Botany & Conservation

A newsletter for alumni of Botany and Conservation Biology

Fall/Winter 2015

Family tree for orchids explains astonishing variability - Page 6

Coryanthes, commonly known as Bucket Orchids

Contents

COLLEGE OF Letters & Science
UNIVERSITY OF WISCONSIN-MADISON

Botany: botany.wisc.edu Conservation Biology: bacmajor.ls.wisc.edu

In Memoriam: Robert R. "Bob" Kowal (1939–2015)

—Ted Cochrane, Senior Academic Curator Emeritus, University of Wisconsin-Madison

Robert R. Kowal, affectionately known to all as "Bob," died on August 3, 2015, at the age of 76. Bob was born on April 23, 1939, at Paterson, NJ. He attended Cornell University, where he earned his doctorate in plant taxonomy and ecology in 1968. His dissertation was based on field research on *Packera*, the ragworts or groundsels, in Quebec. He was also greatly interested in cytotaxonomy, numerical taxonomy, and botanical nomenclature. He held a post-doctoral fellowship in the biomathematics program at North Carolina State University during 1967–69 and a visiting assistant professorship in biology at Kansas State University in 1969–71 before accepting a faculty position in the Department of Botany at the University of Wisconsin-Madison (1971–1997).

Bob devoted a great deal of time and effort to teaching the department's flagship Botany 130 course, and he won the appreciation of undergraduate majors and graduate students who took his courses on the spring flora of Wisconsin, dendrology, community analysis, and biological diversity. The exams he gave in his advanced taxonomy class reminded us students of the high standards to which we were being held. He was the most exacting person we knew when it came to pressing plants, keeping records, and writing clearly. A critical thinker, Bob would quickly see the crux of matters being discussed during plant taxonomy seminars and express the points he made with great clarity. In departmental committee meetings he was extremely conscientious, fair-minded, and reasonable.

Bob's exuberant home garden was stocked with a wide range of plants but was most notable for the range of daylily, peony, and hosta cultivars. Besides being a knowledgeable plantsman, Bob was an avid swimmer and sometime jogger and flute player, a lover of classical music and reading, and a long-time generous supporter of environmental organizations and other good causes.

An individualist with his own obsessions, Bob was unrepentant about his disheveled dress and uncharitable toward shaky ideas, sloppy botany, and slipshod writing. Nonetheless, departmental staff will remember him as a remarkably patient man with a gentle sense of humor. He always found time to assist staff, students, friends, and neighbors who came to him with questions and requests. Above all, he was an excellent botanist.

This newsletter is published by the Department of Botany at the University of Wisconsin-Madison for alumni, colleagues and friends.
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Fishes of Wisconsin

The prolific Botany Artist Emerita, Kandis Elliot, continues to produce beautiful educational posters. Her most recent creation is a poster of all the Fishes of Wisconsin...in life size! This giant canvas print can be purchased at the Zoology Museum web store: https://charge.wisc.edu/zoology/items.aspx. Kandis's botanical posters can be found at: https://charge.wisc.edu/botany/sales.aspx.

BAC becomes Conservation Biology

You may be wondering, "What happened to BAC?" This Fall, the former Biological Aspects of Conservation major was officially renamed "Conservation Biology". Conservation biology was not a widely used term when the BAC major was developed in the early 1940s, but it has now come to best describe the field and the evolution of the BAC program. Retitling the BAC program to the simpler and more modern "Conservation Biology" brings the major in line with programs across the country and more accurately reflects the training that we provide.

Meet our New Faculty!

Q&A with Anne Pringle Associate Professor in Botany and Bacteriology

Please describe your research

I study the biodiversity and evolution of fungi, a megadiverse group of organisms that we don't think about very much, probably because even though fungi are everywhere, they are usually hidden inside substrates - growing inside wood or soil, for example.

How did you get interested in your subject?

I became fascinated by fungi over the course of my Ph.D., when I was exploring a mutualism between plants and a group of fungi associated with plant roots. The fungi bring phosphorous to the plants, and in exchange, the plants provide carbon to the fungi. It's an intricate symbiosis but I quickly realized the fungi were the black box: by comparison to other groups, we know little about even basic aspects of fungal biology.

What is the biggest challenge in your area of study?

The biggest challenge I face is teaching about fungi; most people haven't thought about them and think they're weird. It takes time to explain why fungi are worth understanding. Of course, if you've had a serious medical issue involving fungi, for example asthma or any kind of immune system challenge, or if you've handled dry rot or are interested in bread, beer or biofuels, then you already know the myriad roles fungi play in human lives.

Why are you most excited to join the faculty at UW-Madison?

I'm excited to join the Botany and Bacteriology departments because of the diverse talent pools in Madison. There seem to be thousands of biologists around and it's a real opportunity to take my research in new directions.

If you weren't in your field or academia, what would you be doing?

If I weren't a biologist, I'd be an M.D. focused on geriatrics.

What do you like to do outside of work?

Outside of work, I'm currently renovating my house.

What's your favorite fungus?

My favorite fungus is *Cortinarius iodes*, because it's purple! And because I've seen it in many parts of the world.

