

## Fall 2015 Chair Welcome



Dept. Chair Mike Antolin on the water in Magdalena Bay in Baja California Sur, Mexico, with Shane Kanatous and Graham Peers photobombing.

Where did the summer go? It's sometimes difficult to account for all the "free time" we faculty have during summer. Usually our time is used to focus on our research or to travel to conferences.

For me, the summer's highlight was a trip to Baja California Sur in July, visiting Colorado State's newly-opened Todos Santos Center (see: <http://todossantos.colostate.edu/>) to design a marine biology field course for our undergraduates.

Along with biology faculty Shane Kanatous and Graham Peers, we will lead students to explore both coasts of Baja on the Pacific Ocean

(Magdalena Bay) and the Sea of Cortez (Isla Espiritu Santo and Cabo Pulmo) with the Sonoran Desert in between. Stay tuned, it begins in May 2016!

### DISCOVERY BEGINS HERE!

But keeping busy in summer is only one part of being in biology at Colorado State. Our biggest news is that we have found the team that will complete our new Biology Building. We accepted the bid from Haselden Construction along with Slaterpaul (hord|coplan|macht) Architects, plans are being finalized, and site preparation just east of the Anatomy/Zoology building has begun.

The building will be four stories and 151,560 square feet, accommodating both state-of-the-art life sciences research labs and ample space for new classrooms and teaching labs to serve the >1,400 biological science and zoology majors. We envisioned and designed a campus destination with sunlit seating/study spaces and a glass-wrapped beacon that will welcome all who come to campus.

**Official groundbreaking for both the Chemistry Research and Biology Buildings will be 1:30 the afternoon of October 15, as part of Homecoming Weekend.** Come see the band, President Tony Frank, and watch our own College of Natural Sciences' Dean, Jan Nerger, navigate construction equipment and move some dirt! For more information see: <http://www.natsci.colostate.edu/groundbreaking/>

### STUDENTS GRADUATE, STUDENTS ARRIVE!

Summer is marked by graduation, and this year we saw 254 students being awarded Bachelor of Science degrees as biological science or zoology majors. Thirty-five of these completed Honors Theses and graduated from the University Honors Program. This fall, we've seen a record-number 467 new students enrolling with 368 freshmen and 99 transfer students.

Most of these new students have moved into the College of Natural Sciences' Laurel Village, new college housing along Laurel Street that replaced the small, two-story brick apartment building that you may remember from your days here. Biology remains the program with the largest number of undergraduate students at Colorado State. We serve as a gateway to the life sciences to many incoming students. Many who begin with us eventually transfer to other majors when they discover opportunities like microbiology, psychology, or health and exercise science. Like we said: Discovery begins here!

Our graduate programs also continue to succeed, with diplomas conferred to two Ph.D.s (Eva Fischer (major adviser Kim Hoke) and Kevin Wilcox (Alan Knapp)), and seven M.S. students John Dietrich (Melinda Smith), Skyler Griffin (Janice Moore), Clif McKee (Coleen Webb), Erik Mohlhenrich (Rachel Mueller), Keith Post (Diana Wall), Jaiming Wang (Lianne Pilon-Smiths), and Alison White (Mike Antolin).

Two current students, Michael Caballero from Gram Peers' lab and Brian Gil, working with Chris Funk's, won top awards for research presentations at their scholarly societies' annual summer meetings. Three of our students were recognized by the National Science Foundation with Graduate Research Fellowships to complete the Ph.D.s: James Craven, May Gamboa, and Annie Kellner.

#### FACULTY ACCOMPLISHMENTS!

As always, we like to feature the accomplishments of biology faculty:

University distinguished Professor **Dr. Diana Wall** received the University College of Dublin's highest honor, the Ulysses Medal, awarded annually to an individual whose work has made an outstanding global contribution (see <http://source.colostate.edu/udp-diana-wall-receives-2015-ulysses-medal/>). Diana's long-term research focuses on the Antarctic dry valley ecosystems and the effects of climate change.

Assistant Professor **Dr. Tai Montgomery** was named one of this year's Boettcher Investigators through the Webb-Waring Biomedical Research Awards. This honor recognizes outstanding early-career scholars by the Denver-based Boettcher Foundation and includes three-years of research funding to support his work on the regulation of cellular processes by the recently-discovered micro RNAs.

