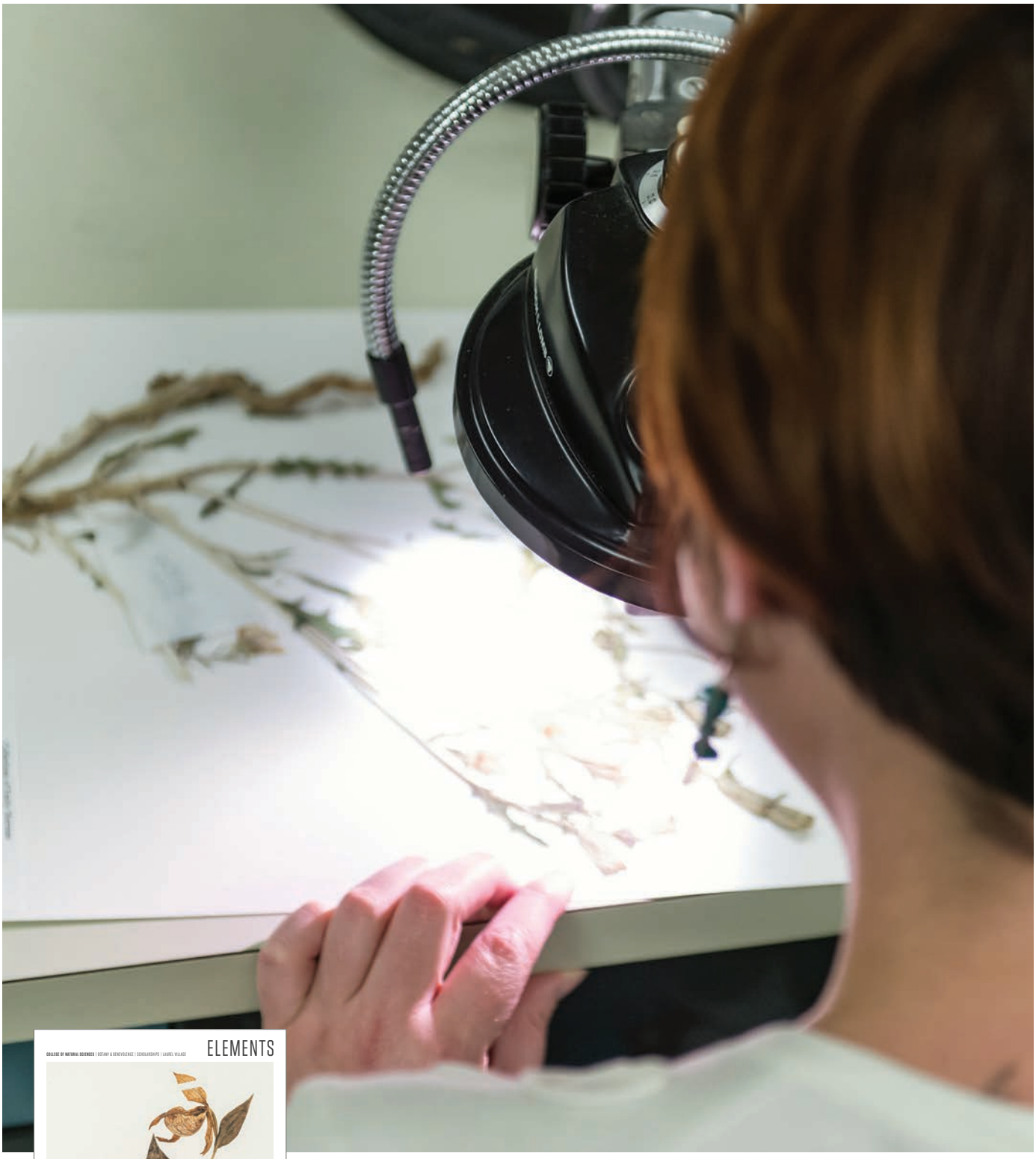
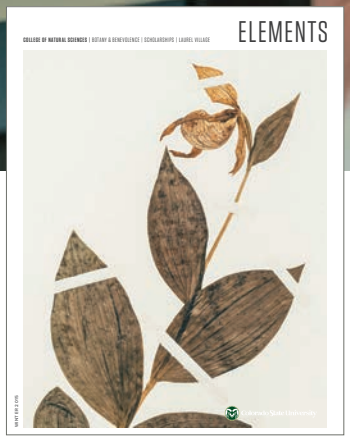
ELEMENTS

COLLEGE OF NATURAL SCIENCES | BOTANY & BENEVOLENCE | SCHOLARSHIPS | LAUREL VILLAGE

Colorado State University

WINTER 2015





ON THE COVER: The Art of Science

Jennifer Ackerfield examines a herbarium specimen of Mentzelia, commonly called a stickleaf plant. It gets its name from the multitude of large, multicellular hairs covered with hooked tips. When these hairs come in contact with just about anything, they stick. Consequently, the plant is referred to as nature's Velcro.

An Introduction to ELEMENTS

WELCOME TO THE NEW State of Communications in the College of Natural Sciences.

Many of you will remember Outlook magazine from years past. After a hiatus, we're back with a brand-new publication meant to help you stay connected and engaged with the College of Natural Sciences.

Elements is the deepest storytelling vehicle in a suite of related CNS communications, both printed and online. We chose the name because it fits our purpose: showcase the many components, big and small, that make up this diverse, highly ambitious college. But it's something more, too: a reminder that the fundamental research we do, and the knowledge we create, are critical to answering many of today's pressing scientific questions.

Our work, in other words, really is science in its most elemental form.

On the following pages, you'll find everything from long-form articles to bite-sized bits, so whether you can spare five minutes or 55, there's content for you.

Enjoy.

DEAN, COLLEGE OF NATURAL SCIENCES Janice Nerger

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We welcome your support! To support the College of Natural Sciences and create many new success stories, contact Simone Clasen at ***simone.clasen@colostate.edu*** or (970) 491-0997. Thank you!

COLLEGE OF NATURAL SCIENCES

On the Road

ONE OF THE GREATEST pleasures of my job is traveling to meet with you – our alumni, donors, and friends. You have amazing stories to tell and inspiring career trajectories. In my view, your successes help define this college.

I've met many of you over the last year, but a trip to Washington, D.C., sticks in my mind. While there, I sat down with several remarkable alumni – people who show us what's possible with a degree in the sciences and what binds us together as a community of scientific thinkers.

One of them, Miranda Ballentine, has followed an amazingly diverse career path. After a bachelor's in psychology in 1996, Ballentine earned her M.B.A. with honors from George Washington University, specializing in environmental management and policy. She eventually served as Walmart's director of sustainability for renewable energy and sustainable buildings, reducing environmental and social impacts across Walmart's global operations.

All the while, she says, she never forgot the lessons from the College of Natural Sciences. Specifically, her foundation in the sciences gave her an edge over her peers: an empirical way of looking at the world, where data and clarity of thought often yield the best decisions.