Q&A with Alex Wiedenhoeft Adjunct Assistant Professor in Botany

Please describe your research.

At my core I am a wood anatomist; I specialize in the anatomical study of wood and woody plants, especially their microscopic structure and function. This can mean micromechanical characterization of pit membranes, the study of wood evolution, the role of botanical wood anatomy in wood technology and use, or forensic wood science, for example, wood identification techniques to combat illegal logging.

What should the general public know about your area of study? Why is it significant?

Because wood has formed the basis for huge swaths of material culture across the known pre-history and history of our species, I work in an area that is directly applicable to nearly every human nearly every day. I'm spoiled in that sense, because it usually doesn't take more than a few moments of conversation to find some way in which a stranger appreciates trees and wood, and so most people 'get' what I do. Combined efforts to understand wood as a material of botanical origin, as a material for human use, and as objects of legal dispute are critical to efforts to value, protect, and sustainably use forest-based natural resources.

How did you get interested in your subject?

When I was a freshman in the Honors section of Ray Evert's Botany 130, a part-time student hourly position at the Forest Service's Forest Products Laboratory in the Center for Wood Anatomy Research opened up. It was announced only to the students in the Honors section of that course, and getting that job was what opened my eyes to the field of wood anatomy. Once a transverse section of *Ulmus* took my breath away, it was pretty clear I was not going to become a nuclear physicist or a diplomat.

Do you have any hidden talents?

I really enjoy learning foreign languages, and I have a comparatively easy time of it, so my hidden talents are probably in the smattering of other languages that I speak, read, and write to various degrees. In a non-geeky context, I am quite handy and can fix or rebuild most non-electronic things.

What's your favorite wood/plant?

My favorite wood to look at with the naked eye is polished *Nesogordonia*, my favorite tree is probably *Robinia pseudoacacia*, and I still have a soft spot for transverse sections of *Ulmus*.

New theory suggests alternate path led to rise of the eukaryotic cell

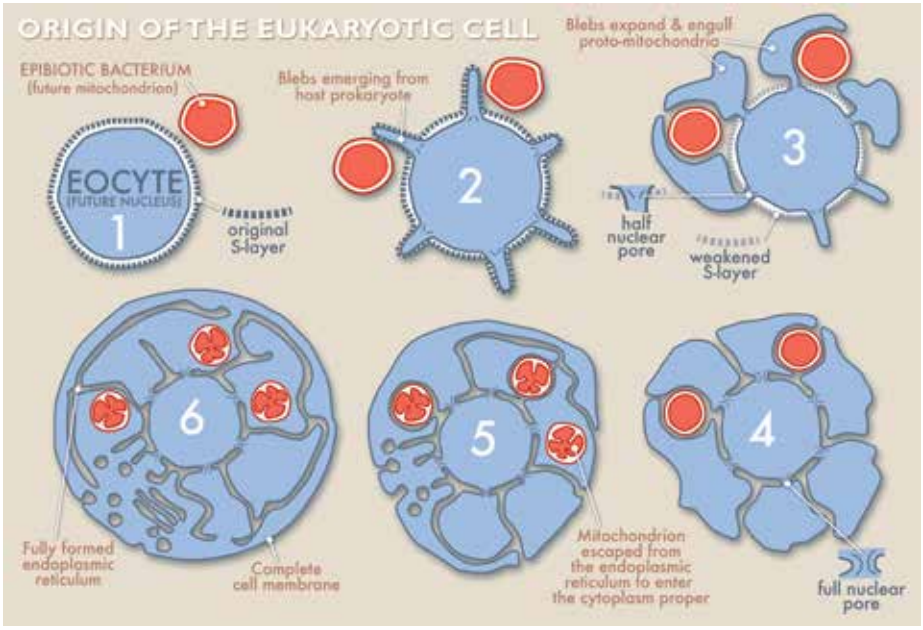
Excerpted from the original news story by Terry Devitt.

As a fundamental unit of life, the cell is central to all of biology. Better understanding of the evolution of complex "eukaryotic" cells, such as occur in animals, plants, fungi, and algae, is needed to better understand how such cells work in health and disease.

But deep thinking on how the eukaryotic cell came to be is astonishingly scant. Now, however, a bold new idea of how the eukaryotic cell and, by extension, all complex life came to be is giving scientists an opportunity to re-examine some of biology's key dogma.

Prevailing theory holds that eukaryotes came to be when a bacterium was swallowed by an archaeon. The engulfed bacterium, the theory holds, gave rise to mitochondria, whereas internalized pieces of the outer cell membrane of the archaeon formed the cell's other internal compartments, including the nucleus and endomembrane system.

"The current theory is widely accepted, but I would not say it is 'established' since nobody seems to have seriously considered alternative explanations," explains Botany Chair David Baum, who, with his cousin, University College London cell biologist Buzz Baum, has formulated a new theory for how eukaryotic cells evolved. Known as the "inside-out" theory of eukaryotic cell evolution, the alternative view of how complex life came to be was published in the open access journal BMC Biology last year.