Associate Professor **Dr. Chris Funk** was named to the latest cohort of mid-career scientists from across North America for the Leopold Leadership Program which is based at Stanford University's Woods Institute for the Environment. This two-year fellowship includes training in communicating science to the public— in Chris' case, his passion for conservation biology and evolution.

The Department of Biology continues to be among leading programs at Colorado State in securing the research funding critical to our mission as a research-intensive university. Biology faculty have responded with 10 new research grants since May!

#### INTO FALL!

As we launch into another academic year, we reflect on summer and on what's to come. Streams of students, special lectures, campus visitors, demonstrations on the Plaza, brilliantly sunny Colorado October days, Rams football and volleyball... all part of the life here in Fort Collins. As for me, my ski pass arrived in the mail yesterday, and I've got the blades sharpened and sticks taped for another hockey season. I'm ready to go!

# New Biology Building

***Groundbreaking for the new Chemistry Research and Biology Buildings –  
October 15, 2015, 1:30 PM!***

*The College of Natural Sciences will host a joint groundbreaking for both the Biology and the Chemistry Research Buildings. These two buildings, to be located next to each other along the south side of Pitkin Street on the main campus, will be the Gateway to the Science Mall.*

*The ceremony will follow our annual Scholarship Luncheon and kicks off homecoming weekend. There will be remarks by Dr. Tony Frank, System Chancellor and President and Dr. Jan Neger, Dean of Natural Sciences.*

*For more information see: <http://www.natsci.colostate.edu/groundbreaking/>*



**We have designed and are building a brand-new state-of-the-art Biology Building to open in Summer of 2017.**

***See a 3-D video of the Biology Building! <https://youtu.be/fboDHhS5NZ4>***

In science, students learn by doing science. A major goal of this facility is to provide more opportunities for students to gain hands-on experiences at the cutting edge of the life sciences. The Biology Building will be the workshop and home to our student apprentices, where standing side-by-side we will forge a future for the life sciences! Discovery Begins Here!

In April 2014, students at Colorado State University approved a facilities fee increase that provides much of the funding to design and complete the building. We have initiated development campaign

to help offset the bonds raised to fund the project, to raise additional funds to complete the fourth floor, and to provide special features (like a large salt-water aquarium) to make the Biology Building a signature destination on campus! We look to you, our alumni and friends, to help in this effort.

The Biology Building will be four stories and 151,560 square feet. Besides up-to-date research labs, ample space is given to state-of-the-art classroom and teaching facilities, including labs for emerging biotechnology, for student advising suites, and for “soft teaching idea spaces” and lounges where students can network with each other and with faculty.

This campus destination is for ALL students at CSU. Some will attend lectures or recitations, some will come for lab classes, and others for general-access computer labs. Many come to work on Honors thesis and other research projects. Some will find a quiet study corner with a view of the Rocky Mountains or meet friends and classmates.

The new building is sorely needed, both now and for future growth, and is critical for the Department of Biology to meet its teaching and research missions as a modern and forward-looking life sciences program.

If you’ve been following our progress, you already know that in recent years the Biology Department has increased by about 30% in undergraduate and graduate majors (~1,400), in research staff (~100), and in funded research projects (about 60 grants totaling ~\$8M of research spending each year). You can read details in the Building Plan Document ([http://www.biology.colostate.edu/wp-content/themes/biology-dept/files/Biology\\_Final\\_Program\\_Plan.pdf](http://www.biology.colostate.edu/wp-content/themes/biology-dept/files/Biology_Final_Program_Plan.pdf)).

All told, about 2/3rds of students graduating from Colorado State will have enrolled in a course taught by the Biology Department. We hire about 100 work-study and hourly students in our labs, and 150 Honors students work on individual research theses. The benefits extend beyond the Biology Department and the College of Natural Sciences: our move from current space in the Anatomy-Zoology building will provide space for the College of Veterinary Medicine and Biomedical Sciences, again to accommodate critical growth in this part of campus.

These projects synergize with the planning for a new research building for the Chemistry Department, partially funded by the Colorado Legislature. The chemistry research building will be built next door to biology, and together they will create the north side of a Science Mall between Pitkin and Lake Streets (picture below), adding to the concept of designing an on-campus destination.

