Brian Teasdale (Class of 2015) reflects on his internship with the Denver Zoo...

When I first met my wife Christine, it became quite evident that she did not have a typical “normal” job like the rest of us. No, my wife was a zookeeper at the Denver Zoo! As a child, animals were a large part of my life including hand raising hurt or abandoned animals with my mother, and having the amazing experience of raising my own colt. This zookeeper and I had a lot in common. When I found out the specific species that had captured my wife’s heart and soul, it became evident that I would have to be okay with sharing her with RHINOS. My wife’s passion for rhinos is infectious, and I soon understood why she has devoted over 27 years to trying to save this species from obliteration due to man’s greed and ignorance. In those many years there is one very special rhino that has truly captured her heart and he is a black rhino name is “Mshindi”. My wife and Mshindi have been together since the day he was born over 21 years ago, and when he developed a foot infection that is where innovation and passion came together to create a unique product.

In April of 2014, this rhino developed a foot infection that required veterinary intervention including immobilization, radiographs, and treatment of this foot. Due to a male rhino’s instinctual behavior of forecasting feces with their hind feet, it became a crucial part of the treatment and management of this
case to keep the feet as clean and dry as possible. Unfortunately, the rhino subsequently removed all materials that were applied to his feet within two to eight hours after application, thus allowing feces and urine to enter into open infected tracts overnight. It was at this point, an idea was developed to make a form-fitting boot that the rhino could not take off, and could easily be taken off on a daily basis by his caretakers to allow for treatments, and then protect the feet from harmful material overnight. After numerous literature searches, it was clear that the boot concept had never been accomplished for a rhino before, so it was a complicated problem for us to solve!

Our daughter works with a local artist, Landon Meier who specializes in custom latex masks, so we developed an idea that could incorporate this technology to produce a custom cast of the rhino’s foot. During one of the veterinary procedures, a cast was performed on Mshindi’s foot using a quick setting elastomer product. After this process, a positive cast of the rhino’s foot was made, and the final step being the production of a perfectly custom formed latex boot.

Just to clarify. I am an electrical engineering student minoring in Biology with a full course load, and now let’s add inventing, designing and production of a product on top of all that minor stuff…. I quickly realized the incredible amount of effort, stress and perseverance that is at the foundation of innovation. It became routine for me over the course of the next six months, to go 4 days in a row without sleep so that boots and schoolwork could be accomplished. My wife was constantly worried about my mental and physical state, but we both took this journey together, and continued the work of refining our product.

When inventing something that has never been done before, you are hit with many things that might stop you in your tracks. Doubt, material failure, redesigns, and money is just some of the factors experienced during this process. The design of the boots has been a fluid process involving numerous refinements and adjustments to get the ideal product that will be waterproof, breathable and most importantly durable. Over 1000 hours of development and labor has gone into the production of these boots, including 30 different iterations of the design and we now have a patent pending on this product! Some of the changes made along the way incorporated changing the boot material from latex to a skin-safe silicon product, multiple zippers for ease of installing/removing, gortex panels for breathability, and an external urethane rubber sole to provide longevity. As Mshindi healed, he participated in the daily treatment of his feet including cleaning, foot soaks, and antibiotic therapy followed by the application of the boots. By using positive reinforcement (using the same principles you train a dog, you can train a rhino!) The boots were placed on his feet with the command of “Lift it”, and stayed on overnight protecting his feet from feces and urine.

This experience has been an incredible journey that has given me the opportunity to work with many different people in several industries. With the collaboration of the staff, management and veterinary department of the Denver Zoo, I have been allowed to participate in the treatment and management of this incredible animal. We could not have developed this product without the support and advice from Landon Meier, Hyper Flesh and Smooth On Corporation in which helped guide us in material usage, techniques and trouble shooting.