Inside-out model for the evolution of eukaryotic cell organization

The inside-out theory proposed by the Baums suggests that eukaryotes evolved gradually as cell protrusions, called blebs, reached out to trap free-living mitochondria-like bacteria. Drawing energy from the trapped bacteria and using bacterial lipids — insoluble organic fatty acids — as building material, the blebs grew larger, eventually engulfing the bacteria and creating the membrane structures that form the cell's internal compartment boundaries.

"The idea is tremendously simple," says David Baum, who first began thinking about an alternate theory to explain the rise of the eukaryotic cell as an Oxford University undergraduate 30 years ago. "It is a radical rethinking, taking what we thought we knew (about the cell) and turning it inside-out."

From time to time, David Baum dusted off his rudimentary idea and shared it

(continued on page 7...)

In Memoriam: S. Galen Smith (1926–2015) –by Ted Cochrane

Galen Smith was born on March 25, 1926, and died on October 23, 2015. He was an Emeritus Professor, UW-Whitewater, and Honorary Fellow, UW-Madison, Department of Botany.

After earning a Ph.D. in Botany from the UC, Berkeley, Galen taught at Iowa State University (1960–1965) and the UW-Whitewater (1965–1991). Primarily interested in wetland ecology, he became one of the leading American authorities on the taxonomy of various aquatic plant groups. He co-founded the Iowa Chapter of The Nature Conservancy, helped establish the Iowa natural areas system and the Beulah Bog and Lulu Lake nature preserves in Wisconsin, and served on the Wisconsin Wetlands Association's Board of Directors for twelve years.

Galen showed curiosity or concern about a diverse array of matters and supported many worthwhile groups and causes. He was an excellent botanist, dear friend, and above all an honorable man.

Flower links Civil War, natural history and 'the blood of heroes'

Excerpted from the original news story by David Tennenbaum.

On August 14, 1864, in a Union Army camp in Georgia, a captain from Wisconsin plucked a plant, pressed it onto a sheet of paper, wrote a letter describing the plant as "certainly the most interesting specimen I ever saw," and sent it with the plant to a scientist he called "Friend" in Wisconsin.

"It was growing outside my tent and notwithstanding the noise of 500 pieces of artillery flourished," wrote John Cornelius McMullen, "and seemed to repose as sweetly at night as if its native heath was not disturbed by the tread of hostile armies."

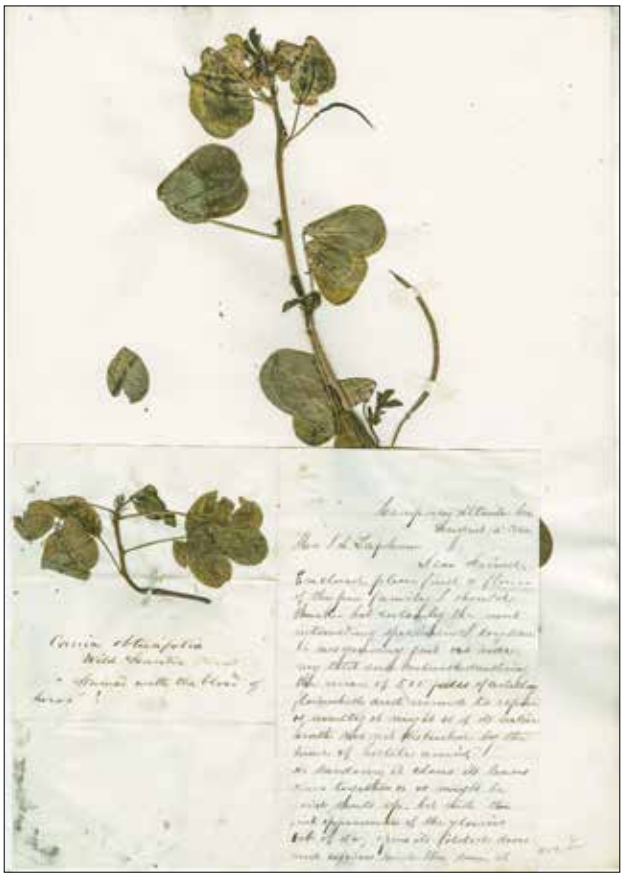
The captain-collector was clearly literate, even poetic.

The scientist, Increase Lapham (1811-1875), is today considered the founder of natural history in Wisconsin. A geologist, botanist and historian, he is the subject of the biography, "Studying Wisconsin: The Life of Increase Lapham," published by the Wisconsin Historical Society Press.

And but for that book, a plant specimen that Wisconsin State Herbarium director Ken Cameron calls "perhaps our most astonishing of all" might never have surfaced from the 1.2 million dried plants in the collection on the University of Wisconsin-Madison campus.

Because Lapham's personal plant collection actually founded the herbarium more than 160 years ago, authors Paul G. Hayes and Martha Bergland held a reading of the biography at the herbarium, located in the Department of Botany, last year. In preparation, the herbarium put on display some of Lapham's original specimens, including the 150-year-old sheet holding *Cassia obtusifolia* ("Wild Sensitive Plant"). "We started to read the letter attached to it," says Cameron. "The sender described the flower as 'stained with the blood of heroes,' and that really caught our eyes!"

