

**Spring17**  
vol16no2

# Washington State MAGAZINE



**22**

Waste not

**28**

Ends of eras

**32**

Paths that grew  
crystal clear



## Features

Reducing food waste, from farm to home, will become critical for a sustainable food future. **22**

Societies are prone to fall apart. What can we learn from a Southwest civilization that already did so? **28**

Growing crystals can solve tough scientific problems. It also helped crystallize these researchers' life paths. **32**

## UPfront

With "critical zones," gone is the idea of a distant gaze to life-sustaining systems on Earth. **8**

Lights. Cameras. Action. A Cougar sportswriter in glittertown **10**

Learning—that's virtually fun **12**

Trees grow slowly but markets want new fruit. Now. These guys have the solution. **13**

**COVER:** IN WOODS NEAR VANCOUVER EMERGE SPOROCARPS OF GENUS MYCENA—SOME SPECIES OF WHICH FRUIT IN THE SPRING (PHOTO REBECCA RICHARDSON) **LEFT:** SPRING COMES TO THE PALOUSE NEAR STEPTOE BUTTE. (PHOTO EUNICE EUNJIN OH)







PHOTO TOMMY SHIH

## Thematics

### SHORT SUBJECT **14**

"There's something out there far beyond me."

### WELL BEATS **16**

A historical birthing practice returns to the Pacific Northwest.

### FALL BACK **17**

From abundant fall rains emerged a menagerie of nature's recyclers.

## Departments

**5** Emergence ... perhaps resolution. **FIRST WORDS**

**18** Enjoy leeks at every meal **IN SEASON**

**20** It's how you play the game **SIDELINES**

**40** Geeking out with the girls **ALUMNI PROFILES**

**42** "Hang Them All"; Swift Dam; One More Last Cast **NEW MEDIA**

**44** You've heard (of) this "Woman of the Year" **CLASS NOTES**

**45** Adopted Cougars can be the best **ALUMNI NEWS**

**48** Music man of the Palouse **CLASS NOTES**

**52** Why don't nonbiodegradables decay? **ASK DR UNIVERSE**

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Emergence. Last August, shifting sands on a well-trafficked beach along Oahu's west coast revealed 400-year-old carvings left behind by Hawaiian indigenous people. The 17 petroglyphs etched into the sandstone on Waianae Coast, and the stories they tell, had never been recorded. Without the right conditions, they may have remained hidden for years or centuries.

Archaeological sites like the one in Hawai'i, or ancient buried pyramids and tombs in Egypt, open up their secrets when the conditions are right, but sometimes even plainly visible ruins hold mysteries. Mesa Verde's astounding Cliff Palace and other Pueblo sites provide insight into the continent's past civilizations to Washington State University researchers Tim Kohler and Kyle Bocinsky, and their colleagues. As more data and evidence become evident, the archaeologists can posit that, despite relative technological sophistication, wealth inequality and climate change had a major role in the violent social collapse of several Pueblo eras.

Sometimes problems hidden in our own society rise in our awareness, and that consciousness helps us seek solutions. Food waste is a prime example: We waste \$165 billion worth of food per year in the United States; much of it ends up rotting and spewing methane out of landfills. If we could redirect even a small percentage of that wasted food to people who need it, as WSU Extension and others are doing, we'd make steps toward solving several problems.

Career paths also form out of a combination of factors—background, timely intervention by teachers, luck. For Kelvin Lynn, a WSU materials engineer and physicist, those factors put him in the lab instead of possibly a jail cell. Thanks to his teachers, the Regents professor directed his intellect and energy to science despite his troubled youth. Now, Lynn and his current and former students make and purify industrial crystals to improve thin-film solar panels and filter radiation in medical scanners, among other technological improvements.

Technology also helps WSU's Nic Lloyd monitor and explain weather, but even with these tools, odd and unexpected things will emerge with the right circumstances. Last year was so wet, the Pacific Northwest witnessed a massive fruiting of mushrooms. My own yard was peppered with them.

The fungi are gone, and sands have once again covered those Hawaiian beach petroglyphs. We know more, though, because the right conditions revealed them. Mycologists can study the mushroom explosion, and archaeologists will protect the carvings. With emergence comes awareness, and thus to understanding and perhaps the resolution of problems.

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## Where would the wood?...

I enjoyed the article “Wood Takes Wing” in the Winter 16 edition of *Washington State Magazine* on the many possibilities for wood as a new source of carbon molecules for all of those polymers we take for granted. Technologies that allow us to reduce burning of fossil fuels for energy recognize its highest value. The potential for atmospheric carbon reduction is a plus.

But there was an unasked question hanging behind the article—where will the timber come from to fill the old mills? The same environmental groups who just say no to transporting or burning fossil fuels also eagerly block timber harvests. It would be interesting to see a future project out of WSU that addresses the politics of where wood comes from.

**SUE LANI MADSEN '78, B. ARCH.**

*From the editor:*

*Sue, thanks for your note. You bring up an excellent question.*

*The science behind using biomass as a way to help diversify our domestic fuels and plastics is pretty clear, if not precisely settled: With science-based forest management plans in place, we can have our cake and eat it too.*

*We can have the wood products we need for building or utensils, and from the “waste” (residuals) from the harvest process, we can develop the fuels and chemicals for industry as described in the story, while still leaving plenty of wild places for wildlife and humans. As NARA scientists have shown, by leaving about 30 percent of the post-harvest residuals on the forest floor, enough organic matter remains for the next generation of plants to thrive. This same residual material also provides forest floor habitat for animals. The same science-based management plan would also reduce fire danger.*

*It is also worth noting that NARA is currently working solely with private land owners to obtain harvest residuals and to conduct economic and social analyses; no public lands were involved in the NARA project.*

*That said, your implied point is well taken: How will we as a society educate ourselves and come to a consensus about the best uses of limited (if, in this case, renewable) natural resources? While NARA doesn't have an explicit answer to that question, the NARA project's ongoing outreach and education programs suggest that we are rapidly moving toward a consensus that will indeed allow us to collectively share the wealth in our forests. One of the driving forces behind that emerging consensus is, as you might well imagine, climate change. The environmental movement is coalescing around the climate crisis and, at the same time, recognizing the value of pragmatic solutions such as those developed by NARA and the other regional biofuels projects as ways of reducing our carbon footprint while enabling us to continue to live the energy-intensive lives we have become so accustomed to.*



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# WOOD TAKES WING

Like Orville and Wilbur Wright, challenging conventional wisdom and tackling problems head-on is part of our DNA.

So when the world applauded after Alaska Airlines flew the first commercial flight in November using biofuel we created from branches, treetops, and other timber harvest leftovers, we briefly traded high fives—and then got back to work.

Because like the Wright brothers following their first flight, all of us at the Northwest Advanced Renewables Alliance know we're just getting off the ground.

Washington State University. **Makers. Doers. Cougars.**

[nararenewables.org](http://nararenewables.org)



## *Zeroing in on*

**For almost half a century, scientists have been measuring carbon dioxide in the air two miles above sea level in the middle of the Pacific Ocean. At first, Charles David Keeling counted 310 parts of carbon dioxide for every million parts of air. When he died in 2005, the number was 380. On May 9, 2013, the number topped 400, "a milestone," wrote *National Geographic's* Robert Kunzig, "on a far more rapid uphill climb toward an uncertain climate future."**

**CRITICAL**







# ZONES

STAFF ILLUSTRATION

We might get wistful over the elegance of what is now known as the Keeling number: a solitary data point, like the Dow Jones industrial average, the time of day, or your body temperature, conveying a complicated process in the simplest of terms.

Students and scholars analyzing the bottom-most level of the atmosphere, a place called the critical zone, have no such luxury. Measured from the treetops, through soil to the groundwater, the critical zone houses a vast array of interdependent biogeochemical processes. The processes have a huge hand in ecosystem services, like clean water and air, as well as the fate of carbon, global warming's fundamental element. The critical zone is also a vastly complicated place, what a National Research Council panel called, "the most heterogeneous and complex region of the Earth."

The bulk of the planet's life forms reside in the critical zone, but the term didn't come into its current use in 1998. Scientists have since started taking a systemic approach to get a holistic view of its workings, with the National Science Foundation and others creating dozens of new observatories in watersheds around the United States and elsewhere.

Marc Kramer, an assistant professor of environmental chemistry at Washington State University Vancouver, led five students last fall through the critical zone's world of complicated relationships. For their lab, Kramer's students didn't have to go past the Vancouver campus backyard, a swatch of field and forest just east of the loop road. It is open meadow at its edge, then a mix of deciduous and conifer forest sloping down to a stream.

It offers a good snapshot, says Kramer. To complete their perspective of processes within the watershed, the students would only need to drive just 20 minutes from here into the mountains, where they can also study increasingly common rain-on-snow events.

It had been a remarkable time to be gathering data, with t-shirt weather in November and the wettest October on record. On their last field day of the semester, the students fanned out to measure a remarkable sweep of things, many involving soil.

"Soils are the quarterback of the critical zone," says Kramer. "They're the integral player to what happens."

In the meadow, Sarah Kintner, a first-year master's student from Green Bay, Wisconsin, collected water to test for total organic carbon and nitrogen. Their relative amounts in both rain and different soil horizons, including the topmost layer of leaf litter, can give insights into processes going on in each place.

In the woods, Corey Ruder, a doctoral student from near Sacramento, could measure changes in carbon-dioxide concentrations in and around the ground, indicators of root and microbial respiration. The levels tended to be lower in the conifer forest.

Greg Clark, a first-year master's student from Harrisburg, Pennsylvania, measured precipitation with instruments in the open meadow and under the canopy. Differences between the two can indicate how much precipitation is altered by leaves and branches.

Luke Reyes, a doctoral student from New Jersey, patrolled litter traps, screens that caught leafy matter as it fell from the trees. He would dry the contents, weigh them and do carbon and nitrogen analyses to see how the vegetation is contributing inputs to the soil.

"Around the time the leaves came down there was an increase in carbon concentrations that were dissolving in the top layer of the soil," he says.

Just then Geoff Kahl, a geology master's student from Portland, arrives. His boots are wet. He was sampling stream and groundwater to analyze their chemistry.

"Marc," says Kintner, "look what I'm standing on."

She's on a fallen tree that wasn't there a week ago.

"That's a large coarse woody debris event right there," says Kramer, whose Oregon State University advisor, Phil Sollins, pioneered the study of rotting logs and their role in forest ecology.

Reyes has already estimated the standing biomass in a 30-foot radius of the forest. Had the tree fallen in one of his leaf traps, says Kramer, Reyes could dry it, weigh it and estimate its volume.

"That's a little beyond the scope of an eight-week class," he acknowledges.

Gathering so many pieces of data and working in a team, the students dramatically increase their capacity to do big science, says Kramer.



WSU VANCOUVER STUDENT RESEARCHERS COREY RUDER AND SARAH KINTNER ON SITE. (PHOTO ERIC SORESENSEN)



# Writing pools, movie stars

BY DAVID WASSON

The New York Yankees were establishing their dominance over America's favorite pastime. The **Golden Era of Hollywood** was in full swing. And a nation recovering from the sacrifices of World War II had begun to heal and find itself.

It was a world of big cars and even bigger personalities. A world that sportswriter **JOHN D. MCCALLUM**, a U.S. Army veteran and former pro baseball player, found he could navigate with surprising ease.

McCallum resumed his English and journalism studies at Washington State after returning from the war, and briefly played for the Portland Beavers in 1947. But it was after he hung up his cleats and moved to New York City, where he worked as a sportswriter, that he found the niche that would help him become one of the hardest working celebrity biographers of the Fabulous '50s.

He was handsome, confident, and skilled in the art of conversation, traits that enabled him to gain the confidence of America's industrialists, freely interact with its sports heroes, and court Hollywood starlets. McCallum's personal and professional calendar read like a who's who of mid-century America.

He spent two often frustrating months with baseball legend Ty Cobb while writing *The Tiger Wore Spikes*, a combination biography and how-to manual that *The New York Times* described as the best sports book of 1956. He immersed himself in the drama and history of President Dwight Eisenhower's prominent Kansas family. And, he introduced America to the blue collar Philadelphia roots of Grace Kelly, the movie star who became princess of Monaco.

By the time he died in 1988, at the age of 64, McCallum had written nearly 40 books,

"They're able to tell a more powerful story based on the part they did," says Kramer.

Back at the science and engineering building, they start trying to figure out what their story might be. They have half a dozen indicators of how water arrives and moves through the system, plus measures of soil moisture, carbon, nitrogen, and carbon dioxide. They have questions about biogeochemical responses to seasonal change, land use, and climate change. They already see big differences between the deciduous and conifer forests, particularly after big winds and four inches of rain came through in mid-October.

Kramer encourages the students to answer the questions they started with but also to look for new questions that might arise from the data they chart. It's science as a reality-based creative process.

Kramer notes that the western side of the Cascade Mountains in the Pacific Northwest is unique in the age of global warming as it stands to be warmer but also quite wet. The October rain event came from the extratropical air of a remnant typhoon. Between the data of the Intergovernmental Panel on Climate Change, long-term climate data, and projections for the area—from a wealth of numbers both old and new—the students just might have a story to tell.

Indeed, by semester's end, Kramer reports that, based on the historical record, the students can say the heavy warm rains of October are a proxy and harbinger of things to come.

"I think they're going to have a high-impact paper," he says. ✱

DOCTORAL STUDENT LUKE REYES COLLECTS TREE LITTER TO GAUGE CARBON AND NITROGEN IMPACT. (PHOTO ERIC SORESENSEN)





ranging from biographies to sports history and reference manuals. He was what the publishing industry would describe as a working writer rather than a novelist, a distinction the Tacoma native embraced.

"He was very gifted," McCallum's sister, Doris Dorwin, recalls. "It didn't surprise the family at all that he found his way into so many circles."

Dorwin, who also attended WSU, remembers her brother as talented, funny, and driven.

To interview Cobb, for example, he traveled to the notoriously mean-spirited retired Detroit Tiger's hunting lodge near Lake Tahoe and spent several weeks serving essentially as his driver, cook, drinking companion, and personal secretary. "Because no one could live with him—and that included two wives who left him, butlers, housekeepers, chauffeurs, nurses, and former friends he had driven off—I fell into the role of Man Friday," McCallum later wrote.

Much of McCallum's work reflects his background as a New York sportswriter and columnist, the career he chose over baseball after being advised by the Portland, Oregon, Beavers he was being assigned to the minor league farm team in nearby Salem.

His personal papers now are part of a special WSU collection. In addition to his book manuscripts, the University's archives hold several boxes of correspondence, including handwritten letters from Grace Kelly, Ty Cobb, and others.

They provide a largely behind-the-scenes look at the business side of biographical journalism. But there are also thinly-veiled references to surprisingly intimate details of East Coast high society as well as the Hollywood social scene. Purposely ambiguous language often used to convey messages without compromising confidences.

He advised a trusted friend at one point that, while he enjoyed dating, he found serious relationships interfered with his ability to get work done: "There's nothing more stifling to the creative mind—more all-consuming and energy-killing—than a 100-per cent love affair."

But he surprised his extended family one day when he brought Hollywood actress Marjie Millar home to meet them. Millar, also a Tacoma native, had landed recurring roles in television shows such as *Dragnet* and starred as the love interest of Dean Martin in the film, *Money from Home*.

"She was so beautiful and so nice," recalls McCallum's sister, Doris. "There was never any hint from her about being a movie star, she was just really likable."

McCallum and Millar both had moved back to Puget Sound and they wed in 1961.

But, like many Hollywood marriages, it lasted just a few years. Millar had suffered a leg injury that left her partially disabled but she returned to southern California, where she died two years later from liver failure. McCallum stayed in Tacoma, where he turned his focus back to writing, and confided in friends even years later it was tough to watch TV when one of his former wife's shows or movies was being broadcast.

Nonetheless, he remained the life of nearly any family gathering.

"He rubbed shoulders with so many famous people," recalls McCallum's

nephew, Bryan Dorwin. "He was the fun uncle—the uncle who could entertain and surprise us kids for hours on end with his stories."

The ability to spin a good story was a skill many in the McCallum family possessed.

McCallum's mother wrote children's stories during the Great Depression. His older brother, George, who went by "Pat," also served in World War II before returning to Washington State to finish a master's degree in 1948. He was a linguist who taught overseas and authored books on conversational English.

Although he spent most of his adult life as an English professor in Europe, Pat McCallum remained close to his family and to his alma mater. He left a significant por-



From top: John D. McCallum at work in front of his typewriter. McCallum (left in photo) with Grace Kelly's family for the 1957 release of his third book, *That Kelly Family*. Courtesy WSU Manuscripts, Archives, and Special Collections

tion of his estate to WSU's Murrow College for a scholarship program in honor of his brother, John.

The John D. McCallum Memorial Scholarship in Communication is in the final stages of development.

Before he died, McCallum reflected on what drew him to biographical journalism in a 1969 autobiography, *Going Their Way*.

"All this has taught me that the most interesting subjects in the world are people, because they are the world," he wrote. "It is unfortunate that we do not get a chance to meet more of them in a lifetime." ✱



# Learning that's virtually fun

Graceful tropical fish circle around me as a sea turtle glides overhead. Slowly and steadily, hundreds of pink jellyfish swarm from behind and a curious striped creature moves in for a better look at what I assume is my virtual reality headset. In awe, I blindly reach out and it pulls away with alarm. The scene is so realistic I'm speechless.

Don McMahon is laughing. "You look pretty engaged right now," says the director of the Washington State University Neurodiversity Lab located in the College of Education. "Fun is engaging and engaged students learn," he's been intoning, seemingly miles away in the background.

McMahon is an assistant professor in special education with a passion for the world of assistive technology. He's the campus guru when it comes to incorporating sophisticated technologies like virtual reality (VR) into K-16 teaching and learning. Though his methods apply to all students, McMahon's primary goal is to promote independent living in people with disabilities such as autism or Down syndrome.

The Neurodiversity Lab is a merger between the College of Education's Assistive Technology Lab and the Neurocognitive Science Lab. The new operation, which opened in 2015, offers faculty, students, and community members a unique opportunity to try equipment and collaborate on research projects.

"What's really great about this space is that it's an open partnership for so many different groups of people," says McMahon. Researchers from across the University use the technology for studies ranging from eye tracking in dogs to autism studies to ROTC officer training.



COURTESY WINTER HERRON

McMahon, himself, specializes in augmented reality (AR) and its use in devices like the Microsoft HoloLens, which superimposes digital holograms onto real world environments. He's published several studies showing how AR can help children learn skills such as tooth brushing and memorizing scientific vocabulary.

Building on that concept, the lab also uses 360-degree cameras paired with VR goggles to enhance cultural understanding, says Jonah Firestone, assistant professor of science education and director of the neurodiversity sister lab at WSU Tri-Cities.

"The idea is that students in Hispanic, Muslim, and other cultures can film their home lives and share them with teachers through VR," he says. "It decreases assumptions and allows teachers to adapt their methods accordingly."