What does this invention have to do with passion? Well, it was all started simply for the love of a rhino. It is that passion which will continue to drive us to broaden our product and develop a business that will make a difference in the lives of many species of animals. Another amazing opportunity that this has provided for us is that this new treatment apparatus will be presented to an international audience this summer in Chester, England at the annual International Rhino Keepers Association workshop. And, if we can save rhinos along the way then that’s what we intend to do.
HIGHLIGHTS FROM THE BEAUTIFUL WORLD OF BOTANY

CONTRIBUTED BY DR. BILL BAXENDALE

The Spring 2014 Plant Anatomy Class got to see the practical applications of their course in action when Dr. Peter R. Brown of Rocky Mountain Tree-Ring Research of Fort Collins visited them. Dr. Brown discussed how plant anatomy studies apply to the research his company performs in analyzing tree rings in dating wood for various projects, with particular applications in archaeological research.

The students then learned to take and read tree cores, and were most enthusiastic about gaining this kind of hands on experience. Inviting professionals from outside the classroom encourages students to think outside the box when looking at employment options and exposes them to careers that otherwise might remain obscure.

Haley H. Oser (Biology,'ll) graduated from the University of Nebraska-Lincoln in May of 2015 with a Doctor of Plant Health degree.

Haley focused on botany while she was at MSU Denver and was a teaching assistant for Dr. Baxendale’s Plant Anatomy Class; she also worked with Dr. Rebecca Ferrell in research on nitrifying bacteria. She took a variety of biology and earth science classes, including a soils class, which prepared her for admission to the Doctor of Plant Health program.

While Haley was at the University of Nebraska-Lincoln, she had a summer internship as a Barley Scientist Intern for MillerCoors and Golden Malting in Golden, Colorado. During this internship she gained a fundamental understanding of malting barley production with a significant emphasis on grain quality. Haley has now been hired by MillerCoors to work with the
farmers who produce barley for Miller Coors to assist them in developing farming practices that will produce a better quality grain for the company. She will also be researching growing practices that will inhibit the premature sprouting of barley, a new problem with the earlier warm temperatures that are a result of climate changes that have occurred in Colorado.

During the early stages of her graduate education…Haley drove a tractor! Photo courtesy of B. Baxendale.

Congratulations
Dr. Haley Oser!!!
Senior Biology Major, Terrin Manes reflects on her experience in the GEMS summer fellowship:

Internships; we all have heard of them, we all know of them, but it can be hard to sort through all of them. Going into my freshman year here at Metro, I knew that one day it would be my time to start applying for an internship. I was introduced to a program hosted through the University of Colorado Anschutz Medical Campus called the GEMS Program (Graduate Experience for Multicultural Students) by my advisor, Dr. Sheryl Zajdowicz. This program matches students with a mentor whose work best suits the interests of the applicants. For 10 weeks, each student works closely with their mentor on a research project, which will be presented in a 15-minute oral presentation and a research paper at the end of the program. Throughout the summer, students get the opportunity to participate in workshops, listen to seminars, and even participate in a debate, group assignments and other activities outside of the lab (white water rafting anyone?). The program is meant to simulate the workload and what being a graduate student is truly like; the rigorous atmosphere helps students grow, learn, and fall more in love with science. You also have the amazing opportunity of getting to know other science lovers; this year we had GEMS who came from places like the Virgin Islands, Pennsylvania, and even Puerto Rico!

As a student passionate about research science, I knew that the GEMS would be an incredible experience. I was accepted into the 2015 summer GEMS program as a junior (soon to be senior) and was paired with my mentor Dr. Michael J. Schurr of the Department of Immunology and Microbiology. Throughout the summer I worked very closely with a nonmucoid strain of *Pseudomonas aeruginosa*, a bacteria that is opportunistic and commonly found in many hospital acquired infections; the pathogen is the most prevalent in cystic fibrosis patients. Our main focus for my summer project was to develop more evidence to suggest that one of the bacterium’s histidine kinases (AlgZ), which is involved in a complex two-component regulatory system controlling the pathogen’s many phenotypes, has the ability to control gene expression through NAD+/NADH levels. We were able to provide evidence supporting the binding of the histidine kinase to the redox molecules. We also measured the ratios of the redox molecules within the pathogen at different levels of oxidative stress (different percentages of oxygen availability) to determine at which redox state the pathogen most active. Throughout the summer, I was introduced to and had the opportunity to practice with many techniques and equipment; I learned how to work...
with a High Pressure Liquid Chromatography machine (HPLC), I became very familiar with gel electrophoresis, and I became especially comfortable with setting up, tweaking, and running a very specific NAD+/NADH 96 well plate assay.