Who was this lyrical captain? John Cornelius McMullen was apparently born in Delaware or New Jersey and graduated from Lawrence University in Appleton, Wisconsin. He entered the First Wisconsin Regiment on Sept. 16, 1861 from Sheboygan Falls, and fought with them through Kentucky, Tennessee and northern Georgia under General Sherman.



A plant specimen collected by a captain in the 1st Wisconsin Regiment, John Cornelius McMullen, during a Civil War battle near Atlanta, Georgia on Aug. 14, 1864. A notation reads "Stained with the blood of heros"! Photo: Bryce Richter

The plant and the letter were both a surprise, says co-author Bergland, a retired English teacher from Glendale, Wisconsin. "I did not know about it until we showed up to do the reading. It's wonderful that it was discovered, but I think Lapham would have had a very ambivalent response to such a letter. He was a Quaker, a pacifist — did not want anything to do with war. But he was very supportive ... of veterans, especially wounded veterans."

In his letter, McMullen laid out the circumstances of the First Wisconsin Regiment. "We are now in plain view of the great commercial city of Georgia. My company are in the front line of works only a half mile from town and while I write shot and shells are constantly passing over us. It may be some days before Atlanta falls but in the end it must yield for the best army in the world are thundering at its gate."

Despite his surroundings — or perhaps because of them — McMullen concluded on a sentimental note: "This flower was moistened by the blood of heroes, for Wisconsin men have died where it was plucked."

McMullen worked for the federal government in Tennessee after the war, and may have moved to Oakland, California, where a man of the same name and general age was described as running a bank.

Although herbarium specimens are now being used scientifically in ways they never imagined a century ago, Cameron says this mystery, worthy of Antiques Roadshow, demonstrates another side of these collections.

"This specimen shows that our collection also has value for understanding history and bridging the sciences with the humanities. This comes down from a time when all well-educated people had a different view of nature and collecting plants was a common activity. There are treasures in the collection that we don't know we are sitting on."

Mediocalcar bifolium

Orchid family tree explains astonishing variability

Adapted from an article by David Tenenbaum

Orchids, a fantastically complicated and diverse group of flowering plants, have long blended the exotic with the beautiful. Most species live on trees, often in remote, tropical mountains. Their flowers can be strange — one even flowers underground, and many species deceive their pollinators into thinking they are good to eat. The estimated 25,000 orchid species outnumber mammals, reptiles and birds combined.

Previously, botanists have proposed more than a half dozen explanations for this diversity. Now, research from the UW-Madison Botany Department, published in *Proceedings of the Royal Society B*, corroborates many of these explanations, but finds no evidence for other logical suggestions, such as that of deceitful pollination.

"Orchids, almost alone among flowering plants, have a large number of species that lure pollinators by mimicking a mate, or a nesting site or food resources — 'lies all for the sake of love' — but such deceit seems to have played no role in accelerating the formation of new orchid species,"

– Thomas Givnish

"It was surprising that many classic characteristics of orchids — the tiny, dust-like seeds, the role of fungi in triggering germination, the fused male-female flower parts that define the orchid flower — did not trigger the acceleration in species formation," says Thomas Givnish, the Henry Allen Gleason Professor of Botany and first author of the new study.

To build a family tree for the orchids, the scientists sequenced genes in the chloroplasts. They looked at chloroplasts from 39 species, strategically placed throughout the orchid family, then added genetic data on 150 more species. By tying their molecular data to fossils of known ages, Givnish and his colleagues created a branching structure that indicated how many million years ago each major group of orchids appeared.

Then, based on the numbers of species known in each of these groups today, the researchers were able to calculate their rate of species diversification and test the many putative causes of the explosion in orchid species. They found that the factors that most greatly accelerated the formation of new species were life in extensive mountain ranges (like the Andes and New Guinea Highlands); the evolution of epiphytism (life in the trees); pollination by orchid bees, moths, or butterflies; and origin of pollinia (packages of hundreds to thousands of pollen grains dispersed as a unit).

Givnish and his colleagues found that initially, orchids speciated no more rapidly than their closest relatives, and at a slow rate relative to flowering plants as a whole. Then there were three waves of accelerated speciation beginning 60, 40 and 33 million years ago. Pollinia apparently sparked the first acceleration, Givnish says. The origin of epiphytism — and the invasion of tropical mountains with a constant swirl of clouds and rain — sparked the second, greater acceleration. The invasion of the Andes as they were being uplifted triggered the third and greatest acceleration.

Interestingly, many proposed explanations for orchid diversity failed the new test. Not even deceitful pollination (present in about one-third of all orchid species) was linked to accelerated speciation, Givnish says.

"Orchids, almost alone among flowering plants, have a large number of species that lure pollinators by mimicking a mate, or a nesting site or food resources — 'lies all for the sake of love' — but such deceit seems to have played no role in accelerating the formation of new orchid species," he says.

