

COLLEGE OF AGRICULTURE AND NATURAL RESOURCES

AG NEWS

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Haflinger horses Pistol and Pete patiently train to pull the College of Agriculture and Natural Resources sheep wagon.

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COLLEGE OF
AGRICULTURE AND
NATURAL RESOURCES



Dean Frank Galey

“Education is
not the filling
of a pail,
but the lighting
of a fire.”

William Butler Yeats

Dear Friends and Colleagues,

The USDA this winter released its latest employment opportunity projections for college graduates in the food, agriculture, and renewable natural resource fields (see www.purdue.edu/usda/employment).

Careers in our industry look very promising, especially for those with expertise in food, agriculture, and renewable resources. New openings in these fields between now and 2020 are estimated to reach 57,900 per year. The study predicts 46 percent of the openings will be within management and business, 27 percent in science- and engineering-related occupations, 15 percent in food and biomaterials production, and 12 percent in education, communication, and government services.

While employers prefer to hire graduates from these areas, program enrollments nationwide are not expected to keep up with demand. Current students in these areas are expected to fill only about 60 percent of the expected openings. Why am I highlighting these statistics? Because it underscores why colleges of agriculture throughout the U.S., alumni, and the agricultural and renewable resources industries should take every opportunity to promote our industry. Qualified, trained people can be hard to find and each of us needs to act as a recruiter for our industry.

These trends again debunk myths regarding agricultural careers. For example, in 2012 Terence Loose, a writer with Yahoo, posted his picks for “College majors that are useless.” They include general agriculture, fashion design, animal science, and horticulture. His comments triggered a nationwide response from educational and industry leaders refuting the rankings and setting the record straight.

Agriculture is a very different industry than it was 20 or even 10 years ago. It encompasses many interesting, rewarding, and productive careers. Outdated stereotypes of agriculture and those who work in the agricultural industry are still out there and influence young people who might otherwise enter our wonderful industry.

Who knows? The young person, career counselor, teacher, or youth organization leader you talk with about the exciting possibilities in agriculture might lead to another Eli Whitney or Norman Borlaug.

It is my hope that when you next sit down to a tasty and safe meal, wearing designer jeans made from 100 percent cotton and a stylish wool sweater, you share your understanding, love, and knowledge of agriculture with your dinner partners.

The study summary and career projections for various agricultural industry sectors can be found at www.purdue.edu/usda/employment.

Dean Frank Galey
College of Agriculture and Natural Resources

AGRICULTURAL EXPERIMENT STATION PRESENTS RESEARCH AWARDS

The professor who is head wrangler at the Wyoming Worm Lab and an assistant professor gaining national attention for grapevine research received research awards from the Wyoming Agricultural Experiment Station.

The awards were presented in February on the UW campus during the WAES research and extension centers planning conference.

“What can I say?” notes Bret Hess, associate dean of research in the College of Agriculture and Natural Resources and WAES director. “This year’s award winners epitomize the quality, depth, and breadth of research being conducted by our college’s fantastic faculty and students.”

Professor David Fay received the Outstanding Research Award.



Molecular biology Professor David Fay was presented the Outstanding Research Award during the Agricultural Experiment Station’s annual research awards banquet on the UW campus. Fay is director of the Wyoming INBRE Developmental Research Project Program.

His Wyoming Worm Lab uses the nematode *C. elegans* to gain insight into how genes and the proteins they encode control fundamental molecular and cellular processes during animal development. He received his Ph.D. in molecular biology and biochemistry from Yale University in 1995, and in 2001 joined the Department of Molecular Biology in the College of Agriculture and Natural Resources.

Fay is director of the Wyoming INBRE Developmental Research Project Program at UW.

Sadanand Dhekney received the Early Career Research Award and is based at the Sheridan Research and Extension Center. His research focuses on grapevine genetic improvement. He received his Ph.D. in horticulture from the University of Florida in 2004



Sadanand Dhekney received the Outstanding Early Research Award. From left, Bret Hess, associate dean of research and director of the Wyoming Agricultural Experiment Station, Dhekney, Dorothy Yates, associate vice president of research at UW, and Frank Gale, dean of the College of Agriculture and Natural Resources.

and in 2012 joined the Department of Plant Sciences at UW.

Dhekney was recipient of the 2013 Society for In Vitro Biology Young Scientist Award.

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Sadanand Dhekney received the Early Career Achievement Award during the Agricultural Experiment Station’s annual research awards banquet. Dhekney is an assistant professor of horticulture in the Department of Plant Sciences and is based at the Sheridan Research and Extension Center.



Professors KJ Reddy and David Legg in the Department of Ecosystem Science and Management were honored for having the top faculty story in *Reflections* magazine. From left, AES director Bret Hess, Professor and department head Scott Miller, Frank Gale, Dorothy Yates, David Jones, vice president for academic affairs, Reddy, Legg.

FIRST CUTTING

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Professors KJ Reddy and David Legg in the Department of Ecosystem Science and Management were recognized as having the top faculty story in the college's research magazine *Reflections*. *Reflections* is a WAES publication.

Their article titled "From wallpaper and green dresses and across the centuries to your well water" details how arsenic has affected humans, from being used as pigment in cloth to contaminating

groundwater in the modern-day West.

Entomology master's student Lawrence Haimowitz was recognized for having the top student story in *Reflections*. He wrote "Tiny wasps take big bite out of bark beetle populations." His adviser is Professor Scott Shaw in the Department of Ecosystem Science and Management.



Frank Galey, dean of the College of Agriculture and Natural Resources, welcomes those at the banquet.



UW president Dick McGinity talked about the history of research in Wyoming by the Agricultural Experiment Station and College of Agriculture and Natural Resources.

AGRICULTURAL EXPERIMENT STATION

The Wyoming Agricultural Experiment Station (WAES) kicked off its 125-year anniversary celebration during its annual Research & Extension (R&E) Center planning conference in February. The college's newly refurbished sheep wagon sported a banner with "Ag Research Transforms Life" while parked in Simpson Plaza throughout the opening day of the conference. Siting the wagon there served as a perfect backdrop for a group photo of conference attendees, notes Bret Hess, associate dean and AES director. This location also was ideal for the many students, staff and faculty members, administrators, and visitors to sneak a peek as they strolled by on their way to and from the Wyoming Union.

In addition to a keynote address from UW President Richard McGinity at the awards and appreciation banquet, the crowd was treated to a short video clip highlighting the existence and mission of WAES over its lifetime. This video clip may be viewed at bit.ly/aes125years

The refurbished sheep wagon will be pulled by a two-horse team of Haflingers at various events around the state throughout the year. Doug Zalesky and his team at the Laramie R&E Center have been working hard to prepare the horses and wagon to offer rides at various locations.

Offering rides in the sheep wagon will be one of many features at each of the R&E Center field days this summer. Attendees of the field days and possibly other events

also will have an opportunity to view a display containing videos to celebrate the WAES 125th. In addition to the video previously mentioned, a short video clip is planned for highlighting each of the four R&E centers.

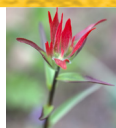
The video clips are based upon information in a book written by David Kruger, Coe Library liaison to the College of Agriculture and Natural Resources. He has done a remarkable job of detailing the history of WAES and its affiliated R&E centers in a reader-easy format, says Hess. Look for a synopsis of the book's content in the upcoming issue of the college's research magazine, *Reflections*. The book also should be available at the various events where the Haflinger team is pulling the sheep wagon.



FIELD DAYS

Take a ride in the sheep wagon and learn about our rich history and insight into current and future research.

- Powell R&E Center – Tuesday, July 19
- Sheridan R&E Center, near WYarno – Wednesday, July 20
- James C. Hageman Sustainable Agriculture Research and Extension Center near Lingle – Thursday, August 25
- Laramie R&E Center – Saturday, August 27



UW LIVESTOCK JUDGING TEAM COMPLETES SPRING SEASON WITH TOP 10 FINISHES

The University of Wyoming Livestock Judging team finished its spring season with top 10 finishes at each contest, according to coach Caleb Boardman.

“The seven individuals on the team have put in countless hours this spring to achieve what they have,” says Boardman, in the Department of Animal Science. “I am very proud of each of them and the progress they have made this spring. The potential for the fall contests is unlimited in this group.”

The first fall contest is the September 12 National Barrow Show in Austin, Minnesota.

The UW team finished seventh at the February Nebraska Cattlemen’s Classic in Kearney, Nebraska. BW Oschner, Torrington, was high individual in reasons and 11th overall, and Sadie Yates, Hesperus, Colorado, was high individual in feedlot cattle, seventh in placings and 14th overall. Tate Chamberlain, Casper, was 10th in reasons and 16th overall. Bobby Dorvall, Fromberg, Montana, was eighth in placings and 18th overall.

The team was 8th out of 26 teams and 240 competitors at the Houston Livestock Show and Rodeo.

“This was the first top-10 finish for UW at Houston since 2004 and

the highest finish since the 1995 team was also 8th,” notes Boardman. “The reasons score for the team was also the highest score for UW at this contest since 1995.”

The team was 8th in reasons and cattle and 9th in swine.