McMahon says VR immersion is also used to prepare ROTC recruits for the challenges they'll face when deployed to war-torn areas like Iraq or Syria.

The Neurodiversity Lab's pioneering spirit likewise extends to man's best friend, the dog, through studies on the human-animal bond, says Phyllis Erdman, executive associate dean for academic affairs in the College of Education.

Today, her sweet-faced Labrador retriever, Duke, is patiently being fitted with "doggles." Winter Herron '16, dressed in a College of

Veterinary Medicine "Class of 2020" t-shirt, is kneeling beside him adjusting straps.

For her undergraduate Honors College thesis, Herron designed and built canine eye-tracking equipment based on models used for humans. Her goal was to determine if dogs, like humans, show a left gaze bias—the tendency to look at the right side of someone's face first and most often.

Humans show most of their emotion on the right side, so people instinctively look to the left to read the right side of someone's face. Previous studies had suggested this phenomenon also occurs in dogs, and Herron wanted to confirm it with eye-tracking cameras. Erdman was her mentor.

"Winter had no training in electronics," Erdman says. "We gave her the equipment and with a combination of popsicle sticks and tape, she figured it out. I thought that was pretty innovative."

And successful too. The experiment revealed that dogs do indeed read our faces and emotions. Using three cameras and special software, Herron demonstrated that nine out of ten dogs in the study showed a clear left gaze bias. She hopes to publish the findings.

"It was a lot of fun," says the future veterinary ophthalmologist as she checks Duke's dogged eyes for squinting. "The dogs thought it was interesting too—they weren't distressed at all." ❄️

# Faster drop for a new crop

Water and time are money if you're a farmer. Trees are especially slow, and to get a new apple variety growing at a commercial scale can take years. It not only takes a couple of years after planting for fruit production to start, but it's a long time just getting trees to plant.

The number of trees needed to plant a commercial-scale orchard is daunting. Even a small orchard of 100 acres needs nearly a quarter million trees to get going. And while it might take only a couple years to "raise a few rootstocks, thousands can take many years," Washington State University apple breeder Kate Evans says.

If you placed an order for trees today—forking over about 25 percent of the total cost as a deposit—you might get your

they can deliver millions of trees in a year to 18 months. Couple that with an extraordinary savings in water, a guarantee of the tree being true to type, and the company is poised to be, well, the next Apple of apples ... and almonds, grapes, cherries, pears, and much more.

The innovation, at first glance, sounds old hat: Phytelligence is basically growing trees in gelatin in Mason jars. Called tissue culture, it's a technique that has been a lab standard for a century. But most commercial nurseries that employ tissue culture are using an old one-size-fits-all recipe that was developed to grow one of the lab rats of plant science, tobacco.

It turns out that by customizing the growth medium—the gelatin at the bottom of the Mason jar—and controlling a few other variables in ways apples or other crops find conducive to growth, things speed up. A lot.

A commercial apple tree is almost always a combination of two different kinds of apple. The fruit-bearing part is called the scion. The scion is grafted to a rootstock. Kevin Hauser of Kuffel Creek Nursery in Riverside, California, says, "It's like joining the brains of a scientist to the legs of an athlete." Rootstocks do a lot for the fruit tree, including conferring disease resistance, drought tolerance and, critically, they don't grow very tall. A short tree is a tree that doesn't demand as many inputs—water, nutrients, chemicals. In other words, it's a tree that saves growers money.

With conventional production of rootstock, there's several years' worth of consumables before the tree gets to the orchard. A young tree is pushed over onto its side so that its branches dive into the soil, forming new roots. The next spring, the whole mass is dug up and separated into individual trees. Over a period of years, this process is repeated many times until the desired number of rootstocks is available. Scions are produced in similar fashion.

Phytelligence saves 50 to 100 gallons of water for every tree they produce, says Tyson Koepke '12 PhD. One of the company's founders, Koepke runs Phytelligence's Pullman operation.

Phytelligence also uses its genomics expertise to guarantee its rootstocks are true to type. Dhingra's lab was one of the core members of an international team that



TYSON KOEPKE BY JOHN VICORY

sequenced the apple genome. They've since sequenced the genomes of many other crops. They use this genetic know-how to ensure that they're delivering what the customer ordered.

If you order dwarfing rootstock, but then discover that you actually got semi-dwarfing trees, you have a major problem. As Koepke says, "Farmers can't afford to replant because of errors like that."

So great has the demand been that Phytelligence has expanded well beyond its original Pullman operation. They've leased a 200,000-square-foot greenhouse facility in Burien, near Seattle, that has a six- to eight-million-plant capacity.

The family that owned and operated Bel-R Nurseries in Burien were, after three generations, looking to retire. Mike Rastelli '83 and his wife, Jodee '83, met Dhingra and decided that Phytelligence would be a good fit for the facility. "It turned out to be two Cougar families melding together," Rastelli says.

"These greenhouses were built with love," Dhingra says. Rastelli's grandfather and father built the greenhouses over a period of years, expanding capacity as the ornamental plant market rapidly expanded after World War II.

The company also leased a vast tissue culture facility just outside Portland. The original setup in Pullman now serves as a germplasm repository and research lab.

Phytelligence's move into the new digs was well timed. They've already sold out their spring 2017 plant production as demand continues to grow. With the expansion of Phytelligence's leadership team to include Tim Zenk '84 as vice president of new business, horizons are expanding, too.

Focused on the world's other two major fruit producers, Zenk says, "China and India have antiquated systems, old trees, and national goals to increase fruit production. The only way to do that is plant new trees." ✱



AMIT DHINGRA BY ROBERT HUBNER

trees in three years. But more likely it'll be five years. In the meantime, you're not growing anything and you're not making any money.

A startup called Phytelligence is disrupting that status quo. Founded in 2012 by Amit Dhingra, an associate professor of horticulture at WSU, and a group of his graduate students, the company is working with an innovative technology that means





*“There’s something out there far beyond me.”*





BY BRIAN CHARLES CLARK

PHOTOS ZACH MAZUR

# From the top

▶ Ruth Boden in Gavin Carter's short film, *Andante*: [magazine.wsu.edu/video](http://magazine.wsu.edu/video)

It's sunrise somewhere on the Appalachian Trail. Ruth Boden is sitting on top of a mountain, playing her cello as she gazes out at a sea of trees. A hiker approaches. "So that's what I've been hearing for the past six miles!" he calls out to her, grinning from ear to ear.

Boden is the cello professor at Washington State University and the founder of Music Outside Four Walls. She is challenging the received wisdom that classical music is played in tuxedos in concert halls with whisper-quiet audiences who've paid big bucks for a seat. So she backpacks, with cello, and gives impromptu concerts at campsites and on mountaintops. If there are people around, great. If not, that's fine, too. What matters is the music, and giving back to the muse.

Boden got her doctorate in Alabama, and then taught in Pensacola while navigating a heavy performance schedule throughout the Southeast. "I wanted to spend time on the Appalachian Trail but I knew I couldn't take six months off from playing and still hope to be competitive when I got back. So my first thought was, I wonder if I can bring one with me?"

Tall and slim, Boden says she's been about the height she is now since she was nine. "Compared to every other fourth grader in the world, who is going to squander a violin on a big, tall kid when you probably need a cellist in your group anyway?" It was love at first vibration.

"It sounded like me," she says—indeed, the cello is noted for its human vocal-like timbre, and Boden points out that the instrument covers the entire range of human singing, from bass to soprano. "You wrap yourself around it, it becomes an extension of you. And I just couldn't let it go!" That first day, she played until her parents—both musicians themselves—told her she had to put it away for the night.

But she was back at it the next day. And every day since has been filled with music. That hasn't changed, but what did change was the Spokane native's physique. "I was a big, fat, sedentary kid!" she says. Then, when she was 15, she climbed her first mountain while at a summer music camp in Colorado. She was hooked. A few years later, she went away to college at the Cleveland Institute of Music, and dropped 70 pounds during her freshman year.

"I started hiking and getting outdoors. I adjusted my diet. I found there was a really attractive side to physical discomfort from really pushing yourself to do something you didn't think you could do." Backpacking with a cello, she says, is a tangible metaphor for being a musician. "You try to explain to people about the art of practicing, and the disappointments and the struggles that we go through—and finally, there's a way to show people. It is no different than having to drag your instrument to the top of a mountain. And you've got to want to do it, and you've got to push through it when it gets hard and you're tired. You've got to remember that the outcome is that

you get to sit on the top of a mountain and play! And I love that—I can't put it into words. But that physical push is like the emotional push of practicing."

Actually, she can put it in to words. She says, "There's something out there far beyond me," a numinous sensation that is familiar to many, but especially athletes, backpackers, musicians, and mystics. "We're conduits" for the music and, especially with improvisation, which she loves, it's about letting go and releasing the emotion. And, on the mountaintop, "there is a feeling of infinity in terms of where that sound is going. You can almost imagine it raining down into the valleys, tiny particles of music."

She still plays that first cello she got when she was a kid. It's been worked on, sure, to make it more professional but, she says, "I know it inside out." In college, there was always the expectation that she'd move up to a "better" cello, but the price tag is daunting: \$25,000 or more. "And I like this instrument for teaching, too, because then my students can't so easily say, 'Oh, it's my instrument...'" And I ask, "Is it really your instrument, or is it something else that is keeping you from making your instrument really sing?"

She laughs, as this reminds her of the gear discussions on the Trail. "Somebody'd say, 'What kind of tent did you bring?' and I'd answer, 'I don't know—I think it's from Walmart.'" "Wow," would come the incredulous reply, "How can you stand the extra weight?" And she'd look at that guy and say, "You did notice I brought a cello? I'm clearly not that concerned about lightweight backpacking."

Not that the cello she hikes with is all that heavy. It's a carbon fiber instrument, made by Luis and Clark in Massachusetts, and weighs about 15 pounds. "About the same as my wooden cello." But she regularly packs around 72 pounds. "I'm ridiculously slow, glacial epoch slow," she says, and so has to pack extra water and food.

Boden's mission is to bring music—especially classical music, which has a reputation for being stuffy and inaccessible—to people who might not otherwise bother with it. She'd hit camp as others were cooking, and ask if anyone minded if she played for a bit. "That'd be great!" was the usual response. "Inevitably, someone would start humming 'Ode to Joy' from Beethoven's Ninth, and say, 'I don't know what this song is called, but can you play that?' So people do know classical music! They just don't know that they do or they don't know that they really like it."

We hiked Kamiak Butte to do a photoshoot for this story. As she started to play—a lovely, lively tune called "Julie-O" by former Turtle Island String Quartet cellist Mark Summers—you see the spirit play across her face. A couple fellow hikers drift by, and stand some distance away, rapt. The air is fine and still, and the sonorous voice of the cello tingles the spine. And when she plays a trill, the air fills with birds. It's an inexplicable, unforgettable, goose-bump moment, a gift from the muse. ✨

# WELLbeats

## Call the midwife

ViviAnne Fischer practices midwifery in her clinic near Pullman, where you can see her connection to the long and complicated history surrounding the practice.

In a green-colored house along a dirt road, at the top of a set of stairs, a large, nondescript black suitcase stands before a crammed bookshelf, her “library” for families. Inside the suitcase is a mix of new, modern medical equipment beside bottles of herbal extracts.

On the other side of the room is an odd-shaped stool at the foot of a bed. The bed is almost cot-like but the wooden frame poking out from beneath the quilt is carved. The quilt itself is bright and cheery, a subtle reminder of the joys of childhood and family.

Fischer positions herself on the stool. Using both her body and her words, she describes how the stool is used by women who want to remain semi-upright during birth. Birthing stools are ancient, she says. They’re designed to help first-time mothers with difficult births.

The Pacific Northwest has a certain reputation for being a little unconventional,

so it’s not surprising that alternatives to the typical hospital birth, including midwifery, are higher in comparison to other regions.

Childbirth is one of the leading reasons for hospital visits throughout the country, yet the Centers for Disease Control reports that Washington, Oregon, Idaho, Montana, and Alaska—along with Pennsylvania—have the highest percentage of out-of-hospital births: between 3 and 6 percent in contrast to around 1 percent nationally.

Although midwifery has been around since humanity began, its use in the United States dwindled over the last century as the medical field expanded. It has staged a comeback in the last 10 to 15 years, even as it remains illegal in some southern states.

Anthropologists like Barry Hewlett have been exploring birth practices throughout the world’s cultures. The WSU professor focuses on what he refers to as the “anthropology of childhood.” Hewlett says that what American society refers to as “alternative” birthing practices is, in reality, rather common throughout other cultures.

While each mother may have a distinct reason for choosing a midwife or another form of alternative birthing practice, many providers suggest mothers may choose alternatives because they enjoy increased individual choice that they may not be able to get in hospitals.

In addition, many midwives report that the women seeking such alternatives have done extensive research on natural births and might wish to avoid interventions such as pain medications and C-sections.

Ashley Wilson has assisted many of those women as a certified nurse midwife, or CNM, in urban environments throughout the country. On the East Coast, she was primarily in hospitals or large ob-gyn clinics. In Spokane, Wilson worked through the Community Health Association of Spokane and with individual-owned birth centers. She has also practiced an increased number of home births.

Wilson describes her job as being primarily educating women. Not only about alternative birthing practices, but also about contraceptives and women’s reproductive health. “Healthy sex lives, healthy bodies, healthy women’s psyches,” she says.

As a WSU nursing doctoral student, Molly Altman ’15 PhD researched the care provided by CNMs compared to care provided by traditional hospital birthing staff. She found significant differences between CNMs and ob-gyns in regards to birth interventions and “specifically in regards to mode of birth, epidural anesthesia use, labor induction, labor augmentation, and cervical ripening.”

She describes midwifery as being a more hands-on form of birthing based on the idea of childbirth as a normal life event for many woman, rather than as a “medical problem,” which is how Altman describes the common view of birth in the last 100 years.

In addition, Altman found that the use of CNMs resulted in less resources and decreased costs for both the hospitals and the families. She concludes that births by CNMs are equally as safe as those performed by ob-gyns. She advocates that midwives should be considered as the primary care providers for medically low-risk mothers as this could decrease the burden on the health care system.

Psychologist Ekaterina Burduli (’08, ’11 MS, ’16 PhD) explores birth satisfaction in the United States. She and other researchers worked with women giving birth in



MINIATURE ENGRAVING OF MIDWIFERY FROM THE FIFTEENTH-CENTURY MANUSCRIPT HISTOIRE DE LA BELLE HECLAIRE. NATIONAL LIBRARY OF FRANCE/HUTTON ARCHIVE



hospitals and with women giving birth either at home or in birth centers. Burduli found that women who followed an alternative birthing plan were more satisfied than those who had given birth in a hospital setting.

Elizabeth Soliday, an associate professor of human development at WSU Vancouver, has studied alternative births for years. She describes mothers seeking out-of-hospital births as having an apparent increased faith in their body's ability to perform natural births. In other words, the women often expressed very little concern regarding the need for interventions such as induced labor, C-sections, medication, or other medical interventions. They feel confident in the midwives' knowledge and ability if an emergency should arise. In addition, many midwives have connections with local hospitals should an emergency occur.

Furthermore, Soliday says the cultural climate of the region adds to the popularity of alternative births. She says the variety of types of midwives and the availability of credentials for the profession are much more extensive in the Northwest states. Washington has "some of the most progressive birth care policies in the nation," Soliday says.

In fact, many insurance companies will cover births performed by midwives, according to Soliday.

Despite decreased costs and comparative safety, midwifery and other forms of alternative births still have a long way to go. Midwifery is still seen as a counterculture, even in the Northwest. There is no nationwide standard for midwives as every state decides on licensure.

Back in Pullman, Fischer says midwifery in the state is "light years ahead" of many areas of the United States but "light years behind" the rest of the world. With this in mind, midwifery associations throughout the country are working together to have a set standard for the profession by the year 2020, which may reflect aspects of international standards. ✱

*Krystle Lyric Arnold, a senior studying communication, is an intern with Washington State Magazine.*

**Clockwise, from top:** Fly Agaric (*Amanita muscaria*)—although relatively common elsewhere, not so in the Inland Northwest. **Golden Chanterelle** (*Cantharellus spp.*)—several species of these choice edibles are found in the Pacific Northwest. **Cauliflower mushroom** (*Sparassis radicata*)—an unusual-looking fungus and actually a good edible. Found by WSU graduate student Erika Kruse. **Rosy Russala** (*Russula rosacea*)—one of the most beautiful mushrooms of the forest; very abundant this year. Found by adjunct professor Pat Okubara. **Lemon-yellow Pholiota** (*Pholiota limonella*)—these slimy golden caps grew in spectacular clusters last fall. **The Prince** (*Agaricus augustus*)—a stately and wonderfully almond-scented mushroom related to the cultivated button mushroom. From Pat Okubara. **Western Black Elfin Saddle** (*Helvella vespertina*)—common forest mushroom found in yards last fall! From Erika Kruse. *Staff photo composite from sources listed; others courtesy Lori Carris*

## After the rains

WSU meteorologist Nic Loyd is stuck on one word for last October's Washington weather: Wet. Make that two words: Abnormally wet. Sea-Tac measured over 10 inches of rainfall. Even dry Yakima saw almost 2-1/2 inches. But the undisputed epicenter of soggy conditions was Spokane which registered not only their rainiest October ever, but the highest precipitation for any month ever recorded: a whopping 6-1/4 inches. That's remarkable when compared to an average October rainfall of just 1-1/4 inches. Especially given that their typical annual total is just over 16 inches.

Loyd says this was due to an unusually deep and persistent trough of low pressure just off the West Coast, coupled with an atypically strong jet stream aimed right at Washington. The result? A parade of storms that contributed to making October a month for the record books.

Record weather events can spawn other records, which in this case was the massive emergence of mushrooms, especially in eastern Washington. Lori Carris, WSU professor of mycology and member of both the British and American preeminent mycological societies, says that the record rainfall resulted in the appearance of some unusual types of mushrooms, such as a beautiful fruiting of the cauliflower mushroom along a trail on Kamiak Butte (found by graduate student Erika Kruse). Never had she seen it in her 27 years of collecting in the Inland Northwest. The abundant rains resulted not only in the fruitings of choice edible mushrooms but also some rare species appearing in unusual locations. Common forest mushrooms known as elfin saddles were even seen emerging in Pullman lawns. As a result of the record October rainfall, the regional forests were awash with many colorful mushrooms, much to the avid hunter's delight.



# Leeks

BY BRIAN CHARLES CLARK

All **Ray de Vries** asks is that we enjoy leeks three times a day. The Skagit Valley farmer known as the **Leek King** is not being selfish, though. He'll also tell you how to grow leeks so you can eat them all year round—and that everyone in the Pacific Northwest should grow them. "We've got the perfect climate," he says.

The de Vries family got into leeks after Ray's dad, Ralph, retired from dairy farming and planted a large produce garden. Ralph went to Seattle's Produce Row and asked sellers what they needed. "We need leeks! As big as you can grow 'em!"

