. As a Fulbright Fellow I recently completed a survey of the entire forest. I intend to continue returning to Costa Rica on a regular basis to follow the long-term spatial patterns of growth, death, and dynamics of the forest.

Since arriving at the University of Arizona my research has continued to focus on highlighting and deducing: (1) how general scaling rules and physical constraints govern many attributes of plant form and function, and (2) how these principles in turn influence larger scale macroecological patterns in plant populations, communities, and ecosystems. Over the past few years my research has been featured in the *New York Times* and *Discover*, in addition to *Science* and *Nature* Magazines.

My lab is currently integrating how fundamental features of temperature and stoichiometry influence plant metabolism. In particular, we are interested in understanding how the biophysical constraints on plant metabolism has guided the evolution of functional diversity of vascular plants. Further, recent work has documented prominent scaling laws associated with the density and spacing of plants in ecological communities (both extant and paleo fossil communities) and the flux of nutrients, CO_2 and energy through ecosystems.

In order to assess global scaling relationships within and across plant communities, my lab maintains a large and global database and 'ecoinformatics' tools for synthesizing patterns of plant community diversity, biomass, and productivity. I currently maintain an externally funded lab supporting two post-docs, three graduate students, two research technicians and several undergraduates.

Travis Huxman

Travis joined the EEB faculty as an Assistant Professor in August 2001.

I am a broadly trained plant physiological ecologist who is interested in the evolution of plant traits relating to resource acquisition and allocation and the relationship between structure and function at higher scales of biological organization. This second aspect includes such topics as, how light interception and photosynthesis are impacted by plant canopy structure, or how species composition is related to ecosystem function.

I received a Master's degree from California State University, San Bernardino in 1996 under the direction of Michael Loik (currently at U.C. Santa Cruz), where I focused on understanding patterns of seed production in two sub-species of *Yucca whipplei* with different morphological constraints on growth and reproduction. This work highlighted the importance of considering morphological and physiological characteristics in understanding the evolution of reproductive strategies in plants.

I attended the University of Nevada, Las Vegas for a doctoral research project (finished in 2000) aimed at understanding how a changing climate affects patterns of

Photo: Travis Huxman

energy capture and resource allocation in plants from an intact Mojave Desert ecosystem.

I showed how a trade-off between investment in photosynthetic resource capture and seed production can occur as a result of accelerated growth rates under future atmospheric concentrations of carbon dioxide. The end result is a shift between growth and reproduction in some plants that produces competitively superior vegetative individuals with dramatic reductions in seed crop quality. I showed that this reduction in seed quality has generational effects that reduces the future performance characteristics of these individuals, potentially offsetting the increases in competitive ability.

This work has implications not only for plant species composition, but interaction with higher trophic levels, changing the total resource pool available for granivore use. In addition, I also focused on understanding how interacting climate variables control the relationship between native and non-native species in arid systems.

I performed post-doctoral research at the University of Colorado, in Russ Monson's lab, where we evaluated the patterns of activity in a high-elevation, subalpine forest (the Niwot Ridge AMERIFLUX Site). I conducted studies on the control over net ecosystem CO_2 exchange (NEE) in the Niwot Ridge forest by climate. I used path analysis to show that cool temperatures during the growing season (and their effects on photosynthesis) were not as important as warm temperatures (and their effects on ecosystem respiration) in controlling NEE, which stands in contrast to a solid body of work developed from smaller scale measurements.

Here at the University of Arizona, I have focused on a number of projects aimed at understanding structure / function relationships in semi-arid and arid ecosystems. I have continued a number of my projects in Nevada and Colorado, and also have recently begun to branch out in Arizona.

At the San Pedro River Basin and at Fort Huachuca, my lab is focused on understanding the ecosystem consequences of non-native species encroachment, using a gradient of invasion in two contrasting systems (a grass invading a grassland, and a shrub invading a grassland). Our goal is to understand the potential non-linear responses of ecosystem metabolism to species composition shifts.

My lab is also involved in a number of other collaborative projects, including evaluating long-term patterns of species composition change at Tumamoc Hill (with Julio Betancourt, Jan Bowers, Ray Turner, and Brian Enquist), and understanding a common mutualism in terms of physiological currencies (with Judith Bronstein, Goggy Davidowitz, and Wendy Mechaber).

In the next few issues, we will be profiling other new EEB faculty.

Photo: Margaret Evans on the dance floor

Multiple Loci

Many of us have interests and talents completely outside of the lab and the field. This new column will allow a glimpse at other facets of our faculty and students. The first contribution was supplied by Margaret Evans, an EEB student and dance afficianado.