Bill Dalles, Laramie, was 6th in swine and 21st overall. Oschner was 18th in reasons, 21st in cattle and 29th overall. Dorvall finished 17th in cattle and 39th overall.

The Department of Animal Science is having a livestock judging camp June 6-8 for 4-H and FFA members, says Boardman.



University of Wyoming Livestock Judging team, from left, BW Oschner, Torrington; Bobby Dorvall, Fromberg, Montana; Sadie Yates, Hesperus, Colorado; Nolan Woodruff, Ventura, California; Bill Dalles, Laramie; Molly Diefenbach, Bellfonte, Pennsylvania; Tate Chamberlain, Casper; and coach Caleb Boardman, with Brahman bulls they judged at the V8 Ranch near Wharton, Texas.

GAMMA SIGMA DELTA HONORS OUTSTANDING STUDENT ACADEMICS, RESEARCH

Gamma Sigma Delta recognized outstanding students in the College of Agriculture and Natural Resources during its awards brunch April 23 on the University of Wyoming campus.

GSD president Associate Professor Dannele Peck in the Department of Agricultural and Applied Economics and secretary/treasurer veterinary sciences Assistant Professor Brant Schumaker presented the honors.

Outstanding student awards were presented to:

Freshman – Corinne Vaughan, Albuquerque, New Mexico, microbiology

Sophomore – Taylor Kirkbride, Meriden, agricultural business

Junior – Haley Ehrle, Shiocton, Wisconsin, family and consumer sciences, and Alanna Elder, Saratoga, agroecology

Senior – Heidi Hanekamp, Laramie, molecular biology; Katherine Jacobs, Rock Springs, family and consumer sciences; Jonathan Miller, Laramie, veterinary sciences; Blake Ochsner, Torrington, agricultural business

Masters – Amy Abrams, Newcastle, California, animal science

Doctoral – Kurt Smith, Troy, Pennsylvania, ecosystem science and management

Departmental and Program Awards

College departments and programs also presented honors.

Agricultural and applied economics – Outstanding Agricultural and Business Senior, Blake Ochsner; Western Ag Economics Association Outstanding Senior, Kaila Willis, Wheatland

Agricultural communications – Honor Book, Kacie Burns, Paonia

Colorado, Kadi Davis, Cheyenne, Matt Doonan, Bishop, California

Animal science – Honor Book, Cole Foreman, San Jose, California, Mary Lenz, Holyoke, Colorado

Ecosystem science and management – Outstanding Senior, Kelsey Welter, Aurora, Colorado; Outstanding M.S. Student, Bea Gordon, Buffalo;

Outstanding Ph.D. Student, Kurt Smith
Microbiology – Honor Book, Daulton Grube, Rock Springs, Callie Wilson, Baggs

Molecular biology – Honor Book, Sara Cisneros Laramie; Irene Rosenfeld Scientific Achievement Award, Nathan Clark, Laramie

Plant sciences – Honor Book, Jared Dillinger, Cheyenne; Hannah Dunn, Laramie; Outstanding Graduate Student, Makenzie Benander, East Greenwich, Rhode Island

Veterinary sciences – Achievement Award, Hannah Shoults, Van Tassell; Honor Book, Jonathan Miller, Laramie

New members were also inducted.

Undergraduate students

Agricultural business – Tevyn Baldwin, Emily Sikorski, Kaila Willis, Rachel Purdy

Agricultural communication – Eilish Hanson

Agroecology – Alanna Elder

Animal and veterinary sciences – Erin Bentley; Mary Lenz, Hannah Shoults

Animal and veterinary sciences and molecular biology – Melanie Whitmore

Family and consumer sciences – Sally Darden, Katharine Jacobs

Molecular biology – Heidi Hanekamp
Rangeland ecology and watershed management – Phillip Klebba

Graduate students

Agronomy – Clint Beiermann, Timm Gergeni, Austen Samet

Agricultural and applied economics – Raymond Tupling Jr.

Faculty and staff

Ecosystem science and management – Melanie Murphy

Family and consumer sciences – D. Enette Larson-Meyer



Alanna Elder, center, and Haley Ehrle receive Outstanding Junior Student awards from Gamma Sigma Delta president Dannele Peck.



New Gamma Sigma Delta members are, from left, Mary Lenz, Hannah Shoults, Katherine Jacobs, Eilish Hanson, Heidi Hanekamp, Peter Thorsness, Alanna Elder, Rachel Purdy, Kaila Willis, with Gamma Sigma Delta secretary-treasurer Assistant Professor Brant Schumaker. Not pictured, Tevyn Baldwin, Erin Bentley, Sally Darden, Phillip Klebba, Emily Sikorski, Melanie Whitmore, Clint Beiermann, Timm Gergeni, Austen Samet, Raymond Tupling Jr., Enette Larson-Meyer, Melanie Murphy.



Gamma Sigma Delta president Dannele Peck presented Kaila Willis the Western Ag Economics Association Outstanding Senior Award and the Outstanding Agricultural Business Senior Award to Blake Ochsner.



Kadi Davis, left, and Matt Doonan received Honor Book awards from Mark Stayton, associate dean and director of the Office of Academic and Student Programs. Not pictured, Kacie Burns.



Johnathan Miller, left, received the Honor Book Award and Hannah Shoults the Achievement Award in the Department of Veterinary Sciences presented by Brant Schumaker.



Mary Lenz and Cole Foreman received Honor Books from animal science department head Mike Day.



Daulton Grube, left, and Callie Wilson receive microbiology Honor Book awards from Gerry Andrews.



Taylor Kirkbride received the Outstanding Sophomore Award from Gamma Sigma Delta secretary-treasurer Brant Schumaker.



Kurt Smith receives the Gamma Sigma Delta Outstanding Doctoral Student Award from president Dannele Peck. Smith also received the Outstanding Ph.D. Student Award in ecosystem science and management.



With plant sciences department head Professor Jim Heitholt, back, are from left, Honor Book recipient Jared Sillinger, Outstanding Graduate Student Makenzie Benander, and Honor Book recipient Hannah Dunn.



Molecular biology student Sara Cisneros received the Honor Book Award and Nathan Clark the Irene Rosenfeld Scientific Achievement Award from Pam Langer, left, and department head Peter Thorsness.



Microbiology student Corinne Vaughan receives the Outstanding Freshman Student Award from Brant Schumaker, Gamma Sigma Delta secretary-treasurer.



Amy Abrams, center, receives the Outstanding Masters Student Award from Gamma Sigma Delta president Dannele Peck, right, and adviser Kristi Cammack.



Receiving Outstanding Senior Awards from Gamma Sigma Delta president Dannele Peck, right, are Jonathan Miller, Blake Ochsner, Heidi Hanekamp, and Katherine Jacobs.

UW RESEARCH SEEKS WHETHER MANIPULATING RUMEN MICROBES CAN INCREASE FEED EFFICIENCY

University of Wyoming scientists will use a \$500,000 National Institute of Food and Agriculture grant to study if microbes in the rumen could be influenced to improve beef cattle feed efficiency.

The four-year study led by Associate Professor Kristi Cammack in the Department of Animal Science will examine the effect of microbes in the rumen on calf performance. The study will also include collaborators at the University of Missouri and Virginia Tech. The first two years will be animal trials and data analysis, with DNA testing the last two years.

Feed is the greatest cost for beef producers, Cammack says, and improving feed efficiency is important to the sustainability of beef production.

Better feed efficiency in beef cattle could help a producer's bottom line and make more efficient use of grazing lands.

"Our aim is to determine how a calf's genetic background, mother, and birth environment affect the microbes in the rumen and how those microbes relate to the calf's performance in later life," she notes.

Cammack will use two biologically different breeds recognized for differences in growth rates and yield – Angus and Charolais – to determine the genetic contribution of rumen microbes. Her research will test the breed differences, the postnatal effects, and the perinatal effects.

Rumen samples will be used for DNA sequencing to determine microbial composition and fatty acid analysis.

"This information will be used to determine how the rumen microbes may be influenced to improve feed efficiency," she says.



Kristi Cammack

NIFA GRANT TO HELP TRAIN, DIVERSIFY NATION'S AGRICULTURAL WORK FORCE

A \$26,546 National Institute of Food and Agriculture grant to Professor Jim Heitholt is one of fourteen 2015 projects to help train and/or diversify the agricultural work force.

Heitholt, head of the Department of Plant Sciences, says this planning grant will bring collaborators together from community colleges in Wyoming, Colorado, and Montana, along with the University of Wyoming and Montana State University, to develop courses to attract under-represented populations for agricultural careers.

"There is a general consensus, nationwide, that U.S. agricultural industries can only achieve their full potential by better diversifying their workforces, and this project expects to contribute to that cause," says Heitholt.

Those courses will be organized into specialties, including livestock and dairy, crops and forages, horticulture, agricultural mechanization, and natural resources, notes Heitholt.

A more comprehensive grant then will be submitted for moving from planning to implementation.

The group would work with community colleges so a student's first agricultural-related course, called "Exploring

Agriculture," focuses on actual job activities. Options would include a selection of courses with no classroom lectures but instead several one-day, hands-on experiences, says Heitholt.

