

# BioLog

north dakota state university | department of biological sciences

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## Students help other students focus on learning

The first thing you notice is the loudness of the classroom as students in NDSU's General Biology I course get down to business. With active and animated conversations among more than 100 students, there is serious learning going on.

In the middle of it all is a student who moves from one clustered group to another, facilitating interaction and answering questions. Caitlin Bussard is the Learning Assistant, commonly called the "LA," for the class.

Bussard, a junior majoring in biological sciences from Minot, N.D., said she became a Learning Assistant because she was apprehensive about Biology 150 when she took the course as a freshman, and an LA helped her succeed.

"Upon my completion of the course, I found myself wanting to provide the same opportunity and guidance for upcoming students – that's why I joined the LA program," Bussard said. "I had many great experiences with students this past semester. Some of the greatest moments are when a student shares his or her success on an exam, homework or increased understanding of a topic after seeking guidance. I truly believe in this program."

Described as mentors, tutors and guides, the LAs are fellow students who lend an important hand in the learning process.

"LAs are outstanding undergraduate students we invite back into the classroom. They've 'been there, done that' and are familiar with all the difficulties there can be to learning. They know the potential pitfalls other students face," explained Jenni Momsen, assistant professor of biological sciences.

The Learning Assistant program started in November 2011 through the initial efforts of Momsen; Warren Christensen, assistant professor of physics; and Erika Offerdahl, assistant professor of biochemistry. The project has evolved into a collegewide program with the support of Scott Wood, dean of science and mathematics. Jeff Boyer, assistant professor of practice, directs the program.

"We have some large enrollment classes with 100 to 300 students, and we wanted students to be more active, more engaged in learning the material," Momsen said, noting the goal is to have



one LA for every 50 students. "The LAs help faculty to make active learning environments. The point is to improve student learning and they are there to make that happen."

Sophomore Calla Price, a zoology major from Hazen, N.D., was the Learning Assistant for another section of the introductory biology course. "LAs help students feel more comfortable learning because they have a peer to ask questions to and show them a different viewpoint on content," Price said. "Leading a student to a correct answer without actually giving him or her the answer was one of the most fulfilling moments imaginable."

The duties of the LAs can vary from class to class. Some work one-on-one with students, while others help organize learning activities for the classroom. Others have office hours, and still others monitor discussion groups and answer specific questions for students taking online courses. Students clearly can relate to what they have to say.

"I love having LAs in my course, and other faculty members have said LAs are critical in making learning activities happen," Momsen said. "The program has the potential to become an amazing tool for our instructors."



## Undergraduate participates in research to combat cancer

NDSU senior Nathan Fix sees his research efforts as small advances in the continuing battle against pancreatic cancer.

Working in the laboratory of Katie Reindl, assistant professor of biological sciences, Fix is a microbiology and philosophy double major who plans to go to medical school.

"In general, we work with compounds isolated from natural products. We want to see molecularly how they affect cancer cell behavior," explained Fix, who is from Jamestown, N.D.

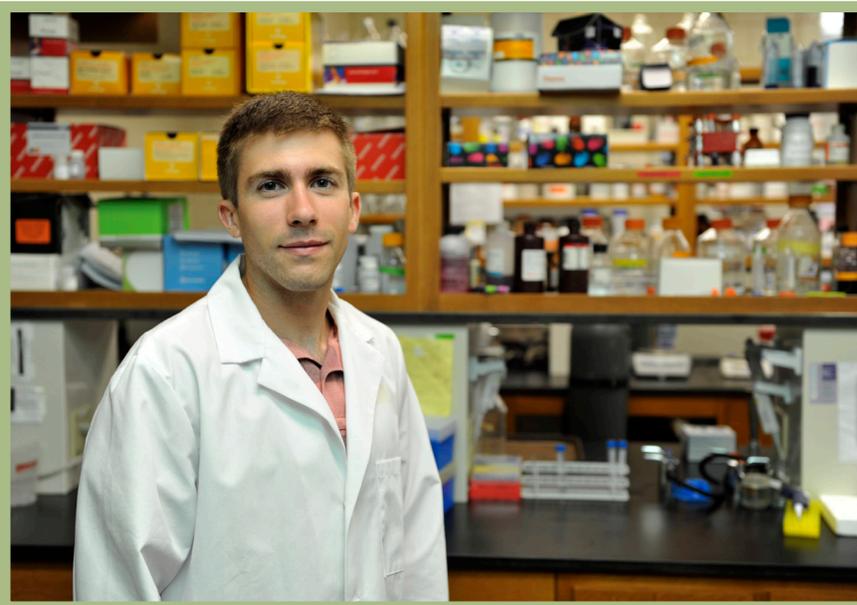
Fix is specifically focusing on a compound called piperlongumine, which is found in peppers. The compound is believed to inhibit tumor growth with no toxicity for normal cells. Fix wants to find out more.