So that's what the de Vries family started growing. The next spring, young Ray packed up ten-pound boxes of leeks and carted them down to the city. When the seller flipped open a box, he said, "There's only four leeks in here!" "You said, grow 'em as big as we could!"

"OK, but one-and-a-half inch stalks will be adequate for next time."

That was the start of Ralph's Greenhouse. "When we started in the mid-'80s," Ray says, "we could grow an acre of leeks and that'd be more than Seattle could eat in a year." Back then, de Vries would do a leek demonstration in a grocery store produce section, and nine out of ten people would say, "What's a leek?"

Leeks, an allium relative of onions and garlic, certainly weren't unknown through history. Along with the daffodil, the leek is a national symbol of Wales, worn on March 1, St. David's Day. Saint David was a fifth century monastic who became a patron saint of oppressed Celts resisting the occupation of invading Normans. Like the apocryphal Revolutionary War command "don't shoot until you see the whites of their eyes," a Welsh army once won out against a superior British force by distinguishing themselves with leeks on their lapels.

Leeks probably originated in Central Asia north of Afghanistan along with the other alliums, garlic, onions, shallots, and scallions. Chemist Eric Block, author of *Garlic and Other Alliums: The Lore and the Science*, calls this region "a tough neighborhood" where plants must fend off insects and other herbivores by defending themselves with "some serious chemical weapons," including the sulfury lachrymatory factor that makes you tear up when you slice into an onion.

De Vries says he starts harvesting leeks in the much friendlier Northwest climate in July and that harvest continues until the following May. The Leek King wants you to know that you, too, can have leeks from your own garden all year round. The following advice is from WSU Master Gardeners, but concords exactly with what de Vries recommends.

Start leek seeds at least 6–8 weeks before last frost. Thin to 1" apart when the seedlings are about 3" tall. It's best to sprout leeks in cool conditions, about 60 degrees Fahrenheit. Harden off the seedlings



a couple weeks before planting by placing the pots outdoors. Once the soil can be worked, plant 6–8" apart at a depth of about 6" in rows 18–24" apart.

As the leeks grow, mound soil around the base of the plant. This will blanch the edible pseudostems, making them larger and tenderer.

De Vries points out that you can start with a winter variety and stagger that with a later planting of a summer variety in order to keep the harvest coming.

Long prized for their mellow, buttery, onion-like flavor, leeks have curried favor from celebrity chefs and are featured in upscale dishes like a shiitake mushroom and green bean side dish and a fried scallops and leeks main course.

De Vries says he enjoys leeks in omelets, on pizza and, of course, in soups. One of his favorites is "roadkill leek."

"When the wagon is going from the field to the packing shed, some times there's a leek that just doesn't want to go, and it jumps off the truck. I drive by and pick it up and that'll be my lunch. I chop it up into discs, cover it with olive oil, then microwave the whole mess for a few minutes. Top that with butter and parmesan cheese and serve."

When he was a boy milking cows at four in the morning, de Vries says he remembers there was nothing on the radio. But then he picked up on "The Crimson and Gray Radio Hour" from Washington State University Extension, and life at O'dark-thirty was no longer so grim.

"When I started farming with my dad, we were always turning to WSU Extension when we had a dilemma." That's still true, de Vries says. "The Mount Vernon research station is incredibly useful to us." ❄



PHOTO PARKER MILES BLOHM/COURTESY KNIX

**Preparing leeks.** Like garlic and onions, the flavor compounds in leeks change rapidly when sliced, diced, or chopped. So if you want raw leeks in a salad, slice them just before serving. Cooking also changes the flavor, mellowing the sulfury taste and enhancing the buttery nuttiness of leeks as well as bringing out their creamy texture.

Be sure to use only the white (and a little light green) portion of the leek. Leeks trap a lot of sand and dirt in their leaf-like sheaths, so cut the white portion in half lengthwise, pull the layers apart and wash thoroughly.



PHOTO CSEH IOAN

Buttered leeks are delicious, and a favorite in the British Isles. The basic recipe is to add leeks and seasonings to melted butter, turn the heat down to low, cover, and simmer for about 15 minutes until tender. Garnish with thyme or parsley and serve warm. It can be modified to include peas or other vegetables, as well as meats, such as sausage. Alternatively, this dish could be draped over hashbrowns for delicious effect.

# How you play the game

BY DAVID WASSON

**IT TOOK A WHILE FOR THE GUYS** to start passing her the ball during pickup games at the gym.

Jeanne (Eggart) Helfer '82 stuck with it, spending much of her free time back in 1977 simply running the length of the basketball court waiting for a chance to show she knew her way around the paint. It was her first semester at Washington State, a few months before she would start setting school records, and Helfer patiently waited for the guys to discover what her older brother and his friends already had learned back in Walla Walla.

That girl can shoot. And pass. And rebound. "I spent a lot of time just running up and down waiting for a chance to get the ball," Helfer recalls with a slight chuckle. "I knew I'd have to be patient but I looked at it the same way as when I played with my brother and his friends. I wanted to be the kind of player they wanted on their team."

Much has changed since Helfer, the first woman to receive an athletics scholarship to WSU, began hitting buckets in mixed pickup games, anchoring the women's basketball team from 1977-82, and then setting track records as well.

Most notably, perceptions.

It's taken a while but general recognition of athletic ability, and along with it the popularity of women's sports, is growing dramatically.

In 2015, for example, the women's World Cup Finals between USA and Japan shattered all previous U.S. ratings for a televised soccer game, male or female. The 2016 U.S. Olympic team featured more women than men for the first time ever. And professional sports is increasingly becoming a career option for female athletes as opportunities in basketball and elsewhere continue to develop.

"It's a great source of pride," WSU women's basketball coach June Daugherty says of the

growth in both the popularity of women's sports as well as professional opportunities for women athletes.

Last year, one of Daugherty's former players, standout guard Lia Galdeira, became the first Cougar to be drafted into the Women's National Basketball Association. She was the nineteenth overall pick in the WNBA draft and was signed by the Washington (D.C.) Mystics.

Although athleticism is nothing new for women, Daugherty, Helfer, and others credit the hard-fought political and legal battles over equal opportunity, specifically Title IX of the Educational Amendments Act of 1972, with setting the foundation for the current growth.

Under the provision, no student can be excluded from participation in educational opportunities based on their gender. That includes athletics, and WSU became one of the key battlegrounds.

In 1979, a lawsuit was filed by 10 coaches and 26 female athletes against WSU over inadequate funding and other support for women's sports as required under Title IX. The case went to the state Supreme Court, which ruled in favor of the coaches and athletes in a landmark decision.

Helfer was not among the athletes who sued the University but readily acknowledges the lawsuit's importance. Many women's teams lacked University-provided transportation, for example, and were unable to reserve WSU training facilities or take advantage of other support services.

But as a highly recruited female athlete, WSU scholarship recipient, and native of Walla Walla, a community widely recognized for its early support of women's athletics, Helfer hadn't ever felt discriminated against.

"I couldn't sign that," she said of the lawsuit. "It's not that I didn't understand there were discrepancies but my experience was different."

Many of Helfer's athletic accomplishments still stand. With 1,967 career points, she re-

mains WSU's top-scoring basketball player of either gender. Her record-setting javelin throws are still at the top of the list, and she narrowly missed qualifying for the 1980 U.S. Olympic track team after taking a one-season break from basketball. Her personal drive also extended to academics, graduating from WSU with a 3.4 GPA.

It's the all-around pursuit of excellence she carried into her own coaching career, which included a year at Clarkston High School before moving to Spokane, where she coached the Mead High School girls team to three state championships in four appearances from the late 1980s to the mid 1990s. She later transferred to Mount Spokane High School and has kept her students' focus on overall athleticism rather than specializing in specific sports.

It is, after all, a part of a school's educational opportunities and Helfer believes it should serve to instill valuable life lessons about teamwork and self-improvement. That's something she worries is being lost.

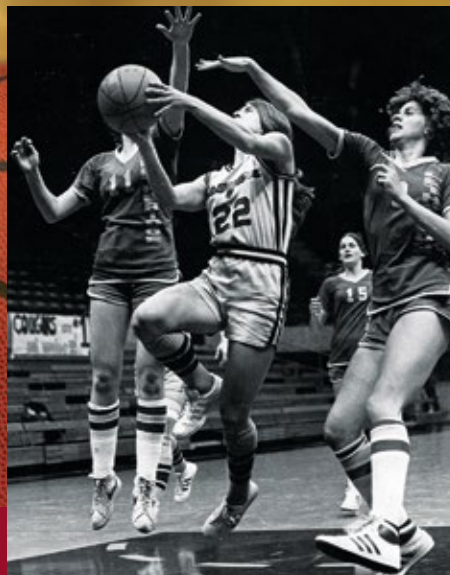
"I've felt we need to focus on athleticism," Helfer says. "We should be coaching athletes... not just basketball players."

Instead, she's seen youth sports treated more as an investment by some, with emphasis placed at young ages on specializing in a specific sport in hopes it improves chances for a college scholarship or more.

Some families prohibit kids from activities such as snowboarding or skiing because an injury might sideline their season, for example. Others miss out on summer fun at the lake.

"My philosophy is that young kids can play multiple sports and be normal kids and still have the skills and abilities that are needed to be successful at the high school level and maybe beyond," Helfer says. "My desire is that my athletes enjoy the journey and not just the goal itself." ✱





The most prolific scorer in Cougar basketball history, Jeanne (Eggart) Helfer was a standout in both basketball and track. In 2015 she was named WSU "Female Athlete of the Century" by the Pac-12 Conference. *Main photo Bruce Andre, insets courtesy WSU Athletics*







**SOMEONE FORGOT ABOUT THE FRUIT SALAD. WHEN THE REFRIG-  
ERATOR DOOR OPENS, THE SICKLY SWEET AROMA DELIVERS A  
POTENT REMINDER. ALL THE ROTTING APPLES, PEARS, AND BANANAS  
IN THE BOWL WILL NEED TO BE THROWN OUT, AND HOPEFULLY  
COMPOSTED. IT MAY SEEM INSIGNIFICANT, BUT THAT FRUIT SALAD  
REPRESENTS A PIECE OF THE 40 PERCENT OF FOOD WASTED IN THE  
UNITED STATES, ABOUT 20 POUNDS PER PERSON EACH MONTH.**

# NOT

In recent years, food waste in this country and many other places around the world has grown not only in volume, but also in the collective consciousness. The numbers are staggering. Americans throw away an estimated \$165 billion worth of food each year. Uneaten food is the single largest item in landfills, creating huge amounts of methane. If even 15 percent of that wasted food were redirected, it could feed 25 million Americans a year, a boon for people who live with hunger.

The last decade has seen increasing efforts to bring greater attention to the problem, as well as spur on creative solutions to reduce food waste from farm to fork, throughout the food supply chain. Ideas like dumpster dinners in New York and San Francisco using entirely

recovered foods, gleaning projects to gather produce that would otherwise rot away, and better understanding of “best by” dates on food packaging, all can help move toward the Environmental Protection Agency’s goal of reducing food waste in half by 2030.

Here in Washington, experimental programs at schools, Washington State University dining halls, and industrial food processors are exploring ways to boost nutrition, reduce waste, and help people without enough food. WSU bioengineers are developing healthier ways to preserve food longer without chemical additives. And, community volunteers are teaming up with county Extension offices to find safe and effective ways to steer uneaten food away from landfills and to those who most need it.

“While it really is a national conversation, I see WSU as a natural leader in the state in this field because of Extension and research on composting, food recovery, food safety, and everything in this food waste picture,” says Meggan Uecker, a former Extension agent now with Clallam County.

**THE APPLES IN THE NOW-DEFUNCT FRUIT SALAD COULD HAVE BEEN USED EARLIER, AT LEAST IN JUICE. APPROXIMATELY 20 PERCENT OF FRUITS AND VEGETABLES ARE LOST IN PRODUCTION, BUT APPLES FARE SLIGHTLY BETTER THANKS TO GROUPS LIKE THE TREE TOP COOPERATIVE.**

Started in 1960 by William Henry Charbonneau in Selah, Tree Top transforms cull apples—fruit rejected for its size, shape, or color—into juice, sauce, or other value-added products. Prior to Tree Top’s inception, giant piles of apples would often rot on the ground, costing orchardists millions of dollars in lost product.

In *Tree Top: Creating a Fruit Revolution*, published by WSU Press in 2010, emeritus history professor David Stratton wrote that the Tree Top grower cooperative began to see profit from fruit that otherwise would have not only been wasted, but could cost them up to \$5 a ton to get hauled away to rot. Charbonneau’s introduction of frozen concentrate juice further increased the market for the processed apples.

Tree Top expanded beyond apples to pears, berries, and other fruits as the orchardist-owners saw their bottom lines improve from the cull. Stratton wrote that, in addition to apple juice and cider, Tree Top distributes consumer packaged goods, such as fresh apple slices, blends with other juices, and apple sauce in 30 states.

The more than 1,000 growers of Tree Top processed over 600 million pounds of apples last year, making it the single-largest user of Washington state apples. The cooperative provides ingredients to 22 of the world’s 25 leading food and beverage manufacturers, and it is the largest supplier of dried apple products in the world.

**THE TREE TOP APPLE SAUCE COULD VERY WELL END UP IN A YAKIMA SCHOOL A FEW MILES AWAY. UNFORTUNATELY, THE APPLE SAUCE MAY END UP IN THE GARBAGE CAN, A RESULT THAT ETHAN BERGMAN WOULD LOVE TO AVOID.**

Bergman ’86 PhD, a professor and assistant dean of nutrition at Central Washington University, says, “Our main concern is that those children from homes that don’t have a lot to eat and may not have a good balance of food in the household need that fuel to learn in the afternoon.”

He considers himself a pediatric nutritionist, interested in how we can improve foods in schools, as well as ensuring kids get enough to eat. A former president of the Academy of Nutrition and Dietetics, Bergman has studied school meals for 21 years.

When Bergman was researching school lunch waste at four low-income Yakima elementary schools, he was dismayed to see the garbage cans filled with green and white from broccoli and cauliflower tossed from the trays. At those schools, he found students wasted 25 to 40 percent of their food, even though most students qualified for free or reduced lunch.

Bergman would love the students to eat better and waste less, and a couple of changes in school policies would help. First, having lunch periods after recess rather than before decreases wasted food—those kids get hungry after running around. Another idea is to increase lunch periods even a few minutes more, to allow children to eat the food.

“If you assume you have a school lunch that’s nutritious, how do you get that school meal inside a student as opposed to having them throw it away?” asks Bergman.

**ON THE WSU PULLMAN CAMPUS, ADAM KOERNER ALSO WANTS TO KEEP FOOD WASTE TO A MINIMUM. AT WSU DINING SERVICES, EXECUTIVE CHEF KOERNER OVERSEES AN OPERATION THAT DELIVERS 5,000 TO 10,000 MEALS A DAY. HE AND SARAH LARSON ’87, ASSOCIATE DIRECTOR OF DINING SERVICES, KNOW THAT CAREFUL PLANNING IS THE FIRST STEP IN SUSTAINABILITY.**

“We have business practices in place to minimize food waste in the first place, forecasting and being smart about how we run the business,” says Larson.

Koerner says Dining Services has used databases for over 30 years for meal planning and to hone in on changing tastes of students. They are also trying more on-demand cooking in the dining halls. Despite their most diligent efforts, though, Koerner and Larson know there will always be some extra food. “Our main



goal is to have zero waste, but that's really hard in food service," says Koerner.

Dining Services is exploring a partnership with the WSU Center for Civic Engagement, Food Recovery Pullman (a registered student organization focused on food recovery), and the Whitman County Community Action Center to safely recover certain unserved foods for people who need it.

For example, says Larson, "if we have a quarter of a pan of lasagna, we might want to donate that." Koerner adds that extra bread or produce could be redirected to the Community Action Center.

The pilot program is set for this spring as part of the EPA Food Recovery Challenge, and could expand to other food service businesses in the community. "All the work that's being done on our end will open doors for other restaurants in the area to be part of this," says Koerner.

It's a great way to connect with the needs of the community. "We repurpose our meals and leftovers where we can, and now we can get the excess to the community," says Larson.

**LARGE FOOD SERVICE ORGANIZATIONS LIKE WSU DINING SERVICES AND SCHOOL CAFETERIAS OFTEN RELY ON PRESERVED FOODS TO SUPPLEMENT FRESH MATERIAL. BUT THE OLD STEREOTYPES ABOUT CANNED GREEN BEANS AND TASTELESS PEACHES DON'T ENCOURAGE EATING MORE AND REDUCING WASTE. THOSE IDEAS COULD GET DISPELLED WITH THE ADVENT OF NEW WAYS DEVELOPED AT WSU TO PRESERVE FOOD LONGER, WITH BETTER QUALITY AND AESTHETIC APPEAL.**

Junming Tang, a Regents professor in the Department of Biological Systems Engineering and distinguished chair of food engineering, spent over 20 years exploring one of the trickiest puzzles of food preservation: how to use the rapid heat of microwaves to sterilize food without ruining the product.

In the 1970s, the U.S. military had researched microwaves as a way to preserve food, followed by food industry studies in the 1980s. "They all failed badly," says Tang. When he arrived at WSU, Tang's department chair Ralph Cavalieri challenged him to investigate long-term, high-risk areas in food science, so he tackled the microwave preservation problem.

Tang's research started primarily as a way to improve shelf-stable rations fed to military personnel in the field. His work led to microwave-assisted thermal sterilization (MATS) about thirteen years later. The MATS system sterilizes with a pressurized hot water bath that delivers heat externally, but then uses a patented microwave energy system to heat the package internally, using a low frequency of 915 MHz, before the package is rapidly cooled. Since temperatures are raised quicker than other systems, it kills microorganisms while minimizing food damage.

Normal shelf life expectancy of microwave-sterilized products prepackaged in plastic containers or pouches is two years or longer. It also reduces salt and eliminates preservatives.

Tang received two patents for the technologies to produce prepackaged, low-acid foods, one in 2006 for sterilization and the other in 2011. MATS is the first microwave technology accepted by the U.S. Food and Drug Administration for in-package sterilization applications.

Microwave sterilized foods can be stored at ambient temperatures and reheated in a household microwave. Eliminating product freezing and thawing also reduces energy use while it improves meal quality. There's no need for preservatives to extend shelf life, a bonus for health-conscious shoppers reading food labels.

A similar technology recently developed in Tang's laboratory, microwave-assisted thermal pasteurization (MAPS), is used to prepare refrigerated ready-to-eat meals. The result is pathogen-free and high-quality products, such as deli meats, that can last up to eight weeks in the refrigerator, as opposed to a week or so.

"This gives the consumer plenty of time when they want to use it at home, or in cafeterias," says Tang.

Tang says food waste has become very prominent in discussions within his field and the industry. The preservation methods he developed could reduce spoilage and foodborne illnesses, particularly with meat and prepared foods, and thus less waste.