He predicts the program will enroll students who might not otherwise consider taking an agriculture course.

An indirect benefit will be improved recruitment and curriculum quality not only for the participating colleges and universities but also for other schools that choose to use this model, he says.

Increasing the number of under-represented students who complete bachelor degrees in agricultural sciences is the short-term goal, with diversifying the work force the overall objective.

"Once under-represented populations compose a greater portion of our nation's trained agriculturalists, our agricultural workforce will achieve the diversification necessary to supply the world with a safe and abundant food supply," Heitholt says.



Jim Heitholt

UW PROFESSOR HONORED FOR MAKING RANGELAND SCIENCE AVAILABLE TO ALL



John Tanaka

The United States Agricultural Information Network (USAIN) in April presented honorary membership to John Tanaka of the University of Wyoming in recognition for making rangeland science more

widely accessible, collecting local knowledge, and strengthening knowledge networks.

Tanaka is a professor and associate director of the Wyoming Agricultural Experiment Station, which oversees all research in the College of Agriculture and Natural Resources, and director of the James C. Hageman Sustainable Agriculture Research and Extension Center (SAREC) near Lingle.

Tanaka and Karen Launchbaugh, professor and director of the Rangeland Center at the University of Idaho, developed Range Science Information System (RSIS), an online bibliographic database of more than 1,400 journal articles and other documents about range management in the United States.

The RSIS provides summaries of articles and provides links to most.

“The RSIS bridges the digital divide between the scientific community and land managers and owners,” notes Sarah Williams of USAIN.

The term rangeland encompasses many open-space habitats grazed by domestic animals and wildlife. RSIS links to articles on rangelands such as Rocky Mountain grasslands, Alaska highlands, Nebraska Sandhills, Kentucky bluegrass, and Gulf Coast prairies and marshes.

Tanaka is also leading Discovering our Nation’s Rangelands, a project to collect oral histories and local knowledge from ranchers and land managers. The project is funded by a grant from the USDA National Institute of Food and Agriculture.

The third awardee is George Ruyle, University of Arizona professor and Marley Endowed Chair for Sustainable Rangeland Stewardship.

All were recognized for helping the Rangelands Partnership (bit.ly/globalrangelands) connect librarians and rangeland scientists and making range science available to researchers, educators, students, and land managers.

The Rangelands Partnership is a collaboration of 19 Western and Midwestern land-grant universities in cooperation with national and international partners.

The honorary memberships were presented at the USAIN 15 Biennial Conference in Gainesville, Florida.

For more information, contact Tanaka at (307) 766-5130 or jtanaka@uwyo.edu.

Forensic entomology students learn how insects help determine postmortem interim

There are no quick answers, contrary to television forensic super sleuths

Chinese peasants ordered by the local inquest official to gather together with their sickles that hot day in 1225 little knew they would be remembered across the next seven centuries.

Authorities were investigating the murder of a man whose body was found by the roadside, slashed 10 times bearing wounds similar to those that could have been made by a sickle used to harvest rice. Nothing had been stolen from the man, and the inquest official suspected a personal attack – not a stranger.

When questioned, his widow said that, until the murder, her husband had

had no enemies. There had been a man who had come to their house, asking to borrow money, which he did not get. But there were no bitter enemies, she said.

So, the investigating official ordered the nearest neighbors to submit their sickles for examination. Anyone concealing a sickle would be considered the murderer and investigated.

More than 70 sickles were laid on the ground that hot day. Flies quickly gathered on one sickle, that of the same man who had wanted to borrow money. He would not confess. The investigator pointed out that the other sickles had no flies, that there were traces of blood on this man's sickle that caused the flies to gather.

The owner then confessed, leaving the “bystanders speechless, sighing with admiration,” wrote Sun Tz’u, a judicial

intendant in 12th century China, in his book “The Washing Away of Wrongs,” written about 1247 or 1248, according to most sources.

Taking Clues from Insects

The work is recognized as the oldest book on forensic or legal medicine in any civilization and carries cheery chapter titles such as “When the head and trunk are in different places,” “Deaths by beating and choking passed off as suicide by hanging,” and “Holding inquests on bodies too decomposed to serve as evidence.”

Bodies were sometimes manipulated in ways to throw off investigators.

There’s no fooling insects, though.

Blowflies lay eggs on a body or carcass – sometimes within seconds of death – and the length or weight of a larva helps determine time since death or postmortem interval.

College of Agriculture and Natural Resources entomology Professor David Legg and laboratory assistant Judi Diamond present their forensic



Ariana Strasheim of Arvada, Colorado, fine-tunes an image.



Forensic entomology students practice identifying various insects in the fourth floor room of the College of Agriculture Building the week before finals.

entomology course every other spring. A green-bodied blowfly with red compound eyes peered at those looking at this year's class announcement, posted in various departments across campus and proclaiming in bold letters, "Your witness is not just a fly on the wall. Learn how collection, preservation & analysis of insect evidence can solve a murder."

The class draws students from across campus: anthropology, criminal justice, and entomology. One former student was on a career path for the FBI, and a student this semester is on track to become a pathologist.

Students learn television shows like "CSI," "NCIS," and "Bones" don't accurately show viewers how the investigative process works.

"If you watch 'Bones' and see Hodges haul something out of a maggot mass and say, 'This is such and such and that means this person died three days ago.' That's hooey," says Legg, clearly amused. "You can't do that. One thing I tell my students over and over again, you don't pull a maggot out of a mass and say, 'The egg of this species was laid three days ago.'"

"But I'm particular about that," and he later adds, "The wriggling larvae are

probably something they found on set or at a bait store."

Class Fills Entomology Niche

This is the fifth time the class has been taught, the first in 2008. The class was born out of necessity. Professor Emeritus Jack Lloyd had taught a veterinary/entomology course and medical entomology course but had retired. Legg had a student, Mary Murrietta, develop the class to use the specimens and partially make up for Lloyd's departure in the department. Murrietta's course outline and development was used as her master of science thesis.

"I wasn't sure if there was an interest or a need from outside groups," says Legg, "but as it turned out, there were quite a few students interested in the class. Not hundreds, but 10, 12, 15 students take this course every time."

Lisa Collins of Vallejo, California, is majoring in criminal justice and physiology with a concentration in forensic science. She's on track to become a pathologist.

"I think anyone attracted to the field of forensic science can appreciate a good mystery," she says. "I had an internship with the Teton County coroner in Jackson last summer, and I found it absolutely fascinating how much a body could tell a pathologist."

The students learn to listen.

Determining Postmortem Intervals

Legg and Diamond teach the course from an ecological and biological perspective. Students learn how to calculate postmortem intervals and fly taxonomy ("Because flies are arguably the most important group of insects that find and colonize cadavers. They are the first," notes Legg).



Professor David Legg began teaching the forensic entomology class in 2008. The course is offered every other year.

They have to learn how to collect and identify and, if they had to, are told how to raise the insects through adulthood at which time they then can be identified.

"We don't raise them in class," Legg adds. "If we did, we'd probably be kicked out of the building because the kinds of materials we would have to raise them on would stink to high heaven."

There are six body farms in the U.S. at which bodies are placed outdoors. How the body decomposes and what insects are attracted and when are studied to provide insights to help law enforcement bring killers to justice – or determine time of death in unsuspicious circumstances.

Such body farms are at the University of Tennessee, Knoxville, Western Carolina University, Sam Houston State University, Southern Illinois University, Carbondale, Colorado Mesa University, and Texas State University.

Students from Diverse Majors

Collins will study at Colorado Mesa University.

"It was really interesting to learn about the process of decomposition," she says. "There is a lot more to it than I previously thought. I also really liked learning about how forensic entomologists collect their specimens from a crime scene."



Amanda Edgerton of Yale, Michigan, selects specimens during insect identification practice.

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Flies and other insects behind Anthony Natale of Sauquit, New York
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They must take nine different temperature readings both on, underneath, and near the body to determine or rule out certain insects, she says.

“It was really surprising to me that some insects migrate away from a body to pupate, so the forensic entomologist has to look within a radius of at least six meters to find these specimens,” adds Collins.

Anthropology student Ashley Dafoe, who has taken forensic anthropology, says there’s somewhat of a crossover between that field and forensic entomology, such as survey methods.

“If you find a skull, how do you go about finding the rest of the person?” she asks. “You use the same thing in forensic entomology. You need to find the rest of the person to find the rest of the bugs. A lot of the survey methods are the same:

how you walk into a site, how you walk out of a site, what are you reporting, what are you paying attention to.”

The laboratory side is different: forensic entomologists work with living larvae while forensic anthropologists work with dead people.

Blowflies arrive first, depositing eggs, larvae hatch and, describes Legg, “Away they go.” Skin beetles are the last to arrive. Forensic entomologists need to know the group of insects or mixture of a group of insects for a particular location at a particular time of year to give a reasonable idea when an individual or animal died.

During the latter part of the semester, Legg shows students how to use statistics – nonlinear regression and categorical data analysis – to help determine the postmortem interval, but the process starts with finding the biggest larva and measuring lengths over time.