Using high-technology equipment to analyze cell samples arranged in petri dishes or 96-well plates, Fix looks for answers at the molecular level. The work is complicated and intricate, but in layman's terms, Fix is exploring a protein produced by the cancer cells that allows them to grow and survive in low-oxygen environments. He hopes to learn how piperlongumine reacts with that protein and explore how it can be used to combat cancer cells.

"This isn't a cure, but along with chemotherapeutic drugs, the natural products will help target and hopefully stop cancer cell growth," said Fix. "I just hope to contribute to the work and maybe produce a research paper that shows we are moving forward within the field."

According to Reindl, Fix has excelled in the lab, demonstrating initiative and outstanding time management skills. "Nathan has a contagious enthusiasm for research that has made working with him in the lab so enjoyable. He is eager to learn and willing to contribute whatever he can to advance our research," Reindl said.

"I love learning, and Dr. Reindl has been able to teach me a ton of techniques. She challenges me to think," Fix said of his laboratory experience. "I've really learned an appreciation for



science. In class, there is a right and wrong answer. But in the lab, I sometimes get no answer. That didn't work – now what?"

During the summer months, Fix developed a new lab protocol for isolating and harvesting mouse pancreatic cells to study the effects of natural dietary agents. He described that as an example of many opportunities undergraduate students have at NDSU.

"Here at NDSU, there is so much research going on and there are a lot of undergraduate experiences to be had," Fix said. "Most professors have room in their labs for an undergraduate to learn."

Reindl said undergraduate research gives students a chance to apply the lessons they learned in the classroom. "As I work with my undergraduates, I strive to help them relate book knowledge with the practical application of that knowledge," she said. "Just the other day, we were learning about protein structure in Cell Biology and I was able to explain to my undergraduate research assistants what effect a certain denaturing agent would have on protein folding and subsequent detection in our assay."

National Institutes of Health grant P30 GM103332-01 supports the research in Reindl's lab.



## Student researcher on leading edge of nanoparticle studies

It is a project in NDSU's Wet Ecosystem Research Group that ventures into a young, exciting field of research.

NDSU senior Hannah Passolt works in a laboratory, in collaboration with plant sciences, where she studies how crops' roots absorb a microscopic nutrient. She is exploring how two varieties of wheat take up extremely tiny pieces of zinc, called nanoparticles, from the soil. The particles Passolt examines are measured at below 30 nanometers – a nanometer is 1 billionth of a meter.

"It's the mystery of nanoparticles that is fascinating to me," explained the zoology major from Fargo. "The behavior of nanoparticles in the environment is largely unknown as it is a very new, exciting science. This type of project has never been done before."

In Passolt's research project, plants supplied by NDSU wheat breeders are grown in a hydroponic solution, with different amounts of zinc oxide nanoparticles introduced into the solution.

Compared to naturally occurring zinc, engineered zinc nanoparticles can have very different properties. They can be highly reactive, meaning they can injure cells and tissues, and may cause genetic damage. The plants are carefully observed for any changes in growth rate and appearance. When the plants are harvested, researchers will analyze them for actual zinc content.

"Zinc is essential for a plant's development. However, in excess, it can be harmful," Passolt said. "We will have to analyze the plants for zinc concentrations to see if there have been any effects from the nanoparticles."

Passolt has conducted undergraduate research with the Wet Ecosystem Research Group for the past two years. Working

side-by-side with Donna Jacob, research assistant professor of biological sciences; Marinus Otte; professor of biological sciences; and Mohamed Mergoum, professor of plant sciences, has been challenging, invigorating and rewarding.

"I've gained an incredible skill set. I have a pretty big role in an important study; that is invaluable," Passolt said. "To put effort into something that goes for the greater good of science is an important lesson to learn."

Since volunteering for the group two years ago, Passolt has become a valued contributor, assisting with the project's design, handling the care of plants and applying treatments. When the project is completed, she will publish a peer-reviewed scientific article.