Last year, Ballentine was nominated by President Obama to the position of assistant secretary of the U.S. Air Force for installations, environment, and logistics. Today, she's acclimating to yet another new role and a new organization. But she's always been good at that.

Another outstanding alumna is Anna Mae Mitchell Jackson, who in 1967 became not only the Department of Psychology's first person to receive a doctorate from CSU, but also the first woman, and the first African-American Ph.D. recipient. She went on to a variety of teaching and administrative roles, eventually retiring as a professor and associate dean at Meharry Medical College, one of the nation's oldest and largest historically black academic health sciences centers. She also served as an associate professor of psychology at the University of Colorado Health Sciences Center, and as chief psychologist at the State Home and Training School in Wheat Ridge, Colo.

Top: Jeri Mulrow
Bottom: Jan Nerger, Oprah Winfrey



Across: Ed Mulrow, Miranda Ballentine, Anna Mae Jackson

Jackson has always been a fearless thinker. While at Colorado State University, she conducted research on cognitive differences in blacks and whites; she followed that by looking at psychotherapy testing norms and outcomes. One important takeaway of that work, she says, was the understanding that prevailing therapies being offered at the time were lacking in cultural sensitivity.

To round out the trip, I met with Ed and Jeri Mulrow, two graduates from the Department of Statistics. In 1986, Ed earned his Ph.D. from the department; Jeri finished her M.S. in 1985. We can enjoy the fact that the couple got acquainted during their studies in the CNS – in the same old Civil and Irrigation Engineering Building that now houses the statistics department and the dean's office.

They make a remarkable statistical team. Jeri is currently the deputy division director for the National Science Foundation's National Center for Science and Engineering Statistics. She also serves as the vice president for the American Statistical Association, the world's largest community of statisticians. In 2013, she received the association's highest honor, the Founders Award.

Ed is associate director for statistics and methodology for the National Opinion Research Center at the University of Chicago. He is also the project manager for the National Children's Study Data Linkages project, which studies "potential relationships between environmental measures and children's health and development." Ed was named a fellow of the American Statistical Association in 2014.

Together, the Mulrows demonstrate the amazing applicability of statistics – as embodied, for example, in the new CNS Master of Applied Statistics program.

There's so much more to say about each of these amazing alumni. But it suffices for now to highlight what's common between them: the clarity and depth of scientific thinking, ambition, and innovation.

When you think of it that way, you've got an apt description of the College of Natural Sciences itself. I look forward to meeting you on a future journey.

– JAN NERGER, DEAN

P.S. And yes, I met Oprah Winfrey while in D.C., too!

WELCOME TO CLASS

NEW FACULTY HIRES IN THE CNS FOR 2014 & 2015

BIOCHEMISTRY & MOLECULAR BIOLOGY

Steven Markus

Tim Stasevich

BIOLOGY

Meena Balgopal

CHEMISTRY

Martin McCullagh

Andrew McNally

A. R. Ravishankara

COMPUTER SCIENCE

Hamid Reza Chitsaz

MATHEMATICS

Henry Adams

David Aristoff

Jessica Ellis

Mark Shoemaker

Clayton Shonkwiler

PHYSICS

Kate Ross

Dylan Yost

PSYCHOLOGY

Evelinn Borrayo

Tori Crain

STATISTICS

Bailey Fosdick

Wen Zhou

EDUCATION AND OUTREACH CENTER CELEBRATES 25 YEARS OF TRIUNFO

AS COLLEGE OF NATURAL SCIENCES students begin a new academic year, some are also welcoming their entry into the Triunfo (Triumph) Mentoring Program, a capstone of their student experience. Started in 1990, Triunfo is a partnership between the CNS Education and Outreach Center and Colorado State University's El Centro student-support program. Each year, it pairs Colorado State student mentors with primarily underserved K-12 students, often paying to bus the mentees to tutoring sessions. The partnerships last an entire academic year, and they produce memorable bonds – and new lessons for all involved.

This year, 70 K-5 students were mentored by 70 college student volunteers.

According to Stephanie Herrera, a junior biochemistry major and Triunfo tutor, the mentorship is crucial to young students because it teaches them about their own potential. Many will be the first in their families to view college as an option. "They can see themselves in their mentors," she says. That connection helps demonstrate that someone has walked their path before them, and that they may follow.

Learn more at ***cns-eoc.colostate.edu/triunfo***.

CHEMICAL BONDS: Alumnus Creates Nancy E. Levinger Undergraduate Research Fellowship

CHEMISTRY PROFESSOR NANCY LEVINGER once kicked Kyle Kung '96 out of her research lab. Now, years later, Kung has created a fellowship in her name.

Eager for research as a freshman, Kung began with Levinger in the spring of 1993. But after a semester, his grades slipped, and Levinger, then a fresh face in the Department of Chemistry, enforced a minimum-GPA rule. Kung was out.

He seized the opportunity he knew might slip away from him. Kung soon returned to the lab after pushing up his GPA, and was an outstanding contributor. After graduating, he earned his Ph.D. in chemistry from UC Berkeley. He's since translated his training into a successful career in finance, and today he works in banking in Hong Kong.

Still, he remembers his time in the lab as one of his most important educational experiences. "I learned the research and critical thinking skills that allowed me to succeed in my graduate and professional career," he says. Add resilience to that list of lessons.

University Distinguished Teaching Scholar Nancy Levinger has a new alumna sponsored scholarship named for her.

A TRUE GIFT

"THIS FELLOWSHIP IS TOTALLY remarkable," Levinger says. "Shocking and humbling."

Kung's offer really was a shock – he emailed Levinger one Monday in January and pitched the idea out of the blue. At a moment of opportunity with his career, he was considering where he might want to give back, and his experience with Levinger leapt to his mind.

"Without scholarships, it would not have been possible for me to go to college full-time or conduct research with Nancy during the summers," he says. "I want to contribute back to the University by offering support for students to work with their professors on research because that experience has been the biggest contributor to my success after graduating from CSU.

And while Kung's remarkable gift came as something of a surprise, his rationale for recognizing Levinger did not.

"Dr. Levinger is an extraordinary scholar who is dedicated to our students and their success," says College of Natural Sciences Dean Jan Nerger. "She is a Colorado State University Distinguished Teaching Scholar and represents the best of the best for her teaching, scholarship, and mentoring efforts. This fellowship award aptly honors Dr. Levinger for her unwavering support for undergraduate research and excellence."

To contribute to the Nancy E. Levinger Undergraduate Research Fellowship and make your own mark on student research, visit https://advancing.colostate.edu/nancylevinger-fellowship.

JACK MCGREW, CNS LEADING MAN

In Retirement, the Longtime Assistant Dean Continues to Impact the CNS

IT WAS A FAMILIAR JOKE: How many times would Jack McGrew "retire" before he'd actually stop coming into the office to work? There was no formal count, but the beloved workaholic called it a career formally on Dec. 31, 2014.