That’s providing the entomologist knows what type of insect it is. Fly taxonomy is a big part of the class.

“I didn’t know flies were so hard to identify,” says Dafoe. “There are the big black ones, the little green ones. There are six different kinds of little green ones



Ashley Dafoe, Thornton, Colorado, an anthropology major, says there are some similarities in procedures between forensic anthropology and forensic entomology.



Agroecology major Jordan Ibarra and linguistics major Madison Pass, both of Laramie, look for specimens to identify in preparation for the class final.

that eat people and thousands of other kinds that do other things.”

Collins says a lot of her aha! moments are in the lab. Identifying anatomical parts of insects bewildered her at times. “Dr. Legg described a golf-club like shape called a haltere on the flies,” she says. “It’s used to help stabilize flight. For the life of me I could not find that thing as it’s sometimes tucked close to the side of the fly’s body.”

When Legg pointed it out, “I was thinking, ‘Oh that’s where it is!’ It was just pretty cool to finally see some of the parts I was looking for, and after that it’s really hard to miss, of course.”

Energy Ecology Connection

Ecology Ph.D. student Michael Curran, who studies restoration ecology associated with natural gas and oil development, was finding the class generated a lot of questions. He likes that.

“I had a bit of an idea what the class would be about, but I had no idea of how broad or new the field is,” he says. “I figured forensics only was used in perhaps murder cases or death cases,

but I’m finding out it’s been used in cases, for example, of unexplained car accidents, that it may have been caused by a wasp flying in the car.”

He took the class for its insect identification component.

“One of the things I’m getting excited about is I’ll find some of the more forensic important insects in some of my sweep nets used at well pads and pipelines,” says Curran. “Is that certain fly there because of some dead rodent on the well pad I didn’t think to look for? The class helps in that sense. Dr. Legg makes the class fun.”

Diamond Polishes the Class

The class wouldn’t be the course it is without specimens. Legg is profuse in his appreciation of Diamond and her laboratory efforts. Diamond says learning insect biology was on her bucket list, and she took the class the second time offered.

She had a bachelor’s and master’s in geochemistry and geology, was living in Laramie, and wanted to keep busy.

“And I was just looking for a side project to do and thought this would be something fun,” she says. “There was a collection of unidentified flies and beetles, and I think I just got started trying to ID them as a special project.”

Diamond’s role evolved, says Legg. The goal was to get the collection in shape in time for the next class and offer something lab-like for students.



Judi Diamond visits with entomology master’s student Lee Noel of Dakota Dunes, South Dakota. Diamond took the course the second time offered, then began to develop a laboratory component to the course. David Legg is profuse in his praise of Diamond.

Legg asked various entomologists for specimens and those, along with some from his personal collection, are helping students learn insect identification.

Now, Diamond is trying to get samples of beetles and has received specimens from as far away as Florida and Washington state.

“The collection would not have happened had Judi not come along when she did,” says Legg. “It is an excellent addition to the course.”

There’s no predicting the life expectancy of the class, as retirements and cutbacks come into play.

“I think the course will be offered as long as Judi and I are here,” says Legg. “If either one of us is eliminated through cutbacks, then I’m not sure what’s going to happen. I’d find it difficult to teach the course without her assistance. She’s been really involved in the collection part and executing the lab. It would be really hard to offer the course if my degree program is eliminated.”

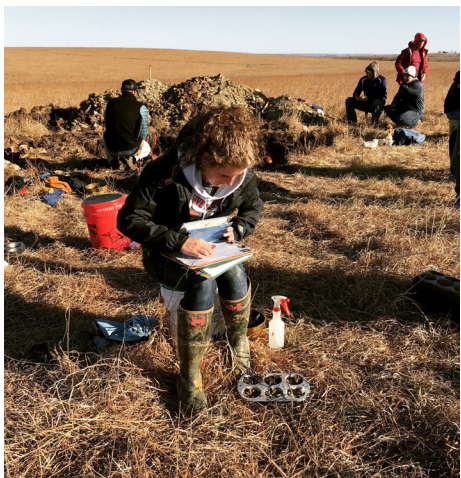
See more photographs at bit.ly/entoclass.



Criminal justice major Anthony Natale, foreground, and linguistics student Madison Pass



Stephen Schierman in a soil pit.



Casey Boyer studies soil data.



From left, soil judging team members Sam Singleton, Alex Foulk, Casey Boyer, Stephen Schierman and assistant coach Erin Rooney at the national soil judging competition at Kansas State University, Manhattan, Kansas.

National soil judging competition UW team's first competition

The college's newly formed soil judging team outperformed its Colorado State University and Oregon State University regional counterparts at the National Collegiate Soil Judging Competition April 3-8 at Kansas State University in Manhattan, Kansas.

The team of Sam Singleton, Wheatland, Alex Foulk, Erial, New Jersey, Casey Boyer, Somerset, Pennsylvania, and Stephen Schierman, Riverton, finished 18th among the 23 universities, and Boyer placed 28th out of 159 students.

Assistant Professor Karen Vaughan in the Department of Ecosystem Science and Management coaches the team with assistant coach and graduate student Erin Rooney, Fort Collins, Colorado.

"When students walk away from that one-week trip at a national contest, I hear things like, 'I learned more in that one week than all semester,' and I might have been the professor," says Vaughan, who has 11 years of experience guiding students on soil judging teams. "I don't take it personally. The contest is immersion, repetition, it's real and there is so much science back to back."

Students spent four days in practice pits described by Natural Resources Conservation Service soil scientists. Students then competed in the two-day contest describing three soil profiles individually, then conducted two soil profile descriptions as a team.

Their descriptions are compared to those of the area experts.

Vaughan had planted the idea of creating a soil judging team with her 2015 soil morphology and genesis class and hooked several students. Team members are connected with the Soil and Water Conservation Club at UW.

The team practiced weekly starting in early January by learning about the soil properties of the contest location in the Flint Hills surrounding KSU.

"Ninety percent of the learning occurs in the field," says Vaughan, who has participated in soil judging as an assistant coach or coach three years at the University of Maryland and four years each at the University of Idaho and at Cal Poly.

While students practice weekly, the avalanche of learning happens at the contest, she says.

"The student learning that happens is phenomenal," says Vaughan.

Students descend into soil pits to document the morphology and characteristics of the whole soil, including wetness class, water holding capacity, hydraulic conductivity, and soil taxonomy. Site characteristics described include landform, parent material, slope, surface runoff, rangeland ecological site, and interpretations for the suitability of septic tanks and basements.

During the individual contest, one member from each of the 23 universities competing joined one

another in the soil pit with as many as 25 rotating through at a time.

“The real challenge is they must do this in 60 minutes,” says Vaughan.

The speed is practical, to get all the students through, but also part of the competition.

“If you don’t know it in an hour, you probably don’t know it,” she says. “The competition side of you forces you to learn, and you want to do well. It’s a necessary evil. They like it. It’s stressful but kind of a neat process. You’re with 100 people doing the

same thing. You’re not surrounded by soil scientists like that in any other setting.”

Most schools must compete in a regional contest to qualify, but because only three schools in the northwest region fielded teams, the rules state there was no need for a regional competition. Idaho, Montana, Utah, and Washington were not represented at the competition.

Two of the four team members return next year, and Vaughan adds

there is momentum going into 2016-17. This year’s team members had applied for and received SEND (Student Engagement and Networking Drive) grants through the college. They will again next year, and joining the soil club should add further energy.

“The team size is only limited by available funding, so we will work harder next year to solicit outside funds,” she said.

“Without a doubt it’s happening next year.”

Plant science posters, papers win top honors in Albuquerque competition

Three University of Wyoming students took top honors for posters and papers at the 2016 meeting of the Western Society of Weed Science in Albuquerque, March 7-10, says Associate Professor Andrew Kniss in the plant sciences department.

Carl Coburn of Cincinnati, Ohio, earned first place in the poster category for “Methods for

Confirming Resistance to Different Herbicide Modes of Action: Does One Size Fit All?”

Second place was awarded to Albert Adjesiwor of Asesewa, Ghana, for the poster, “Physiological Mechanisms of Shade Avoidance Response in Beta Vulgaris.”

Coburn took second in basic biology and ecology papers for

“Experimental Methods for Confirming Resistance to Synthetic Auxin Herbicides.”

Second place for agronomic crops papers went to Clint Beiermann of Big Piney for “Effect of Winter Wheat Stubble Height on Dry Bean Growth and Development.”



Carl Coburn



Albert Adjesiwor



Clint Beiermann

Lamarck, Darwin would probably high five each other despite theory chasm

Mentioning Jean Baptiste Lamarck and HIS theory of evolution during the celebration of Charles Darwin's birthday February 12 might have drawn snickers from the "survival of the fittest" faithful.

After all, didn't Lamarck suggest organisms altered their behaviors in response to environmental changes and that changed behavior in turn modified their organs and then those traits were passed along to their offspring?

Ridiculous, say Darwinists, who have the dour claim individuals are fixed and unchanging.