I learned so much from everyone I had the pleasure of meeting with, talking to, and learning from this summer. I am so grateful I had the opportunity to do science at such a great campus with so many talented and seasoned professionals. Many opportunities can present themselves to students who are involved in this fellowship – traveling with your mentor to a conference to present your work is the award given to the student who was judged to have the top paper and presentation, an incredible opportunity! If I were to recommend an internship to anyone who is sifting for one, especially to those students who are interested in a career in research, I would 100% suggest the GEMS fellowship.

Congratulations to Terrin for being awarded the Best Presentation and Research Paper for her GEMS Fellowship research work!!!

Way to go, Terrin!
The Paleobotany class (BIO 3170), taught by Dr. William Baxendale, took a field trip to Florissant National Monument on September 12 to learn about this unique site of scientific interest. Florissant brings together the geologic, biologic, chemical and paleoclimatic story behind the preservation of the 34.1 million year old Lake Florissant. Three stages of the lake, caused by three separate explosions of the Guffey Volcanoes, some 15 miles from the site, preserved a flora and fauna unlike any found in the United States. The students took a tour led by Ranger Jeff Granger, keyed fossil plants, and drew some conclusions about the paleoecological differences between the Upper Eocene climate and how it compares to that of today.

Students also learned about internship and volunteer opportunities in the national park system and how to apply for those opportunities.

The students also visited the commercial Clare Florissant Quarry where they spent a number of hours learning to split the fossiliferous shale beds to find and identify the plants and insects contained in the rocks. This is always the most exciting part of the field trip, and the students spent a good part of the afternoon seeking that elusive major find! This activity shows the students how professional paleobotanists locate, study and preserve their research material.
Dr. Baxendale instructing the technique for splitting shale. Photo courtesy of B. Baxendale.

Want to learn more about the Florissant Fossil Beds National Monument? Check them out on Facebook!

A fossilized beech leaf. Photo courtesy of B. Baxendale.

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Metropolitan State University of Denver Department of Biology
A student researcher’s perspective:

Sitting in Invertebrate Zoology, Dr. Hsiu-Ping Liu dropped by to talk to us about mollusks, as she is invited to do by Dr. Cindy Church every semester. At the end of this particular semester, she was planning a field trip to collect spring snails in the state of Utah along with Dr. Robert Hershler from the Smithsonian Institute, Peter Hovingh, and Mark Karlok. Four of us jumped at the opportunity. On May 20, 2015, a road trip began that took us over 1,500 miles through Colorado, Utah, and southern Nevada.

Our goal was to collect *Pyrgulopsis kolobensis*, a spring snail, from several locations within the states of Utah and Nevada. The ultimate purpose is to sequence their mitochondrial DNA to determine if the previously identified taxonomy was correct or if these snails from different locations are, in fact, different species.

Spring snails, as the name implies, are only found in freshwater springs. Some of our collection locations were easy to access from the road, while others took us on long hikes down canyons and up rivers. We must applaud Hsiu-Ping and Mark for their patience with us on the long driving times between collection locations, putting up with the many restroom stops, listening to the incessant chatter from
the back seats, and not complaining about our music choices.

We had a lot of fun on this trip and forged new relationships. Each of us had individual, lasting impressions of the methods and practices of field biology. The things that stand out most in our memories include seeing our first tiny snail, the vast array of plant and animal life we encountered on our journey, the beautiful views, hiking down (and back up) steep canyons, putting a hand, foot, or unmentionable body part in cactus, or getting rained on while we collected, to name just a few. We will never forget our time together and will always value this experience for the rest of our academic and scientific careers.
The 46th Annual Meeting of the Rocky Mountain Conference of Parasitologists featured Dr. William Campbell as the keynote speaker. Dr. Campbell, who refers to parasites as “beautiful and brilliant” because of their incredible life cycles and ways to evade our immune responses, has devoted decades to developing drugs to fight them.