Since 2006, the Wet Ecosystem Research Group has worked with more than 50 undergraduates through support from the North Dakota IDeA Networks of Biomedical Research Excellence program, known as INBRE, of the NIH National Center for Research Resources.

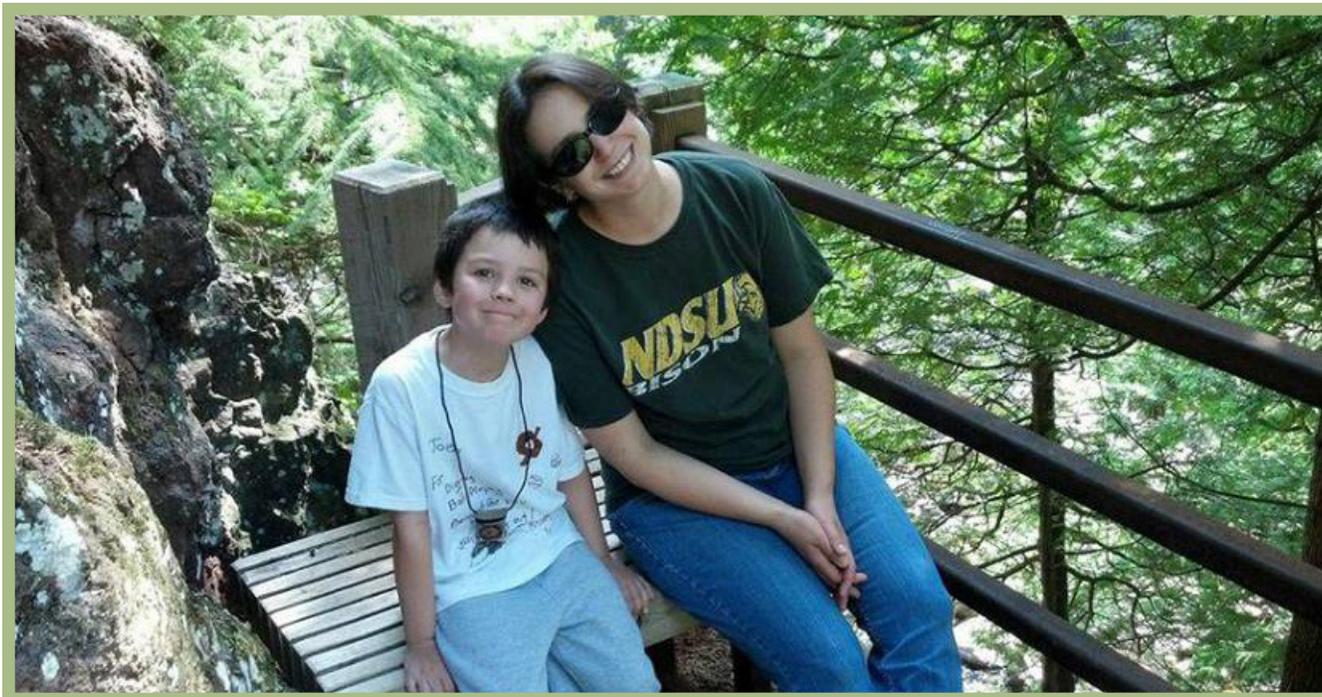
"Students gain valuable experience and an understanding of what scientists really do during fieldwork and in the laboratory," Jacob said. "I hope they come away with some excitement about research."

The results of Passolt's work may be used in a broader view of our ecosystem. Zinc nanoparticles are an often-used ingredient in such products as lotions, sunscreens and certain drug delivery systems. "Zinc nanoparticles are being introduced into the environment," she said. "It gets to plants at some point, so we want to see if zinc nanoparticles have a positive or negative effect, or no effect at all."

The research was supported by National Institutes of Health grant P20 RR016471 from the INBRE program.



## Alumna to offer alternative curriculum for home-schooled students



NDSU alumna Adriane (Ross) Cooper is about to put her education and experience to the test.

After teaching at Moorhead High School for about nine years, Cooper, MS '04, botany, has decided to set out on her own. Her plan is to start a consulting business, designing custom curriculum for home-schooled students.

"There is a strong home-schooled community in the area, and I know some of those families. I'll likely work with them," Cooper explained, noting her idea stemmed from having her 8-year-old son enrolled in the Montessori School in Moorhead.