Not so fast, according to Steve Ford, professor and Rochelle Chair of reproductive biology and fetal programming at the University of Wyoming. He probably won't call for celebrating Lamarck's birthday August 1 (1774), but Ford's

epigenetics work with University of Wyoming sheep validate at least some of Lamarck's concepts.

Lamarck vs. Darwin

Lamarck's 18th century theory says organisms get more complex as time passes, and an organ is lost if not used. If that organ or an organ with a different function is needed later, that would develop. Darwin did agree with the organ description, notes Ford.

"The big difference between Darwin and Lamarck was Lamarck's theory was user- or person-friendly," he says. "It suggests an organism could control its own fate."

Lamarck theorized an organism is driven by an inner need. And this is where snickers start among the Darwin crowd. A giraffe with a short neck would keep stretching to reach

higher leaves, its neck becoming progressively longer, and that trait was passed on to offspring.

It wasn't as simplistic as that, says Ford.

"His hypothesis did suggest, however, that an organism directly controlled beneficial phenotypic changes in its offspring," he says. "The offspring would be improved based on the environment in which its parents were subjected."

Ford notes Lamarck's thesis was that the environment in which an animal was subjected could alter traits expressed by offspring. Not millennia ahead, but that the mother could somehow send the information to her offspring during development.

That's not on Darwin's timescale.

Center's Commitment

Ford, with Peter Nathanielsz, helped establish the Center for the Study of Fetal Programming at UW in 2002. The center has a double mission, a commitment to developing understandings leading to the production of healthy, high-quality livestock while at the same time applying this understanding to improve the health and longevity of human babies.

Nathanielsz is the core scientist and Distinguished Professor of Life Course Health at the Southwest National Primate Research Center in San Antonio, Texas, and a faculty member in the UW Department of Animal Science.

In 2013, National Institutes of Health awarded a five-year, \$1.5



Steve Ford, right, professor and Rochelle Chair of reproductive biology and fetal programming at UW and director of the Center for the Study of Fetal Programming

million grant to Ford for research to find ways to stem obesity, now classified as a disease, in the U.S. and around the world.

“Some of the experiments we’ve run suggest you could change an individual’s phenotype in the next generation, and you can do that because the environment will change the way genes are expressed,” says Ford.

Genes can be turned on or off – or silenced – a variety of ways, like a series of switches. The phenotype is changed – not an organism’s DNA.

Epigenetics Piques Interest

Epigenetics, the study of the biochemical reactions that activate and deactivate parts of a genome at strategic times and in specific locations, was in its infancy when Ford joined UW in 2001.

Trained in classic genetics concepts, Ford was trying to convince himself one way or another whether an altered in utero environment could permanently change gene expression patterns in the fetus when he conducted the UW sheep experiment involving animals with the same genetic background but living in two extreme environments.

“I thought I’d see a little effect but not the effect I saw over that relatively short period of time,” he says. “That experiment really got me interested in epigenetics.”

A portion of the UW sheep flock was separated more than 30 years ago, some staying at UW and living in relative luxury and the other sent off to the harsh conditions of the Baggs area in south-central Wyoming. The Baggs sheep not only survived, their offspring thrived.

The mothers responded to the harsh conditions by modifying the

fetuses so they could survive in those conditions. Even though the mother was severely undernourished during pregnancy, her lamb when born was healthy and vigorous and developed normally throughout its lifespan.

Gene Expression at Work

Ford believes environmentally induced epigenetic changes in gene expression were at work in an attempt to optimize offspring survival.

He determined from this study that, in a few generations, the Baggs sheep had altered their placental structure and function, increasing nutrient transport from mother to fetus so the fetus developed normally in a mother who was severely nutritionally deficient.

“That is Lamarckian because it suggests to me the placenta is able to change its phenotype in response to a nutrient-deficient maternal environment,” he says.

Ford and his collaborators hypothesize a signal from the fetus and/or mother is responsible for altering placental phenotype, and this is transmitted across generations epigenetically.

Environmentally induced changes in offspring phenotype would allow a relatively rapid (on an evolutionary scale) adaptation of an organism to a new and potentially stressful environment.

“While the specific environmental cues which facilitate these phenotypic changes are at present unknown, we have confirmed that they are passed on from mother to offspring to increase its chances of survival,” notes Ford.

The specific mechanisms involved are under study.

CAN CLIMATE CHANGE ALTER PHENOTYPE?

Says Ford, “The environment in which an animal is exposed (increasing or decreasing temperatures) during pregnancy could affect its diet and/or the availability of food (overnutrition or undernutrition), and thus can program the fetus in utero. Thus offspring born may have an altered phenotype resulting from this environmental change. These new phenotypes may help offspring adapt to alterations in their environment. One cannot discount that past changes in the earth’s climate may have already altered the phenotype of previous generations. This may be one method whereby a mother can pass along information to her offspring in utero about changing environmental conditions to increase its chances of postnatal survival.

AFTER THE ARTICLE

Since the article was first written, Professor Steve Ford has passed along information about related articles in scientific journals.

“Paper that confirms very quick epigenetic changes in gene expression with domestication. Closer to Lamarck!” (Nature Communications, February 2016) <http://bit.ly/domesticationexpression>

And,

“The major conclusion of their paper published in Science is that ‘a single locus facilitates rapid diversification’ of a phenotypically important trait such as beak size, and that this change is facilitated by environmental factors such as resource competition. It seems to me that this is very close to a Lamarckian idea!” (GEN April 22, 2016) <http://bit.ly/beaksize>

PISTOL AND PETE TURN BACK THE CLOCK TO 1891

College's draft horses pull sights, sounds of past into present

This mobile University of Wyoming billboard boasts two horsepower and will be viewed across the state this year and foreseeable future.

Haflinger horses Pistol and Pete will patiently pull the College of Agriculture and Natural Resources sheep wagon, refurbished with new canvas and sporting new logos and lettering, in parades and at other venues, promoting the 125th anniversary of the Wyoming Agricultural Experiment Station (AES).

But on this early spring day far in advance of hot-pavement parade weather, snow was falling on already white-clad fields surrounding the Laramie Research and Extension Center west of Laramie. The muffled

sound of heavy hoofs casually shifting position on cement came from the open door of a storage building. Pistol and Pete were standing patiently, haltered, each with a back hoof angled, hip shifted, resting, waiting for harnessing.

Mobile Brown and Gold

The pair's color scheme may not be the OFFICIAL institutional color tones mandated by the University of Wyoming marketing team, but there's no doubting the two Haflingers represent the university with their brown and gold hair and mane.

Travis Smith, manager of the center's beef unit, rounded the door and came inside, wearing sunglasses and his cap's flaps over his ears against the cold and began getting the



Travis Smith prepares to unhitch Pistol and Pete, muddy after their Friday afternoon cattle feeding.

pair ready for the afternoon alfalfa feeding of cattle.

The AES, housed in the college, directs operations at four research and extension centers in Wyoming: Laramie, near Lingle, Powell, and Sheridan. Pistol and Pete are expected to put in appearances at the centers' field days this summer and at other venues across the state, pulling the college's revamped sheep wagon and offering rides on a flatbed trailer.

The AES obtaining the Haflingers "was pure, dumb luck," Smith had said earlier, and smiled.

Laramie center director Doug Zalesky believed the college should make more use of its sheep wagon



A muddy yard didn't sap Pistol and Pete's exuberance on their way to the pasture feeding.

– a symbol of Wyoming’s ranching heritage that had been sitting idle at the Laramie center – to promote the AES 125th anniversary and the college.

Zalesky received the go-ahead from AES director Bret Hess and Frank Galey, dean of the college, to revamp and use the wagon.

“Some things needed to happen,” says Zalesky, based at the Laramie Livestock Center near the Cliff and Martha Hansen Teaching Arena. “One, we needed to find a team to pull it, and two, we needed to update the logo and the wording to the College of Agriculture and Natural Resources.”

Smith says the two outlined what they wanted in the team: a smaller-framed draft horse broken for the purposes for which they would be used.

“We came to the conclusion a nice set of Haflingers would be ideal,” says Smith.

A Circle Back to Home

The breed, which originated in present-day Austria and northern Italy, has a gentle disposition and is easy to handle and travels easily.

“We started looking for parade-broke Haflingers, and it went downhill from there,” Smith says.

They checked Pennsylvania, Ohio, and the closest set was in Missouri.

Meanwhile, Smith had contacted Ty Blake at Wyoming Wagon Works in Laramie to ask a few questions about the wagon.

“At the end of the conversation he said, ‘So, I suppose you are looking for a team of horses to pull it?’ Without knowing what we were looking for, he said, ‘I might have a deal for you. I’ve got a team of pretty well broke Haflinger geldings here, and I’m not using them. And I’ll sell them with the



Students usually help feed, but they had Friday afternoon classes this spring semester.

harness – but I have to break it to you, it’s a parade harness and not a work harness.’ ”

Smith asked if Blake had been reading Smith’s emails, “And he said no,” Smith says, and laughs. “Doug and I went out a night or two later, and they were exactly what we were looking for. Right here in Laramie.”

The pair had belonged to the late Dean Alexander, a local whose family had expressed to Blake they preferred if the team could stay near Laramie.