The MATS and MAPS treatments at WSU have produced salmon fillets, macaroni and cheese, mashed potato and beef in gravy, among other "ready-to-eat meals"—frozen, refrigerated, or shelf-stable entrees sold at retail markets and used in institutions.

WSU hosts boot camps for product developers and food technologists of food companies, as well as chefs and other food service professionals, to learn the science and try out their own recipes. They've developed lobster, pasta, and other restaurant-quality dishes that will last for weeks thanks to Tang's microwave techniques.

Tang worked closely with research institutions affiliated with the U.S. Department of Defense and the Australian Department of Defense, and the NASA Johnson Space Center Food Laboratory. His patents led to the formation of 915 Labs, a company that is designing industrial systems for companies worldwide. Tang thinks it might be one to two years before we see high quality meals produced by WSU technologies in markets.

**WHILE TANG'S RECENT INNOVATIONS CERTAINLY PERFORM TECHNOLOGICAL WONDERS TO PRESERVE FOOD LONGER AND BETTER, WSU EXTENSION HAS A HISTORY OF FOOD PRESERVATION. EXTENSION BULLETINS FROM ALMOST A HUNDRED YEARS AGO OUTLINE STEPS FOR HOME GARDENERS AND COOKS TO PREVENT FOOD WASTE THROUGH CANNING.**

Now, Extension does more than offer canning tips. Staff members work within their counties and communities to reduce food

BELOW: JUMING TANG WITH A PRODUCT FROM HIS MAPS PROCESS (PHOTOILLUSTRATION)

waste through gleaning and other food recovery programs to redirect vegetables and fruits to food banks and people without enough food. They also lead education efforts about food waste and ways to mitigate it.

In Clallam County, for example, Extension agents work with a cadre of volunteers, farmers, food banks, and schools on food recovery efforts.

Clea Rome, director of Clallam County Extension, says their office wants to connect farms to food banks. "Extension is a unique spot to connect different aspects of the food system and make it more equitable through food recovery," she says.

Uecker, who worked with Clallam County Extension and recently moved into the county's solid waste office, says the food waste reduction effort there got a boost from a state Department of Ecology grant a few years ago.

"These programs are funded on a shoestring budget, but we've made some great inroads on food recovery for a small county. We have to get creative," says Uecker. That includes gleaning, food processing, and other plans to reduce food going into the landfill.

The grant also allowed Rome to hire Dan Littlefield from VISTA AmeriCorps through its Harvest to Hunger program. He and Karlana Brailey, a nutrition coordinator for Clallam County Extension, joined Uecker in the food recovery work.

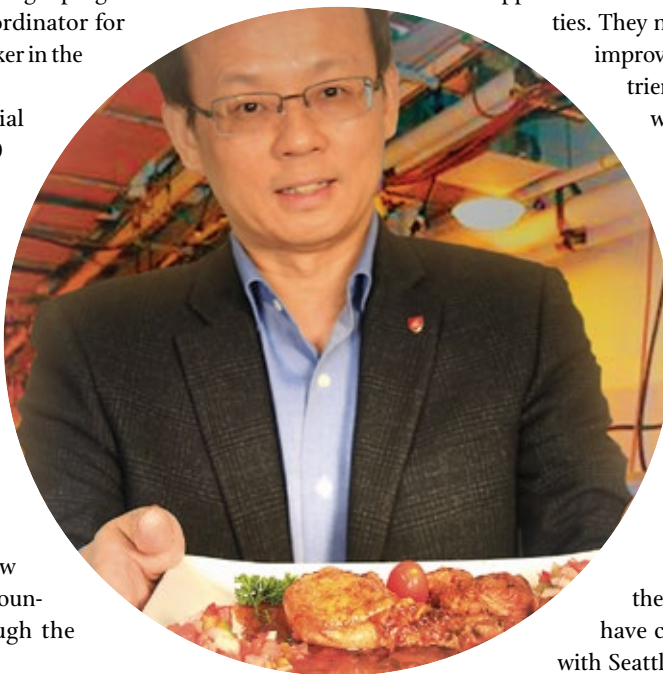
The gleaning has had substantial effect. Brailey recently gave away 2,500 pounds of locally gleaned apples and pears to families in the Port Angeles School District. She's also conducting a pilot project to turn some of those gleaned apples into apple sauce, which will be distributed to clients at meal sites and food banks.

"Food banks are getting a huge influx of apples that would otherwise be rotting on the ground or worse, going into a landfill," says Rome. "Dan and Karlana asked, 'How can we preserve this product in the bountiful times and spread it out through the year?'"

Brailey and Littlefield continue to cook up ideas for food recovery and educate residents of Clallam County, such as developing recipes with the high school culinary club to conserve gleaned foods.

"Food conservation is the most effective way to combat waste. I would love to see it hand in hand with composting," says Uecker.

**SO, THAT FRUIT SALAD IS A LOST CAUSE FOR DINNER. THERE IS SOMETHING THAT CAN BE DONE, THOUGH. THE FINAL STEP TO KEEP FOOD MATERIALS FROM LANDFILLS SHOULD BE COMPOSTING.**



Like other forms of waste, uneaten food is out of sight, out of mind for many people when it ends up in the trash. But organic matter breaking down in landfills accounts for 16 percent of methane emissions in the United States, according to a 2012 Natural Resources Defense Council study. The potent greenhouse gas contributes significantly to climate change. A United Kingdom study claims that removing food scraps from landfills would be the equivalent of taking one-fifth of the cars off the road there.

Composting at the home, municipal, and industrial level could alleviate the problem. Unlike recycling rates, which have consistently risen, only about 2.5 percent of Americans compost food waste. According to a state Department of Ecology 2009 waste audit, over 30 percent of the state's garbage was compostable material, including compostable paper and natural wood.

The first step to improve the numbers is to show the benefit of composting at home. Compost can help build healthy soil and plants. It reduces the need for garden chemicals, and the soil retains moisture longer—so less watering.

Researchers at WSU Puyallup have evaluated effects of compost applications on nitrogen availability and soil properties. They note that it may be more useful for improving long-term soil quality and nutrient supply, while stabilizing organic waste materials. They train compost facility operators, while Extension offices also deliver composting information and a number have a volunteer Master Composter program to complement their Master Gardener efforts.

On the Pullman campus, WSU has long had a composting facility. "We try to eliminate what goes into a landfill and compost, which is the next best thing to food recovery," says Larson.

Koerner adds that many of the students coming to college already have composting in mind, particularly with Seattle mandates to reduce food waste.

It's an educational process as well. A survey by the International Food Information Council reveals that one-third of Americans say they "don't create any food waste." If people are to become aware, they'll also want to know how to reduce food waste. Since its beginning, Extension has played a role of educating Washingtonians and spreading scientific knowledge.

Any movement toward reduction of food waste will require that education, as well as a suite of solutions from the field to the kitchen.

The refrigerator will be slightly less stinky without the moldy fruit salad. It'll turn into fine composted organic material to grow more vegetables. It's equally important, however, as a symbol of the new recycling and increasing consciousness of our food waste problem. ✱



# HOW MUCH GOES TO WASTE?

## ONE-THIRD OF THE WORLD'S FOOD

EVEN MORE  
in the U.S.

**40%**

ALMOST  
**HALF**  
— OF THAT IS —  
THROWN AWAY BY  
CONSUMERS



**672.5 LBS.**

TOTAL LOSS PER CAPITA  
— IN 2008 —

CONSUMER 47%  
PRODUCER 33% RETAIL 20%

In one month, a family of four wastes...

• FRESH •  
FRUITS + VEGGIES  
**24.0 LBS.**

• MEAT + FISH •  
**10.4 LBS.**

• GRAINS •  
**18.5 LBS.**

• SWEETENERS •  
**15.0 LBS.**



• PROCESSED •  
FRUITS + VEGGIES  
**10.5 LBS.**

FLUID MILK  
**22.0 LBS.**

FATS + OILS  
**8.60 LBS.**

OTHER FOOD  
**12.8 LBS.**

**HARVESTtoHUNGER**

INFOGRAPHIC BY MARGARET KIMBELL. DATA SOURCE THE NEW YORK TIMES



From left: In Clallam County, Extension staff work with the community to glean apples and find other ways to recover food that would otherwise be wasted. Courtesy WSU Clallum County Extension





Yes, **Mesa Verde** is the richest archaeological preserve in America. A sanctuary of cliff dwellings. Petroglyphs. Thousands of sites holding clues to an ancient civilization. But is it too much to ask for better cell phone reception?

For two days, my wife and I meandered around the park and its environs, climbing with other tourists among the 150 rooms of Cliff Palace, visiting dozens of kivas—rooms for religious rituals—and walking among striped pieces of broken pottery, or “sherds,” that litter the place. But it wasn’t until we retreated to the park’s Spartan lodgings, also called kivas, that we could tap the wi-fi and fill our mitts with the twenty-first century’s throbbing stream of news and email. The daily information void made me feel like echoing one of those irony-laden, one-star Yelp reviews. Death Valley is a desert! Yosemite has crappy parking!

I feel badly about this. Would that I could glimpse the world of the ancients—connected to nature and the cultural and historic grandeur of a place—without reaching for my technological binky.

BY ERIC SORENSEN

# ENDS



Except.

Except this place is a marvel of technology. Its innovations span centuries. They gave rise to not one culture but several, over several distinct eras. They include a massive architectural development that is unlike any seen among prehistoric societies. The cliff dwellings, tragic emblems of the need for protection against lethal enemies, are only their most famous of feats. Coming at the mysterious end of an era, after which almost no one lived here, the dwellings are only one in centuries of invention. They are the violent exclamation mark at the end of a long, powerful sentence.

Ancestral Pueblo people abandoned the elaborate cliff dwellings of Mesa Verde sometime in the late thirteenth century, creating a mystery that *The New York Times* has called “the most vexing and persistent question in Southwestern archaeology.” Tim Kohler, a Washington State University Regents professor of anthropology, has pondered this question for some four decades, but it has only been one of several questions. He has also wondered about the human impact on the environment, why people choose to live where they live, how they share public goods, how they deal with inequality.

He can ask so many questions because the region has a rich record, a trove of data and artifacts so substantial that a researcher can explore numerous hypotheses and lines of evidence. The evi-



dence is sizeable, with much shoveled, troweled, and analyzed by a long line of WSU researchers. With Kohler, WSU anthropologist Bill Lipe led the Dolores Archaeological Program, one of the largest excavations in the world. Both he and Ricky Lightfoot '91 PhD were instrumental in running the Crow Canyon Archaeological Center, a “living classroom” devoted to researching, teaching, and preserving ancient Pueblo history. Carla Van West '90 did pioneering work on the effect of historic climate changes on agriculture in the region.

With Crow Canyon, Kohler led the National Science Foundation-funded Village Ecodynamics Project. It is a technological marvel, testing computer-driven scenarios that reach back in time against the region's voluminous data archive. It's a process common to most of science but largely foreign to archaeologists. They can't make happen in a lab what happened hundreds of years ago. But Kohler can make finely-scaled predictions and test them against records of climate, precipitation, settlement, and other clues.

Just last year, he and Kyle Bocinsky '11 MA, '14 PhD, used data from 1,000 Southwest archaeological sites and nearly 30,000 tree ring dates to chart year-to-year changes, including climatic changes, spanning 900 years. Published in *Science Advances*, their study focused on the exploration and exploitation of niches—places to live, the

Around 600 CE, a new corn appears in southwest Colorado. It is more productive than earlier varieties, with wider, larger kernels, which are also easier to shuck and grind.

“They basically have a lot more starch in them,” says Kohler. Starch has a higher glycemic index than earlier corns; women can put on fat, ovulate more, have more kids. The Mesa Verde area gets its first substantial population of year-round residents. Birth rates start to rise and late in the eighth century, villages appear.

Eaten with beans to make a protein of all nine amino acids, corn became the ancestral Pueblo meal ticket. Throw in ceramic pottery and permanent dwellings, and the people of the region had the “Neolithic package,” the suite of developments that fueled a flourishing society.

“By the time the Neolithic gets up to southwestern Colorado, it's all been put together,” says Kohler. “It includes a bow and arrow. It includes efficient ceramic containers. It includes beans. It includes a more productive variety of maize.”

Technological changes in ancient Pueblo society have served as organizing principles for archaeologists since 1927, when 40 or so of them conferred in Pecos, New Mexico, and laid out eight distinct periods or “cultural stages” of the region's prehistory. The first three were Basketmaker I, II, and III, followed by Pueblo I, II, and so on up to Pueblo V.



technology needed to do it, and ways of organizing, often through rituals, to cooperate and get things done.

Their approach was so data-intensive that it required climate reconstructions at a national supercomputer. If they wanted, they could have done all the work without ever touching a sherd. As it was, Bocinsky, while no stranger to field work, collected none of the data he analyzed.

“Twenty years ago, they would not have let you do that,” says Mark Varien, Crow Canyon director of research and a frequent collaborator with WSU researchers.

Bocinsky and Kohler concluded that the depopulation of Mesa Verde after 1285 was only the most severe of four population crashes in five centuries. Cultures came and went, often in response to the vagaries of a changing climate, but from their inception, technology had an outsize role.

Consider corn.

For millennia, largely nomadic people in the Mesa Verde region of western Colorado and corners of New Mexico, Arizona, and Utah lived off game. Corn had been in Mesoamerica since 5000 BCE and in the Southwest since 3000 BCE, but the maize in what is now Arizona needed its feet in water, says Kohler. To survive on the mesa tops to the north, it would need to grow in colder conditions and mature faster, with less rainfall.

The early Basketmaker periods spanned the changes from semi-nomadic hunter gatherers to settled agrarians with bows and arrows instead of spears. In the Pueblo eras, the people moved into masonry dwellings whose changing sizes and arrangements offer insights into the shifting prosperity and social relations of their time.

Basketmaker III, which ran from 600 to 700 CE, featured great kivas and dance floors, as well as underground grain storage. It ended with a mild drought. In the ensuing Pueblo I, the people moved their grain storage to above-ground chambers. Kohler and Bocinsky interpret this as a shift from people freely sharing food to more tightly controlled exchanges by households or family groups. This period ended around 890 with a slightly larger drought.

Pueblo II was a heyday of sorts, judging from its architecture. It was the era of what archaeologists call the “Chaco world,” a large, complex social system that grew out of Chaco Canyon 100 miles to the south in northern New Mexico. It was filled with huge plazas and houses, the largest being the canyon's Pueblo Bonito, a complex of 600-plus rooms some 300 years in the making. Kohler calls it “the largest masonry structure in North America at the time, in fact, ever built up until something like the nineteenth century.”

But while it is the biggest known great house, it is one of many. Remains of more than 200 others have been found in the northern



Southwest. Bocinsky, now director of sponsored projects for the Research Institute at the Crow Canyon Archaeological Center, lives next to the remains of one.

In many ways it looks like so much rubble. What looks like a passageway between two walls is actually a gap created by a bulldozer when the site was, as Bocinsky puts it, “nonprofessionally excavated for commercial purposes.” As the excavation was done by a previous landowner, it can’t be called looting.

It takes some imagination, but the house once covered the length of a football field. It also has a great view, with Mesa Verde to the south, Ute Mountain to the west and a vast sky full of clouds and virga. Ancient Pueblo people were on intimate terms with their environment, looking to it for sacred touchstones, hunting signs, cues for planting and harvest, and physical reminders of one’s place and identity.

“When you didn’t have Google Maps, this is all you had,” says Bocinsky.

To Kohler and Bocinsky, the mix of large and small buildings, room sizes, and varying access to food in the Pueblo II era suggests a more hierarchical social structure with someone in charge. People are staying in place longer, sometimes decades. This has implications for one’s inheritance. The children of wealthier parents are more likely to be wealthier, so differences can accumulate. As a result, Kohler and Bocinsky see a world of haves and have-nots, of mounting inequality and social tension.

Add climate change to the mix, and there is a potentially combustible situation.

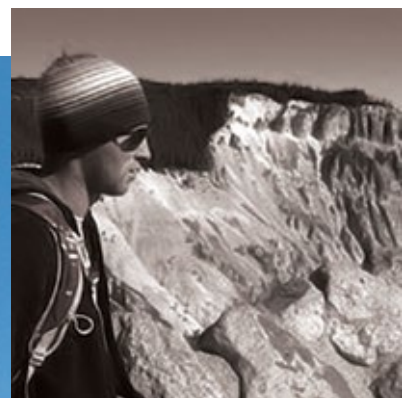
“These niches are woven together with a web of ceremony and ritual that requires belief in the supernatural and belief that people who are enacting the rituals know what they are doing,” says Kohler. “If they know what they are doing, that will bring the rains so there’s plenty of food and everybody is living well. But if the ceremonies are conducted but everybody’s starving to death, something is clearly wrong. So those rituals become what we call ‘delegitimized.’ Then there’s a point where people say, ‘This isn’t working. We’re leaving.’”

Kohler and Bocinsky’s analysis saw that happening four times.

“Their leaders are telling them, ‘This drought is going to get better, things are going to get better. You just stay right there,’” says Bocinsky. “And at the same time, those leaders are feasting on deer. They have plenty of corn. You get this amplification of inequality and at some point that breaks, that snaps, and the thing that seems to snap in each of these four periods is a climate downturn that’s a little bit worse than ones that people have been dealing with before and it just makes them say, ‘We’re getting rid of it all. Throw it all away.’”

The fourth time was brutal.