Chloroplasts were a useful source of DNA for the study, Givnish says. "There are thousands of chloroplasts per cell, and many loops of DNA

Cypripedium acaule photo: Per Verdonk

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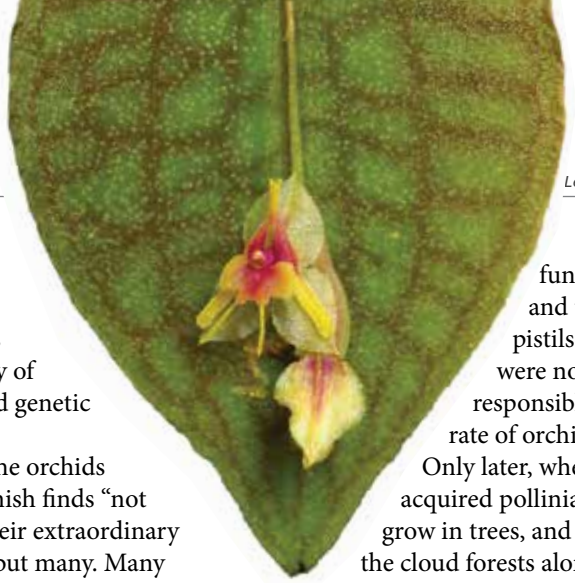


Lepanthes photo: Andreas Kay

per chloroplast, and the genome structure is quite stable." Mercedes Ames, a post-doc with Givnish, sequenced most of the chloroplast genomes.

Other UW-Madison Botany collaborators included students Daniel Spalink and Alejandro Zuluaga, and orchid specialist Kenneth Cameron, director of the Wisconsin State Herbarium. Collaborators in Australia and Chile provided DNA for the study, and W. Mark Whitten and Norris Williams of the University of Florida provided genetic data.

Looking at the orchids as a family, Givnish finds "not one spark for their extraordinary diversification, but many. Many hypotheses advanced by previous investigators proved to be correct, but some of the defining characteristics of orchids — their tiny seeds, their requirement for fungi to germinate, and their fused pistils and anthers — were not themselves responsible for the high rate of orchid speciation. Only later, when the orchids acquired pollinia, started to grow in trees, and then colonized the cloud forests along extensive mountain ranges in the tropics, did the orchids' unrivalled diversification begin."

New origin theory of the eukaryotic cell (continued from page 5)

with others, including the late Lynn Margulis, the American scientist who developed the theory of the origin of eukaryotic organelles. Over time, Buzz and David Baum refined and detailed their idea, which, like any good theory, makes predictions that are testable.

"First, the inside-out idea immediately suggested a steady stepwise path of evolution that required few cellular or molecular innovations. This is just what is required of an evolutionary model," argues Buzz Baum, an expert on cell shape and structure. "Second, the model suggested a new way of looking at modern cells."

Modern eukaryotic cells, says Buzz Baum, can be interrogated in the context of the new theory to answer many of their unexplained features, including why nuclear events appear to be inherited from archaea while other features seem to be derived from the bacteria.

"It is refreshing to see people thinking about the cell holistically and based on how cells and organisms evolved," says Ahna Skop, a UW-Madison professor of genetics and an expert on cell division. The idea is "logical and well thought out. I've already sent the paper to every cell biologist I know. It simply makes sense to be thinking about the cell and its contents in the context of where they may have come from."

The way cells work when they divide, she notes, requires the interplay of molecules that have evolved over many millions of years to cut cells in two in the process of cell division. The same molecular functions, she argues, could be repurposed in a way that conforms to the theory advanced by the Baums. "Why spend the energy to remake something that was made thousands of years ago to pinch in a cell? The functions of these proteins just evolve and change as the organism's structure and function change."

Knowing more about how the eukaryotic cell came to be promises to aid biologists studying the fundamental properties of the cell, which, in turn, could one day fuel a better understanding of things like cancer, diabetes and other cell-based diseases; aging; and the development of valuable new traits for important crop plants.

One catch for fleshing out the evolutionary history of the eukaryotic cell, however, is that unlike many other areas of biology, the fossil record is of little help. "When it comes to individual cells, the fossil record is rarely very helpful," explains David Baum. "It is even hard to tell a eukaryotic cell from a prokaryotic cell. I did look for evidence of microfossils with protrusions, but, not surprisingly, there were no good candidates."

A potentially more fruitful avenue to explore, he suggests, would be to look for intermediate forms of cells with some, but not all, of the features of a full-blown eukaryote. "The implication is that intermediates that did exist went extinct, most likely because of competition with fully-developed eukaryotes."

However, with a more granular understanding of how complex cells evolved, it may be possible to identify living intermediates, says David Baum: "I do hold out hope that once we figure out how the eukaryotic tree is rooted, we might find a few eukaryotes that have intermediate traits."

Spiranthes longilabris photo: NC Orchid

Field Notes: Amelia Rossa

Amelia is a Conservation Biology Major graduating in May 2017.

I knew coming to UW-Madison as a first year that I wanted to major in the natural sciences. My parents had nurtured my appreciation for nature through everything from teaching me gardening and plant identification to backpacking all over the western United States. Conservation biology was a natural fit and classes relating humans to our environment such as Human Geography and American Environmental History lead me to pursue Geography as an additional complementary major.