The pair will but will soon be traveling across Wyoming to various

venues. Pistol and Pete have been exposed to highway traffic, have been switched from one side of the harness to another, used to feed cattle this winter – and driven past pigs.

The swine bothered them a little.

“Which is fairly common,” says Smith. “I don’t know what it is about swine, but saddle horses are commonly afraid of pigs as well.”

Not for the Weak

Smith guided via reins the fully harnessed Pistol and Pete to the

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Sounds of harnesses and wagon wood squeaking brought cattle running.



Pistol and Pete – and Travis Smith – gave rides at a Cinco de Mayo celebration in Laramie.

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flatbed wagon already holding large hay bales. All three slopped through mud. Pistol and Pete knew what they were supposed to do, but apparently wanted to hassle Smith a little by coming up over the tongue at odd angles.

They gradually got situated, and Smith hooked the harnesses to the wooden evener with single trees, climbed aboard the trailer, and the pair leaned into the load, full of extra energy despite the flatbed tires sinking into the mud. Smith circled them a round in the yard before heading

out to the pasture, the spirited pair showing no signs of slowing. The cattle heard the noises of harnesses and the flatbed and came running, calves in tow, although the young calves might not have known what all the fuss was about.

Smith held the reins in one hand while using the other to feed slices off the bale. A student worker would usually be helping, but this was Friday afternoon, and all the students had Friday afternoon classes.

The only noise was the harness, an occasional groan from the wagon of wood against wood, and the huffing of Pistol and Pete. Otherwise, there was snow falling, cows eating, an occasional bawl of a calf, and nothing else.

“The number-one question I got when the word got out we were bringing in the team was why feed with a team of horses when you have all the

nice equipment out here?” says Smith. “I tell them I can still feed with nice equipment when I have to, but I get to feed with the team. It’s not a curse. It’s an enjoyable, kind of a relaxing part of my day.”

1891-2016

The team and wagon connects modern-day Wyoming to when the AES was started in 1891, only one year after the last soldiers left the decommissioned Fort Laramie and one year after Wyoming was admitted to the union.

Ranches dominated the state’s landscape, as they still do.

“In Wyoming there are a lot of cattlemen who are sheep producers and vice versa,” says Zalesky. “There are sheep wagons all over, and I think a symbol of agriculture in the state of Wyoming.”

The sheep wagon, says Smith, is a billboard that also connects UW to Wyoming’s heritage.

The next feeding stop by Smith that Friday was to animals definitely not in historical Wyoming – half yaks. He circled once or twice, feeding the livestock, and headed Pistol and Pete across the stark, white, silent pasture back to the haven of the barn. Smith unhooked them from the empty wagon, and they made their way to the barn, where Smith took off the harnesses and brushed their coats of brown hair before taking them – this time Smith leading – to their corrals and freedom.

“It’s a piece of our heritage to have a horse-drawn wagon represent the college and the University of Wyoming and maybe connect the modern-day agricultural experiment station with the original ag experiment station,” he says.

See more photographs at bit.ly/waeshafingers.



The college’s sheep wagon sports new canvas, updated logos, and lettering.

WYOMING STATE VETERINARY LABORATORY INVESTIGATES HIGH-STAKES DISEASES IN COWBOY STATE



Situated next to I-80 at exit 311 in Laramie is the Wyoming State Veterinary Laboratory (WSVL). Here, 30 faculty and staff members and 25 to 30 university student employees work to diagnose disease in domestic and wild animals and to protect animal and human health.

Last year, they handled 21,420 cases, including screening tests for transmittable animal diseases.

An aborted calf, an elk found dead, suspected chronic wasting disease in a hunter's kill, the sudden loss of a companion animal: what these have in common is someone needs an answer.

Merl Raisbeck, now-retired toxicologist and professor emeritus, wrote up a case of equine poisoning.

A quarter horse gelding was presented to the local veterinary clinic with hind limb ataxia [loss of movement], elevated heart rate, and marked discomfort while standing. The horse was treated while lab work was initiated and improved enough to be released the following day; however, a mare in the same herd died overnight.

The affected horses were from a group of 30 maintained on grass pasture supplemented with cake. Several, including the mare, had been ridden the day before the onset of signs, and none were noticed to be ill.

Eighty to 100 Accessions a Day

Samples come by mail, including Saturdays, and by parcel service and walk-in delivery. They arrive preserved in fixative or chilled in coolers: blood, surgical tissues, organs, and entire animals. Testing may involve environmental samples such as bedding, water, forage, and feedstuffs.

Heading the WSVL is William Laegreid, professor and head of the Department of Veterinary Science, of which the laboratory is part. The WSVL is a 365-day-a-year operation.

"We get calls where someone says, 'I've got something really crazy going on,' so we have people at the lab even on Sundays and holidays," he says.

For cases involving large animals or multiple disease deaths, the client – typically an owner or veterinarian

– might pull a stock trailer around to the back of the brick building. Live animals are examined by WSVL veterinarians, carcasses hoisted onto a rail and moved inside for a complete

necropsy (examination of the dead body).

"Few people are happy to be here," observes Laegreid, as he stands by the door. An aborted calf might be a random event, or it might be the first of 50 that could bankrupt a rancher. A dog, cat, or horse might have died unexpectedly.

The veterinarian visited the ranch to do a necropsy on the dead horse and observed at least one other horse showing signs similar to the first case. This horse was treated but became recumbent, grinding its teeth and in apparent pain, and after five days had to be euthanized.

Necropsy of the first horse to die was unremarkable except for diffusely petechiated lungs [spotted from bleeding into the tissue]. Samples were submitted to the WSVL for testing, with a tentative diagnosis of ionophores, mycotoxins, or botulism.

[An ionophore is a lipid-soluble substance capable of transporting specific ions through cellular membranes. Small quantities of ionophores may be added to ruminant animal feeds as antibiotics or to increase feed efficiency and body weight gain in cattle.]

Diagnosis Begins

Staff members open boxes and remove samples and accession forms, also called history sheets, which detail contact information, test orders, and history of the problem.

With accession numbers assigned, samples are routed directly to the appropriate sections for testing or they undergo further preparation.

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Jacob Chaloupka (left), a UW pre-vet student and WSVL employee, logs in samples with laboratory technician BreAnna Bonner.

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Besides histology (microscopic reading of biopsies and necropsy specimens), are serology, toxicology, virology, bacteriology, parasitology, clinical pathology, and genetics testing.

The WSVL provides regulatory testing for diseases such as brucellosis and equine infectious anemia (EIA). Because a negative Coggins test (no antibodies for EIA) is required to transport horses across state lines, demand is steep during show season. This test is performed from a simple blood sample.

In contrast, processing tissue for microscopic examination is “pretty involved,” says Laegreid. Most people can picture sample collection and microscopic examination but miss the steps in between. Occasionally, processing starts with a cleaver and butcher block.

How an incoming sample is trimmed might determine if the margins of a tumor can be seen and whether the type can be identified. A WSVL tissue trimming technician or students cuts sections, places them in plastic cassettes, then sends them to histology to be embedded in paraffin, stained and made into

microscope slides. “A lot of skill is required,” says Laegreid.

In March, the WSVL was reaccredited by the American Association of Veterinary Laboratory Diagnosticians after an eight-month review found that personnel, practices, equipment, and facilities meet the highest professional standards.

Microscopic lesions consisted of intense pulmonary congestion, diffuse splenic congestion, and scattered renal tubular necrosis. Sections of myocardium were unremarkable. Microbiology isolated only common contaminants; serology and virology were negative for EHV-1 [equine herpesvirus 1] and EVA [equine viral arteritis], and virus isolation on rabbit kidney cells was unrewarding.

An outside lab that analyzed samples of the range cake reported they contained 220 ppm monensin. [Monensin is a commercially available ionophore; the lethal dose in horses is approximately 1/100th that of cattle.] Analysis of a separate sample by the WSVL toxicology lab identified 250 ppm.

The operator of the feed mill that produced the cake insisted the cake couldn’t be contaminated as, “We don’t even keep monensin on the premises,”

and requested a split sample for his own lab.

Subsequent analysis of other dietary components (e.g., mineral supplements) did not detect monensin (<10 ppm), but stomach contents from the first dead horse did contain 1.4 ppm.

Teachers, Technicians, Students, Collaborators

At the WSVL, Mitchell Szymczak determined the morphology of the little-known Rio Grande virus using negative contrast and thin-section electron microscopy. He identified antigenic cross-reactions between Rio Grande virus and Rift Valley fever virus, a human pathogen, and in 2015 published the groundbreaking work in a peer-reviewed medical journal with WSVL professor and veterinary virologist Myrna Miller. What makes this extraordinary? He did it while an undergraduate student at UW.

As important to the WSVL mission as diagnosis are animal disease research and education for students, veterinarians, and others with a stake in animal health.

UW students from the veterinary science program work in paid positions side-by-side with highly trained technical staff and faculty members who are veterinarians and researchers. “We couldn’t really function properly without these students,” says Laegreid. “They are an integral part of what we do.”