Jack McGrew is a case study in dedication to an institution. He served CSU on staff for 28 years, is an alumnus of the College of Natural Sciences (Ph.D. in zoology and entomology, 1982), and he and his wife, Liz, have been thoughtful and dedicated donors for many years. McGrew's generosity has taken many forms – teaching, advising, program development, student recruitment – and he has touched an untold number of lives here.

Fortunately for the college, his impact will continue even though he's left the 8–5 work schedule behind.

SCHOLAR AND ADMINISTRATOR

MCGREW'S DEDICATION TO HIGHER education started with his entry into it. A scholarship propelled him into a college, where he obtained a degree in biology, as well as a new conviction: that a quality education should be accessible to the best and brightest young thinkers.

In part, that's because college had never been a guarantee for McGrew. "My parents would have had a great deal of difficulty paying for it," he says, "and they might have chosen not to. That hasn't changed for a lot of first-generation students over the years."

McGrew applied this idea as assistant dean in the CNS starting in 1986. He served as liaison to the Division of Students Affairs; was the faculty adviser for Ingersoll Hall; served as scholarship chair for the CNS; and directed undergraduate recruitment, advising, and retention programs.

"Jack has guided our thinking, in many ways, for decades," says CNS dean Jan Nerger. "His passion for education and dedication to the undergraduate mission of the University has been extraordinary."

Jack McGrew and director of inclusion Arlene Nededog discuss natural sciences workshops in the TILT Great Hall.

MODEL DONOR

MCGREW'S NEARLY 30 YEARS of giving back began with small gifts and routine payroll deductions, but lately he's upped the ante. He and Liz recently created the Liz and Jack McGrew Scholarship, as well as a generous planned gift.

They did it in large part because the College of Natural Sciences exposed Jack to the value of giving back every day.

"When I was serving as scholarship chair for the CNS," he says, "I got to see so many people who were impacted. It was an awful lot of fun helping allocate that money to students. Those Saturday mornings when I'd sit in with list of students and list of scholarships and match them up were rewarding."

Today, McGrew can rest assured that the College of Natural Sciences is taking care of its students in the way he did for all those years.

He's given us quite a model from which to work.

Celebrate the McGrews' impact at CSU and help untold numbers of future Rams by contributing to the Liz and Jack McGrew Scholarship. Contact Simone Clasen at simone.clasen@colostate.edu, or (970) 491-0997.

Botany & Benevolence

TWENTY THOUSAND SPECIMENS GIFTED TO THE COLORADO STATE UNIVERSITY HERBARIUM ARE ENRICHING A VENERABLE PROGRAM – AND TEACHING US ABOUT OUR OWN HISTORY.

JENNIFER ACKERFIELD, CURATOR OF COLLECTIONS of the Colorado State University Herbarium, is beaming.

She stands in front of a lab table strewn with newly arrived plant specimens – *Mentzelia decapetala*, or stickleaf; *Abronia glabrifolia Standl.*, or clay sand verbena. These aren't ordinary specimens. Although they're new to the Herbarium, most are decades old. But they were pressed with such care and skill that it's as if not a day has passed since they were plucked from the dry earth of Colorado's eastern plains.

"This is old-school science," she says, finger on the spiny leaves of the stickleaf, whose microscopic hooks tug back like Velcro. "These plants change everything."

The new specimens are the work of Dr. Miriam Denham, a college educator and researcher, and her late husband, Dale Denham, also a botanist. The pair spent decades roaming the globe fulfilling their love of flora and visited some of Colorado's remotest corners – places other researchers seldom reach. Their work is impressive not just for its size, but for the geographical diversity it represents.

And now, the Denhams' collection has become Colorado State's collection. Last fall, the family transferred what is essentially a life's work to the College of Natural Sciences. A University of Colorado alumna, Dr. Dehnam looked to CSU because she was comforted that her specimens would be put to good use here. And how useful they are: Her collection of almost 20,000 plants is a fifth the size of the entire herbarium. It has redefined the program.

It is also redefining our understanding of our state's flora.

HISTORY, PRESERVED

HERBARIA HAVE A REPUTATION for being unspectacular spaces – lots of metal, ceiling-high cupboards and the vague mustiness of dried leaves and aging paper – but once the specimens come out, visitors are dazzled.

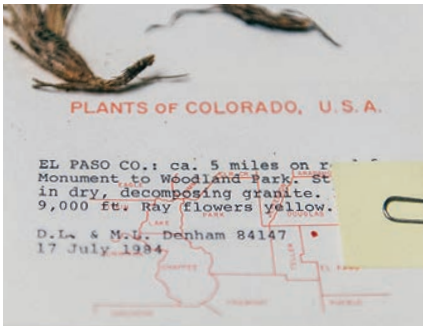
In CSU's herbarium, mouths drop when Ackerfield pulls out the root of a bindweed – a four-foot-tall, gnarly alien pod by the looks of it. (This one was found six feet beneath a paved driveway, curiously healthy.) Or when she opens the cabinet that contains all the mint species and the air fills with exactly the smell you'd expect.

Visitors are especially impressed by the place's surprising history.

CSU's herbarium, started by botanist James Cassidy in 1883, is the oldest in Colorado. Cassidy was unlucky, growing sick and passing away a short time after he'd begun the project, but his successors tended it carefully. By 1906, New Yorker P.A. Rydberg had used many of the specimens to publish the first "Flora of Colorado," a 450-page brick of a guidebook. It described, in intricate detail, thousands of the area's most important plants. It stood for many years as the authoritative account for the region, and it was complemented in 1956 by longtime herbarium curator Harold Harrington's "Manual of the Plants of Colorado." These publications, and the leaders who produced them, are part of why CSU's small-but-mighty herbarium has maintained its prowess as other herbaria have cropped up in the area.

These preserved plants are important because they tell the genetic and evolutionary history of our section of the Earth. Archived inside the herbarium are the original specimens of newly defined species. There are examples of organisms that are now extinct, as well as samples of plants so endangered that Ackerfield can't disclose the coordinates of where they were found. It's hard to overestimate the value of the biology contained

IN A WORD: METICULOUS. DENHAM'S COLLECTION IS REMARKABLE FOR ITS SIZE, BUT ALSO FOR ITS THOROUGHNESS. IN MANY CASES, SHE'S EVEN DONE THE CRUCIAL GEO-LOCATING WORK NECESSARY FOR PROPER CATALOGING, GREATLY SIMPLIFYING TRANSFER TO THE STATE DATABASE ACKERFIELD AND HER TEAM HELP MAINTAIN.



within these cinder-block walls, whether you measure in terms of scientific knowledge, work hours expended, or beautiful – artful, even – floral preservations available to the public and researchers of all sorts.

Today, the facility is experiencing a second bloom. With funds from a National Science Foundation grant, Ackerfield and her team recently digitized the entire collection, making tens of thousands of samples searchable and viewable online. To do so, she enlisted a cadre of botany students, and the herbarium's frequent visitors – members of the public, school groups, students and researchers from other CSU colleges, unaffiliated botanists – can watch these dedicated young researchers bustling about each day.