***To donate toward the Biology Building Enhancement fund, please visit:***  
**[https://advancing.colostate.edu/BIOLOGY\\_BUILDING\\_ENHANCEMENT](https://advancing.colostate.edu/BIOLOGY_BUILDING_ENHANCEMENT)**





As seen from the northwest corner of Pitkin Street and East Drive. Biology in the foreground, Chemistry Research to the west.



The Biology (on the right) and the Chemistry Research Buildings will make one side of the Science Mall on the south side of campus.

# Welcome to Associate Professor Meena Balgopal



It is with great pleasure that we welcome Dr. Meena Balgopal to the Department of Biology as an Associate Professor of Science Education. Her move to biology (from the School of Education here at Colorado State) completes a long-standing goal for the department, where we have pursued filling a post in STEM (Science, Technology, Engineering and Math) education for more than a decade. Dr. Balgopal focuses her research on understanding how students learn through writing and how teachers develop both their base of knowledge and ability to effectively communicate with students. For the College of Natural Sciences, her hire helps us meet our goal of increasing the number of DBER's (*deeburrs*, Discipline-Based Education Researchers) across departments.

Before changing focus to science education during her doctoral work at North Dakota State University, Dr. Balgopal began her career as an entomologist studying the behavior and evolution of parasitoid wasps (those mostly tiny insects that make their living by destroying other insects... think of miniature "Aliens"). Her interests in education were piqued in graduate school in trying to understand why and how students resist learning about evolution. Understanding this requires knowing how students learn in general, and the nature of knowledge. Since then, Dr. Balgopal has not looked back, applying her experience as a biologist to researching STEM education. She came to Colorado State as an Assistant Professor in 2008. Dr. Balgopal has amassed quite a record of publishing research in science education and in successfully funding her research group. We could not be more pleased!

# Recent Research Funding to the Biology Department

As a research-intensive program, the Department of Biology depends on external grant funding to support laboratory and field studies. Much of the funding goes to support those who do much of the hard work: the fabulous post-doctoral researchers, talented research associates, graduate students gaining their degrees, and our undergraduates working as hourlies and/or Honors thesis students. In addition, faculty provide their own salaries from grants during the 3 summer months when they spend more of their busy time on research projects than during the academic year while more classes are in session. Research expenditures in the biology department in the last fiscal year were \$7.7 million, slightly less than the ~\$9M of the previous two years.

We are happy to report recent funding successes by eleven of our faculty, noting that these grants were awarded to biology in times when funding for research has become increasingly competitive (success from individual programs is often as low as 5% of submissions being funded!). Further, the richness and breadth of research in biology spans from molecular biology and biotechnology to evolution, physiology and behavior, to ecosystem studies.

**Mike Antolin**, Colorado Division of Parks and Wildlife, *"Evaluating Oral Plague Vaccines for Black-footed Ferrets,"* 3 years.

**Lisa Angeloni**: National Park Service, *"Wildlife Sensory Ecology Research: Responses to Noise and Light Pollution,"* 3 years.

**Meena Balgopal**: National Science Foundation, *"CSU Noyce Phase II: Empowering Scholars and STEM Teachers,"* 5 years.

**Cameron Ghalambor**: National Science Foundation, *"An Integrative Approach to the Ecological and Evolutionary Causes of Geographic Range Limits,"* 4 years.

**Chris Funk**: U.S. Fish and Wildlife Service, *"Application of Modern Genomic Techniques to the Conservation of the Great Basin Columbia Spotted Frogs, a Candidate for Listing under the U.S. Endangered Species Act,"* 4 years.

**Alan Knapp and Melinda Smith**: National Science Foundation, *"Integrating NEON ANPP Data with Existing Long-term and Spatially Extensive Data Sets – Providing Context and Testing Theory,"* 2 years.

**June Medford**: Defense Advanced Research Projects Agency, US Department of Defense: *"Synthetic Biological Desalination,"* initially one year.

**Lianne Pilon-Smiths**: National Science Foundation, *"Mechanisms of Selenate-Specific Transport and Selenium Hyperaccumulation and Tolerance in Stanleya pinnata - Hypothesized Key Genes SpSultr1;2 and SpAPS2,"* 3 years.

**Diana Wall**: National Science Foundation, *"Water Availability Controls on Above-Belowground Productivity Partitioning: Herbivory versus Plant Response,"* 3 years.