Opportunities are not limited to UW students. Veterinary students come for preceptorships (mentoring) from institutions throughout the United States and Europe.

A big component of research at the College of Agriculture and Natural Resources is directed to how diseases are maintained and passed between wildlife and livestock populations. Disease ecologists, epidemiologists, and virologists are working on brucellosis and problems such as chronic wasting disease in deer and elk.

WSVL faculty and staff members and students discovered five previously unknown viruses in 2015. Miller discovered Spring Creek virus in swallow nests in Laramie while



Jessica Jennings-Gaines, a wildlife disease biologist with the Wyoming Game and Fish Department, conducts diagnostic testing for chronic wasting disease. The WGFD conducts about 60,000 of the tests annually, mostly from samples collected from hunters in the fall.

looking for a virus closely related to more serious viruses such as equine encephalitis viruses. It has now been sequenced, and Miller is in the process of publishing the findings.

The Wyoming Game and Fish Department (WGFD) maintains a separate but integrated laboratory in the building. The two programs often work cooperatively on wildlife cases.

“We have a great relationship,” Laegreid says. “I don’t know of any other diagnostic lab where the game and fish equivalent is co-located.”

This case points up one of the big problems in the diagnosis of monensin poisoning from real-world samples. The equine single oral LD50 [Lethal dose for 50 percent of a test sample] of monensin is commonly cited as being between 1 and 3 mg/kg, although in our experience the minimum lethal dose is probably closer to .1 to .5 mg/kg.

Accidental contamination of a feedstuff, by definition, results in very heterogeneous concentrations, and the sample collected after the event may not be representative of what the horse ate. In any group of livestock fed as a group, some will eat more and some less. The metabolism of monensin is rapid and sufficiently complex that it is difficult – or even impossible – to extrapolate a total dose from stomach or tissue concentrations.

The lesions (myocardial necrosis) of ionophore intoxication in horses are characteristic but may not be present in animals that die peracutely [suddenly]. Clinical chemistry, e.g., elevated “cardiac” isoenzymes or troponin levels, is strongly suggestive, but again, does not provide positive proof.

Outcomes

Wyoming’s first human rabies death occurred in 2015.

The WSVL provides testing for rabies, tularemia, plague, and other



Quality results depend on quality control at the testing laboratory. BreAnna Bonner is fastidious, as outcomes can be influenced by pre-analytical factors.

diseases that can be transmitted to humans. Positive tests are reported to the Wyoming Department of Health and Wyoming state veterinarian for follow-up and control. High-consequence diseases are reportable to the Centers for Disease Control and Prevention and U.S. Department of Agriculture, as well.

“Many people are put on prophylactic regimes based on our test results,” states Laegreid. Often, an increase in animal cases precedes a rise in human cases. Tularemia, a bacterial disease carried by rabbits and other rodents, is “way up.” Way up is not hundreds of human cases, but it is a lot, he says.

Laegreid stresses the distinction between incidence and impact. “To put it in human terms, one case of Ebola has a lot of impact. Thousands of cases of influenza don’t.” And impact is not always related to severity of disease. For example, the impact could be economic.

In elk, a high rate of brucellosis is normal in the greater Yellowstone area. The number of cattle cases is very small, but the impact is high.

“We really care about the risk of transmission to domestic cattle and the effect that has on ranchers’ ability to sell their cattle,” Laegreid states.

WSVL reports findings to the Wyoming Livestock Board and WGFD. The WSVL also cooperates with the USDA Animal and Plant Health Inspection Service to provide services for foreign animal disease investigations and eradication programs.

Forensic investigations are undertaken to produce legal evidence. The equine ionophore case did not suggest malicious poisoning, but it underscores the need to know and the training and judgment required to arrive at answers. Raisbeck concluded with the following.

Thus, the clinician must often rely upon the traditional triad:

- clinical signs (sudden onset of weakness, ataxia, pain)
- lab work suggesting myocardial damage (pathology, clinical pathology, EKG or ultrasonography)
- presence of more than background amounts of ionophore in feedstuffs or tissues.

Treatment for ionophore poisoning is symptomatic and usually unrewarding. Mildly affected horses may recover, but the owner should be warned of the possibility of chronic, sub-clinical myocardial damage that may affect suitability for riding months after apparent recovery.

WWAMI trains medical superheroes to champion health care in Wyoming

Students at Wyoming's medical school are out to avenge a statistic. The Cowboy State ranks 47th nationally in physicians per capita, according to the Association of American Medical Colleges.

Those students who complete the four-year WWAMI (Washington, Wyoming, Alaska, Montana, and Idaho) regional medical program earn their doctor of medicine degree (M.D.) from the University of Washington School of Medicine and return equipped to defend patient health and function in their home state.

The program targets five major goals:

- Provide publicly supported medical education. (The Wyoming legislature provides some funding for WWAMI in Wyoming.)
- Increase the number of primary-care physicians.
- Provide community-based medical education.

- Expand graduate medical education (residency training) and continuing medical education.
- Achieve this in a cost-effective manner.

The 20 UW students who entered WWAMI in the fall of 2015 are the first under a new curriculum that emphasizes active group learning.

The entire curriculum got an overhaul last year. Pamela Langer, associate professor in the Department of Molecular Biology, swept in and took a leading role in her subject area. For Langer, an acknowledged active learning transformer, it was clobbering time for the traditional lecture. "If I get bored, I ditch it – it's out of there."

Collaboration among the five universities took off. "Active learning inspires active learning," says Langer. Working with colleagues from the other WWAMI sites, she dedicated about 70 hours a week last summer to converting WWAMI Block 1, Molecular and Cellular Basis of Disease, to an active

learning format more like her undergraduate clinical biochemistry course. The course features mini class dramas, such as "Hey, Sugar" about diabetes.

Langer had another impetus. Like all entering WWAMI classes since 1997, this year's participants complete their first year at the University of Wyoming. In Langer's current WWAMI class, however, are students from her son's soccer team, plus four of her former teaching assistants.

"I know these people very well, so in my mind I had a huge sense of responsibility to

make that curriculum good. And I did that."

Phase 1, Foundations of Scientific and Clinical Medicine

Superheroes-in-training don't start out flying. On top of the four-hour, four-day-a-week blocks, students study material on their own to prepare for class activities and clinical cases, and they develop clinical skills by shadowing primary care physicians in Laramie and Cheyenne.

Threads and themes form the warp and woof of the WWAMI superhero cape. Threads running through the entire WWAMI training are human form and function, pharmacology, and pathology. The themes are issues of diversity in medical care, global health, ethics, quality and safety, communication, and lifelong learning.

Between the first and second years, students can opt to work side-by-side with Wyoming physicians in rural, underserved communities for a four-week clinical rotation. Those who enroll in the Targeted Rural Underserved Track (TRUST) are assigned to one Wyoming community for continuous engagement through all four years.



Pam Langer (left) of molecular biology narrates the biochemical action during WWAMI Boot Camp in August 2015. Raf protein cancer villain Jason Reynolds is held in check by cell growth champion Rage Geringer, as Wyoming WWAMI director Tim Robinson and students Sarah Koch, Danielle Borin, and Brittany Myers look on. For 2014 and 2015 class composites with hometowns, see bit.ly/WWAMIstudents.



Michael "Dee" Alley plays a p53 protein preparing to lead Brian Schlidt, Daniel McKearney, Weston Hampton, and Rachel Piver in a fight against tumor development.

Farther afield, UW students have worked in a clinic in Peru – conducting clinical research on malaria – and traveled to Uganda and Kenya, where they helped educate children in villages about tuberculosis and other diseases.

Returning in year two, the class meets back up in Seattle for the last two blocks of their foundational training at the University of Washington. For more than two decades, U.S. News & World Report has pointed to the University of Washington as the nation's number one training school for primary care, family medicine, and rural medicine.

Phase 2, Patient Care

The third and fourth years, WWAMI students let their capes fly. It could be in OB/GYN in Rock Springs, internal medicine in Sheridan, family medicine in Buffalo, or psychiatry in Casper. The Wyoming Rural Clinical Experience (WRCE) lets them fulfill four or more of their required six third-year rotations throughout the state.

The Wyoming Rural Integrated Training Experience (WRITE) sends students to Douglas, Powell, or Lander for 22 weeks to develop their clinical skills and learn to treat medical, surgical, and psychological problems in a single rural setting.

Or students can spread out within the five-state WWAMI region, perhaps for a month in a remote community near Nome, Alaska, or at a Level I trauma center in Seattle.

Phase 3, Career Exploration and Focus

The final Phase 3 block for this year's WWAMI students comes at the end of April, 2019, with Transition to Residency. By then, they will no doubt possess insight and perspectives unimaginable last August.



Langer (center) directs signaling proteins Galen Mills, Borin, and Brandon Douglass and Reynolds, Brian Feinstein, and Levi Hamilton to join forces in a cancer-causing complex.

The majority of graduates in the WWAMI training program choose to practice medicine in Wyoming, and over half in the primary care fields of family medicine, internal medicine, and pediatrics. Others among the 74 WWAMI-trained doctors practicing in the state have found their superpowers as general surgeons, OB/GYNs, ER docs, neurologists, otolaryngologists (ear, nose, and throat specialists), and as an anesthesiologist, radiologist, dermatologist, and pathologist.