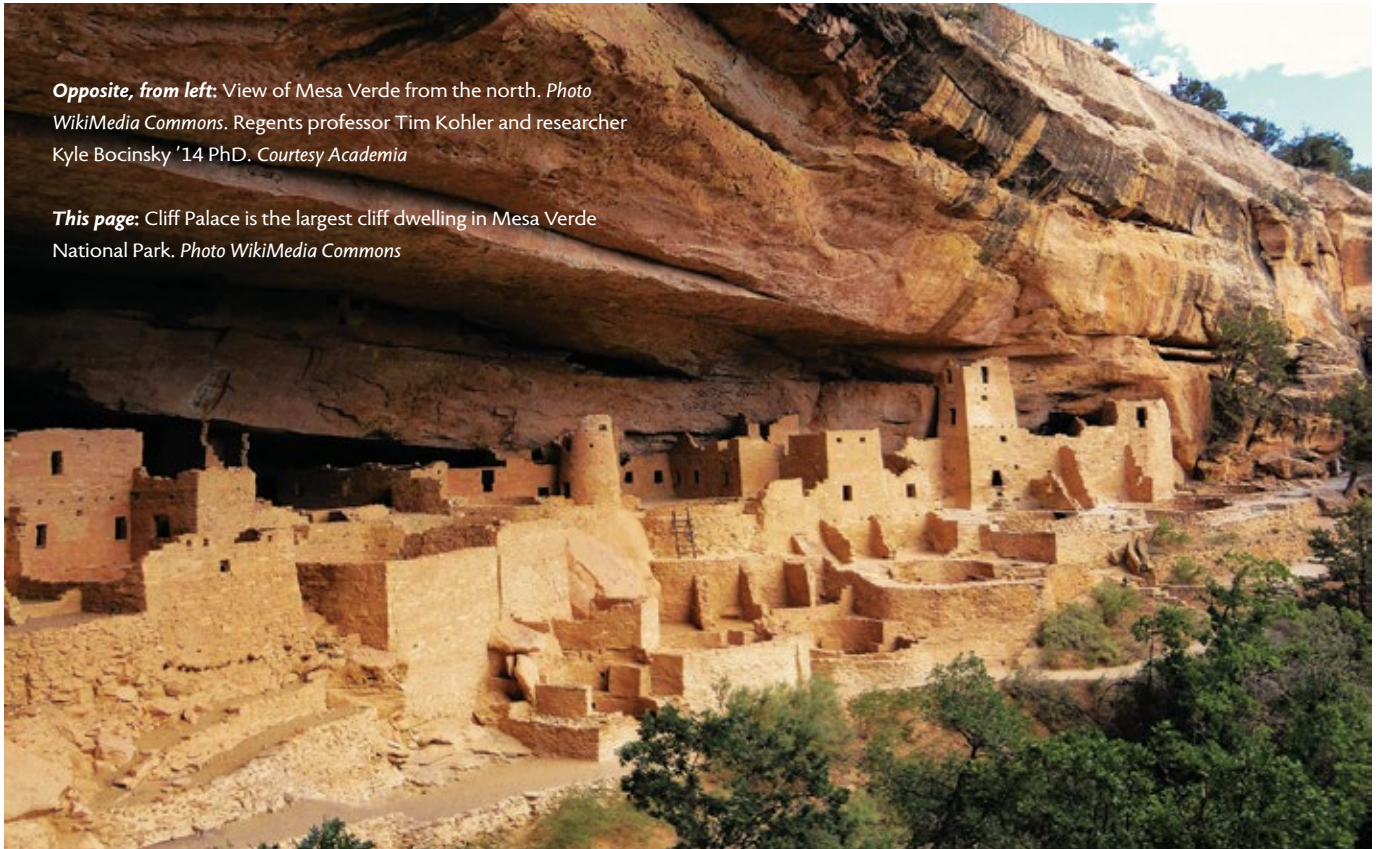
“In none of the previous ones was there a depopulation of the entire northern Southwest,” Kohler says. “There were certainly local population crashes but never did you lose everybody out of the northern Southwest.”





**Opposite, from left:** View of Mesa Verde from the north. *Photo Wikimedia Commons. Regents professor Tim Kohler and researcher Kyle Bocinsky '14 PhD. Courtesy Academia*

**This page:** Cliff Palace is the largest cliff dwelling in Mesa Verde National Park. *Photo Wikimedia Commons*



The end of Pueblo II, the third period in their study, saw the Chaco world fall apart. Without its socially unifying effects, tensions were more likely to produce outright conflict. Whatever the reason, the region saw a wave of horrific violence. Between 1130 and 1180, the region saw its longest and most severe drought. Kohler has documented how nearly nine out of ten sets of human remains from the last 40 years of that period have trauma from blows to either their heads or parts of their arms.

In Pueblo III, the people built the Mesa Verde cliff dwellings. Even today, they are striking works of architecture with a natural intimacy cultivated by architects centuries later. But they are at heart defensive structures, hard to attack from above and with removable ladders to keep out enemies from below.

The end game is unclear, but a pretty good picture has emerged in the last decade or so. The so-called Great Drought ran from 1276 to 1299, starting what Kristin Kuckelman, a Crow Canyon archaeologist, has called “a downward spiral of resource competition, hunger, strife, and warfare.” The land was played out after 700 years of farming, says Kohler. Corn was now 80 percent of the diet, and much of the crop was going to feed domesticated turkeys, yet another of the Pueblo innovations. The cliff dwellings offered protection, but their existence suggests it was dangerous to tend to the fields above. Across the region, archaeologists have found numerous human remains with similar skull fractures, presumably from stone axes found at sites from the period.

In the late 1200s, the region sees the first population decline in 300 years. People are abandoning dearly held farms for the more

placid northern Rio Grande Valley to the south. They’re also not living as long. Things have fallen apart. As many as 10,000 people may have lived in the region in 1260. But after 1280, they are no longer cutting the wood that provided tens of thousands of tree ring dates from the region. They’re likely gone.

It’s tempting to see parallels to contemporary society, particularly in light of climate change, growing disparities in wealth, and the sense of disenfranchisement voiced around the recent presidential campaign.

“We still freak out when oil changes price,” says Bocinsky. “We still freak out when the cost of certain grains fluctuates. Corn is actually so essential to the global economy that it’s almost silly that we’re talking about corn still.”

“We think we’re immune to all those things that happened to Pueblo society because we’re so technologically sophisticated,” says Kohler. “Maybe by their standards, they thought they were technologically sophisticated too. But that didn’t necessarily prevent things from falling apart in the 1100s. It didn’t prevent the Pueblo I villages from falling apart in the late 800s. It certainly didn’t prevent the Pueblo III villages from falling apart in the late 1200s.”

Kohler hopes there is a lesson in there.

“Societies are prone to falling apart,” he says, “and if we value our well-being as individuals, we will attempt to forestall those crises that cause societies to fall apart because they’re often accompanied by great violence and great hardship for the constituent members of the society.” ❄

# paths that gre

Crystals reflect the best of nature's handiwork. With their atoms aligned in repeating 3D patterns, crystals can be as momentary as a snowflake or as common as the sodium chloride in table salt. They can sparkle on a finger, scatter rainbows across the room, or be grown on your kitchen table with a few ingredients from the hobby shop.

Some also possess unusual properties, such as quartz crystal's ability to generate a tiny electrical current when pressure is applied. Known as the piezoelectric effect, this useful phenomenon helped inspire the rise of a global, multibillion dollar crystal growth industry.

Today, manmade crystals power an astonishing range of devices from the sensors that control electronic functions in cars to the semiconductors driving computers and smartphones. Discreetly hidden from view, industrial crystals form the backbone of our technology-based society.

Much of the credit for perfecting the underlying raw materials goes to the glittering mind of Kelvin Lynn, the crystal maker.

When not locked away in his office, this unassuming Washington State University professor can be found in the engineering hallways, bantering with students in his crystal growth program. Sometimes, just for fun, he'll let them grow artificial rubies or sapphires in one of the nine furnaces that crank out a unique array of crystals in vacuums and at higher temperatures than any other institution in the world.







ABOVE: WSU REGENTS PROFESSOR KELVIN LYNN (PHOTO ROBERT HUBNER). BELOW: CADMIUM TELLURIDE CRYSTALS



“It gives them experience and they all get good jobs in the industry,” says Lynn, Regents professor in physics and mechanical and materials engineering, and Boeing Chair of Advanced Materials at WSU.

With an amiable, Burl Ives demeanor, the white-haired physicist started the program when he first arrived from Brookhaven National Lab in 1996. Getting acquainted with the Pacific Northwest, he learned that the region’s abundant, reliable supply of hydroelectric power helped make Washington a leader in crystal manufacturing. A large percentage of the world’s silicon and laser materials, for example, are produced in the area.

Hoping to give his students hands-on training, Lynn set about building the infrastructure for an academic program. His success was no small feat considering the enormous cost and energy requirements of growing crystals. The process itself can be long and tedious, the end product frustratingly fragile.

Today, after 20 years of effort, WSU is renowned for the precise engineering of a variety of valuable crystals including cadmium telluride (CdTe), popularly referred to as “CadTel.” These lead-colored, difficult-to-grow crystals are an industry favorite and WSU is one of the only universities actively developing them.

CadTel’s adaptable nature and unique electrical properties make it particularly attractive for use in solar energy and medical imaging. The crystals are exquisitely sensitive to radiation, paving the way for cheaper solar power as

well as low-radiation dental X-rays, mammography, and CT scans.

The fortunate students who graduate from the crystal growth program each year carry their experience into top research and manufacturing positions across the nation. Waiting to take their place in a coveted mentorship with Lynn are new students from as far away as Iraq and India.

Lynn is indeed an accomplished, highly regarded scientist, but it wasn't always this way. As a boy, his sights were set on testing the laws of society rather than the laws of physics.

KELVIN LYNN (PHOTO ROBERT HUBNER)



Kelvin Lynn was born in Rapid City, South Dakota in 1948. Like a lot of kids during the Sputnik craze, he began building rockets with his brother. Since model kits were unavailable, the Lynn brothers scavenged raw components and concocted their own rocket fuel.

"We used saltpeter, gunpowder, stuff like that," says Lynn. "It was fun and challenging—of course, there was something about the explosions too." And their rockets flew great distances—one right through the front room window of a house miles away. "They knew immediately who it was," he says. "Those Lynn kids!"

While the boys were busy with their adventures, however, trouble was brewing behind the scenes. A series of family problems erupted that quickly put an end to Lynn's carefree existence. In the fallout, the brothers were left to fend for themselves during their teen years.

"I drank a lot," Lynn says. "One time I got in a fight with a teacher. But I could still do well in certain classes in school. If I was interested in a class, I could do really well."

And, if he didn't like it, well, he just wouldn't bother. As for homework—why waste his time on problems that thousands of

students had already solved? School officials were at a loss as how to handle Lynn.

First, they wanted to put him in the special education classroom. A year later, they were ready to send him to military school. They also tried to advance him two grades in one year.

Yet a few teachers recognized something special in the troubled boy who, despite his behavior, showed a flair for math and science. They reached out to him and provided opportunities to help him find his way.

"It's what saved me," Lynn says.

One of those teachers, Mr. Pearson, taught high school chemistry.

"He was an incredibly good teacher at a time when I was starting to explore things academically," says Lynn. "He encouraged me and let me work in the chemistry lab after hours. During that time, I realized there were problems in science no one had the answers to—things you could do that no one else could."

That exciting insight lit up his whole life. Suddenly, Lynn saw science as a world of interesting puzzles to be solved—a passion that has endured through the years.

Sitting in his office today, Lynn no longer looks the part of a teenaged rebel. Yet his face grows boyishly animated—blue eyes darting around the room—as his thoughts skip from antimatter to solar power to jaw-dropping medical technologies to collaborations with major industrial giants.

Through it all, Lynn makes it clear that teaching and interacting with good students are his top priorities, and something he genuinely enjoys.

Just as science saved his sanity and probably his hide, Lynn pays it forward by mentoring students from all over the world—training them, testing them, working them hard until, he says, "If I do my job right, they'll think I'm worthless."

At a small research company near Boston, Amlan Datta '13 PhD painstakingly grows CadTel and other crystals in their simplest forms. Then, he finds ways to improve them.

Datta was hired as a scientist at CapeSym, Inc. one week after he graduated from the WSU crystal growth program.

"It's an exciting field," says Datta. "We develop the core crystal material that is used in a huge range of applications from medical imaging, homeland security, nuclear, and astrophysics research." Like the foundation of a house, he says quality core material is essential for manufacturing reliable instruments and systems.

Datta remembers Lynn as a great mentor who took good care of his students.

"Kelvin was very involved," he says. "Because we were students, we got tired and wanted to go home but he'd say, 'Let's talk some more.' It was amazing as some PhD students never talk to their advisors for months."

That level of involvement paid off for Datta who now develops innovative crystal materials such as CadZincTel (CZT). Used as radiation detectors for medical imaging, CZT crystals give a very precise, detailed picture with less radiation.

"It is possible to see a tumor only a couple millimeters wide," he says.



A few companies already have CZT products on the market. Datta says Gamma Medica, for example, makes a system called LumaGem for molecular breast imaging (MBI.) A Mayo Clinic study in 2015 showed that MBI provided superior imaging and low radiation exposure for women with dense breast tissue, which can affect up to 40 percent of the female population.

High-resolution, lower-radiation CT scanners are also in development by other manufacturers.

Sixty miles north in New Hampshire, fellow alumnus Drew Haven '13 PhD grows industrial sapphires as a research scientist for Saint-Gobain.

"Kelvin was a great advisor. He provided direction but at the same time let me figure things out by myself which was really helpful in the work I'm doing now," he says.

Haven develops sapphires for military applications such as infrared windows in the new F-35 Joint Strike Fighter jet scheduled for deployment by the Air Force, Navy, and Marines. The sapphire windows protect infrared tracking sensors within the aircraft.

He is also involved in the production of bullet-resistant windows for large military ground vehicles.

"These protective windows are usually made of many layers of glass and are very thick and heavy," says Haven. "Sapphire is significantly harder and stronger than glass, so we're using sapphire as the outside face that would be hit by a bullet. It allows us to make the window much thinner and lighter than the standard window."



Industrial sapphires grown by research scientist Drew Haven '13 PhD are used to protect sensors within military aircraft. *Courtesy Lockheed Martin*

The College of Engineering sprawls over the west end of campus in a massive complex of hallways, cargo elevators, and laboratories. Scattered throughout this maze are the specialized crystal growth furnaces hand-built by Lynn and his graduate students.

The superheated Czochralski furnace, for one, turns out a sparkling array of laser crystals as well as industrial rubies and sapphires similar to those Haven uses. The Czochralski has the singular ability to grow at different pressures or even in a vacuum.

Then there are the assorted Bridgman furnaces, adapted for growing piezoelectric and semiconductor crystals. The largest of these, the high-pressure Bridgmans, are tucked away in the corner of a cavernous old building. The giant contraptions once produced piezoelectric crystals for use in Navy sonar and medical ultrasound machines manufactured by Philips, Inc.

Today, these furnaces are being remodeled for the development of thin-film CadTel solar material under a \$1.1 million Department of Defense SunShot Initiative award. WSU will join forces with the National Renewable Energy Laboratory (NREL) and Nious Technologies, Inc. to enhance and refine the CadTel growth process.

The goal is to make solar power more efficient and affordable while boosting U.S. competitiveness. Ninety percent of solar cells are currently made of silicon and manufactured in China.

CadTel offers a low-cost alternative. The cells are cheaper to produce than silicon and don't degrade as fast. They also perform better in hot, humid weather and under low light.

Unfortunately, CadTel had a problem that stumped scientists for years. It was less efficient than silicon for converting sunlight into electricity. But that was about to change.

COURTESY AMLAN DATTA



# ANTI-MATTER

## AND THE MATTER OF

DEEP IN THE BOWELS OF A LARGE BRICK BUILDING ON THE WSU CAMPUS IS A LABORATORY GUARDED BY RED FLASHING LIGHTS AND WARNING SIGNS. A TINY WINDOW IN THE DOOR OFFERS GLIMPSES OF STAINLESS STEEL MACHINERY WHILE A LOW PULSATING HUM EMANATES THROUGH THICK CONCRETE WALLS.

INSIDE THE W. M. KECK ANTIMATTER LABORATORY, A DEUTERON ACCELERATOR PRODUCES UP TO 120 BILLION POSITRONS PER SECOND—ABOUT 10 TRILLION POSITRONS PER DAY, MORE THAN ANY OTHER UNIVERSITY OR SMALL LABORATORY IN THE NATION.

POSITRONS ARE A TYPE OF ANTIMATTER. FOR EVERY PROTON, NEUTRON, OR ELECTRON SPINNING WITHIN AN ATOM THERE IS A PARTICLE OF OPPOSITE CHARGE—ITS ANTIPARTICLE. POSITRONS ARE THE ANTIPARTICLE OF ELECTRONS. WHEN THE TWO COLLIDE, THEY ANNIHILATE, RELEASING ONE HUNDRED PERCENT PURE ENERGY IN THE FORM OF GAMMA RAYS.

IT'S A TYPE OF ENERGY THAT COULD ONE DAY PROPEL STARSHIPS FAR BEYOND THE SOLAR SYSTEM.

"WE CAN CREATE ANTIMATTER VERY EASILY IN THE MATTER WORLD," SAYS KELVIN LYNN, DIRECTOR OF THE KECK LABORATORY AND REGENTS PROFESSOR IN PHYSICS AND MECHANICAL AND MATERIALS ENGINEERING, "IT JUST DOESN'T LIVE VERY LONG BECAUSE IT EVENTUALLY FINDS AN ELECTRON AND ANNIHILATES. BUT IF YOU PUT IT IN A VACUUM, IT WILL LIVE FOREVER."

Read more about Lynn's amazing effort to trap antimatter:

[magazine.wsu.edu/extra/antimatter](http://magazine.wsu.edu/extra/antimatter)

Not far from the high-pressure Bridgmans, postdoctoral researcher Santosh Swain grows CadTel crystals in a modified vertical Bridgman furnace. Swain came to WSU from India in 2005. Last year, he and Lynn made solar power history.

Through a slight twist in the crystal growth process, Swain, along with researchers from NREL and the University of Tennessee, increased the maximum voltage of CadTel solar cells to more than one volt, boosting their efficiency and breaking a decades-long barrier.

For over 30 years, the maximum voltage had been stuck at 900 millivolts, frustrating hopes for widespread use of thin-film solar cells. The discovery was published in *Nature Energy* in February 2016 and culminated in the SunShot award.

The trick was to add a little phosphorus during the crystal growth process.

"It's a significant milestone—one that brings CadTel closer to becoming a competitive energy source," says Lynn. "Others have tried but they didn't have the control and purity that we have. WSU is known for growing really high quality crystals. You have to control every step."

Swain dons blue rubber gloves and carefully lifts a circle of polished CadTel crystal. Tilting it in the light, the wafer shines like a silver mirror.

"In terms of the synthesis process, there is no difference between solar and medical grade CadTel crystals," he says. "The difference is what we add when we grow them. Depending on the properties we want, we add a tiny amount of foreign atoms in a process called doping. In this way, we fine tune the electrical characteristics of the crystal and make it suitable for different applications."

For example, crystals destined for medical imaging are doped with indium. Solar grade crystals are doped with phosphorus or arsenic.

To demonstrate, Swain ushers me to a small room housing the vertical Bridgman furnace—a silver stovepipe-looking affair bristling with wires and hoses. Here crystals are grown in a process called the melt growth technique.

In effect, the raw crystal material is liquified layer by layer as it rises through a series of heaters set at 1,200 degrees Celsius. The heaters are then cooled from the bottom up, allowing the material to crystallize vertically.


Swain shows me some of the finished product—miniature CadTel solar cells used for testing purposes. A full-size solar panel made by First Solar, the largest U.S. manufacturer of CadTel solar cells, is propped against the wall. It looks like a big black rectangle.

"They start with a sheet of glass and then deposit roughly 4 microns of CadTel film on top of it," he explains. "Silicon, in comparison, requires hundreds of microns of material."

The panel absorbs 99 percent of visible light which is converted into electricity that can be stored in a battery, used to power an





 Q & As with Kelvin Lynn: [magazine.wsu.edu/audio](http://magazine.wsu.edu/audio)

appliance, or routed into the electrical grid. Though CadTel solar is currently used in commercial markets, Swain says it's not quite ready for residential use.

Tawfeeq Al-Hamdi is trying to speed that along. As a faculty member in the College of Engineering at Al-Mustansiriya University in Baghdad, Al-Hamdi was offered a chance to pursue a doctoral degree at WSU in 2014 and recently began working with Lynn on a CadTel solar project.

