



University of Missouri

College of Veterinary Medicine

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NEWS & EVENTS

CVM Alumna Takes a Walk on the Wildlife Side

The website for Hedmark University College advises prospective students and visitors that its Evenstad campus is "in the middle of nowhere." While the nearest town is 20 kilometers away, the online survival guide advertises that there is a canteen on campus that specializes in moose burgers. For students who prefer to prepare their own meals, the guide notes that there is a small shop that sells groceries situated close to campus just across the Glomma River. It can be reached by foot in about 10 minutes, however, in winter students can slip across the frozen river, cutting their trip for supplies in half. When the volume of snow makes walking impractical, the university library stocks not just books, but also skis that students can borrow. According to the website, surrounded by forests, mountains and lakes, Evenstad, in southeast Norway, is "the Place for Wild Hearts."

Andrea Miller, DVM, felt right at home in this wild place for the past year. Miller, who earned a bachelor of science, fisheries and wildlife degree at the University of Missouri in 2005, and a doctor of veterinary medicine from the MU College of Veterinary Medicine in 2009, recently completed a year-long fellowship as a Fulbright Scholar based at the Evenstad campus. While there, she drew blood from wolves and roe deer, helped assess the effects of an anesthetic protocol on moose and tracked a bear that she then performed surgery on in the field.

In her understated manner she admits, "I do have a sense of adventure."

Evenstad is a long way from the small mid-Missouri town of Bonnots Mill where Miller grew up and first developed an interest in working with wildlife. Her interest deepened while attending MU as an undergraduate and during her professional education at the



One of Dr. Andrea Miller's colleagues places his hand next to the track left in the snow by a bear. As part of her research into stress factors for Scandinavian brown bears, Miller, working with other veterinarians and biologists, would locate bears by following their tracks, then call in a helicopter crew to anesthetize the bears. Once the bears were anesthetized, the team on the ground would move back in and fit the animals with radio collars, VHF transmitters and heart rate and temperature monitors. Hair and blood samples would also be collected for ongoing studies. (Photo by Nikolaus Huber)

College of Veterinary Medicine. As a veterinary student, she participated in the Raptor Rehabilitation Project and in the Zoo and Exotics Club. She also spent three weeks in South Africa with a group called Vets-in-the-Wild. There, she learned wildlife medicine, wilderness survival, and chemical immobilization techniques. Her academic achievement, research activity, and extracurricular participation earned her the Gary D. Weddle Wildlife and Exotic Animal Award in 2009.

After graduating from the CVM, she pursued an internship in avian and exotic animal medicine in Houston, Texas. But it was during the summer after her internship ended when the cosmic tumblers clicked into place and would point her compass 4,000 miles to the east, ultimately changing the course of her career.

The Road to Nowhere

Miller spent the summer of 2010 as a volunteer research technician in Nome, Alaska. She assisted with the University of Alaska-Fairbanks Reindeer Research Project, collecting virology and bacteriology samples from reindeer herds on the Arctic tundra. The work was an effort to determine the cause of eye infections in the animals. Miller's supervisor on the project was Alina Evans, DVM, a previous Fulbright Scholar herself. At the end of the summer, Evans moved on from the Alaska project to begin pursuing a PhD in Evenstad under the tutelage of Jon Arnemo, DVM, PhD, and wildlife veterinarian. Miller, meanwhile, returned to Missouri and began work as a research technician in a laboratory, and as a veterinarian, first at the Central Missouri Humane Society, and then at a rural mixed animal practice in central Missouri. She also began the application process to be selected as a Fulbright Scholar with the guidance of longtime mentor John Dodam, DVM, PhD, chairman of the CVM Department of Veterinary Medicine and Surgery, Marie Kerl, DVM, MPH, CVM associate teaching professor of small animal internal medicine, Natlie Antinoff, DVM, of Gulf Coast Veterinary Specialists, and Leona Rubin, PhD, CVM associate professor of biomedical sciences.

"I have known Dr. Miller since she enrolled at MU as a freshman undergraduate student," Dodam said. "I served as her Pre-Veterinary Scholar mentor during her undergraduate training. I also had the opportunity to teach her in the classroom, laboratory, and on the clinic floor when she was enrolled in our College of Veterinary Medicine. Finally, I supervised her on research projects and employed her as a



Dr. Andrea Miller administers oxygen to a moose as part of an experiment to try to counteract the effects of hypoxemia, low blood oxygen, which some combinations of anesthetic drugs can induce. (Photo by Marianne Lian)



Dr. Andrea Miller traveled to Norway and Sweden as a Fulbright Scholar to research the effects of stress in Scandinavian brown bears. (Photo by Alina Evans)

teaching assistant for our didactic anesthesia and surgery laboratory. She was invaluable as a research assistant because of her attention to detail, her participation in development of experimental methodology and logistics, and her reliability.”