By the end of their time there, the students feel almost as much attachment to the herbarium as Ackerfield does.

A SCIENCE AND AN ART

THAT MIGHT HAVE SOMETHING to do with the fact that plant preservation is an age-old task – an exercise in history-keeping as well as a technique of science. There's a certain romance to it.

"When you think about it, we use plant presses today that are identical to the ones the earliest botanists used when they were roaming the Rocky Mountains in 1890," Ackerfield says. This link to the past is clearly part of the program's allure – and it's also why Denham's immaculate preservations are so useful and have essentially limitless shelf lives.

It starts with the press. Moisture is the enemy of preservation, so plant presses exert a surprising amount of force to extract water and keep plants' shape. Under the best of circumstances, managing several layers of absorbent materials, along with a fragile specimen and the press straps, can require a contortionist. But because freshness is so important to getting the best result, much of the preparation takes place in the field.

Denham, teamed with her husband, excelled at field collection, though she remembers Colorado's eastern plains as being a less-than-ideal laboratory. "Pressing sometimes took both of us," she says with a chuckle. "It was always so windy out on the plains."

Denham's favorite plant? Mentzelia laevicaulis, a flashy wildflower common in the west and often called the giant blazing star. Her instant recall of plants and locations

SUPPORT THE HERBARIUM

GRANTS AND GIFTS LIKE the one from Denham and her family have bolstered the herbarium's programming in recent years. Today, the College of Natural Sciences seeks to capitalize on this incredible momentum to create a self-sustaining endowment to support the herbarium.

If you'd like to make your mark on this incomparable Colorado institution, visit https://advancing.colostate.edu/herbarium or contact Jennifer Pedneau, associate director of development, at (970) 491-5711 or ***jennifer.pedneau@colostate.edu***.

As Jennifer Ackerfield displays a piece from the new collection, Dean Jan Nerger and Dr. Miriam Denham show off Jennifer's new book at a Herbarium event. Preservation is the name of the game for the Herbarium, including plant specimens and a sizable collection of botany books.

grows, no doubt, from her years teaching biology to college students at CU. The feat of producing something like "Flora of Colorado" – a reference that might seem to be beyond a single person's capacities – starts to look a little more reasonable after talking with devotees like Denham.

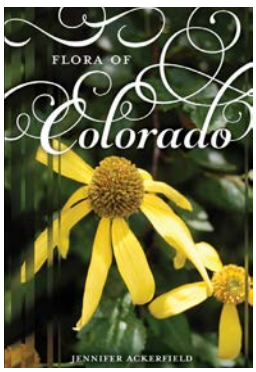
"To find someone like Miriam is a treasure," Ackerfield says. "This is more than a collection of fascinating flora – it's a window into the history and biological makeup of Colorado." Ackerfield likes to show visitors a map of Colorado on which small dots represent pulled plant samples. The map is the most intuitive way to represent clusters of sampling coverage and the wide-open spaces where the state's flora have not been adequately studied. "Unusually, Miriam spent a lot of her time out in these remote regions with no dots," she says. "This is so important. Each time we log one of these specimens, our understanding of Colorado expands."

Ackerfield urges her students to consider the fact that Denver's vast paved acreage covers what used to be some of Colorado's richest habitats. The Herbarium has many samples from these areas where, today, nothing grows but weeds in asphalt cracks.

"We're literally preserving our history."

Ackerfield picks up one of the dried plants from Denham's collection. Its paper backing has yellowed a bit, but the plant itself is pristine. According to custom, the darkened root is attached at the lower left corner, with the stem and leaves filling the rest of the space except for an empty rectangle for the label in the lower right corner. Typical of Denham's specimens, the penciled label on this one is a case study in precision and care. Her penmanship draws the eye.

"You could put one of these on your wall they're so beautiful," Ackerfield says. She pauses, cocks her head. "You know, that's not a bad idea. I need to get back into the field."



THE NEW "FLORA OF COLORADO"

"Flora of Colorado" is available through ORDER PROTOCOL, **http://shop.brit.org/products/coloradoflora**. Ackerfield plans to donate a percentage of the royalties back to the herbarium. This edition, with nearly 1,000 photos, is now considered the most comprehensive, up-to-date (and colorful) guide available. The book, which has sold nearly 1,000 copies since its debut in mid-May, is the only guide to flora ever authored exclusively by a woman. Fans of our state's natural environments should consider a copy.

GATEWAY TO DISCOVERY

DISCOVERY BEGINS HERE

NEW CNS CHEMISTRY RESEARCH AND BIOLOGY BUILDINGS WILL CREATE COMMUNITY AND COLLABORATION

IN THE NEW BIOLOGY BUILDING, Colorado's abundant sunlight will be a significant design feature. In public spaces and casual meeting areas, students will gather in that sun with their professors to process the day's lessons. They'll walk away inspired, energized, and maybe even more committed to their major.

Then they will walk through a doorway into the most high-tech lab they have ever seen and wander upstairs to visit with faculty in their state-of-the-art research labs.

Educators today understand that academic buildings aren't just glorified office spaces or vessels for the tools of learning. These days, the space in which education takes place is actually part of the learning process. The biology building's design, for instance, which encompasses four stories and 151,560 square feet, will include student advising suites and "soft teaching" study lounges, where students can network with each other and with faculty. These spaces create unforeseen partnerships, reinforcing lessons from the classroom and giving students – particularly underclassmen finding their way – educational allies.

Campus is ready. Last year, student leadership at Colorado State University sent a powerful message: science education is a priority for us, and we will invest in it. The Associated Students of Colorado State University approved a fee increase that provides a significant portion of the estimated $81 million for a new, state-of-the-art biology building. Concurrently, the Colorado State Legislature earmarked $55 million in installments for a new chemistry research facility of similar scope.

Together, these buildings will form a new "Gateway to Discovery" – a learning hub unlike anything on campus.

> ONE OF OUR MAIN GOALS IS TO HELP STUDENTS FIND PURPOSE AND MEANING IN THEIR SCIENCE EDUCATION. THIS HELPS THEM MAKE CONNECTIONS BEYOND THEIR CURRICULUM AND FORESEE WHAT THEIR WORK MEANS OUT IN THE WORLD.
>
> ALLIE KELLER
> COORDINATOR OF THE CNS LEARNING COMMUNITY

SCIENTIFIC COMMUNITY

NEARLY 60 PERCENT OF students at Colorado State enroll in a course taught by the biology department. Chemistry has a huge reach as well. These departments are large in terms of majors, but they also serve thousands of non-majors who need these fundamental science courses for other graduation requirements. Traffic is high, and it's only getting higher.

Biology department chair Mike Antolin sees these new buildings as a huge opportunity. "This isn't just a building," he says. "It's a campus destination: a space that gives students a home base, promotes connections, and enables them to discover their passions."

In chemistry, department chair Professor Chuck Henry echoes the enthusiasm. "The current chemistry building has served us well, but our department's capabilities have expanded enormously, as have enrollments. Having a central research and teaching hub here in the College of Natural Sciences will serve everyone."