**Colleen Webb**: Department of Homeland Security, *"U.S. Animal Movement Model (USAMM) and Disease Outbreak Simulation (USDOS): Incorporating Premises Heterogeneity and Consequences for Control,"* 3 years.



# Prestigious Post-Doctoral Research Fellowship Awarded in Biology

Post-doctoral researchers continue their training while working in the laboratories of faculty in the biology department. Many are supported by research grants of their mentor/sponsors, but we are fortunate to also attract highly skilled post-docs who gain their own support.

This year, two awards have been awarded to post-docs in biology:



Dr. Justin Havird

**Dr. Justin Havird** was awarded a 3-year Kirschstein Post-doctoral Fellowship from the National Institutes of Health to work in the lab of **Assistant Professor Dan Sloan** on a project entitled “Mitochondrial-nuclear Genomic Interactions in a Plant Lineage with Quickly-evolving mtDNA.” Justin completed his Ph.D. in 2014 at Auburn University and before that studied at the University of Florida. His personal web page describes his research interests and background: <http://jchavird.wix.com/jchavird#!cv/ckiy>.



Dr. Denis Jallet

**Dr. Denis Jallet** received the Fondation Bettencourt-Schueller Young Researchers Award (France), to work in the lab of **Assistant Professor Graham Peers**. Denis completed his Ph.D. at the Université Paris-Sud in Gif-sur-Yvette, France. The foundation awards recent life sciences Ph.D. graduates from France opportunities to continue their studies abroad. The award recognizes the excellence of research, the reputation of the host university and laboratory, the quality of their proposed research project, and includes funds to support Denis’ research activities at CSU. For more information on the prize see: <http://www.fondationbs.org/fr/sciences-de-la-vie/soutien-aux-chercheurs/prix-scientifiques/prix-pour-les-jeunes-chercheurs>.



# Cameron Ghalambor and Kim Hoke

## Published in NATURE



The Trinidadian guppy is a model for evolutionary studies in natural settings, where this tiny fish is able to evolve its color, behavior, and breeding patterns in response to different predator regimes. Along with several others in biology's guppy group, **Cameron Ghalambor** and **Kim Hoke** have extended the experiments demonstrating evolution in wild populations of guppies to genomic analyses of which genes are turned on and off during the evolutionary process.

Their study was published in *Nature*, one of the most prestigious peer-reviewed journals in science. For more, including videos featuring Cameron and predation on guppies, see the article on Colorado State's *SOURCE*:

<http://source.colostate.edu/groundbreaking-study-finds-changing-environment-can-lead-to-rapid-evolution/>

# Biology Faculty & Student Award Winners

Once again, the Department of Biology demonstrates excellence by receiving a long list of awards. Please join us in congratulating the 2014-15 award winners and the 2015-16 scholarship recipients:

## **DEPARTMENT OF BIOLOGY AWARDS FOR EXCELLENCE IN TEACHING AND MENTORING**

Faculty Excellence in Undergraduate Teaching: Dr. Debbie Garrity

Faculty Excellence in Graduate Education and Mentoring: Dr. Kim Hoke

Graduate Student Excellence in Teaching: Eva Fischer and Liz Harp

## **EXTERNAL AWARDS:**

Leopold Leadership Fellow: Dr. Chris Funk

USDA Secretary's Honor Award for Increasing Global Food Supply: Dr. Steve Stack and colleagues

National Science Foundation Doctoral Dissertation Improvement Grant: Brian Gill

National Science Foundation Graduate Research Fellowships: James Craven, May Gamboa, and Annie Kellner

## **DEPARTMENT OF BIOLOGY SCHOLARSHIPS:**

### ***Undergraduate Scholarships:***

Biology Scholarship: Francis Commercon

Bruno Klinger Memorial Scholarship: Rachel Jones

Peitersen Memorial Scholarship: Shay Koetting

### ***Graduate Scholarships:***

Sharon E. and David E. Kabes Scholarship: Clifton McKee

Harold Harrington Fellowship: Ava Hoffman

Stavros Family Fund: Alyssa Cochran and Ava Hoffman

## **FRONT RANGE STUDENT ECOLOGY SYMPOSIUM AWARDEES:**

Graduate oral presentation: Charlotte Alster

Graduate posters: David Markman, Robert Griffin-Nolan, Whitney Beck

Undergraduate presentation: Jillian Gerberich

## **CMB/BMB/MCIN POSTER SYMPOSIUM AWARDEE:**

Honors: Michael Cantrell

# Ken Kassenbrock: Mushroom Stalker and Fungi Forager



Dr. Ken Kassenbrock shares the results of a day of mushrooming in the Colorado Rockies.