One of the requirements necessary to be selected as a Fulbright Scholar is to know someone in the country where the applicant is applying to study. With Evans and Arnemo now in Norway, Miller had the contacts she needed to pursue her own studies there. She also began learning Norwegian under the tutelage of Carla Waal Johns, a Columbia resident and MU professor emeritus, who had also been a Fulbright Scholar to Norway.

“She not only taught me language basics, but also the culture. We would have tea, speak Norwegian and she would tell me about her experiences there and what to expect,” Miller said. “We even had a May 17 (Norwegian Constitution Day) party before I left. Because of her teaching, I felt comfortable in Norway right away.”

Miller began her studies overseas by attending an intensive language course in Norwegian at the Oslo International Summer School. She credited Johns’ instruction with enabling her to immediately jump to level two Norwegian. After completing the course, Miller left Oslo for the Evenstad campus where she began her year with several months of coursework in ecology and statistics as part of her program leading to a master’s degree. Fieldwork began shortly after Christmas last year with Miller working on a variety of wildlife ecology projects under Arnemo’s direction.

On Bears and Bugs

Her first field assignment took her to Sweden to assist with the Scandinavian Wolf Project. Local and government trackers would spend days searching for wolf tracks. Once they located tracks, they would call in a helicopter crew to locate and anesthetize the wolf from the air using a dart gun. With coordinates provided by the helicopter team, the crew on the ground would then race to the wolf’s location. As the biologists would take measurements and place a tracking collar on the wolf, Miller and other veterinarians would monitor the anesthetized wolf while collecting hair, skin and blood samples for genetic tests and other ongoing research. Once all samples were collected, Miller would administer drugs to reverse the anesthesia and then remain with the wolf until it was recovered. That process could take several hours.



Dr. Andrea Miller (left), Dr. Krista Jones and Dr. Jon Arnemo are pictured with one of the Scandinavian brown bears they captured and fitted with a radio collar, heart rate and temperature sensors and intra-abdominal VHF transmitter. The bandana reduces light stimulation to the eyes while the animal is under anesthesia. (Photo by Jon Arnemo)



Veterinarians Andrea Miller and Krista Jones examine a brown bear’s teeth and check its capillary refill time (CRT), which is the rate at which blood refills empty capillaries and can be used to assess whether an animal is dehydrated. CRT can be measured in animals by pressing on their gums. (Photo by Jon Arnemo)

"My first night I got to help recover two wolves in a field under a gorgeously clear starry Swedish sky. It was fun, but a bit cold," she said.

The following week found her helping to capture roe deer, place collars on them and take blood samples. Since the deer didn't require anesthesia, the time between capture and releasing the deer to run free was less than 10 minutes.

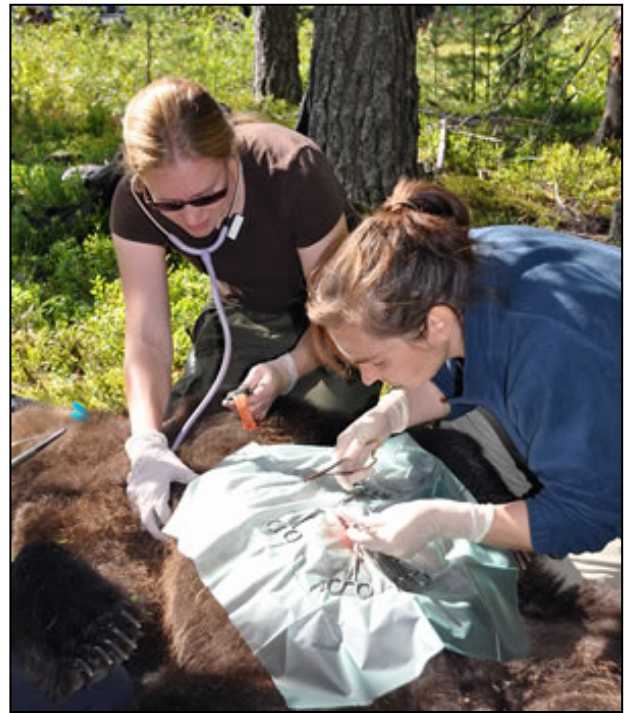
In addition to helping with other scientists' roe deer, wolf and moose projects, Miller worked on her own research. She and her colleague Evans partnered on the Scandinavian Brown Bear Research Project, which is centered at Tackåsen field station in Sweden. Their fieldwork included tracking, darting and capturing bears. Some of the bears had been caught previously and fitted with radio collars with GPS transmitters allowing researchers to track their moves. They also captured bears that had never previously been studied. While anesthetized, the bears were fitted with new collars, VHF transmitters were surgically inserted into their abdomens, heart rate sensors were placed under their skin and temperature loggers were placed beneath their skin and in their abdomens. Miller also collected hair samples, which the project uses to identify each bear and in studies assessing how these Scandinavian bears are related to each other and to bears elsewhere in Europe.