The field of conservation encompasses many different careers so during my summers in Madison I have pursued a variety of experiences. During the spring semester of my freshman year I began working with my Botany TA, Kristin Michels, to assist in her PhD research. In her lab I am currently sorting and counting charcoal samples using a dissecting microscope. Kristin's research uses frozen lake sediment cores to sample plant remains from fires and determine the effects of anthropogenic activities on native forests. Her work will help determine how settlement and activities like logging affect natural fire regimes and when completed could inform boundary placement of nature reserves.

The following summer I had a position as a Native Plant Gardener at the UW-Madison Arboretum where I was lucky enough to work outside every day learning restoration techniques and perfecting my native plant identification skills. I also worked at the Dane County Land and Water Resources office where I learned more about the administrative management of local natural areas.

Last summer I was a horticulture intern at Olbrich Botanical Gardens where I worked with a team of staff and other interns to care for sixteen acres of public gardens. I got to plant and care for a huge variety of plants and interact with the public on a daily basis.

I am currently preparing to study abroad through the Ceiba program in Ecuador for spring semester. I am looking forward to traveling throughout Ecuador for terrestrial and marine ecology field courses as well as perfecting my Spanish skills and completing an internship with a local conservation agency.

Field Notes: Julisa Ricart

Julisa is a Conservation Biology Major graduating in 2016.

During my freshman year at UW Madison, I took Zoology 260 Intro Ecology with Dr. Tony Ives. Each day, the class began with "the organism of the day." I fell in love with it. I went running to my CCAS advisor demanding to find a major where I only had to take "fun classes" like ZOO 260. Together, we found a major that fit the bill, the BAC major, and Dr. Ives soon became my faculty advisor.

This semester, I am working as a field research assistant in the Andes of Ecuador for PhD candidate Anusha Shankar (The Graham Lab – SUNY Stony Brook) who is studying hummingbird energetics. I have been able to work on a variety of physiology and ecology projects and even developed my own ecology study investigating the effects of nectar availability on territorial behaviors in *Aglaeactis cupripennis* (a species of hummingbird).

In the field, I have been able to integrate many of the skills I have acquired during my time at UW-Madison. But, now that I have been living and working in the field for 6 months, I've learned many things that I would not have learned in the classroom environment! For instance, I am amazed at some of the strange things that field biologists have to do to collect data. One component of Anusha's thesis is doubly-labeled water experiments to study daily energy expenditure. To do this, we catch a hummingbird, inject it with marked water, release it, and then recapture it within 24 hours. Blood samples are usually collected for these experiments, but since hummingbirds are so small (sometimes weighing less than a nickel), we collect their urine instead. I've learned some of the best techniques to get a hummingbird to feed (usually involving airplane noises). I've also learned how to collect hummingbird pee off my face when the bird doesn't exactly aim it's "stream" where I want it to!

After Ecuador, I'll return to Madison and graduate in Summer 2016. Post-graduation, I plan to gain more international field experience with the eventual goal of returning to a formal education to pursue a graduate degree.

ALUMNI NEWS

Thank you to all the alumni who took the time to send us their updates. Please keep the news coming!

Jim Habeck (left) in the spring of 1955.

Jim Habeck (Botany PhD 1959) taught plant ecology at the University of Montana from 1960 to 1995. He writes, "John Curtis did provide routine indoor lectures on plant ecology history, theories, and methodology, but he was a firm believer that an ecologist needed to develop the basic skills of 'reading the landscape.' And this required hiking the outdoor landscape; bogs, swamps, forests and grasslands. It required seeing, assembling and integrating pieces of 'ground information', and once digested, develop a narrative of a site's likely past history, current status, and possible future. And I used the same technique in my years of teaching ecology to Montana students majoring in botany, wildlife and forestry." Now, at the age of 83, he continues to attend ecology seminars, and is often in a position to comment on how things were done, and how ecological knowledge was acquired, 60 years ago!

Fred Swan (Botany MS 1961) is grateful for the education he received and for his association with Professors Curtis and Cottam and the talented graduate students in the plant ecology program. His association with Richard Vogl and his Ph.D. work on the effects of fire on the vegetation of Crex Meadows in northwestern Wisconsin provided the inspiration for his Ph.D. research at Cornell University on the effects of fire on the vegetation of south-central New York State. He and his wife Pat enjoyed a great tour of central and southern Spain in May and a week's stay in Provincetown, MA in September. Their whale watching trip off Provincetown was outstanding; they witnessed four whales breeching.

Bob Ream (Botany PhD 1963) continues to give a number of lectures around Montana, one titled "A 40 Year Odyssey with Wolves in Montana" and another "Climate Change and Wildlife in Montana". He skied a lot last winter and did several backpack trips this past summer. Bob and his wife visited London and Wales last fall and did some hiking in Wales. He now serves on the Board of the Montana Environmental Information Center, the University of Montana President's Advisory Council, and the College of Forestry and Conservation Dean's Advisory Council.