A wet spring is not only welcome for our gardens, it also causes the mountains to spring forth mushrooms in abundance. It's a mycologist's dream.

Dr. Ken Kassenbrock, who teaches Mycology (BZ333) for the Department of Biology, is especially happy with our wet spring as he plans to once again teach mushroom hunting classes at the Eagle Mushroom & Wild Food Festival August 21 to 23.

<http://eagleoutside.com/events/eagle-mushroom-wild-food-festival/>

The mushrooms should be at their peak at that elevation.

Wild food has always been of interest to Dr. Kassenbrock. As he explored his interest in wild foods, discoveries about edible plants led to discovering edible fungi and mushrooms. He explains, "They seem otherworldly and transient. When you discover a big patch of mushrooms, it's exciting!"

You could think of mushroom hunting as an Easter egg hunt for grownups. The big difference is that Easter eggs are pretty much, well, Easter eggs. Mushrooms come in many varieties and they look different at different stages of development. Because they can be toxic, it is critical to spend time learning identification, preferably with an experienced person to look over your shoulder.

Remember, it takes a long time to learn how to identify edible mushrooms. Not only do they look different in the wild from the pictures in the books, other factors such as smell and where it is found are important parts of identification. Kassenbrock suggests focusing on one species to begin. Learn what attributes are important and learn what you can confuse it with. Then you can branch out to other species to add to your body of knowledge.

Once you start, it's easy to get hooked; you start looking forward to the rain. The season is short and it peaks in August in the high country. Hunting for the table is not for the faint of heart as it can be risky. Not only do you have to be certain of your identification, you also have to be right! And look



Dr. Kassenbrock demonstrates identification techniques to interested mushroom foragers.

out, long time mushroom hunters tend to protect their secret spots as mushrooms will fruit in the same area each year.

What's interesting is that mushrooms require a healthy forest to grow; the relationship between fungi and trees is important. Identifying trees can be critical to finding mushrooms. Some species, such as chanterelles, porcini and truffles, absorb nutrients from trees and supply nutrients to their host in return. If the forest is out of balance, the mushrooms can't thrive.

Finding them is one thing, eating is another. Different species of wild mushrooms have different flavors; some have a savory meaty character, others may be nutty, some even have notes of apricot or anise. Best with lighter foods to showcase the flavors, they are low calorie and very satisfying. It's important to cook them. Some species, such as morels, are toxic when raw and require cooking to be edible. Cooking also gets the most nutrition out of them.

If you love the taste of mushrooms but prefer to pass on the stalking and foraging, you could grow them in your basement as Dr. Kassenbrock does. The best way to start is to purchase a kit online. Kits are fairly easy, requiring only watering and moist air, and a variety of species are available. Going beyond kits can be a bit more challenging as it requires pasteurizing or sterilizing things like straw, hardwood sawdust, or compost that different mushroom species use as food.

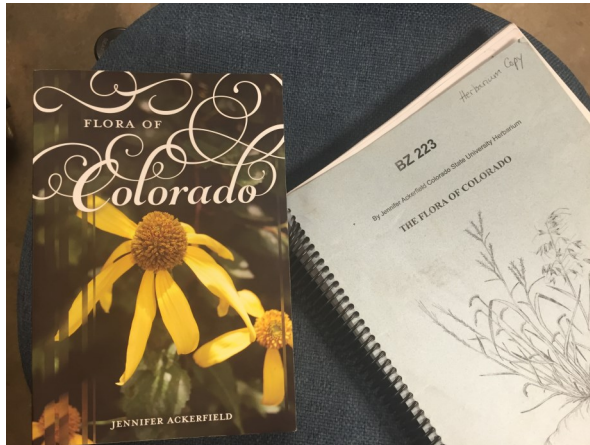
Growing your own allows you to have the species you want when you want them. If you love to garden, this will allow you to enjoy your hobby all year long, even in the middle of winter.