Al-Hamdi is among more than 300 graduate students in the United States who are taking part in an Iraqi government-sponsored scholarship program aimed at rebuilding their country's scientific community.

During the Gulf Wars, he says the United Nations Security Council imposed sanctions on Iraq that made it difficult to get the publications and resources necessary to conduct quality research. They're now rushing to catch up.

Tall and well-spoken, Al-Hamdi says, "Coming to WSU offers a good chance to see how professors in the U.S. teach their students. We also have a chance to see procedures for advanced research here."

Al-Hamdi is learning to build a multilayered CadTel solar cell and will study its performance under different temperatures. Solar cells are less efficient in high heat, so he hopes to stabilize the cell by adding a type of "phase-change" material often used in silicon.

He says Iraq's year-round sunshine makes it a good candidate for solar energy. As a clean and competitive source of electricity, it could also reduce the air pollution lingering in Baghdad and throughout the Middle East.

Even as Al-Hamdi smiles, the strain of relentless war and terrorism shows in his eyes—Al-Qaeda and ISIS are all too real. But the skills and education he's gaining can help Iraq recover, and he's thankful for the opportunity.



TAWFEEQ AL-HAMDI (STAFF PHOTO)

Upon entering Lynn's office, the first thing you notice are the NASA posters. Then, the bumper sticker: "Positrons are another matter." On his desk, sunlight plays up a sampling of crystals—lavender, yellow, green, and deep red.

More than just a pretty display, the crystals represent a crucial step in Lynn's passion to harness the power of antimatter. He'd originally come to WSU to kickstart an antimatter research program with the goal of developing fuel for space travel. As fate would have it, the project stalled.

He was having trouble detecting the gamma rays that are emitted when antimatter particles, called positrons, collide with matter and annihilate. CadTel could solve the problem but the rare material was extremely expensive and difficult to come by.

Lynn knew a bit about crystals and decided to try growing CadTel himself. With typical intensity, he not only succeeded but also managed to improve the crystal's purity and yield.

It wasn't long before major industry leaders came knocking at Lynn's door, anxious to collaborate and hungry for the high-quality crystals he could produce.

It's a story he wants to continue. "We need to keep developing novel materials and make them better, more efficient, and less expensive," Lynn says. "Crystal growth is a key economic driver in the U.S. But it's very hard—you have to be very patient to grow crystals."

Though he doesn't talk about it much, Lynn is grateful to that small South Dakota town where people took the time and gave him that second, third, and fourth chance.

"They kind of turned a blind eye," he says, thinking back. "I probably wouldn't have made it if it happened today. After living in New York, I saw a lot of the young people there...if they got in trouble, they didn't often get a second chance."

He pauses, looking out the window for a long moment.

"It paid off," he says. ✨



COURTESY SANTOSH SWAIN

- 
- 39** alumni profiles
  - 42** new media
  - 44** class notes
  - 45** alumni news
  - 50** in memoriam



# Sweet strumming



FRED KAMAKA (LEFT) WITH HIS BROTHER SAM KAMAKA JR. (PHOTO TOMMY SHIH)

Leaning back against a wall mounted with a variety of ukuleles, Fred Kamaka begins the story of his family's 100-year-old ukulele business for a tour group at the factory in Honolulu.

"To be cool in the '20s, you needed to have a coonskin cap and a uke in hand," he says, "So my father started making ukuleles."

A spry 91-year-old, Fred sprinkles the history with dry jokes, and periodically pulls down one of the ukuleles to musically punctuate a point.

His father, professional musician Samuel Kamaka Sr., traveled to New York and Europe and learned the luthier's art before he returned to Hawai'i and began making high-quality ukuleles in 1916. They sold for \$5 each, and many of his first instruments were shaped like pineapples, lending a distinctive mellow sound.

His sons, Samuel Jr. '50 and Frederick '51, worked in the ukulele factory as kids, but they were also surrounded by the music of the islands. "The family played music all the time," says Fred. Their mother was a hula dancer and many extended family members played instruments, sang, or danced for arriving tourists.

Sam Sr. made the brothers partners in the ukulele factory in the late 1930s despite their youth. The course of their lives changed, however, on December 7, 1941. Sam Jr. was working another job on a pier near Pearl Harbor that day, while Fred attended Kamehameha High School on the hill above the harbor.

When the Imperial Japanese planes began bombing and strafing, Sam took cover on the pier. On the hill, Fred and a classmate saw the planes coming in, then attacking the U.S. Navy ships. At first, teachers didn't believe the kids, but with the anti-aircraft fire and explosions, it was clear this was no drill. They hid in the basement as bombs fell outside.

The Kamaka brothers, like many other American boys, were drafted to fight in World War II. Then the pair joined the GI generation heading to college after the war. Sam chose Washington State College, followed by Fred, so the brothers packed their ukuleles and headed to Pullman.

Sam studied entomology and Fred political science, but they also performed music all over the Northwest, including for Washington's governor. Their ukuleles sometimes provided a meal ticket. Fred and Sam say

that when they got tired of dining hall food, they joined fellow Cougs from farm families for a hearty Sunday dinner and entertained everyone with music, like favorite "My Yellow Ginger Lei."

They were also founders of the Hawaiian students' organization at Washington State, Hui Hau'oli 'O Hawai'i Club, hosting popular luaus along with hula dancer Beverly Ross '53 and other performers, where they'd play the Cougar fight song, Hawaiian style.

Their father passed away in 1953, so Sam Jr. returned from entomology graduate studies to take over the family's ukulele business. Meanwhile, since he was in ROTC at WSC, Fred headed to the Korean War.

As an officer, Fred led a squad on notorious Pork Chop Hill in 1953. The fighting was intense, but Fred says he played the ukulele for his troops in the relatively quiet times. He earned a silver star for action, and a Meritorious Service and two Legion of Merit medals. His ukulele also earned a burned spot in the battle.

Fred returned to Honolulu and the family business in 1972. His brother Sam thought he'd do a favor and fix the wounded ukulele. "I said, 'You ruined my memento from Korea!'" says Fred with a laugh.

The ukulele business was booming through the '50s, especially with popular TV and radio personality Arthur Godfrey's adoption of the small instrument. Godfrey played a custom baritone ukulele from the Kamakas. The Kamaka brothers continued the tradition of fine ukuleles, later endorsed by celebrities such as former Beatle George Harrison, Pearl Jam's Eddie Vedder, actor Adam Sandler, and Hawaiian musician Jake Shimabukuro.

Kamaka Ukulele received many local, state, and national awards for craftsmanship and contributions to Hawaiian culture and music. Sam and Fred say they're especially proud of the first award from the state of Hawai'i as an "Outstanding Employer of Persons with Disabilities."

Their father had several disabled workers, a tradition carried on by the brothers. Sam, whose wife Geraldine was an occupational therapist, hired deaf employees. "They could tell a good ukulele by its vibrations," says Sam, an advantage in the noisy work area. At one point, half of their 20 employees had disabilities.

The family business continues under three sons—Fred Jr., Chris, and Casey—who took over operations in 2000 and used their engineering degrees to automate parts of the process while maintaining important handcrafted elements.

They produce about 4,000 ukuleles a year out of Hawaiian acacia, called *koa*, with exquisite rosewood or ebony fretboards. Chris Kamaka still plays every ukulele produced and determines if it's worthy of the Kamaka name.

For their long dedication to music and Hawaiian culture, Fred and Sam received the WSU Alumni Achievement award last summer. Along with their father, the brothers have been inducted into the Ukulele Hall of Fame. ✱

▶ Watch "Heart Strings: The Story of the Kamaka Ukulele" on PBS: [magazine.wsu.edu/extra/HeartStrings](http://magazine.wsu.edu/extra/HeartStrings)

⊕ Read Fred Kamaka's first-person account of the 1942 Pearl Harbor attack: [magazine.wsu.edu/extra/Kamaka-memory](http://magazine.wsu.edu/extra/Kamaka-memory)

## Dinner with girl geeks

BY ANDREW FAUGHT

**Working for a Portland, Oregon, staffing firm in the late 1990s, Kristin McKinney '95 helped recruit employees to the city's burgeoning tech industry. The job unleashed her own geek.**

"I found I had a bit of an inner nerd," says McKinney, who got her degree in business. "I never really knew that."

Her newfound enthusiasm was tempered by a sobering reality: Women then, like now, accounted for less than 30 percent of the computing and information technology workforce, according to the National Science Foundation.

McKinney, now a recruiter in Nashville, Tennessee, is working to reverse the trend. In 2013, she joined computer application engineer Rachel Werner to form Nashville Girl Geek Dinners, a networking cum social group for women tech professionals.

The organization is part of London-based Girl Geek Dinners, whose 64 chapters in 23 countries promote broader tech participation by women.

Every month in Nashville, between 40 to 60 women—some hoping to transition into the tech industry and others who are simply curious—nosh on everything from hot chicken sliders to pizza, while they participate in workshops that, in addition to imparting the latest tech know-how, provide a safe outlet for sharing personal experiences. Most of the participants are in their 20s and 30s.

"Women tend to be those lone warriors in the midst of a large number of men," McKinney says. "You don't feel as confident, and there's a bit of that imposter syndrome. We wanted to build confidence and give them encouragement."

Cultural stereotypes, including charges that tech is a "boys club," are partially blamed for gender disparities. A 2014 National Student Clearinghouse study showed that women accounted for just 18 percent of computer science bachelor's degrees.

Nashville Girl Geek Dinners also hosts a monthly Code + Pinot, in which women can learn computer coding while sipping their favorite libation.

"It's a very chill environment," says McKinney. "We don't want it to be too serious, but we absolutely want you to get something from your time, whether it be a new relationship, learning a new topic, or just being encouraged by the panelists."

Besides her recruiting work, McKinney does community outreach for the nonprofit Nashville Software School, which bills itself as a "software boot camp." The school was launched in 2012 to help Nashville's tech industry nurture local software developers. Nearly 300 people to date have graduated from the program.

In August, McKinney helped to launch a Girl Geek podcast, which focuses less on technology than the personal stories of the women who attend the dinners. McKinney interviews many of the participants, a number of whom found the confidence to pursue a tech career after taking part in the dinners.

"It really shows that the work we're doing matters to people," she says. "Part of it is just getting women to apply to these jobs and be confident to say, 'This is a direction I can go.'" ✱

COURTESY KRISTIN MCKINNEY





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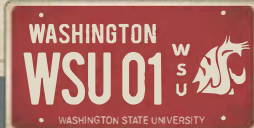
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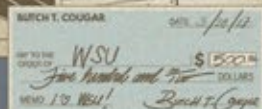
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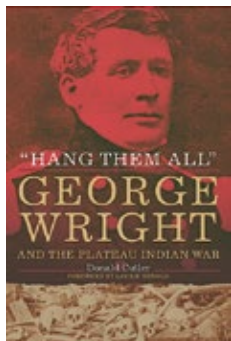
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## "Hang Them All": George Wright and the Plateau Indian War

DONALD L. CUTLER '76

UNIVERSITY OF OKLAHOMA PRESS: 2016

Questions about the viciousness of Col. George Wright's month-long war against Indian tribes of the Upper Columbia Plateau typically are filtered through a lens of historical and cultural context.

The cruelty of Wright's tactics during the Plateau Indian War of 1858 are undeniable. He hanged 16 Indians, including some who had surrendered after being told their lives would be spared. He ordered the slaughter of more than 700 horses and other Indian livestock captured near Spokane. Villages and food supplies were raided and destroyed.

Yet any trepidation over Wright's depiction as a frontier hero or the devastation of his military campaign—essentially a prelude to the fiery Sherman's March across the Confederate South six years later—often have been explained away as simply circumstances of a different era.

Cutler peels away those simplistic filters to explore deeper issues surrounding Wright's legacy and the faltering narrative that built it. Through meticulous research and careful review of the violence on both sides leading up to the 1858 war, Cutler takes readers on a journey through the events that shaped Wright's military career along with the region's turbulent political landscape at the time.

A retired banker, Cutler now is an independent historian of the Columbia Plateau and the Pacific Northwest. His book candidly recounts the brutality of Wright's tactics,

including the hanging of Indian detainees in front of their families. But he stops just short of calling Wright a war criminal, largely on technical grounds but also because it's clear the colonel was under unmistakable orders from Washington, D.C., to punish tribes for previous attacks on miners, settlers, and military units while also forcing their compliance with unpopular treaties.

Either way, though, controversy has dogged Wright's legacy. As greater understanding of his tactics spread, the heroic narrative grew even more elaborate, with early historians and others depicting Wright's army of 700 soldiers as vastly outnumbered underdogs, even though they were better armed and likely faced an Indian force of roughly similar size.

These are the kinds of dichotomies where Cutler puts his greatest focus.

"The depth of passion that accompanies some stories of Wright's actions perhaps indicates a defensiveness that compensates for an unwillingness to admit that U.S. western expansion came at a high human price," Cutler writes.

Wright was a veteran of the Seminole Indian wars and, perhaps surprisingly, had been among a handful of U.S. military officers suggesting that settlers in the Pacific Northwest bore some of the blame for worsening relations with the region's Native American tribes. Politically, he was at odds with territorial governor Isaac Stevens, who, in addition to negotiating treaties with the tribes, was serving as a consultant for railroads wanting more land for new train lines.

Growing numbers of settlers moving into the Inland Northwest had created tension with tribes and the treaties that had been negotiated were still awaiting congressional approval.

But in the spring of 1858, following a series of violent clashes between some tribes and settlers, a combined force of about 1,200 warriors from the Coeur d'Alene, Palouse, and Spokane tribes attacked a U.S. military force under the command of Col. Edward Steptoe near what is now Rosalia. Humiliated by the defeat, and under pressure from settlers calling for protection against Indian raids on their farms and cattle, the federal government ordered Wright to muster an

army, avenge the attack, and force tribal compliance with the treaties.

Wright's strategy, built on his training at West Point, was to strike such fear in the Indian population through cruelty, brutality, and destruction that they would beg for peace.

Armed with superior weapons and military training, Wright's tactics achieved his goal but with devastating consequences for the Native population—not just the warriors who chose violence.

Cutler suggests Wright was neither a war criminal nor a hero.

"If we look at George Wright as a human being having the ability to make choices, he becomes more real—even if the choices he made created unnecessary pain and trauma," Cutler writes. "He was not a hero and at times he was cruel; he was a man created by a culture that valued conquest."

—David Wasson



## Swift Dam

SID GUSTAFSON '77, '79 DVM

OPEN BOOKS: 2016

*Swift Dam* pulls you in, drags you practically, sweeping you over the western landscape until you are ankle deep in Sid Gustafson's world. The writing flows through the reader's mind like water and entrenches the reader in the story. With each passing chapter, it becomes harder to discern if you are reading a published novel or a form of the author's diary.

The story follows the major life events of a traveling veterinarian and a small-town sheriff, describing the intertwining of the two lives. Although the back panel of the book



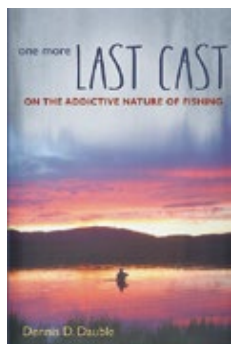
suggests it is about the travesty of a disaster in rural Montana, it is really so much more.

The author walks his readers through each of the two men's memories of a flood in 1964. A break in the title's Swift Dam swallows up several residents of the small reservation and town both men call home. Despite the years gone by, both men use the event as a way to grow, to engage, and to remember those they lost.

As they grow and remember, so do we. Through the eyes of the vet, we begin to see the world not as a mechanical structure machined by man, but as a revolving reaction between man, nature, and beast. Meanwhile, the sheriff helps us to examine the humility and humanity of our fellow man.

The story brings to mind the Oso landslide in Washington in 2014. Whether or not Gustafson intended it to be, *Swift Dam* is a lovely tribute to anyone who has ever been impacted by a disaster. It speaks of the friends, brothers, sisters, children, mothers, and fathers who are no longer with us. It speaks of, and to, those who have lived to remember and love after any catastrophe.

—Krystle Lyric Arnold



## One More Last Cast: On the addictive nature of fishing

DENNIS D. DAUBLE '78 MS  
FISHHEAD PRESS: 2016

Fishing is serious business for anglers, and absurdly funny for everyone, a truth understood fully by author Dauble. His misadventures, fishing treks, and philosophical musings fuel this amusing and thoughtful

series of short true-life stories by the retired fish biologist and WSU Tri-Cities instructor.

Whether he's griping about his buddy Leroy's vintage—and only marginally functional—outboard motor, traversing the Tucannon or Touchet Rivers in search of steelhead, or trolling for salmon among too many other boats, Dauble does a fine job of hooking a reader's interest in this most addictive of pastimes. And for him, and many others, it's certainly an addiction.

"Not to dwell on quirky behavior, but there is little doubt that fishing fulfills a deep emotional need for many of us. Indeed, for some anglers, this need can lead to addiction. ... The addict requires little if any excuse to continue past the designated quitting time and will do so until you wrench the rod out of their cold, stiff fingers," Dauble writes.

He confesses he was trapped himself from the time he caught his first trout. But despite Dauble's prowess, as evidenced by a Columbia River fishing hole on the Hanford Reach named after him, his taciturn friend "GM" outshines the intrepid author on at least one excursion.

Dauble follows his habit to some far-flung locales, too. In La Paz, Mexico, he hunts dorado on the Sea of Cortez with his friends Ted and Ken. Other journeys include seeking coho in Ketchikan, Alaska, and fighting high-velocity albacore off the Washington coast near Westport. Another, to Sheboygan, Wisconsin, featured a rough charter boat trip on Lake Michigan.

Dauble dedicated this book to his older brother Daran, who accompanied him to Sheboygan. Daran died of cancer in 2012, and one of the most moving stories memorializes a fishing trip of the Dauble brothers on the Columbia, and how the author later fished with Daran's rod after he passed away.

Dauble is the author of two award-winning books, *Fishes of the Columbia Basin* and *The Barbless Hook*, another series of essays on fishing. In this third book, Dauble's salty humor and insights grab readers just as surely as his Magnum Wiggle Wart and Kwikfish lures attract salmon in deep pools of Northwest rivers.

—Larry Clark

## BRIEFLY NOTED

### No Barriers: A Blind Man's Journey to Kayak the Grand Canyon

By **ERIK WEIHENMAYER AND BUDDY LEVY**  
THOMAS DUNNE BOOKS: 2017

After Weihenmayer became the first and only blind man to reach the top of Mount Everest, he decided his next adventure would be to traverse the treacherous Grand Canyon by kayak. He and Levy, a Washington State University instructor, chronicle the turbulent whitewater journey, and the insights gained by Weihenmayer and other trailblazers he has met.