These plans align with current best practices in education, but they also represent a broader theme in the College of Natural Sciences. Just last year, the college opened the CNS Learning Community, which is located at the newly constructed Laurel Village. The CNSLC approaches learning from another angle – residential life.

There, residents are immersed in scientific conversations throughout the day and night. Extensive programming, community-service activities, and on-site lectures create close bonds and support networking.

In the spring, the CNS welcomed Allie Keller, its first CNS Learning Community coordinator. Keller will be in charge of refining and expanding the community's programming and integrating it with all of the college's academic departments.

"One of our main goals is to help students find purpose and meaning in their science education," Keller says. "This helps them make connections beyond their curriculum and foresee what their work means out in the world."

Together with the biology and chemistry building projects – not to mention a host of existing programs and resources – the CNS is helping usher in a new era in science education at CSU.

ONE YEAR LATER:
The Science of Learning in the CNS Learning Community

THE COLLEGE OF NATURAL SCIENCES Learning Community – a 400-student community housed in Laurel Village, CSU's newest residential facility – is a year old.

This symbiotic melding of residential life academics has changed the college fundamentally. What has always been a natural (dare we say organic) community cohesion among the departments and students is now supported by new programming and state-of-the-art curricular/residential learning models. This distinctive learning environment is working wonders.

BEST PALS

LINDSEY YOUNG SAYS SHE has the best job on campus.

The effervescent rising junior has worn plenty of hats in the CNSLC over the last year. As Peer Academic Leaders (PALs) coordinator, she's helped managed what is probably the signature academic support initiative in the facility; she's also tutored for the PACe math program, run various other academic programs, and was in charge of advertising, social media, and coordination between the PALs and the Laurel Village residential assistant and desk staff.

Next year, her position will evolve to include management of the sustainability science/learning floor in Piñon Hall.

"We had some great successes last year," she says. "There was a PAL/RA-run program in front of the pavilion where we learned about and planted personal Paper White flowers (Narcissus papyraceus), and a program connecting students to research opportunities with faculty."

The diversity of these programs – from informal to highly orchestrated – is what provides residents with so many chances to feel attached to the community.

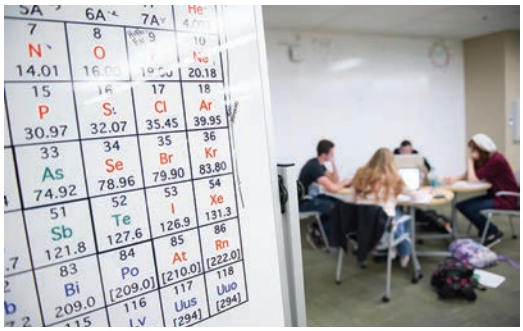
"I'm really excited for what's in store next year," Young says.

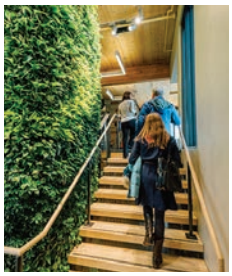
The character of the community continues to develop. In the spring, the College of Natural Sciences welcomed Allie Keller as the Learning Community Coordinator. Keller, a Fort Collins native who received her master's in biology from Northern Arizona University, is the best kind of science junkie – trained in the sciences and enriched by study and work abroad, she can reach students in two languages and fully understands the value of integrating curriculum with community. Having developed science curricula herself, she has seen some of the pitfalls in science education – and created fresh solutions.

BUILDING ON HISTORY

ASSISTANT DEAN LISA DYSLESKI and her team view the CNSLC as an opportunity to invigorate CSU's existing learning-community programming. There are already 17 learning or theme communities on campus, and over the years they have gelled into a cohesive program as their curricular and co-curricular benefits have become more obvious.

The Laurel Village complex was built not just as a modern residential shell, but as a setting that facilitates and sup-





ports programming. It is defined by two main residential buildings, an outdoor amphitheater, and a central pavilion. The pavilion is the first project on the main CSU campus to pursue LEED Platinum certification, and the entire complex was built to at least LEED Gold standards. The site includes classrooms, offices for academic advisers and faculty, study rooms that will facilitate group work, and versatile space for guest lectures and other events. Over a year of use, residents have come to appreciate the thoughtful design.

"One of the core ideas at CSU is that we'll support students wherever they want to head," Dysleski says. "When they're surrounded by their peers and truly immersed, they discover all kinds of things about themselves and where they want to go."

The sights and sounds of the new Learning Community reflect the enthusiasm of some 850 Natural Sciences freshmen who transitioned to the University.

LEARN MORE:

www.natsci.colostate.edu/future-students/cnslc/
Facebook: www.facebook.com/csucns/learningcommunity
Twitter: @csucnslc

LEADERSHIP DEFINED:

ASSISTANT DEAN LISA DYSLESKI CREATES CNSLC RESIDENTIAL ASSISTANCE FUND

$514 A YEAR.

That's the cost differential between living in the College of Natural Sciences Learning Community and CSU's less expensive housing locations. And while that might not seem like much of a burden in the context of a modern college education, it's enough to deter some students from experiencing life in the CNSLC.

"I hate to see that be a barrier," Dysleski says. "These students are often a great fit, and they could do well at the CNSLC and really impact the community."

Last winter, Dysleski personally started the College of Natural Sciences Learning Community On-Campus Residential Assistance Endowment, which provides need-based aid to students to erase that cost challenge. That way, the decision is a purely academic one, not a financial one.

Donors are currently bolstering Dysleski's gift to ensure that the fund provides robust returns and perpetual help to the students who need it most.

Want to help make the CNSLC experience possible for everyone – right now? Contribute. Contact Simone Clasen at ***simone.clasen@colostate.edu***, or (970) 491-0997.

IN THIS SECTION:

SIGNATURE RESEARCH PROJECTS

You might see us in the news for these. This is trailblazing research that is making a difference now.

BIG QUESTIONS

What makes the department tick? What are the pressing issues of the day?

FACULTY SUCCESS

LEADERS DOING EXCELLENT WORK – these are just some of the people to watch.

Undergraduate Emily Robitchek, CANCER RESEARCH STANDOUT

CNS RISING SENIOR EMILY ROBITSCHEK has already established herself as a formidable cancer researcher. Last year, she was awarded a Goldwater Scholarship, which is among the highest national honors for undergraduates; previously, she received a Thomas J. Bardos Science Education Award from the American Association of Cancer Research. And after researching abroad in Argentina, she received a grant from Sigma Xi that has propelled her even further.

"There is a lot of evidence to suggest that our own immune system, which protects us from pathogens such as viruses and bacteria, can also play a role in protecting us from cancer," she says. "However, this response is imperfect, and the cancer can evolve mechanisms of defense and evasion to get around our bodies' immune defenses."

So she's working to improve the immune system's ability to keep cancer in check or even to kill it completely. One of her several current projects seeks to improve the recognition of a tumor by a type of immune cell known as a cytotoxic lymphocyte (CD8+ T cell), which has been implicated as the immune cell that plays the most central role in actually killing cancer cells.