Mark McKenna of Casper (entering class 2001) followed his WWAMI training with a residency in orthopedic surgery at the Geisinger Medical Center in Danville, Pennsylvania, and a shoulder and elbow fellowship at the University of Washington. He joined Premier Bone and Joint Centers in 2011.

McKenna, who is certified by the American Board of Orthopaedic Surgery, lives in Laramie, where he sees patients three days a week. He and nurse Abra O'Brien, who earned two degrees at UW, also travel to Cheyenne, Casper, and Rock Springs every week and to Rawlins and Torrington every other week.

To say McKenna has thousands of patient contacts a year is only to hint at the scope of his service in the state. As a surgeon, he replaces, reassembles, restores, and reassures. As a team physician for UW athletics, he keeps players playing.

WHAT DO WWAMI STUDENTS LEARN AT UW?

- Block 1, Molecular and Cellular Basis of Disease.
Leader: Pam Langer, Department of Microbiology. She also teaches in Blocks 1, 2, and 5.
 - Block 2, Invaders and Defenders. Includes immunology, microbiology, parasitology, and virology.
Leader: Gerry Andrews, Department of Veterinary Science, Wyoming State Veterinary Laboratory (WSVL).
 - Block 3, Cardiopulmonary and Renal.
Leader: Alison Doherty, clinical assistant professor for WWAMI. She teaches in Blocks 1-5.
 - Block 4, Blood and Cancer.
Leader: Jonathan Fox of the Department of Veterinary Science – also based at the WSVL. He also teaches in Blocks 1 and 3.
 - Block 5, Energetics and Homeostasis. Includes endocrinology, nutrition, and major organ systems such as the liver, gut, and pancreas.
Leader: Brenda Alexander, Department of Animal Science.
- Of five first-year blocks, four are led by UW College of Agriculture and Natural Resources associate professors. Also jumping in from molecular biology are 25-year WWAMI veteran Kurt Miller and Jay Gatlin, who taught in the program for the first time this year. From veterinary science, Myrna Miller and Will Laegreid contribute in Invaders and Defenders.

Like other WWAMI-trained physicians, McKenna volunteers as a teacher and mentor to a succession of new students in Wyoming's medical education program. And another thing – McKenna and O'Brien drive to Cheyenne. Everywhere else, they fly.

PROGRAM NOTES

Extension associate named UW's outstanding employee of year

Cathy Shuster, an office associate with University of Wyoming Extension, was named UW's outstanding employee of the year during the annual Staff Recognition Day in April at UW.



Cathy Shuster

She was named from among four individuals who had been selected for UW's Outstanding Employee of the Quarter Award that recognizes excellence in the workplace.

Sarah Kauer, senior office associate in the Office of Academic and Student Programs, received a Meyer Family Outstanding Staff Award.



Sarah Kauer

Dozens of employees were honored for their years of service and contributions to UW. Sponsored by the UW Staff Senate, with support from the UW Office of the President, Staff Recognition Day encourages and acknowledges the work of all UW staff members.

Farm manager joins James C. Hageman Sustainable Agriculture Research and Extension Center

Kevin Madden began in April as farm manager at the James C. Hageman Sustainable Agriculture



Kevin Madden

Research and Extension Center (SAREC) near Lingle.

Madden brings experience as an owner, operator and manager of a family production farm and ranch in Potter, Nebraska, notes SAREC director, John Tanaka.

Madden will manage irrigated and dryland crops, rangelands, and livestock at SAREC. He will also help coordinate off-site research and extension activities on the center.

Madden may be reached at (307) 837-8200 or kmadden1@uwyo.edu.

Irrigation specialist starts at Powell Research and Extension Center

Vivek Sharma began April 4 as the University of Wyoming Extension irrigation specialist based at the Powell Research and Extension Center.



Vivek Sharma

Sharma is an assistant professor in the Department of Plant Sciences.

"Water is the life support of irrigated agriculture in Wyoming, as the state's 1.5 million acres of irrigated lands are vital to the economy," says Sharma. "I welcome input on issues and concerns, especially those related to agricultural water management at different locations throughout the state."

Sharma's areas of focus are maximizing the benefits of irrigated crop production through efficiently designed agriculture water management and monitoring soil moisture and crop water use. He cites special interest in techniques such as remote sensing and geographical information systems (GIS) to

enhance decision making in agricultural sustainability and water resources.

Sharma earned a bachelor of technology degree in agricultural engineering from Punjab Agricultural University in India and a master's degree and Ph.D. in biological systems engineering from the University of Nebraska-Lincoln.

Sharma may be reached at (307) 754-2223 or vsharma@uwyo.edu.

University of Wyoming Extension

Blake Hauptman joined UW Extension in March as the area Sustainable Management of Rangeland Resources educator based in Sundance and serves



Blake Hauptman

extension's northeast area. He attended Montana State University and earned a bachelor's degree in animal science and his master's in animal and range science. Hauptman gained additional experience working on and managing ranches in Montana, where he helped manage winter feedlot and summer yearling operations as well as sustainable management of rangelands critical to the yearling operation and the wildlife on the ranches.

Hauptman may be reached at (307) 283-1192 or bhauptma@uwyo.edu.

Karen Allison is the new administrative assistant to the State 4-H Program Office. She relocated to Laramie from Texas, where she most recently worked for the Texas Health and Human Services



Karen Allison

Commission. She comes from a military family background and has lived around the world. She is an active outdoor enthusiast and enjoys hunting, archery, hiking, and camping.

Allison may be reached at (307) 766-5170 or karen.allison@uwyo.edu.

Sarah Torbert joined the State 4-H Program Office in May as the 4-H volunteer development specialist. She earned a bachelor's degree in ag education from the University of Wisconsin-River Falls and a master's in training and development from the University of Wisconsin-Stout. She has 14 years of experience working with 4-H volunteers through extension programs in Wisconsin and Missouri. In addition, she worked with volunteers in the Girl Scout program in Wisconsin.

Torbert may be reached at (307) 766-5027 or storbert@uwyo.edu.



Sarah Torbert

Julie Balzan is at the Platte County Extension Office and has served the southeast area in nutrition and food security since June 1. She has a bachelor's in home economics education and a master's in agricultural extension, both from the University of Wyoming. She joins extension with expertise in utilizing research to develop and provide nutrition, food safety and preparation, and wellness programming and implementation.

Balzan may be reached at (307) 322-3667 or jbalzan@uwyo.edu.



Julie Balzan

College relations

The college scholarship awards committee meets each winter and early spring to award scholarships to undergraduate and graduate students. The college awarded \$374,000 in scholarships this academic year, and next

year will offer close to \$400,000.

Says Anne Leonard, college affairs coordinator, "As alumni and friends of the college, you should take pride in our robust scholarship program and its deep impact on students. This has lasting and, in some cases, life-changing effects on many students."

Leonard says some current and past student ambassadors have shared that the scholarship program allowed them to graduate from UW debt-free. In many cases, receiving scholarships allowed them to save and afford graduate school or pursue a medical or veterinary medicine degree. "What a gift," she says.

Scholarships are listed on the college's web page at bit.ly/uwagscholars. Scanning the list is a historical synopsis of the college and Wyoming agriculture, Leonard says. "You will see many awards



Anne Leonard

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named for faculty members and created by former students and colleagues. Alan 'Doc' Beetle, Andrew Vanvig, Gordon Kearn, Carroll 'Schoony' Schoonover, Margaret Boyd, Dr. T. Dunnewald, and LeRoy Maki are all part of this group."

Others scholarships were created by organizations, individuals, or family members to honor their family's contributions to Wyoming agriculture. Leonard points out Karyl Kohrs Rickard and her husband, Eugene, created the Ben and Allene Kohrs Memorial Dietetic Scholarship to honor her father, Ben, the Campbell County Extension agent, and her mother, Allene, who taught home economics.

Ted Lloyd received his bachelor's and master's degrees from the University of Wyoming in the early 1960s. He and his wife, Susan, founded AGVISE Research Corp., which provides agriculture and soil testing services to clients in 15 countries. They established an award in 2007 to help graduate students in plant sciences complete their research programs and encourage them to pursue careers in research, extension, or industry.

According to Leonard, Joe and Arlene Watt built the Triangle T Ranch near Moorcroft into one of the most efficient cattle operations in the industry. They also wanted to help young people attend the University of Wyoming and created

scholarships in agriculture, engineering, and business. "Joe and Arlene's legacy helps 12 to 16 students a year," she says. "I remember talking with Joe in the mid 1990s. He loved receiving letters from the scholarship recipients and took pride in helping young people finish their undergraduate degrees."

In all, the college now has 114 awards for undergraduate and graduate students. Some are funded by annual gifts from the donor and others from permanently endowed funds. Every one of these is deeply appreciated, says Leonard. "On behalf of the student recipients, thank you."

Issued in furtherance of extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Glen Whipple, director, University of Wyoming Extension, University of Wyoming, Laramie, Wyoming 82071.

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