### Unusual Punishment: Inside the Walla Walla Prison, 1970–1985

By **CHRISTOPHER MURRAY**  
WSU PRESS: 2016

Murray was an employee of the Washington State Department of Social and Health Services in 1976 when he first visited the prison at Walla Walla, and was stunned by the excesses and freedoms enjoyed by prisoners. He details the explosive story of failed reform at the Washington state penitentiary as well as the complex, challenging, and painful path back from chaos.

### All for the Greed of Gold: Will Woodin's Klondike Adventure

By **WILL WOODIN (AUTHOR),**  
**CATHERINE HOLDER SPUDE (EDITOR)**  
WSU PRESS: 2016

Enhanced with family photographs and skillfully edited, Will Woodin's diaries, a short story, and his candid 1910 memoir describe the travails of taking an uncommon route to the Yukon, the workings of the gold fields, and the camaraderie and cooperation among the men seeking riches.

### Kierkegaard in the Pulpit: Sermons Inspired by His Writings

By **RONALD F. MARSHALL '71**  
CAVE MOON PRESS: 2016

Marshall, a philosophy major, serves as pastor of First Lutheran Church of West Seattle, where he has been since 1979. This is his second book on Danish philosopher Søren Kierkegaard and the application of his writings to Christianity.

### Down to Get Up

By **CHANCE MCKINNEY '96** 2016

Fans of fun country music with a healthy dose of rock guitar will enjoy the latest foray from McKinney.



AWARD-WINNING RADIO CORRESPONDENT ANNA KING (KAYO LACKEY/NORTHWEST NEWS NETWORK)

Growing up in the foothills of Mount Rainier, **ANNA KING '00** figured she'd end up either a veterinarian or a writer. Her family ran a small cattle farm in Roy, and she loved animals.

King participated in 4-H projects, raising animals but also giving presentations that taught her to communicate with an audience. When a TV reporter from the Seattle area paid a visit to her high school class, she remembers thinking, "This person is so smart, so edgy, so inspiring."

The Honors College alumna worked for several newspapers in the Puget Sound area, including the *Puyallup Herald*. She figured out early that by being honest and true to herself, people would confide in her. She left that job with a Key to the City.

At the *Tri-City Herald*, she recalls, she had a meeting with a group of alfalfa farmers annoyed that a "city girl" had taken over the agriculture beat. They "really wrangled me," she says, but she gave as good as she got. "I know how to buck hay, I know what timothy is!" she snapped at the farmers. She had no trouble reporting on ag after that.

But newspapers, King realized, weren't changing fast enough to stay afloat in the flood of new media. King jumped to radio

in 2005 as a journalist for Northwest Public Radio at WSU's Murrow College of Communication. Her reports are heard on public radio stations throughout the region via the Northwest News Network. "I really wanted that job. They were doing multimedia reporting, you had a big territory, you had editorial freedom, and they cared about journalism reaching younger people."

King recently won two Gracies, awarded by the Alliance for Women in Media. She was also named WSU's 2016 Woman of the Year. "What I really enjoy now is mentoring WSU Tri-Cities students in multimedia and journalism. It's been great to have them as interns and to share some of the hard lessons I've learned, but also to learn from them."

King laughs at her memories of school days in Pullman. "It was a city to me!" she says. "My friends would say, 'Order a pizza!'" But to her that meant a long car ride to town and back, and cold pizza when it finally got home. "The idea of hot, fresh pizza delivered right to your dorm—that was magic!" ✨

BY BRIAN CHARLES CLARK

**70 JAMES MOLL** ('72 Comm.) was recognized as a local hero in Butte County, California, by the local newspaper. Moll, who has worked in radio and serves as emcee for community events, is known as "The Voice of Oroville." He was recognized for his efforts to help restore the historic State Theatre in downtown Oroville. Moll served as president of the local Society for the Prevention of Cruelty to Animals and led a drive to build a new shelter for the surrounding community. ✨ **Pierce College Chancellor MICHELE JOHNSON** ('74 Poli. Sci., '75 MA Poli. Sci.) won the Chief Executive Officer award for the Pacific region, presented by the Association of Community College Trustees. ✨ **RANDY SUESS** ('76 Ed.) received the Alumni Achievement Award from the WSU Alumni Association. A farmer near Colfax for 30 years, he has advocated for WSU and regional agricultural programs for many years. Due in part to Suess's interest in foreign markets, much of Central America now buys wheat from the Pacific Northwest. ✨ **DEBORAH HOLCOMB** ('79 Ed.) is the new superintendent of North Beach School District in Western Washington. Holcomb has been an educator for 37 years,

19 of which were at Bainbridge Island School District. Most recently Holcomb worked as executive director of inclusive education at the Highline School District. ✨ **JOHN UNRUH** ('79, '81 MS Ani. Sci.) is the new dean of California State University, Chico's College of Agriculture. The agriculture college has won many awards and Unruh says he plans to keep the university's focus on providing practical education for its students.

**80 ERIC DIETERLE** ('80, '82 History) published a memoir, *Where the Wind Dreams of Staying* (Oregon State University Press) in October 2016. In November, the book was put on the *High Country News* recommended reading list. Dieterle is an assistant professor at Northern Arizona University. ✨ **LLOYD GALEY** ('80 Crim. Jus.) is the new fire chief of South Pierce Fire and Rescue. Galey grew up in Spokane, attended WSU, and then joined the Air Force to become a firefighter. Afterwards he worked for fire stations in Illinois before returning to Washington, where he taught in the fire service program at Bates Technical College in Tacoma. South Pierce Fire and Rescue operates seven fire

stations and serves an area of approximately 22,000 residents. ✨ **GREGORY MICHAEL "DEKE" GASSETT** ('80 Crim. Jus.) was given the WSU Alumni Association Alumni Achievement Award for his work as a drug enforcement agent as well as his volunteer work. His career was inspired by a bomb explosion in WSU's Streit-Perham residence hall in 1979. In the early 2000s, Gassett directed a Drug Enforcement Agency investigation into a major Canadian drug trafficker. He also helped with an investigation into the first known tunnel used for drug trafficking between the United States and Canada. Gassett has also been involved in numerous community programs educating children and parents about drug abuse. Since his retirement in 2008, Gassett has worked as executive mentor to the national police in Afghanistan in their fight against drug trafficking, which is believed to help finance terrorist groups. ✨ **BILL CUMMINS** ('81 Ed.) joined Hughes Equipment Company as its new sales manager for food processing equipment for the Northwest, including Oregon, Washington, Idaho, Montana, and British Columbia. ✨ **KERRI MARSHALL**



## Adopt a Coug

Meleah Nordquist '16 loves WSU, and so does her dad, Dan Nordquist. He grew up on the Palouse, has worked at WSU for 26 years, and enjoys listening to his father tell stories about his days as student body president and a Cougar football player in the early '50s.

With those ties, you'd think that all of the Nordquists are Cougs. Truth is, Dan is not. He went to the University of Idaho. Despite his silver-and-gold education, Dan bleeds crimson and gray. Meleah knew that her dad was a Coug deep inside. She just needed to find a way to officially acknowledge it.

This is when the WSU Alumni Association enters the story along with its Adopted Cougar program.

When Meleah learned it was possible to make someone an Adopted Cougar, she knew it was the perfect way to recognize her dad's love of WSU. She contacted the WSUAA and arranged to make her dad an officially Adopted Cougar. "My dad is a Coug in his heart and soul, and now he has the paper to prove it," Meleah says.

She waited until Father's Day and surprised him with the gift in front of their family. "He was so excited and so touched. It was such a special way to salute his heartfelt connection to WSU and acknowledge his enthusiasm for the University."

Taylor Eylar '11, who runs the Adopted Cougar program, says "the program is based on the belief that not everyone can attend WSU, but everyone who loves WSU can be a member of the Cougar Family. If you know someone—spouse, friend, family member, coworker—who exhibits genuine passion for and commitment to WSU but didn't attend WSU, you can adopt them."

*Read more about Cougar adopters, like Larry Arcia, and Adopted Cougs, and how to adopt someone at [magazine.wsu.edu/extra/AdoptedCoug](http://magazine.wsu.edu/extra/AdoptedCoug).*



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**Go Cougs!**



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('81 Zool., '85 DVM) has joined BabelBark, a pet-related software developer located in Newton, Massachusetts. Marshall is part of the founding team as chief veterinary officer and a member of their board of directors. ❁

**CRAIG A. CURTIS** ('83 Arch., '84 Const. Mgmt.), an architect from Kitsap County, began a two-year term on the board of directors for the First Federal Community Foundation. The First Federal Community Foundation offers funding for community support and development, affordable housing, and economic development within communities with full-service branches. ❁

❁ **TOM NOVOTNEY** ('84 Elec. Eng.) was named Frontier Communication's area general manager for central California. Novotney has worked within the telecom industry for over 30 years. ❁ Orthopedic surgeon **JOHN D. OSLAND** ('84 MS Nut. & Ex. Phys.), began work at the Jefferson Healthcare Orthopedic Clinic in Port Townsend. Osland will help to transition the clinic from one surgeon to a team of three surgeons and two physician assistants. Osland specializes in knee and shoulder arthroscopy, knee replacements, and sports medicine. ❁ Chicago Mercantile Exchange Group CEO **PHUPINDER GILL** ('85 Fin., '87 MBA) has retired. Gill was born in Malaysia and moved to the United States to attend WSU. He began working for CME Group in 1988, became president of the company in 2007, and then CEO in 2012. ❁ **DENNIS PAUL LEMASTER** ('85 Range Mgmt., '87 Forest Mgmt.) was promoted to Brigadier General in July. He commands Regional Health Command Europe, headquartered in Sembach, Germany, which includes all U.S. Army medical assets in Europe. LeMaster received his commission in 1987 from WSU ROTC. ❁ **BRAD RAWLINS** ('87 Comm., Foreign Languages) became a special assistant to the provost of Arkansas State University. Rawlins will oversee the new campus in Queretaro, Mexico. The campus will be an "American-style" university offering degrees in engineering, biosciences, business, and strategic communication. ❁ Sentry Insurance in Stevens Point, Wisconsin, has promoted **STEPHANIE SMITH** ('87 Comm.) from assistant vice president of marketing and brand management to a vice president position. Smith has worked in public relations and marketing for 25 years and at Sentry Insurance since 2013. ❁ **JOHN BROOKS** ('89 Crim. Jus.) is the new chief of

police for the Ridgefield Police Department. Previously Brooks served as a captain of the Portland Police Bureau for 25 years. He is a graduate of the FBI National Academy.

**KEVIN "K.C." ALBERG** ('91 Crim. Jus.) is the new marshal of Mesilla, New Mexico. Alberg has been the Mesilla fire marshal for over a year, and a volunteer at the fire department for three years. He has served as chief special agent for professional standards for the Corrections Department since 2013. Alberg has worked in law enforcement and related fields for more than 21 years in Washington, Alaska, and New Mexico. ❁ **VICTORIA BLACHLY** ('93 Biol.), a partner of the Portland, Oregon, law firm Samuels Yoelin Kantor LLP, has been recognized in the *Chambers High Net Worth* guide. The guide covers private wealth management work and related specializations. The guide named Blachly a "Leading Individual" for private wealth law in Oregon. ❁ Previous Ellensburg track coaches **ROB MOFFAT** ('93 Phys. Ed.) and **ROBERT PRICE** ('91 History) were inducted into the Ellensburg High School Athletics Hall of Fame. From 1992 through 2006, the combined efforts of the two brought 21 event state championships and one overall state title to Ellensburg. They have sent more than a dozen athletes to collegiate programs, including three athletes who qualified for the Olympic trials. Price is a coach at Eisenhower High School. Moffat is principal of Valley View Elementary School but still volunteers as a coach. ❁ Toppenish educator **JOSE CORONA** ('95 Ed.) was named the Regional Teacher of the Year. Corona has taught third grade for 20 years. Before graduating from WSU with a degree in elementary education, Corona grew up in a migrant family, a background shared with many of his students. ❁ **TYSON FICK** ('95 Busi.) became the executive director of Alaska Bering Sea Crabbers (ABSC). Fick will work in Juneau and the main ABSC offices in Seattle. Previously, Fick was communications director for the Alaska Seafood Marketing Institute and legislative liaison at the Department of Commerce's Community and Economic Development. ❁ Lawyer **MICHAEL N. EVANGELISTA** ('96 Poli. Sci.) of the law office of Michael Norita Evangelista has been appointed as a regent of the Northern Marianas College. He was later elevated as the new Board of Regents

chair. ❁ The University of Texas at Tyler has a new president in **MICHAEL TIDWELL** ('96 MA Comm., '02 PhD). Tidwell was previously dean of Eastern Michigan University's College of Business. Tidwell has worked in multiple faculty and administrative positions across the United States as well as a visiting professor in both India and Kenya. ❁ **ERIKA HARTLIEP** ('98 Ag. Econ.) joined the law firm of Stokes Lawrence Velikanje Moore & Shore. Her legal practice focuses on business and agricultural transactions and litigation. ❁ **TIM JOHNSON** ('98 Poli. Sci.) was promoted to CEO of Mondo, a digital marketing and IT resourcing firm. Johnson has worked with the company for over 12 years as both director and vice president of sales. ❁ **DAMIEN PATTENAUDE** ('99 English, '05 MED, '16 EdD) was named the next superintendent of Renton School District. Pattenaude is currently the assistant superintendent of learning and teaching for the district. He has been a teacher at Renton High School, assistant principal at Hazen High School, principal at RHS, and chief academic officer for the district. Pattenaude will step in as superintendent next July.

**MISTY LAWRENCE** ('00 Biol.) is the new area lead for the main nuclear processing buildings at the Uranium Processing Facility in Oak Ridge, Tennessee, owned by Bechtel. Lawrence joined Bechtel in 2001 and has held multiple positions including deputy procurement and subcontracts manager at the Waste Treatment and Immobilization Plant in Richland. She also served as the acquisition services manager at the Blue Grass Chemical Agent-Destruction Pilot Plant in Kentucky. Lawrence most recently held the position of executive assistant to the president of the Nuclear, Security, and Environment Global Business Unit at Bechtel. ❁ **STEVE LEE** ('00 Acc.) has been the president of the Lewis and Clark Trail Heritage Foundation through 2016. In July, he presided over the 48th annual meeting of the foundation in Harpers Ferry, West Virginia. ❁ **DAVID OTIS** ('00 Busi.) is the new Seattle area director for Holliday Fenoglio Fowler L.P. His focus is on investment sales of office, land, retail, and industrial properties within the Pacific Northwest. ❁ **APRIL BRUNS** ('01 Human Nutr.) recently joined United Dairywomen of Idaho. Bruns has worked as a health and wellness manager



for the Idaho Dairy Council based in eastern Idaho. With United Dairyman of Idaho, she will act as a link supporting nutrition science and research to educators, school food service professionals, and health professionals. ✨ The American Institute of Architects of Oregon voted for **SETH ANDERSON** ('02 Arch.) as the council's president-elect for 2017. Anderson, the principal architect at Ascent Architecture & Interiors in Bend, will subsequently step into the role of AIA-Oregon president in 2018. ✨ **RAPHAEL X. MOFFETT** ('02 English) was named the new vice president of student affairs at Texas Southern University. He began his career in student affairs in 2002 as a graduate student working in residential life at Clark Atlanta University. Moffett has worked at multiple colleges and was most recently the vice president of student affairs at Langston University. ✨ Aberdeen Superintendent **TOM OPSTAD** ('02 Ed., '10 EdD) plans to retire at the end of this school year. He has worked as an administrator for several school districts throughout Washington. ✨ Texas police officer **MATT PEARCE** ('02 Crim. Jus.) received the Star of Texas award in September after being injured during a car chase. Officer Pearce was shot five times when the occupants of the vehicle and the officers exchanged fire. The Star of Texas award is given to officers, firefighters, and other emergency personnel who are injured or killed in the line of duty. ✨ **ANNIE SANFORD** ('02 Nursing) was welcomed into the International Nurses Association with a publication in the *Worldwide Leaders In Healthcare*. Sanford is a stroke program manager at the Swedish Medical Center in Seattle. She also holds a faculty teaching position for new employees and residents. ✨ **BEN BREWER** ('03 Comm.) is the new vice president of sales for LiquidPlanner. Brewer came to LiquidPlanner from Concur where he served for over ten years and held many senior positions including director of sales, senior director of sales, and vice president of sales. ✨ **ADAM DROKER** ('03 Fin., '04 MBA) and his wife Aly welcomed their third child last March, joining their son Evan and daughter Meredith. Adam is the chief investment officer at WaterRock Global Asset Management LLC, a registered investment advisory firm in Bellevue. ✨ **CHRISTI SCHULTZ** ('03 Elem. Ed.), a science teacher at Battle Ground High School, loves to integrate forensics-type lessons

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Everywhere you go on the Palouse, there's **DAN MAHER '78**. He's playing at the Co-op in Moscow, the farmers' markets in Pullman and Moscow, on Terrell Mall on the WSU campus—if there's acoustic live music, Dan Maher, his guitar, and his guide dog can't be far.

But, says Maher, the music scene is nothing like what it once was. "When I was a student here in the early '70s there was a guitar every 30 feet. Everybody played guitar! We used to go to the basement of the K-House and jam every night."

Even if you've never seen Maher play live, you may have heard him on public radio. He's the voice—the force of nature—behind *Inland Folk*, heard across the entire Pacific Northwest. On the air since 1982, Maher's show may be the longest continually running folk music show on radio with the same host. A show called *The Folk Sampler* has been on the air in the Ozarks since 1978, but has had multiple hosts.

When Maher started *Inland Folk*, National Public Radio was only 12 years old. In 1982, "NPR was expanding, and the Spokane station wanted a folk show. So I got the show," he says.

Long a collector of what he calls "nonindustrial folk," Maher hauled a box of vinyl records up to Spokane on the bus once a month to record his show. After a year of that, "I was tired of hauling that vinyl around!" So he pitched the show to the Pullman-based KWSU, which was in the process of becoming the Northwest Public Radio network.

is a good singer, and we'd do live shows, with her singing harmonies." Rilette left NWPR for Maine Public Radio earlier this year.

Maher has played hundreds of shows all over the West. He's opened for many of his "nonindustrial" folk heroes: Tom Paxton, Norman Blake, Bill Staines, the Irish folk band Patrick Street, Dave Van Ronk, Utah Phillips—the list goes on. "It seasoned me, and I had to open for people who intimidated me. Van Ronk would say, 'Don't upstage me,' while Paxton would say, 'Make me work! Upstage me!'"

Maher has had a day job at WSU since 1980, when he started working with the Associated Students of WSU. He's been there ever since. "I advise students, teach them how to program events, how to fundraise, and so on." Maher's work at WSU has touched the lives of thousands of Cougars.

His one piece of advice is that "the sky really is a limit," he says.

But once you figure out the few things you truly can't do, go for what you can do. "I'll never drive a car or fly a plane," the blind-from-birth Maher says. "After that, develop your confidence and just stick with it, whatever it is." ✨

BY BRIAN CHARLES CLARK

in her classes, one of which was published in *The Forensic Teacher* magazine in 2012. In 2015, Schultz fulfilled a dream by publishing her first novel *My Epiphany* under the pen name Misty Reins. In 2016, her four-book *Cabin Series* was published, and is available from Amazon. She's completing her seventh book.