After CSU, Robitschek has her eyes on a Ph.D., "because I'm deeply motivated to lessen the suffering from this disease that touches us so profoundly."

SIGNATURE RESEARCH PROJECTS

Engineering more stable proteins through halogen bonds (patent submitted)

The role of chromatin structure on gene a (NIH P01 grant)

Mechanisms of chromosome segregation (PEW Scholar)

Identifying prion-like proteins (Nature paper)

BIG QUESTIONS

What are the molecular causes of cancer?

Can vaccines be developed against human (polio) and animal (hoof-and-mouth disease) RNA viruses?

Can eating blueberries prevent neurodegenerative disease?

How can writing help improve undergraduate learning in the life sciences?

FACULTY SUCCESS

CANCER: Jenny Nyborg, Laurie Stargell, Tingting Yao

CHROMOSOMAL DEFECTS: Jennifer DeLuca

VACCINES AGAINST RNA VIRUSES: Olve Peersen

IDENTIFYING PRION-LIKE PROTEINS: Eric Ross

DRUG DESIGN AND DEVELOPMENT: P. Shing Ho, Crystal Vander Zanden, Melissa Ford (Ph.D. graduate students)

NEURODEGENERATIVE DISEASE: James Bamburg

INCORPORATING WRITING IN TEACHING: Paul Laybourn

The New Biology Building Approaches

If you've made it to this page without checking out the feature articles, flip to p. 12 to read more about the upcoming Biology Building. The facility, part of a new "Gateway to Discovery" with the new Chemistry Research Building, will change the way the life sciences are taught at CSU.

SIGNATURE RESEARCH PROJECTS

Understanding the genetic basis for congenital heart defects

How social context modulates predator evasion strategy in guppies

Using quantitative disease dynamics as a tool for guiding response to avian influenza

BIG QUESTIONS

Why don't hibernating animals lose bone mass?

What does Colorado's diverse flora tell us about our state's history – and future?

Will genetic hybridization help or harm dwindling inbred populations of animals?

Why and how do birds in the same location evolve in different ways?

FACULTY SUCCESS

EVOLUTION AND GENETIC DIVERSITY AMONG GUPPY POPULATIONS: Chris Funk, Lisa Angeloni

PLANT ACCUMULATION AND DETOXIFICATION OF ENVIRONMENTAL POLLUTANTS: Elizabeth Pilon-Smits

SOIL BIODIVERSITY, ANTARCTIC RESEARCH: Diana Wall

TOMATO GENOMICS AND FRUIT BIOLOGY: Steve Stack

Amber Krummel Awarded Alfred P. Sloan Research Fellowship

AMBER KRUMMEL WAS NAMED a 2015 Sloan Research Fellowship recipient by the Alfred P. Sloan Foundation. This extremely competitive award is the centerpiece of the Sloan Foundation's support of the best and brightest young researchers in the country – men and women who are often in their first university appointments.

Established in 1955, the fellowships are intended to "identify those who show the most outstanding promise of making fundamental contributions to new knowledge." And these investments have been well placed: Over the years, 43 Sloan fellows have gone on to win Nobel Prizes, and hundreds have received other prestigious awards and honors.

PIONEERING CHEMISTRY

USING ULTRAFAST LASER SPECTROSCOPY, Krummel's research group a focuses on the very small – including, as a primary subject, pore-forming toxins. PFTs, "the first line of offense for many organisms," are peptides or proteins that form pores in cell membranes by self-assembling in lipid membranes.

The Krummel group specializes in developing ways to measure these self-assembly processes, including microfluidic technology and ultrafast laser spectrometers that are capable of probing chemical interactions that occur on very fast timescales. The combination of microfluidic technology and spectroscopy puts Krummel in a unique position to probe events early in the self-assembly processes.

Understanding PFTs has many applications, one of which could be developing anti-viral, anti-microbial medications.

SIGNATURE RESEARCH PROJECTS

Upcoming Medical Center of the Rockies facility and joint research/ translational programs

Atmospheric chemistry, spectrometry and instrumentation, measurement of reactive trace gases, pesticides, and particles

Pore-forming toxins, self-assembly, and anti-viral/microbial medication

BIG QUESTIONS

How can we meet our future energy needs with new battery technologies?

What chemical processes underlie air quality, soil safety, and environmental sustainability?

FACULTY SUCCESS

HIGH-PERFORMANCE LITHIUM BATTERY TECHNOLOGY: Amy Prieto

CHEMICAL COMPOSITION OF ATMOSPHERIC AEROSOLS AND QUANTIFICATION OF SURFACE/ WATER POLLUTANTS: Chuck Henry

POLYMERS, RENEWABLE ENERGY, SUSTAINABLE MATERIALS, ORGANOMETALLIC/CATALYTIC CHEMISTRY: Eugene Chen

NANOPARTICLE STRUCTURE AND CHEMISTRY, BIOLOGICAL IMAGING, MATERIALS CHEMISTRY: Chris Ackerson

SOLID-STATE AND MATERIALS CHEMISTRY ("MATERIALS BY DESIGN"): Jamie Neilson

BEYOND SIRI: Researchers Are Bridging Human-Computer Interaction

FOR MOST PEOPLE, USING a computer is limited to clicking, typing, searching, and, thanks to Siri and similar software, verbal commands.

Compare that with how humans interact – smiling, frowning, pointing, tone of voice all lend richness to communication.

With the goal of revolutionizing everyday interactions between humans and computers, Colorado State University researchers are developing new technologies for making computers recognize not just traditional commands, but non-verbal ones – gestures, body language and facial expressions.

Their project, titled "Communication Through Gestures, Expression and Shared Perception," is led by Professor of Computer Science Bruce Draper, and is bolstered by a recent $2.1 million grant from the Defense Advanced Research Projects Agency (DARPA) under its "Communicating with Computers" funding program.

"Current human-computer interfaces are still severely limited," said Draper, who is joined on the project by CSU researchers from the computer science and mathematics departments. "First, they provide essentially one-way communication: users tell the computer what to do. This was fine when computers were crude tools, but more and more, computers are becoming our partners and assistants in complex tasks. Communication with computers needs to become a two-way dialogue."

The team has proposed creating a library of what are called Elementary Composable Ideas (ECIs). Like little packets of information recognizable to computers, each ECI contains information about a gesture or facial expression, derived from human users, as well as a syntactical element that constrains how the information can be read.

To achieve this, the researchers have a Microsoft Kinect interface set up. A human subject sits down at a table with blocks, pictures and other stimuli. The researchers try to communicate with and record the person's natural gestures for concepts like "stop," or, "huh?"

"We don't want to say what gestures you should use," Draper explained. "We want people to come in and tell us what gestures are natural. Then, we take those gestures and say, 'OK, if that's a natural gesture, how do we recognize it in real time, and what are its semantics? What roles does it play in the conversation? When do you use it? When do you not use it?'"