Miller performed the abdominal surgeries in the field under a variety of conditions. Her first full surgery was on a 10-year-old brown bear that weighed 200 kg (more than 440 pounds). She performed another surgery on a 100 kg male bear in the forest as snow fell. In August she performed surgery on four more bears. While snow was not a problem in August, dusk brought out swarms of biting insects that attacked Miller's arms during surgery and triggered a mild allergic reaction.

The intra-abdominal temperature loggers provide Miller with readings on the bears every one to three minutes. She is collecting the data as part of her master's thesis, which examines the animals' stress. She will analyze the bears' temperatures during the summer, when they encounter humans, and if they are approached by hunting dogs. She hopes to have her master's project completed in about 18 months, but said that is an "optimistic" target.

Pursuing a New Quarry

Miller said her experience as a Fulbright Scholar opened up other opportunities.



Dr. Andrea Miller monitors a bear's vital signs including its heart rate while Dr. Krista Jones, a fellow Fulbright Scholar, performs her first surgery on a Scandinavian brown bear. (Photo by Jon Arnemo)



Although her program has ended, she will remain in Scandinavia to pursue a PhD. She recently relocated from Evenstad to Uppsala near Stockholm, Sweden, where she will pursue her studies at the Swedish University of Agricultural Sciences (SLU). She has been selected to work on a research project that is a collaboration between scientists in Sweden, Denmark, Latvia, Finland and Switzerland. However, instead of capturing 200 kg bears for study, she will be focusing on a parasite, *Echinococcus multilocularis*.

Echinococcus multilocularis is a tapeworm that is normally transmitted between rodents and foxes. However, if humans accidentally ingest the parasite eggs, it can cause alveolar hydatid cyst disease. This causes parasitic tumors in the lungs and other organs and can be fatal without treatment.

"It's big news in Europe. People are advised to wash all wild berries before eating them, because that is one of the ways people can accidentally eat the parasite eggs" Miller explained. However, until recently, *Echinococcus multilocularis* had never been found in Sweden. "The parasite was identified in a fox that was shot in a hunt in southwestern Sweden. The parasite may have originally come to Sweden in a dog that hadn't been dewormed properly." Miller said the four-year project will focus on the epidemiology of *Echinococcus multilocularis* in rodents in Sweden.

Home is Where the Wild Heart is

She said although she has felt some homesickness for the United States, she quickly embraced the Scandinavian culture. In Norway, Miller lived on a small farm about three kilometers from school. Because Evenstad is so far north, it gets dark early in the winter. From October to March she would walk or ski home from campus under the stars. As the house was only heated by two wood stoves, Miller quickly learned how to chop wood. A more daunting challenge was learning to ski, which is a national pastime in Norway and without a car, a necessity to get around in the winter. "It was frustrating, but exhilarating when I had moments of breakthrough. What's even funnier is skiing hooked up to a dog, or 'skikjoring'. I didn't have good balance, and I had a dog that was easily distracted," she laughed.

"One of the strangest things I had to get used to was going to class in my socks. In Scandinavia it is part of the culture to take off your shoes when you go into someone's house. It's not a suggestion; it's actually



Dr. Andrea Miller draws blood from the leg of a wolf for analysis. In addition to her own research focusing on bears, she assisted researchers who were studying wolves, roe deer and moose. (Photo by Jon Arnemo)



One of the biggest challenges Dr. Andrea Miller faced after moving to Norway was learning to ski, a national pastime among Norwegians and a necessity for getting around the countryside in the winter months. (Photo Credits: Andrea Miller)



rude to wear your shoes past the entryway. At Evenstad the main classroom building is also like that, so all of the students go to class in socks and the teachers lecture in socks.”

Miller even embraced Nordic dietary habits. She says moose burger is very good. She also enjoyed moose barbecues and reindeer roasts. One of her favorite lunches is mackerel in tomato sauce on crackers and sliced hard boiled eggs with caviar on top. Waffles with brown cheese or sour cream and jelly are another staple.

Although her research will keep her in Sweden for four years, she would like to return to the United States at some point, but hopes to continue to collaborate on projects in her adopted home.

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(From left) Marianne Lian, who was working on earning a master’s degree and doctor of Veterinary Medicine, and veterinarians Andrea Miller and Alina Evans wait with wolves after collecting blood and hair samples from the animals. Making sure the wolves suffered no ill effects from the anesthesia that was administered and were kept safe until they could fully wake up could take several chilly hours. (Photo Credits: Jon Arnemo)

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