As unlikely as it may seem for a student of ecology and evolutionary biology, my other passion is modern dance. Why would a graduate student make room in her already full schedule for something like dance? I am drawn to dance for at least two reasons: first and foremost is the joy of dancing itself. It simply feels good to move, to exercise the many sides of my self (playful, sensual, aggressive, sad, etc.) at the same time that I exert myself physically.

The second reason is that dance is continually challenging on multiple levels. Obviously it is challenging on a physical level, in terms of strength, flexibility, balance, and control. It is also challenging intellectually: to remember complex sequences of motion, to analyze and refine movement. Dance is challenging creatively as well. There is always another level to achieve in each of these aspects of dancing, and the more I dance, the more I become capable of.

My history of dancing has been full of starts and stops. I was a latecomer to dance: I didn't start lessons until junior high (mostly ballet). That bout of dance training lasted only two years or so. I was drawn to dance again in college, but this time it was modern. In modern dance I found a broader, more expressive and individualistic range of both motion and emotion.

In the last five years, while I've been a student, I've been able to dance on a more consistent basis. Through various local modern dance teachers and companies, I've picked up training in a wide variety of techniques.

Through the UA Presents series, I've had the chance to take master classes with several modern dance companies of national or international caliber. And in the last three years, I've become a member of a local modern dance company called NEW ARTiculations. I've also started dancing with a second local company, Funhouse Movement Theater. The Funhouse production I'm involved in is about Australia, and I get to dance the part of an emu.

The world of modern dance is a whole other world, with specialized language, styles, techniques, and movement genres. Though my dance and biology worlds are quite disparate in content, they do have some similarities. Certainly it requires discipline and persistence to do well in either. Both require me to exercise intellect and creativity. What more could one ask for in life?

-Margaret Evans

Outreach News

Marine Discovery

"Marine Discovery is the best field trip for my students, and I am the queen of field trips!" exclaimed a teacher that accompanied children to the Marine Discovery Program, an Ecology and Evolutionary Biology outreach program in Marine Biology for 3rd through 8th graders.

Two to three mornings each week during the school year a different elementary or middle school class visits the UA campus to participate in the Marine Discovery Program. Students dissect sharks and squid, hold live starfish and sea cucumbers, and see evidence in marine fossils of a time when the Tucson area was covered by an ancient sea.

The students are led through a variety of interactive stations on different topics in marine science. Topics include marine fossils, shark, perch and squid dissection, marine conservation, and fish diversity. University undergraduates are responsible for instruction in the workshops, and they develop and construct each of the interactive stations.

An aquarium filled with corals, fan worms, and sea cucumbers welcomes those who enter the Marine Discovery Laboratory. A model jaw of the fossil shark *Megalodon* looms from the ceiling; children have a chance to handle a hand-sized fossil tooth from the same giant and see how the ancient shark could have swallowed a great white shark whole.

The take-home messages for Marine Discovery participants are that science is intriguing, science is filled with unknowns as well as facts, and science is an accessible career. Undergraduate students represented in the program can be majoring in ecology and evolutionary biology, molecular and cellular biology, anthropology, teaching, or even art and journalism.

Over 1300 schoolchildren participated in the on-campus, 2-hour Marine Discovery workshops in 2001/2002, and many teachers have brought their classes to Marine Discovery since its inception in 1995. The Marine Discovery field trip to the UA is featured as the culmination of a semester-long curriculum in marine science.

Photo: Marine Discovery participants examining sea urchins under the microscope.

Marine Discovery consistently gets the highest of ratings among the teachers and parent chaperones that bring classes to the program, and of course, among the children themselves. "My favorite was the shark dissection, even now my pencil stinks", wrote one fan.

The marine biology subject, the on-campus setting, and the undergraduate instructors form the huge success of the program. The young students are taught a subject that they have a fascination for, marine biology, while they are introduced to college life and college students.

Marine Discovery receives funding from the Howard Hughes Medical Institute through the Department of Molecular and Cellular Biology. The program is directed and taught by Katrina Mangin, Director of Science Outreach for the Department of EEB.

-Katrina Mangin

Photo: Undergraduate Anna Hetsler and children preparing to design their school yard desert habitat.

Desert Discovery

Desert Discovery, patterned after Marine Discovery, is a desert ecology outreach program. The program focuses on the ecology of the Sonoran Desert region and offers hands-on activities in desert biology for elementary and middle school students in their schools or schoolyards, or through extended University's SEEK program. For example, EEB undergraduate Anna Hetsler and the children at Roskruge Elementary School in Tucson in 2001 planted a Desert Discovery Habitat in their schoolyard. Anna's honor's thesis described her experience as a case study of how to proceed in creating a desert habitat in a schoolyard, from the importance of enlisting the support of the principal to fostering a love for desert "weeds" among the school groundskeepers.