Gary Gallo (Cons. Bio. 1973) loved the botany courses he took as an undergraduate and remembers Dr. Iltis lecturing about cloud forests. After Madison he graduated from pharmacy school in Boston, then graduate pharmacy school at UNC-Chapel Hill. He then took a faculty position at the University of Minnesota (sorry!). After that, Gary "went corporate" and took a position at E.R.Squibb and Son in Princeton, NJ. He remained at Bristol-Myers Squibb from 1989 until his retirement in 2012. His positions were in the medical development department and included work on lipid-lowering medicines and anti-viral medicines – not research positions but interesting nevertheless. Gary currently resides in Hatboro, PA.

Janet Metzger (Mattison) (Botany BS 1979) currently works at Moose Crossing Burl Wood Gallery in Waynesville NC, which produces custom crafted burl wood furnishings from salvaged American woods. Last spring they brought in what may have been the largest burled oak tree in America: a white oak 6 feet in diameter. It had caught on fire and was saved from the ashes – a "Phoenix Oak"! Janet was pleased to have the opportunity to work with this magnificent wood. All of the woods they use are American so they know the source and can verify no old growth habitat is cut.

Emmet Judziewicz (PhD Botany, 1987) retired from UW-Stevens Point in June 2015 and is now an Emeritus Professor there. He has a nook in the Robert W. Freckmann Herbarium, so stop by for a visit! His retirement projects include: continuing work on a revision of the Neotropical bamboo genus *Aulonemia*; assisting with Paul Hlina and Mary Ann Feist with field work on their "Analysis of the Vegetative Cover of the Brule River Watershed (Wisconsin), Revisited 2015-2018"; publishing "Vascular Plants of St. Martins Island, Delta County, Michigan" in the *Michigan Botanist*, with coauthors Mike Grimm (The Nature Conservancy) and Gary Fewless (UW-Green Bay); as well as continued teaching including the "Field Biology of Hawai'i Island" course

Emmet Judziewicz (back row, white hat) and UW-Stevens Point field biology class assisting The Nature Conservancy with erecting anti-ungulate fencing at their Kaiholena Reserve on Hawaii Island, January 2015.

for UWSP this (and every) winter break, and summer plant taxonomy courses.

Adam Larson (Cons. Bio. 2007) It's been a long, crazy trip for Adam since graduation. After an extra year in Madison, he stumbled into a ten-month residential internship teaching environmental education in Western Massachusetts building and maintaining hiking trails across the state. Trail work and conservation field work have since become his passion and led him to the Adirondacks of upstate New York, the deserts of Arizona, the mountains of Virginia and California, and the canyon country of southern Utah. The seasonal lifestyle can be hard, but it allows for months of adventures in the off-season, and he's been lucky enough to spend a couple of winters in Central America, guiding treks in Guatemala and teaching SAT math in El Salvador. This December he'll be moving back to Utah to work once again in Zion National Park.


Adam Larson

Laura Stevens Randall (Cons. Bio. 2009) After graduating, Laura spent two years in AmeriCorps at Common Wealth Development in Madison as a youth mentor and program coordinator. Feeling a pull back into environmental work, she accepted an offer as volunteer coordinator and community engagement coordinator with Third Millennium Alliance in Manabi, Ecuador. She lived in a small rural town leading environmental education and reforestation projects while supervising biology interns from around the world. During that time, her focus shifted towards health. She began apprenticing with a Shiatsu practitioner in Ecuador, and returned to the U.S. to certify as a massage therapist and women's health educator. She is currently developing her practice and engaging with individuals on a deeper level to promote healing and balanced health.


Laura Randall in Ecuador

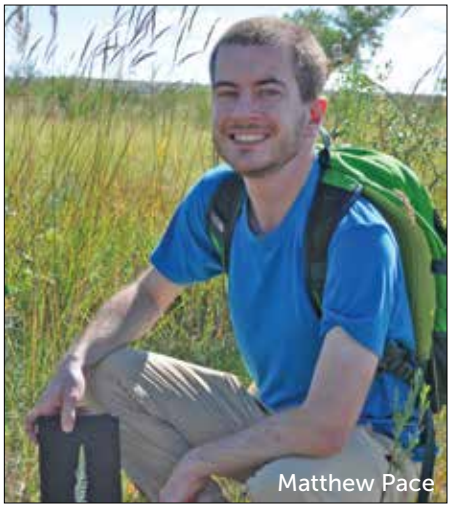
Melissa Weymiller (Cons. Bio. 2010) currently attends graduate school at the University of Idaho in Conservation Social Science. She is completing a graduate assistantship with the Bureau of Land Management at the St. Anthony Sand Dunes in Idaho conducting a visitor survey regarding visitor preferences for future management decisions. She's also working with the Yellowstone National Park Social Science Program on issues related to increasing visitation and as a technical editor with the Yellowstone Science publication. Melissa will be graduating with her Master's degree in May. She writes, "My time in Yellowstone has been so amazing and I have been so fortunate to spend time in Wonderland!"