Cooper's business will probably go by the name "Adriane Cooper Consulting and Instruction," but, for now, she is working with an attorney and accountant to put the company's groundwork in place.

"I really love education," Cooper said, suggesting an alternative curriculum of customized mathematics and science classes is important for some teenage students.

"I'll encourage them to take responsibility for their curriculum, make more choices in what they do and to do more 'real-world' work," Cooper said. "I'll prepare an all-around, comprehensive curriculum, customized for each family and each student's wants and needs."

As Cooper embarks on her new business venture, she's confident her education at NDSU helped prepare her for what lies ahead.

"At NDSU, I got to see what actual research was like, and I taught a number of labs," Cooper said, praising the quality of her instructors and making particular note of her excellent cell biology and biochemistry classes. "I think I gained more of a global understanding and intuition for how cell biology works."

Cooper said having her master's degree allows her to advise students on critical skills as they prepare to enter college – issues like what they'd like to pursue for an undergraduate degree, how to volunteer for work in their field and how to get to know professors by working on projects. "This helps immensely with networking and letters of recommendation, but perhaps more importantly, it helps students figure out what they really like in their chosen field of study."

With her master's degree and nearly a decade of experience, Cooper is looking forward to her new opportunity. "I just feel there are other ways we can meet students' needs, and I'm excited to explore that," she said. "But, for now, there is a lot to do to get my business going."

Cooper lives in Moorhead with her husband, Andrew, and their son, Joe.

# A glance back, visionary look forward

By Gary Clambey, associate professor of biological sciences

It's hard to imagine what young Henry Luke Bolley thought when he came to the newly formed North Dakota Agricultural College in 1890. As the designated professor of botany and zoology, he was one of only four faculty members.

And there were no students – none had been admitted yet.

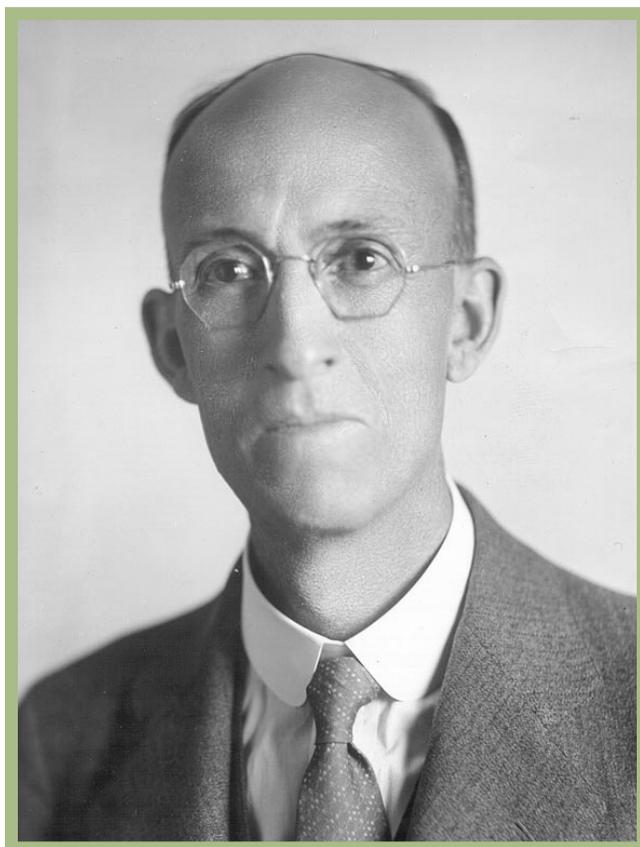
Could he have imagined the growth from that tiny beginning to a university of now more than 14,000 students with a Department of Biological Sciences having 21 faculty members, more than 500 undergraduate majors and some 40 graduate students at both the Master of Science and doctoral levels? Could he have foreseen the impacts of his teaching, research and service activities on both science and agriculture?

In a different vein, did Bolley, a former Purdue Boilermaker quarterback, dream that by helping start a fledgling NDAC football team he would set the stage for an athletic heritage with multiple national championships, including three consecutive titles in the past three years?