Dr. Kassenbrock and Dr. Pat Bedinger with a basket full of mushroom goodness!



# Jennifer Ackerfield and Flora of Colorado Book Launch



Before and after – Herbarium copies of *The Flora of Colorado* by Jennifer Ackerfield.

Ask Jennifer Ackerfield about blood and she pales; ask her about plants and you'll feel the flood of enthusiasm wash over you. Jennifer knew she wanted to work with plants from early on when her kindergarten teacher pointed out buds on trees. Jennifer said, "I thought it was the coolest thing ever!"

Growing up on a farm in Kansas she was always curious about her surroundings. In high school, she planted her first herb garden and was always bringing home plants. Learning about plant adaptations, medical properties, habitats, and all the diversity in the botanical world has sustained her interest since.

She also loves to solve puzzles, especially when you sort out the pieces and make them fit, or find out why they don't fit. Plant identification is a puzzle with pieces that include not only the physical properties of the plant, but also the geography where those plants are distributed, whether they are rare or invasive, and whether they're in a bog or along a stream, on a hillside, in a mountain forest, or on the prairie.

Jennifer curates the CSU Herbarium which houses plant samples well over 100 years old. When she began teaching classes in plant identification 15 years ago, she became frustrated with the convoluted dichotomous key provided. She and her students couldn't even properly identify a dandelion.

She explains, "A dichotomous key is simply a series of paired questions about the plant you are attempting to identify. It's like a choose-your-own-adventure for plants." If the key contains questions that are unclear, you will go down a completely different path and misidentify that plant.

As a way to improve the situation she developed her own keys and used them as a lab manual for her students. To test the key, she decided to clean up the Herbarium and create the best annotated collection possible.

Jennifer knew she was on to something when other botanists used her key and said things like: "Great!" "This is fast and easy!" and "How can I get one?" After several years of classroom use Jennifer took the keys to another level and developed her comprehensive *Flora of Color*-



Jennifer Ackerfield assists a student in plant identification in the CSU Herbarium.

do (2015, BRIT Press). The flora, a dictionary of every plant in the state, includes species descriptions, photographs, and maps along with the dichotomous keys.

With a flora in hand as you gather plant data from a geographic location, you can begin to make predictions. It's a snapshot – here is what is in this location at this point in time. Do that enough times and you can begin to track species, and perhaps see how their distribution and abundance is changing. You can determine whether invasive plants have altered the landscape. You can also use DNA fingerprinting to compare the plants of today to the historical specimens in the CSU Herbarium. The puzzle then becomes, are things shifting, and if so, how?

Observations become data, data become predictions, and natural history meets science! If change is happening, what's likely to be imperiled? You can use the genetic data to assess relationships between populations now and in the past, and between species.

This comprehensive *Flora of Colorado* is an essential tool for botanists and planners, and is a cornerstone of scholarship and achievement. The book is the only guide to flora ever to have been authored exclusively by a woman. Join us in congratulating Jennifer on the publication of an important milestone in Herbarium history.



Jennifer Ackerfield  
autographs a book for  
her fans.

The *Flora of Colorado* can be purchased online from the Colorado State University Bookstore:

<http://col.st/XzNE2>

# Asst. Professor Tai Montgomery Named a Boettcher Investigator for 2015-2018



Assistant Professor Tai Montgomery

It is our great pleasure to report that Assistant Professor Tai Montgomery has been honored by a 3-year, \$225,000 award as Colorado State University's 2015 Boettcher Investigator. Dr. Montgomery joined the Biology Department in Fall 2013, and studies molecular genetic regulation of cellular processes via micro-RNA's, using the nematode worm *Caenorhabditis elegans* as a model.

Please join us in congratulating Dr. Montgomery for this accomplishment, and for more information see CSU SOURCE:

<http://source.colostate.edu/work-on-drug-efficacy-earns-montgomery-early-career-boettcher-award/>

# CSU and Ecuador Collaboration and Scientific Inquiry on Two Continents



Frog diversity abounds in Ecuador

You could think of Ecuador as the southern branch of the CSU Department of Biology. Five faculty members have established research sites in that exquisitely beautiful country to study ecology and evolutionary biology. (For more on their research, scroll to the end of this article and click on the links to their labs.)