-Katrina Mangin

Obituaries

Four longtime EEB faculty members passed away this past year: Bill Calder, Chuck Lowe, John Hendrickson, and Art Winfree. They were valued colleagues and friends. We will miss them.

Art Winfree

Art Winfree passed away on November 5, 2002 at the age of 60 after a 7 month battle with cancer. Art received his PhD in Biology from Princeton University in 1970 and his Bachelor's degree in Engineering Physics from Cornell University in 1965. He joined the EEB faculty in 1986. He was also a much valued member of the UA Applied Mathematics program.

Art was an uncommon and original man and a brilliant scientist. He was most famous perhaps for his discovery and elucidation of three-dimensional scroll waves in excitable media.

He was widely respected by his peers. He received a Guggenheim Fellowship in 1982, the John D. and Catherine T. MacArthur Fellowship in 1984, the Einthoven Award in 1989-1991, a Regents Professorship at The University of Arizona in 1989, and the Norbert Wiener Prize of 2000 from the American Mathematical Society and the Society of Industrial and Applied Mathematics.

While he received much recognition, he also gave much back to the scientific community. He was a natural teacher and a great believer in learning by exploration.

This lovely and curious man will be greatly missed by family, friends and colleagues both in EEB and around the world.

Bill Calder

William Alexander Calder III, age 67, passed away on April 23, 2002 after a brief but courageous battle with leukemia. He was a passionate university educator and a loving husband and father.

He earned his Master's degree in Zoology from Washington State University in 1963 and his PhD as a NSF Scholar in Zoology from Duke University in 1966. He began teaching at University of Arizona in 1969.

He was a Fellow of the American Academy of Sciences and the author of many scientific papers and textbook chapters. He was nationally and internationally recognized as an expert on hummingbirds, and delighted in educating the general public.

Bill lived and taught passionately, combining his unbridled enthusiasm for scientific enquiry with deeply held personal ethics and compassionate human values. He was a tireless advocate for social equality and environmental conservation. He lived his life with deep compassion for everyone around him, and he met life's challenges and even his own illness with a wry humor, humility, and optimism that will be long remembered.

Chuck Lowe

Dr. Charles H. (Chuck) Lowe, Professor Emeritus of Ecology and Evolutionary Biology, who arrived at the University of Arizona in 1950 and retired in 1995, died September 13, 2002, after a period of declining health.

Dr. Lowe was an intense and colorful character who for many years was a leading naturalist and ecologist of the Southwest. In 1964 he published *The Vertebrates of Arizona*, a landmark book that also included detailed descriptions of all of Arizona's natural environments.

During the 1960's, he and his students, especially John Wright, Jay Cole, and Bob Bezy showed that many of our whiptail lizard species are in fact of hybrid origin, and are all-female species, reproducing without males.

Although a herpetologist at heart, his ecological interests were broad. From 1969-1983, with National Park Service naturalist Scotty Steenbergh, he published a key series of books and papers on the natural history of the saguaro cactus in the Tucson area and elsewhere in the Sonoran Desert.

His drive to learn and achieve brought him great success and led to wide renown as a researcher. Matching this was his enjoyment of teaching, as well as the many stories about him that made him much larger than life. Yet larger still were his thoughtfulness, generosity, and his depth of feeling for nature and for those working with him.

John Hendrickson

Dr. John R. Hendrickson, Professor Emeritus of Ecology and Evolutionary Biology, died September 6, 2002 at the age of 81.

He attended the University of Arizona, in Tucson, where he received his Bachelor of Science Degree in Zoology (with Distinction) in 1944. He joined the U.S. Navy Hospital Corps in 1945, and was honorably discharged in November 1946. In 1949 he earned his Masters Degree in Zoology from the University of California at Berkeley, and his PhD in 1951, also from UC Berkeley.

In 1969, he returned to the University of Arizona, where he held the post of Tenured Professor of Ecology & Evolutionary Biology until he retired in 1987. He is recognized worldwide as a pioneer in the field of marine turtle ecology and conservation.

In his final days he enjoyed expressions of love and admiration from his entire family and a global community of colleagues and friends.

Keep us posted:

Name _____ Other degrees _____

Change of address? (Circle which you prefer as a mailing address)

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_____	_____
Phone _____	Phone _____
e-mail _____	

Employer and job Title _____

New job? Married? Kids? Take a trip? Retired? See a classmate? Send us your news for future newsletters:

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In future issues, we will use this space to report on additional alumni, faculty, and graduate student news.

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Ecology and Evolutionary Biology
BioSciences West, Room 310
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Tucson, AZ 85721-0088

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