When O.A. Stevens joined Bolley in 1909, did he think his presence on campus would span more than 60 years, even eclipsing Bolley's nearly 50 years? Could he have foreseen the influences resulting from his botanical efforts, including a still-used account of North Dakota's flora, a state herbarium that continues to grow and serve as a regional resource? Remarkably, his earlier decades of work compiling phenological data still is being used in current studies of climate change. Part of such work goes on in Stevens Hall, which has housed biological sciences since its opening in 1968, an event that was shared with an elderly but active Stevens, his equally energetic wife, their children and grandchildren.

Since 1890, NDAC went on to become NDSU. Our internal organizational structures have changed numerous times, most recently in 2000 when the longstanding, neighboring Departments of Botany and Zoology merged to form the current Department of Biological Sciences. Through all the changes, faculty and staff have effectively served students while accomplishing research objectives in a wide variety of endeavors and also contributing to public service activities.

At the risk of overlooking someone, but also hoping to evoke appreciative memories of longstanding faculty, people such as Warren Whitman, Earl Helgeson, J. Frank Cassel, Gabe Comita and Don Scoby come to mind. To those names can be added a list of more recent retirees, including many who served NDSU for more than 30 years – John Peterka, Jim Brammer, Murray Duysen, Bill Barker, Don Galitz, Tom Freeman, Jim Grier, Jeff Gerst, Gary Nuechterlein, Ted Esslinger and Will Bleier.



*O.A. Stevens, longtime NDSU faculty member.*

History continues to unfold as younger biologists join the department. Highly qualified new members are building new research programs, expanding the curriculum and attracting the next generation of students. The department has been a campus leader in establishing gender equity, and Wendy Reed, as department head, is providing creative leadership to further grow and diversify programs in the biological sciences.

Beyond the people mentioned comes the most important story of students, past and present, who build the educational foundations critical to successful careers and satisfying personal lives. Examples can be offered of alumni achievements in various arenas, whether they be educational institutions ranging from high schools to colleges and universities, state and federal agencies, health care organizations, private businesses or agriculture.

This is history in the making, and we would appreciate hearing from readers of this newsletter about your own experiences, what you might know of other NDSU graduates, or personal reflections about NDSU. Keep in touch, and we will do the same through periodic issues of this newsletter.



## Renowned expert on lichens retires



Ted Esslinger clearly made a difference during his long and respected career as a researcher and educator. Esslinger, NDSU professor of botany/biology and one of the leading authorities on lichens, retired May 13, 2012.

"Spending my career at a mid-sized institution like NDSU has been great, because it offers opportunities for both teaching and research that you don't always get at a small liberal arts college or at larger universities," said Esslinger, who joined the NDSU faculty in 1975. "The excitement of making unique discoveries in your area is even more meaningful when you also have the chance to transmit some of that knowledge and excitement to young biologists."

He loved his work with lichens, which are sometimes called "the most bizarre of all forms of life." Each lichen is an association of two, sometimes three, separate organisms. The main organism is the fungus, which makes its living by associating

with photosynthetic algae. Compounding the situation, there sometimes can be a cyanobacterium that photosynthesizes. They are often found on trees and on boulders across North America and around the world.

Esslinger made a lasting mark with his research and service.

In 1995, he published a checklist of more than 3,500 species of lichens found in North America. The checklist is updated annually, and now includes more than 5,000 species. He also worked with an international group that built an online database that contains more than 32,000 references dealing with lichens. Not surprisingly, the lichen genus *Esslingeriana* is named in his honor. It is a monotypic genus, containing the single species *Esslingeriana idahoensis*, a species Esslinger himself first discovered and described from the Pacific Northwest.

"One of the things that make lichens special is they do really well in extreme environments. Some are well adapted to Arctic environments, others to Arizona deserts and still others to Minnesota forests," said Esslinger during a 2012 interview.

Esslinger's research found more than 100 previously unknown lichen species. "It's an inspiration to discover something no one else knows. That moment of discovery is truly wonderful," he said. His most recent research was a collaboration to study the DNA of a group of lichens to try to discover the evolutionary pathway that led to the organism's ability to adapt to diverse habitats.

Esslinger is a past member of the executive council and past president of the American Bryological and Lichenological Society. He was a reviewer for many journals, including *American Journal of Botany*, *Bryologist*, *Environmental and Experimental Botany*, *New Zealand Journal of Botany* and *Smithsonian Contributions to Botany*.

He earned his bachelor's degree at Eastern Washington State University, and doctorate at Duke University and did postdoctoral research at the Smithsonian Institution before coming to NDSU.