✨ **MICAH LAUER** ('04 MIT) of Meridian, Idaho, has been awarded the Presidential Award for Excellence in Mathematics and Science Teaching. An educator for 12 years, he has taught the seventh grade life science class at Heritage Middle School for nine years. For the past two years, he has partnered with the biology department at Boise State University to take his students to a local research site. Lauer is also a teacher consultant with the Boise State Writing Project, an affiliate of the National Writing Project. Currently, he is helping lead 20 science teachers through a year-long, graduate-level professional development experience. ✨ Battle Ground teacher **MEREDITH GANNON**

('05 MIT) has won the 2016 Presidential Award for Excellence in Mathematics and Science Teaching, the highest national honor for a teacher. Gannon is an instructional coach as well as a teacher. In addition to this award, Gannon is the recipient of many other teaching awards. She is currently pursuing administrative credentials from WSU Vancouver and is a National Board Certified Middle Childhood Generalist. ✨

**NATHAN BROWN** ('06 Ed.) opened a Paul Davis Emergency Services franchise in Spokane in November, offering emergency management services during disasters. Brown's team is trained in flood, fire, smoke, wind, and mold damage, among others. He hopes to use his business to volunteer with local nonprofits to clean up schools and parks. Brown worked as an NBA executive for the Portland Trail Blazers before he and his wife returned to the Spokane area to raise their children. ✨ **EMILY GAUSE** ('06 Socio.), a criminal defense lawyer and owner of the Law Offices of Emily M. Gause PLLC, has

been awarded the Washington Association of Criminal Defense Lawyer's 2016 Anthony Savage Award for her work in the felony case *USA v. Frazier*. ✨ **AARON SOLAIMANI** ('08 HBM) has been promoted to vice president of HVS, a global consulting company which focuses on hotels, restaurants, and leisure industries. Solaimani has written several articles about hotel markets for California publications, where he lived and worked before relocating to Seattle. While attending WSU, Solaimani was president of the student-run National Society of Minorities in Hospitality.

**RIKKI KING** ('10 Poli. Sci.), a reporter at *The Daily Herald* in Everett, was awarded third place in investigative reporting by the C.B. Blethen Awards for Distinguished Newspaper Reporting. King has been at *The Herald* since 2010. ✨ **BRETT SANDWICK** ('10 Psych.) achieved certified consultant status from the Association for Applied Sport Psychology. The



association is an international organization that promotes the development of science and ethical practice in the field of sport psychology. Sandwick is the CEO, founder, and mental conditioning trainer for Elite Mentality. He trains military personnel and athletes in cognitive techniques for performance improvement. He also trains resilience performance psychology and mental toughness to the U.S. Army outside of Tacoma. ✧ **MICHAEL VARGA** ('10 Pharm. D.), director of pharmacy at Northwest Specialty Hospital in Post Falls, Idaho, was awarded the WSU College of Pharmacy's 2016 Preceptor of the Year. The award is given to mentors of WSU pharmacy students during the student's experiential training rotation, and to those who demonstrate a high standard of professionalism, ethics, and clinical practice while mentoring. ✧ **TREVOR PARK** ('11 Fine Arts) was recently hired to be the new regional marketing director for Pinnacle, a property marketing firm in Seattle. Park has worked most recently with Greystar, a real estate firm, and before that he worked as a marketing strategist in the banking industry. ✧ **SISTER JORDAN ROSE** ('11 Ed.) professed her first vows as a novice Catholic Sister of Life at a ceremony in Suffern, New York. Rose, 25, is from Cottonwood, Idaho, and was a teacher before entering the sisterhood. ✧ **BRIAN W. BODAH**, ('13 PhD Ag. Eng.) has been named the assistant director of the New York State Agricultural Experimental Station in Geneva, New York. Bodah comes to Cornell University from Washington State University, where he was director of Pierce County Extension. ✧ Salem Community College in New Jersey named **DESTINY BUSH** ('14 MED) as project director for its Gaining Early Awareness and Readiness for Undergraduate Programs (GEAR UP) grant. SCC has partnered with the Penns Grove-Carneys Point Regional School District to begin preparing middle and high school students for college success. Bush worked as a care manager for the Camden County Partnership for Children before joining SCC. ✧ **MEGAN ABUNDIS** ('16 Comm.) is a multimedia journalist with the KSBY news team in California. Before becoming part of the KSBY team, she interned at both King 5 in Seattle and KHQ in Spokane. Abundis is a two-time award winner from the National Academy of Television Arts and Sciences.

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**ROBERT WILLIAM PIRIE** ('40 Forest & Range Mgmt.), 99, October 17, 2016, Tacoma. **DOROTHY M. PIRIE** ('41 Home Econ.), 96, April 27, 2016, Tacoma. **BLANCHE ADAMS KING** ('42, '46 MA Home Econ.), 98, September 12, 2016, Pullman. **CHARLES E. GARDNER** ('43 Chem. Eng.), 93, October 17, 2016, Sonoma, California. **FRANCES EVELYN HURD** ('43 Home Econ.), 90, July 24, 2012, Spokane. **WARREN KELBLE SMITH** ('43 Busi.), 94, May 15, 2016, Shoreline. **JEAN GLEASON WITT** ('43, '48 MS Botany), 95, August 27, 2016, Des Moines. **JAMES L. FREDERICKSON** ('44 DVM), 95, August 1, 2016, Bakersfield, California. **VERNA LOU HISEY** ('44 Phys. Ed.), 95, November 14, 2016, Everett. **BARBARA PAINE NANCE** ('44 Ed., Kappa Alpha Theta), 95, October 12, 2016, Yarrow Point. **WILLENE HORTON DANIEL** (x'45 Lib. Arts), 92, September 16, 2016, Pullman. **BETTY LIEB** ('45 Home Econ.), 92, January 13, 2016, Napa, California. **JANET ROBERTS MOOERS** ('46 Psych., Pi Beta Phi), 91, September 11, 2016, Carmel, California.

**DELMAR WHITMAN DOW** ('48 Mat. Sci.), 92, September 24, 2015, Sonoma, California. **CAROL MORRIS REARDON** ('48 English), 90, October 19, 2016, Auburn, Massachusetts. **DORIS ELAINE WARNER** ('48 Home Econ.), 90, September 29, 2016, Gig Harbor. **WILLIAM W. ARMFIELD** ('49 Ag. Chem., '55 DVM), 93, June 28, 2016, Pullman. **ILLIENE A. BOAWN** ('49 Phys. Ed.), 89, September 4, 2016, West Seattle. **TEH CHENG HUANG** ('49 MA, '51 PhD Ani. Sci.), 96, August 10, 2015. **WILLIAM J. NANCE JR.** ('49 Elec. Eng., Sigma Chi), 95, November 25, 2016, Yarrow Point. **HAROLD T. PEDERSON JR.** ('49, '54 MS Bacterio.), 89, June 21, 2016, Spokane. **MILTON H. STEINMUELLER** ('49, '52 MA Ag. Econ.), 92, October 15, 2016, Vancouver. **DONALD CLYDE WILEY** ('49 Civ. Eng.), 90, October 20, 2016, Spokane.

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**MOLLY G. JOHNSON** (x'50 Lib. Arts), 88, September 11, 2016, Aberdeen. **DONALD W. MACNEIL** ('50 Busi.), 88, September 18, 2016, Thousand Oaks, California. **JEAN**

**MARIE SPRINGER** ('50 Busi., Kappa Delta), 88, August 22, 2016, Albuquerque, New Mexico. **DAVID GORDON YOUNG** ('50 English), 89, September 8, 2016, Boise, Idaho. **DAVID G. ACKERMAN** ('51 HBM), 83, February 10, 2013, Parma Heights, Ohio. **JAY WENDELL ATHERTON** ('51 Elec. Eng.), 91, November 8, 2016, Seattle. **KATHERINE "KASHIE" GREGORY** ('51 Comm., Kappa Kappa Gamma), 86, November 7, 2016, Spokane. **ARTHUR D. JOHNSTON** ('51 Chem. Eng.), 89, October 16, 2016, Gig Harbor. **CLARENCE "JERRY" MASON** ('51 DVM), 92, September 22, 2016, Ellensburg. **DELLA VIRGINIA PARKER** ('51 Lib. Arts), 85, June 14, 2015, Albany, California. **MARILU ANDREWS** ('52 Comm., Chi Omega), 85, June 17, 2016, Yakima. **ALAN CONWAY DOYLE** ('52 Socio.), 86, November 28, 2014, Tacoma. **HOWARD F. LANCASTER** ('52 DVM), 88, July 9, 2016, Coeur d'Alene, Idaho. **WILLIAM IUOLO** ('53 MA Econ.), 88, April 22, 2016, Bainbridge Island. **HUGH T. JONES** ('53 Geol., Theta Chi), 85, October 30, 2016, Belmont, California. **EDWIN MCCREARY PHILLIPS** ('53 Ani. Sci.), 85, September 5, 2016, Redwood Valley, California. **CHARLESE. POULTON** ('55 PhD Botany), 99, November 6, 2016, Surprise, Arizona. **DAVID B. "BERT" UNDERWOOD** ('55 Comm.), 83, September 8, 2016, Post Falls, Idaho. **JOANNE CORA ECKERT** ('56 Elem. Ed.), 82, August 25, 2016, Redmond. **WILLIAM T. "BILL" SWEAT** ('56 Mech. Eng.), 84, August 13, 2016, Coeur d'Alene, Idaho. **LES H. RUDY** ('58 Phys. Ed., Beta Theta Pi), 82, October 17, 2016, Fremont, California. **PHILIP EUGENE "GENE" DADE** ('59 PhD Agro.), 87, November 16, 2016, Meridian, Idaho. **GRANT E. RICHARDSON** ('59 Psych.), 80, April 30, 2013, Troutdale, Oregon.

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**ARTHUR E. FULKERSON** ('60 DVM), 83, October 27, 2013, Milton Freewater, Oregon. **MICHAEL A. GRUMMETT** ('60 Busi.), 79, October 26, 2016, Juneau, Alaska. **LLOYD EDWARD HENNING** ('60 Civ. Eng.), 75, December 14, 2012, Everett. **CALVIN M. JEPSEN** ('60, '63 MS Civ. Eng.), 83, October 31, 2016, Carmichael, California. **MARY ELLEN KILGORE** ('60 Bacterio.), 77, September 23, 2016, Mandeville, Louisiana. **STELLA MCKINSTRY** ('60 MEX Human Dev.), 93, October 25, 2016, Pinedale, Wyoming.

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**DOROTHY RAE MECH** ('60 Elem. Ed., '67 MED, Alpha Phi), 78, August 29, 2016, Pasco. **DONALD E. GUINOARD** ('61 EDD Couns.), 87, September 26, 2016, Tempe, Arizona. **HOWARD E. MOUNT** ('61 Busi.), 82, September 14, 2016, Silverdale. **GLEN S. PUTERBAUGH** ('61 Ag, '66 MEX), 77, May 26, 2014, East Wenatchee. **DONALD EUGENE GREEN** ('62 PhD Pharm.), 89, October 1, 2016, Chico, California. **JANE ROUSSER** ('63 Gen. St.), 74, October 28, 2016, Riverside, California. **JOANNE MARIE BROWN** ('64 Speech & Hearing Sci.), 74, September 30, 2016, Fairfax Station, Virginia. **JAN L. BROOKMAN** ('65 Econ., Sigma Kappa), 72, September 8, 2016, Seattle. **JAMES B. DEMEERLEER** ('65 Busi.), 73, September 17, 2015, Moscow, Idaho. **R. CRAIG KNIGHT** ('65 Mat. Sci.), 75, August 24, 2016, California. **MICHAEL LESLIE HERROLD** ('67 Hum.), 72, September 7, 2016, Novato, California. **LOUIS DEAN RASPLICKA** ('67 PhD Food Sci.), 85, September 1, 2016, San Antonio, Texas. **JUNE H. MOULTON** ('68 MA Phys. Ed.), 91, September 28, 2015, Lewiston, Idaho.

**DIANE SALT** ('70 English), October 8, 2016, Spokane Valley. **JAMES K. KILLINGSWORTH** ('71 Ag. Eng.), 67, August 21, 2016, Spokane. **ROBERT B. BERLIEN** ('72 Arch.), 73, October 8, 2016, Seattle. **JOHN ANTHONY BUSCH** ('72 History, '97 MED), 67, September 2, 2016, Spokane. **VERNON THOMAS JUDKINS JR.** ('73 Fine Arts, '93 Ed.), 73, June 30, 2016, Spokane. **GREGORY BRUCE SMITH** ('74 MS Elec. Eng.), 64, October 23, 2014, Spokane. **JOHN GALEN DURKEE** ('75 Forest & Range Mgmt.), 63, June 23, 2016, Yakima. **ERIC PAUL ROZELL** ('75 Forest & Range Mgmt.), 64, October 11, 2016, Kalispell, Montana. **MARK STEWART ZENIER** ('75 Comp. Sci.), 63, May 31, 2016, Seattle. **GARY LEON MINOR** ('76 Police Sci.), 62, September 14, 2016, Desert Hot Springs, California. **SUSAN M. SHECKET** ('76 MA Human Dev.), 66, October 18, 2016, Seattle. **DANA LYNN BLAIR** ('78 Phys. Ed.), 60, October 15, 2016, Vancouver. **GINA KATHRYN BULL** (x'78), 57, October 12, 2016, Walla Walla. **THOMAS E. CALLAHAN** ('78 Acc.), 61, August 23, 2016, San Rafael, California. **TERREA LEE WEISHAAR** ('78 Comm., '79 Ed.), 63, September 4, 2016, Spokane. **BRIAN JAMES LEWINSKI** ('79 Mktg.), 59, October 23, 2016, Kennewick.

**MARCIA J. PANATTONI** ('81 Home Econ.), 57, September 8, 2016, Boise, Idaho. **GARY C. MUELLER** ('82 Int. Des.), 56, October 20, 2016, Seattle. **LIBBY W. FORSYTH** ('83 Fin., Alpha Gamma Delta), 54, September 9, 2016, Spokane. **CHESTER LAMONT BRITT III** ('86 MA Socio.), 54, August 30, 2016, Ames, Iowa. **DONALD EDWARD JORDAN** ('89 Zool., Sigma Phi Epsilon), 49, October 19, 2016, Snohomish.

**JANE SARMIENTO SCHWAB** ('03 PhD Amer. St.), 76, September 7, 2016, Seattle. **CHARLES CHRISTOPHER SHAW** ('03 Econ., '06 MBA, '12 Env. Sci.), 38, October 3, 2016, Richland. **PHYLLIS LORRAINE TOMPKINS** ('04 Soc. Sci.), 64, September 19, 2016, Kennewick. **JARED MICHAEL HATCH** ('08 Busi.), 39, April 14, 2014, Richland. **BRIAN NEIL LAMB** ('08 Comm.), 29, February 9, 2015, Vancouver. **JOSEPH MARTIN STEFANIK** ('08 Soc. Sci.), 45, February 13, 2016, Ashburn, Virginia. **JAMES EDWARD JENNINGS** ('09 Lib. Arts), 51, September 6, 2016, Spokane.

**DENNIS JESSE JOE FRANKLIN** ('13 Psych.), 45, May 6, 2014, Port Angeles. **ELLIE MEGAN ROSE MISCHAIKOV** ('15 Comm., Alpha Gamma Delta), 23, August 29, 2016, San Luis Valley, Colorado. **AUDREY NOELLE JIMENEZ** ('16 Wildlife Ecol., Women's St.), 23, September 17, 2016, San Jose, California.

#### FACULTY AND STAFF

**JOHN COPPERILL**, 44, Housing and Dining Maintenance Services, 2012-2016, November 18, 2016, Moscow, Idaho. ✨ **CHERYL C. ENNIS**, 70, Electrical Engineering & Computer Science, 1967-1970, 1999-2014, August 7, 2016, Spokane. ✨ **LIBBY FORSYTH**, 54, Health Policy & Administration, 2013-2016, September 9, 2016, Spokane. ✨ **WILLIAM IULO**, 88, Economics, July 22, 2016, Bainbridge Island. ✨ **JAMES REILLY**, 97, Western Washington Research and Extension Center, 1968-1982, July 7, 2016, Puyallup. ✨ **WILHELMINA "TONI" SARAI-CLARK**, 89, Office for Equal Opportunity, 1965-1992, October 20, 2016, Pullman.



## ANNIVERSARY

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**DR. UNIVERSE, I HAVE A GINORMOUS QUESTION FOR YOU.  
HOW COME NON-BIODEGRADABLES TAKE LIKE A MILLION,  
BILLION, ZILLION YEARS TO DECAY?**

ILLUSTRATION ROB MCCLURKAN

—Madeline C., age 8

Dear Madeline,

You're right. It can take a really long time for some things to decay. If we buried an apple peel in the backyard it might only take a few weeks to break down into the soil. But if we buried a plastic water bottle, it would probably still be there hundreds of years from now.

There are a lot of living creatures in nature that help break down things. In fact, our trash cans are almost like an all-you-can-eat-buffet for tiny creatures called microbes. Well, an almost all-you-can-eat-buffet. There are some things that they can't really feast on. It all depends on what's in our trash bins.

For billions of years, microbes have been munching on plants and animals. They've also had some help from fellow decomposers, like worms, flies, and fungi.

The environment where they work can also speed up or slow down the process. The conditions of dirt, air, water, temperature, and sunlight can change the speed of decomposition.

These decomposers are pretty great at breaking down a lot of things we find in nature. But they aren't as good at breaking down some other materials, such as plastic.

To find out why, I visited my friend Shuresh Ghimire, a scientist who studies biodegradables at Washington State University. He is also really curious about finding ways to decrease the amount of plastic waste in our world, particularly on farms.

Plastics were introduced in the 1930s, he explained. Now, that may seem like a long time ago to us. But for microbes that have been around for billions of years, that's still a pretty new material.

Both an apple peel and a plastic bottle are made up of different kinds of atoms. Those atoms are bonded and held together in different ways. In an apple, the bonds between atoms are pretty weak. Microbes don't have to use a lot of energy to break them into smaller parts.

But the plastic bottle has really strong bonds—especially where a carbon atom bonds with another carbon atom. It makes the material sturdy, but it also makes it pretty indestructible. Most microbes don't recognize these bonds as something they can break down, at least not yet.

"There is a possibility that evolution of microbes over many years in the future may enable more of them to recognize bonds in plastics," Ghimire said.

In fact, a group of scientists in Japan recently discovered a microbe that looks to be pretty good at eating plastic. They might be able to help us manage some of the plastic waste, but we can help, too.

A water bottle might last hundreds of years buried underground or in a landfill, but it could have a new purpose in our own lifetime if we remember to reuse or recycle it.

Sincerely,

**DR. UNIVERSE**





# Happy half-birthday!

## Are you 70<sup>1/2</sup>?

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