Melissa Wymiller

Deidre Jaeger (neé Conocchioli) (Botany & Cons. Bio. 2012) continues working for the US Forest Service Shrub Science Lab in Utah. Her research is centered on sagebrush conservation genetics and recent work involves how seeds and smells can be used to identify species/subspecies in this group. She just coauthored a paper published in Ecosphere on how sagebrush seed weights can be a diagnostic for subspecies identification. She is finishing a manuscript on how volatile organic compounds (i.e. essential oils) are a better taxonomic indicator than phylogenetics for sagebrush. Deirdre will be looking for a new plant science job as her husband's graduate school will bring them back to Madison in January 2016!


Deirdre Jaeger

Matthew Pace (Botany PhD 2015) began his new position as the Assistant Curator of The New York Botanical Garden Herbarium (the largest herbarium in the Western Hemisphere). His position allows for both management and curation of the collection in addition to continuing his original research focused on the evolution and systematics of Orchidaceae.


Matthew Pace

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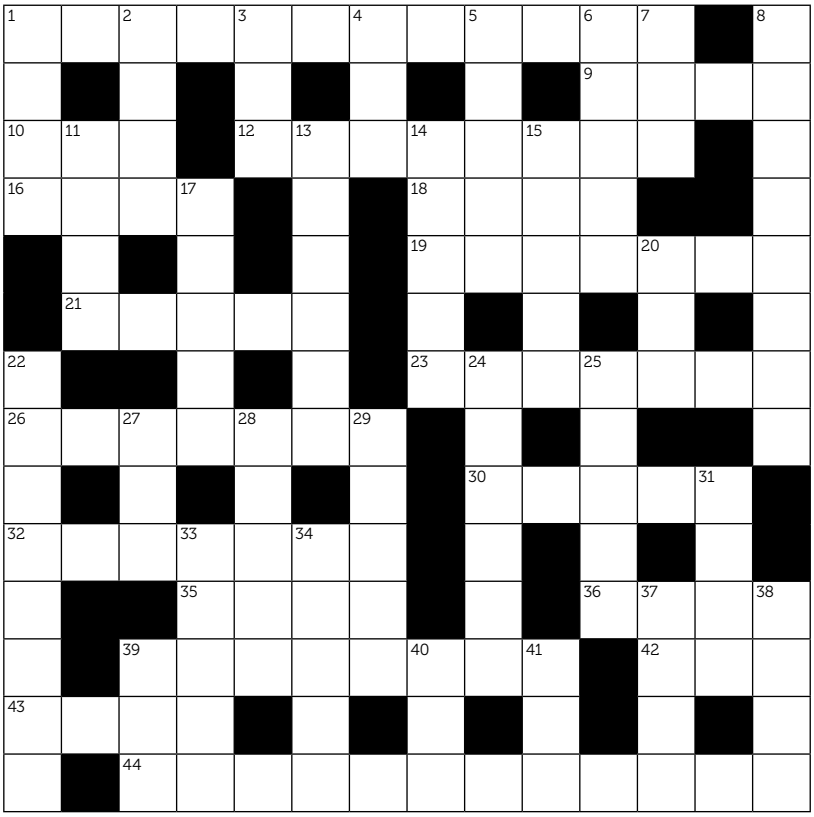
Count Classic: A Botanical Crossword

contributed by David Baum (answers at botany.wisc.edu/alumni-newsletter.htm)



Across

1. Folded lengthwise, as in a leaf
9. *Ploidy in the coast redwood (*Sequoia*), for one
10. Genetic material for Cécile Ané?
12. Pressed drupe product
16. Wood sought for ship-building
18. London rocket epithet
19. Segregate genus of *Phyllanthus*
21. Having no trace of life, for example in rocks
23. Artichoke thistle
26. Of landscapes formed by dissolving soluble rocks
30. *Leaflets in the pink trumpet tree
32. Without microbes
35. The word "druid" derives from the word for "oak" in such a language
36. An infusion of oak bark or vegetable matter, used in tanning (primordially?)
39. Oxygen avoider
42. Tasty bolete
43. Speaker of "Mars will come to fear my botany powers" in 2015 movie, to friends
44. Channeled lengthwise

Down

1. Stimulating plant, that makes you want to talk?
2. *Tepals in some *Magnolia* flowers
3. *A rough start to the count, or Botanist Gordon in 22?
4. *Plumeria* product
5. South African Aizoiaceae genus minus its "tum"
6. Chemical with an SH
7. Resemblance of an *Anguillicarpus* fruit
8. Drying West Coast wind
11. *Petals in the thinleaf sunflower
13. Arillate fruit crop
14. Of *Vitis* products
15. User of 12
17. Patch of hard, cross-grained wood
20. Equal prefix
22. Plains state
24. Not a tree or a shrub
25. *Stamen whorls in *Ornithogalum*, for example
27. *Secale*
28. *Sporangia in a typical stamen
29. Chickpea
31. Farming tool
33. *Horn-like carpels in the Australian bastard crows ash
34. Genus in Convulvulaceae
37. *Petals in *Dryas*
38. herbe à _____ (Wild millet)
39. DNA codon for Ile
40. Location for the start of bacterial chromosome replication
41. Ratite favoring *Distichlis distichophylla*?

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Ferns of Ice Professor Marisa Otegui's photo of ice crystals growing on glass was a 2015 Cool Science Image contest winner.