Esslinger has been given Professor Emeritus status and he continues to work on some of his research areas. He has an office and a small research space in Hastings Hall.

# September Science Café examines mysterious honeybee illness

News reports tell the story: a mysterious illness is wiping out a significant percentage of honeybee colonies in the United States. During the September Science Café, Julia Bowsher, NDSU assistant professor of biological sciences, explained why this is happening and outlined the challenges of restoring colony health.

The topic of this important discussion on Sept. 10 was "Collapse: How honeybees are dying and what we can do about it."

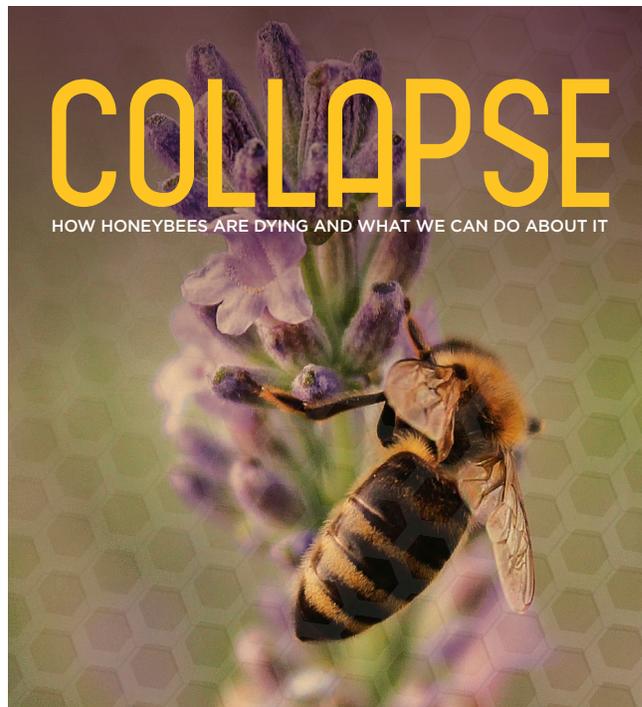
According to Bowsher, honeybees are responsible for the pollination of many different crops. During the last decade, honeybee colonies have died due to an illness called colony collapse disorder, which threatens food production worldwide.

"My goal was to discuss the scientific evidence behind the many causes of colony collapse disorder. Land use in North Dakota will be an important factor in improving bee health because colonies from across the nation spend summers here," Bowsher said.

The presentation was intended to inform and spur action.

"I was very happy to see such a diverse audience, including local beekeepers and members of the community who were not affiliated with NDSU," Bowsher said. "Because most people

had heard about colony collapse disorder, we were able to have a communitywide conversation about what can be done to help honeybees. It was a lot of fun to discuss science with the public."



## Message from the department head

*Hello, alumni and friends of the NDSU Department of Biological Sciences.*



I hope this newsletter finds you and your family well. For many of you, when you recall your time as a student in biological sciences at NDSU, you think of the many friendships you made and your engagement in the scientific process. The department continues to value and offer experiences that develop personal connections and scientific inquiry.

Our classrooms are being transformed into student-centered learning environments that are dynamic and engaging, and our research laboratories continue to provide students with world-class research experiences. The department is a thriving community of scholars, educators and students, and many of the opportunities we provide students are made possible

through the generous donations made by our alumni and friends. For that, we thank you.

I hope you enjoy this latest issue of the Biolog newsletter. We include a feature on Ted Esslinger, who recently retired from the department and a history of the department by Gary Clambey. I think you will enjoy reading about the reflections of past department members and their impact on students and the research community. Currently, undergraduates play an active role in both teaching and research as is evident from the profiles of student researchers and the learning assistant program. Finally, we catch up with an alumna.

Best wishes,  
*Wendy L. Reed*  
Head, Department of Biological Sciences



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## We'd love to hear from you!

*If you have anything you would like to submit to the newsletter, please email us at [marinus.otte@ndsu.edu](mailto:marinus.otte@ndsu.edu) with your news.*

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*The Herpetology Zoo held Feb. 13 in Stevens Hall featured amphibians and reptiles from NDSU's biological sciences collection and the Fargo Herpetological Society. The event was part of NDSU's fifth annual Darwin Day celebrations. Events were cosponsored by the NDSU Department of Biological Sciences, NDSU Cooperative Sponsorship and the College of Science and Mathematics.*

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