Dr. Campbell’s crusade against illnesses began in the 1970s. While working at Merck Research Laboratories, Dr. Campbell was investigating how to fight heartworm in dogs. He was able to identify the antiparasitic activity of the soil bacterium, *Streptomyces avermitilis*, and derive a drug compound from it. The compound, known as ivermectin and marketed by Merck as Heartgard, was a huge success and is still the standard for heartworm prevention.

Based on ivermectin’s efficacy against nematodes in dogs, Dr. Campbell became interested in the human parasite that causes river blindness, which is prevalent in sub-Saharan Africa and parts of Central and South America. The worms are transmitted to humans by black flies and live just below the skin, causing severe pruritus; they eventually migrate to the eyes, causing blindness.

Because those who most need the drug are usually the world’s poorest and most neglected people, Dr. Campbell facilitated an international collaboration between Merck, the World Health Organization, ministries of health and people in the endemic communities to distribute the drug. Merck now donates about 70 million treatments a year. The ultimate goal of eliminating onchocerciasis globally still remains, but great progress is being made.
Dr. John Janovy, Jr. gives a presentation on writing at the 46th RMCP. *Photo courtesy of C. Church.*

MSU Denver students at the 46th RMCP. *Photo courtesy of C. Church.*

MSU Denver students at the 46th RMCP. *Photo courtesy of C. Church.*

MSU Denver students enjoy seminars on high impact parasitological research at the 46th RMCP. *Photo courtesy of C. Church.*
A FAREWELL TO A COLLEAGUE, MENTOR, AND FRIEND

This spring, the Biology department lost a cherished colleague, Dr. Mark Mazurek. Dr. Mazurek, whose expertise was neurobiology, joined MSU Denver in 2010. He taught Anatomy and Physiology, Advanced Physiology, and Neurobiology courses. Additionally, he acted as the primary advisor for the Future Doctors of Denver and as an advisor for students interested in pursuing medical school. His expertise in neurobiology provided unique experiences in research for any student interested in Biology and Psychology. Dr. Mazurek was truly a mentor who guided students through the rigors of their undergraduate education and assisted them in taking those next steps toward graduate school or professional school. He was the epitome of a colleague and was a champion for everyone at MSU Denver, both students and colleagues alike. He is missed by all who knew him. Farewell, my friend.

Dr. Mark Mazurek
1971-2015

Always willing to help out coordinating the judging of research posters, even if it meant a bit of frustration! Photo courtesy of S. Zajdowicz.

Dr. Mazurek with his research student Jacob Paschall. Jacob one 3rd place for his Biology poster presentation at the 2nd Annual MSU Denver Undergraduate Research Conference. Photo courtesy of S. Zajdowicz.
More information regarding the MSU Biology Club can be found:

Facebook: https://www.facebook.com/MSUDenverBiologyClub

Website: http://msudbiologyclub.weebly.com/

The Biology Club is also actively seeking faculty and staff who would like to present on their research or a key topic of interest. Please contact the Biology Club at: biologyclub@msudenver.edu

MSU DENVER BIOLOGY CLUB EVENTS

Learn more information regarding events through OrgSync!!

Become a member or find additional events and information through www.orgsync.com or on our Facebook page: https://www.facebook.com/MSUDenverBiologyClub
At this time, the newsletter is scheduled to be prepared during the fall and spring semesters. However, additional newsletters may be prepared per semester if a great number of entries have been received.

**Biology Faculty, Staff, Students, and Alumni:** if you have an accomplishment (ie awards, acceptance into a fellowship, entry into graduate or professional school, presentation at local, national, or international meetings, or publication) that you would like to showcase in the newsletter, please send a brief summary and any photos to **Dr. Sheryl Zajdowicz** at **dr.zbiology@gmail.com**. We are also looking for any photos of anything biological to include in upcoming newsletters. Faculty, who would like to have their research highlighted in an issue of the newsletter, may also submit their request and a synopsis of their research with any appropriate images; please indicate if you are looking for research students. Also, any club who would like to have their events advertised may send their information at the start of the respective semester.

This newsletter is compiled and edited by S. Zajdowicz. Photograph credits: Unless otherwise indicated, S. Zajdowicz provided the photographs used in the making of this newsletter.