Their goal: making computers smart enough to reliably recognize non-verbal cues from humans in the most natural, intuitive way possible. According to the project proposal, the work could someday allow people to communicate more easily with computers in noisy settings, or when a person is deaf or hard of hearing, or speaks another language.

The project, which falls broadly under DARPA's basic research arm, is focused on enabling people to talk to computers through gestures and expressions in addition to words, not in place of them, the researchers say.

The project includes co-principal investigators Ross Beveridge, professor of computer science; Jaime Ruiz, assistant professor of computer science; and Michael Kirby and Chris Peterson, both professors of mathematics.

SIGNATURE RESEARCH PROJECTS

Brain-computer interfacing as a method of helping victims of "locked-in syndrome" and loss of voluntary muscle control due to ALS, cerebral palsy, and other ailments

Big Data and streaming medical data, particularly for real time processing in cloud environments

BIG QUESTIONS

How do we attract more female students to computer science?

How do we handle booming enrollments and industry demand for computer science graduates?

How do we create more opportunities for undergraduate research?

FACULTY SUCCESS

THE INTERNET AND OBSOLESCENT INFORMATION ARCHITECTURES: Christos Papadopolous

BIOINFORMATICS AS APPLIED TO DROUGHT-RESISTANT CROPS AND ANTIMICROBIAL TREATMENTS FOR CATTLE: Asa Ben-Hur, Christina Boucher

HEALTHCARE AND BRAIN-COMPUTER INTERFACING: Chuck Anderson

Detecting an Ebola Infection Early – **WITH MATH**

ONE OF THE MANY problems health officials have faced during the ongoing Ebola outbreak in Africa is early diagnosis of the deadly disease.

Current blood tests only detect Ebola once a person displays symptoms- which appear anywhere from two to 21 days after they contract it – making it even harder to contain spread of the highly contagious disease.

Researchers at Colorado State University are working to develop an early warning system that can detect the deadly disease as soon as the body's immune system notices the presence of Ebola pathogens and starts marshaling a response.

The team, led by Michael Kirby, a professor in the Department of Mathematics, is developing complex algorithms to analyze gene expression data generated from mice infected with the Ebola virus during a research study conducted a few years ago.

Kirby's goal is to identify the genetic pathway Ebola travels from the time the body recognizes the disease's unique pathogens until symptoms emerge.

"The immune system kicks in as soon it senses these pathogens and we know that it immediately starts sending signals throughout the body," Kirby said. "If we can detect and understand those signals, then we may be able to better understand the course of the disease in terms of a cascade of activated biological pathways. This may allow us to identify and treat infections much, much earlier."

The Ebola warning system project, which is funded by the National Science Foundation, is based on work Kirby conducted a few years ago when the team he was on used data from H1N1 influenza patients to identify the pathway that illness took and that more than 1,400 genes were involved as the sickness evolved and took root. The H1N1 project was funded by the federal Defense Advanced Research Projects Agency (DARPA).

Kirby and others analyzed gene expression data from blood samples that were taken from patients every eight hours over several days. That sequential data helped them determine the genetic pathway H1N1 used to travel through the body and at which point a person went from being asymptomatic to symptomatic.

"We delved into the data and were able to figure out how the body was responding and see the differences in responses from those who had symptoms and those who didn't," he said.

Identifying a disease or illness' genetic pathway is akin to re-tracing a route from the end to the beginning by using signals or clues along the way.

Kirby and his team will start evaluating gene expression data collected from the mice at later stages and look for anomalies that will help them find Ebola's pathway.

By looking at how the disease progresses and comparing immune responses from mice with symptoms and those without, the team believes it will be able to find the "clues" it needs to find re-trace this critical pathway.

That knowledge – and this basic research – are crucial to developing early warning or diagnostic tests for people who have exposed to the deadly Ebola virus.

SIGNATURE RESEARCH PROJECTS

Collaborative research with microbiology and biomedical engineering researchers on applying data science to infectious disease control

BIG QUESTIONS

How will the new calculus center propel teaching and learning at CSU?

How can mathematics help the CNS advocate for and expand STEM education in Colorado?

How does this field inform the science of learning?

FACULTY SUCCESS

DATA SCIENCE AND THE APPLICATION OF DATA SCIENCE TO INFECTIOUS DISEASE DIAGNOSIS – EBOLA SPECIFICALLY: Michael Kirby

SIGNATURE APERTURE RADAR TECHNOLOGIES: Margaret Cheney, Kaitlyn Voccola

TRACKING THE NEUTRINO

Norm Buchanan shows off a small version of one of his photon detector prototypes.

NORM BUCHANAN, ASSISTANT PROFESSOR of physics at Colorado State University, is playing a lead role in important work in neutrino and particle physics being done in the U.S. and around the world. And his leadership has helped shine the spotlight on him and Colorado State's Department of Physics.

Buchanan is a member of the currently operating NOvA experiment, which is based at Fermi National Accelerator Lab, located just outside of Chicago. The NOvA team, which includes researchers from eight countries, examines neutrinos as they travel great distances from a detector at Fermi to another in Ash River, Minn. – a 500-mile journey completed in less than three milliseconds.

"This is tremendously exciting stuff in the world of neutrino physics," Buchanan said. "We're looking for answers that have eluded physicists for a long time."

Buchanan is also managing a team building a photon detector to be installed as one of two major systems comprising the far detector for the Deep Underground Neutrino Experiment (DUNE), a proposed long-baseline neutrino experiment to be based at Fermilab and begin operation in around 2023. His team includes researchers from eight different institutions, including the University of Indiana, LSU, the University of Hawaii, Berkeley Labs, and Fermi.

He's working with graduates students, faculty, and researchers from CSU in the massive NOvA and DUNE projects, which include researchers from 42 countries and 144 international institutions, respectively, and are funded by the Department of Energy.

One of the things that sets CSU apart is a one-of-a-kind Cryogenic Detector Development Facility (CDDF) located on the Foothills Campus. The CDDF was designed and built by Buchanan, with assistance from the Department of Physics and the College of Natural Sciences, in 2013 and has been operating since 2014.

"No other university in the area has anything on this scale," Buchanan said.

The CDDF, which utilizes liquid argon as a particle detection medium for detector component testing, is 11 feet tall and contains 500 liters of liquid argon. Many of the detector component tests related to DUNE can be completed at CSU, saving time and money that otherwise would be spent traveling to Fermilab or elsewhere.

If all goes well, the first DUNE Photon Detectors will be ready for a pre-production test in 2019 at CERN, the largest particle physics lab in the world, and installation into the DUNE far detector in Lead, S.D., in 2021.

SIGNATURE RESEARCH PROJECTS

High-energy physics collaborations – particularly DUNE (Deep Underground Neutrino Experiment that will be housed in part in Lead, SD): Robert Wilson, John Harton, Walter Toki, Norman Buchanan, Bill Fairbank, Jr.