When all five professors are in the same room talking about their experiences in Ecuador, the air crackles with energy. By the end of the conversation, ideas are flying on new collaborations and developing new courses to enhance the relationship between Ecuador and CSU. The re-

search is exciting and the collaborations generate even more potential to push the edge of scholarship in this exciting ecosystem.

As would be expected, Ecuador is culturally very different from the US and working with local collaborators is a key factor in making progress. Without an Ecuadorian scientist on the project to share knowledge of the local flora and fauna and help with the permits and bureaucracy, life is so much more difficult. For example, to leave the country with plant or animal samples in hand, you must have a permit from the government. On one trip, after waiting months, that permit was issued the day before Dr. Pat Bedinger was scheduled to leave. "That can be enormously frustrating," she said.

The citizens of Ecuador are increasingly aware of the potential of their country's environment and welcome researchers. Many local researchers are US trained and quite open to alliances. As Dr. Kim Hoke said enthusiastically, "These relationships dramatically shape our research."

In addition to the research, sharing knowledge through teaching is an area where the partnerships shine. Through collaboration with the local university in the capital city, Quito, Dr. Hoke teaches classes in next-generation sequencing to scientists, and neuroethology to undergraduate students. Here at CSU, Dr. Chris Funk advises Ecuadorian Ph.D. student Mónica Páez and teaches BZ482, Ecology, Evolution and Conservation of Ecuadorian Biodiversity. Part of that classwork brings his CSU students to Ecuador for three weeks in the summer for incomparable hands-on learning.

In a different collaborative effort, Dr. Bedinger is currently in conversation with a faculty member in Loja seeking to establish a seed bank on their campus to preserve genes of wild and cultivated species. Repositories of genetic material are not new to CSU where the USDA maintains a seed bank on the Fort Collins campus. [http://www.ars.usda.gov/main/site\\_main.htm?modecode=30-12-05-00](http://www.ars.usda.gov/main/site_main.htm?modecode=30-12-05-00)

Current plans will have an Ecuadorian scientist come to CSU and the University of California – Davis to receive specific training in how to set up and maintain a seed bank.

Ecuador, a relatively small country about the size of Colorado, is especially attractive because of its



astounding biodiversity. “Megadiversity,” actually. For example, in all of the US and Canada, there are about 800 species of birds; Ecuador has about 1700. Working in Ecuador is also attractive because there are roads to get to the remote areas.

Researchers can travel from one research site to another without undue hardship.

Additionally, this country has a huge variety of habitats. There are very high mountains (20,000+ foot elevation), active volcanoes, the Amazon Basin, rainforests, coastal regions, and plenty of rivers and lakes. Some areas are really dry, for example along the southwestern Ecuadorian coast, and places that are really wet, like the southern tip of the Chocó rainforest, in the northwestern corner of Ecuador.



Ecuador is in the northwest corner of South America along the equator.

Altitudinally, because of its proximity to the equator, the climate is very stable at any given elevational zone. It’s always cold at the top of mountains and always warm in the lowlands. One researcher, working for a period of time at 10,000 feet found that a coat and gloves were not enough. She needed a heater to keep her hands supple. This stability in bands of climate creates a lot of biodiversity, but conversely makes organisms more vulnerable to climate change, as they are adapted to narrow ranges of temperatures.

Rapid change and unparalleled biodiversity in Ecuador has potential for exciting research, and top scientists in that country are eager to continue working with CSU. Perhaps one day, working on the south side of campus will mean something different entirely!



Collaboration will continue even as Ecuador takes economic advantage of their environment. Development of the land is increasing, including an oil and gas pipeline that transverses the Andes. Capturing the energy of the many rivers to generate electricity means that dams can go up overnight and change the landscape suddenly and irreparably.

Research in Ecuador

Dr. Pat Bedinger: <http://wp.natsci.colostate.edu/bedinger/>

Dr. Chris Funk: <http://wp.natsci.colostate.edu/funklab/>

Dr. Cameron Ghalambor: [http://sites.biology.colostate.edu/ghalamborlab/Ghalambor\\_Lab/Welcome.html](http://sites.biology.colostate.edu/ghalamborlab/Ghalambor_Lab/Welcome.html)

Dr. Kim Hoke: <http://hokelab.weebly.com/>

Dr. LeRoy Poff: <http://rydberg.biology.colostate.edu/poff/>