Multiple efforts studying magnetism at a fundamental level – including waves in magnetic materials and magnetism at the nanoscale (the smallest length scales we can technologically access): Kristen Buchanen, Mingzhong Wu, Kate Ross, Jose de la Venta

Laser cooling projects studying atoms cooled to nearly absolute zero in temperature: Siu Au Lee, Jacob Roberts, Dylan Yost

Study of photovoltaic devices (solar cells) to understand their physics in the quest of higher efficiency: Jim Sites

BIG QUESTIONS

Why is there any matter in the universe? There is an ongoing puzzle of why all of the matter in the universe didn't annihilate in collisions with antimatter early in the history of the universe.

Can we understand the physics associated with very small structures of nanometer scale sizes (tens to thousands of atoms across)? Once we understand these structures in more detail, can we use them for useful devices in magnetism or as devices?

Can we use the ability to laser cool atoms to temperatures of nearly absolute zero to study fundamental questions in many different areas of physics and to create useful scientific and technological devices?

FACULTY SUCCESS

THE ANTIHYDROGEN TRAP (ATRAP) EXPERIMENT TO COMPARE HYDROGEN ATOMS WITH THEIR ANTIMATTER EQUIVALENTS – ANTIHYDROGEN ATOMS: Siu Au Lee, Dylan Yost

WEATHER AND SCIENCE DAY 2015 AT COORS FIELD DREW MORE THAN 12,000 YOUNG STUDENTS: Brian Jones, the Little Shop of Physics, 9News, the Colorado Rockies, the College of Natural Sciences

LABEL MAKEOVER: Nutritional Facts = Healthier Choices

DAN GRAHAM HAS A healthy passion: Finding ways to help unhealthy people change their eating habits so they can lead healthier lives.

Identifying that problem – particularly in traditionally underrepresented populations – is the easy part. Changing habits is the challenge.

"When I started looking at this problem, it got me curious to see if nutrition labels on food were effective at all," said Graham, an assistant professor of psychology in CSU's College of Natural Sciences. "I felt like if we could learn what goes into making purchasing decisions we could find ways to help people make healthier choices."

In controlled studies done with Gina Mohr, professor of marketing in CSU's College of Business, and with University of Pennsylvania professor Christina Roberto, Graham put together a variety of scenarios to see how effective food labels are when people choose foods.

One case utilized a system already in place in Europe, where "traffic light" colors are used to help people make healthy choices. Red lights are for unhealthy, yellow for neutral, and green lights signified healthy choices.

Another case utilized a star system to label foods – ranging from three or four stars for more healthful choices to zero or one stars for less healthful products. Still another tested the impact of cartoon characters on kids' food choices. Other studies have modified nutrition label location, format, font sizes, and contents and tested changes proposed by the Food and Drug Administration and the Institute of Medicine.

The conclusion?

"Most of them don't work very well (to attract consumer attention or impact food choices)," Graham said.

Graham dons a pair of eye-tracking glasses used to read food labels.

Graham, a competitive triathlete, recognizes that eating healthier foods is just part of the solution to the obesity epidemic in the United States. Promoting physical activity – especially in children – is another important aspect of his research.

But deciphering the puzzle of food labeling and why people very often make unhealthy choices that are high in sugar, salt, and fat would solve a lot of problems. His current research, funded by a grant from the Colorado School of Public Health and the National Institute of Food and Agriculture, is part of a larger campaign to fight obesity.

"If we could standardize labeling at the policy level it would clear up a lot of the jumble of information out there and make things simpler for consumers," Graham said. "The goal is to come up with a system people will understand and utilize. If we do that we've got a chance to make some progress in the fight against obesity."

SIGNATURE RESEARCH PROJECTS

Senior alliance for broadening participation in STEM

Substance abuse among American Indian youth: epidemiology and etiology

BIG QUESTIONS

How do people derive meaning in their lives, and how can this be facilitated?

How can we encourage healthy diets and lifestyles?

How can we create and sustain healthy workplaces?

How can we make students better learners and instructors better learners?

FACULTY SUCCESS

UNDERSTANDING HOW A PERSON'S ABILITY TO ACT INFLUENCES PERCEPTION: Jessica Witt

SHEDDING NEW LIGHT ON THE MEANING OF RELATIONSHIPS: Jennifer Harman

Statistics Professor Serving as PI on Investigation of Extreme Weather Events

STATISTICS PROFESSOR DAN COOLEY is currently serving as PI for a collaborative project investigating extreme weather changes, like floods and droughts – events that seem as daunting now as ever.

Cooley and his team seek to improve analyses of the effects of extreme weather events on agricultural production and the forestry sector for specific regions of the U.S. They will develop risk-assessment measures that take into account possible increases in the frequency of extreme weather events.

The team is comprised of statisticians, climate scientists, and social scientists based at CSU, UC-Berkeley, Lawrence Berkeley National Labs, and UNC Chapel Hill. The 5-year grant, funded by the National Science Foundation and the Department of Energy, totals $4.9M.

"When we see impactful extreme weather events, such as the 2013 Colorado floods or the current California drought, we ask ourselves, 'How rare is this event?' and 'Has climate change altered the frequency or intensity of this event?' Current methods are only partially able to answer these questions," Cooley says.

At this project's core is the need to develop multivariate statistical methods that can describe and model extreme events arising from a combination of meteorological factors, which may or may not individually be extreme. Researchers will also use spatial downscaling methods to study extreme phenomena occurring at spatial scales not resolved by climate models, and they'll create a solid statistical foundation for the detection of changes in extremes and attribution of extreme events.

"In the Colorado flood," Cooley says, "damage was due both to short-term, relatively local rain (like in Boulder) and longer-term spatially aggregated effects (like in Greeley). Creating models that account for data from multiple locations and over time (a week for Colorado, months/years for California) is central to our research."

Given that Coloradans can still easily recall 2013's floods and Californians continue to struggle with water resources, this research couldn't come at a better time.

SIGNATURE RESEARCH PROJECTS

Large-scale government surveys and ensuring that data are collected in scientifically defensible ways, and that estimates are statistically valid and precise

Yearly Graybill Conference bringing together statisticians from all over the world with the goal of developing new applications and solutions to contemporary problems

BIG QUESTIONS

How do we modernize our curricula, at the graduate and undergraduate levels, to ensure they meet the needs of future statisticians and, increasingly, related professions such as data analysts, data scientists, etc. Should we create a new interdisciplinary degree in data science?

How do we develop methods that come to us in many different forms (text, numbers, images, etc) and in very large quantities? How do we ensure that our methods are used by analysts in other disciplines, and used and interpreted correctly?

FACULTY SUCCESS

EXTREME WEATHER EVENTS AND USING STATISTICAL METHODS TO IMPROVE ANALYSES OF THEIR EFFECTS ON AGRICULTURAL PRODUCTION, FORESTRY, AND OTHER AREAS:
Dan Cooley

BAYESIAN STATISTICS AND ECOLOGICAL STATISTICS:
Jennifer Hoeting

Colorado State University

COLLEGE OF NATURAL SCIENCES

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DISCOVERY BEGINS HERE

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