

FRIENDS OF THE PHILIP L. WRIGHT ZOOLOGICAL MUSEUM

SPRING 2021 (No. 37)

FROM THE CURATOR

A BUSY SPRING IN THE MUSEUM

Phew! Maybe I'll end up saying this every semester, but this really was a busy one around the PLWZM. While there was a combination of factors at play, I think most of it boiled down to two big things.

First: with the renovation behind us and me settling more into my role as curator (nearly two years!), it's spread by word-of-mouth among students that we're back open and accepting volunteers. Second, and related: **I got excited by the amount of interest and figured, why not see how many students I can orchestrate at once?**

This semester we had 10 students working on dedicated projects around the museum, plus another 5 who attended our Friday "Carcass Club" specimen prep sessions. (Plus, 7 others on my waitlist that I just couldn't fit in yet.) We had so many people working on so many different projects that one of our wildlife experiential interns, Camryn Rhodes, stepped up to help document it all. Her work resulted in the series of short student videos posted on our Facebook page and our Instagram page (collected in a Highlight section at the top). We have more videos to release, so you can catch up on the ones already posted and stay tuned for more if you want to hear about the students' work in their own words!

One of our regular students was of course our Spring 2021 Graslie Curiosity Intern, Sky Gennette. Sky's comprehensive small mammal identification guides will be incredibly useful, as she gathered all the best information from multiple places into one resource that we can easily update with taxonomic changes or other new information in the future. Sky is completing her guides this summer, and I'm excited for students in the museum and Mammalogy class to get to use them.

On the technical end of things, I got to spend time working on a couple of special projects. One was quick but important: cleaning up and georeferencing our northern bog lemming (*Synaptomys borealis*) records, which were requested by U.S. Fish and Wildlife Service as part of their Species Status Assessment (SSA). The SSA will inform whether this species will be recommended for proposed listing under the Endangered Species Act. SSA



ABOVE: A glimpse into one of our more colorful drawers—specimens of western tanager (*Piranga ludoviciana*).

is a long process that requires a lot of information, and we were pleased to offer what we could. The other project is larger and ongoing, as I joined a worldwide group of bird specimen experts in the Bird Data Harmonization working group. If you're interested in how we manage biodiversity information as a community, you can read more about this work in the "Backroom Notes" section.

And, finally, we are gearing up for our summer projects, including two student hires. Spencer Kim will be our summer 2021 Graslie Curiosity Intern, working on a joint exhibition with the UM Montana Museum of Art and Culture. And we're bringing on Dennin Holmes-Mora (and maybe YOU as well!) to assist in our special hoary marmot survey project.

Like I said—phew! And that's just the tip of the activity iceberg lately in the PLWZM. As always, read on to learn more.

Angela Hornsby, Ph.D.
PLWZM Curator



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2021 GRASLIE CURIOSITY INTERN



Sky Gennette
Wildlife Biology '21

The focus of my internship project was creating comprehensive guides for identifying Montana's mammal species. When I initially proposed this project, I was thinking about what I had learned in previous

mammal identification courses I took at UM and what type of materials would be useful for that sort of work. When identifying mammal specimens, one must draw on many sources of knowledge, whether it be field guides, keys, scientific articles, or other online or physical sources. I thought that combining key pieces of information from all these sources and compiling it into one comprehensive document would be a great way to create a useful resource for people interested in identifying mammals.

To do this, I looked through resources made available by the museum as well as online resources and recorded information to be included in these guides. Then, I took photos of museum specimens to provide a visual aid for key identification features of the species. Finally, I compiled the information and photos into documents for each species. The groups of mammals I created guides for were shrews, rodents, and bats, all of which are tiny, tough to identify animals. The guides I created for these species will be helpful for students, museum staff, or any other people working with these animals. Hopefully, this project can be expanded to provide these types of guides for other mammal groups.

Overall, this was a great experience for me. The highlight for me was getting hands-on experience with the museum's amazing specimen collection. I got to refer back to the knowledge I gained in previous mammal identification courses while also learning new things along the way. The access to the museum's resources, along with Angela's guidance, made for a really great opportunity to develop my vision for this project. I'm really proud of the outcomes of this internship, and I hope that others can find these resources useful in their own endeavors. **I'm super grateful for the opportunity to have been a Graslie Intern—it's a great opportunity to engage with the zoological museum and all it has to offer!**

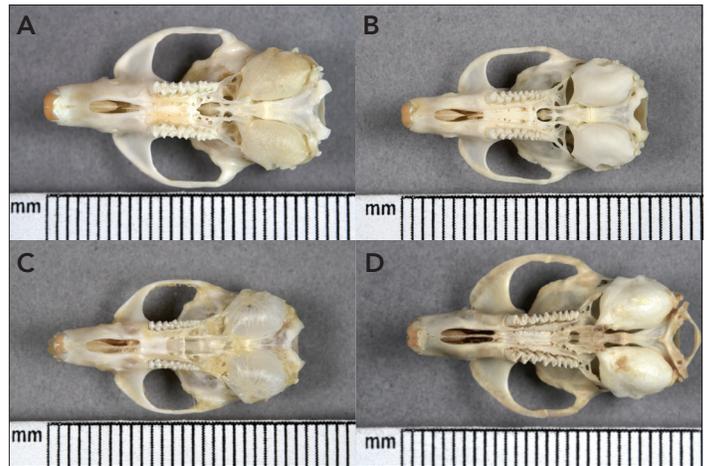
RIGHT: A photo from Sky's guide to *Sorex arcticus*. Her efforts to capture high-quality photos and edit them to highlight key features paid off! Groups like shrews are notoriously hard to identify, in part because of the difficulty in generating good images like this that allow you to see details like tooth cusps without fuzziness or background interference.

Did you know? All of Montana's shrew species are classified in subfamily Soricinae, the red-toothed shrews. Those red cusps aren't stains, they're iron deposits that strengthen the teeth against tough and crunchy prey.



ABOVE: Getting good photos of tiny shrew, bat, and mouse skulls—like this face-on photo of shrew incisors—takes a combination of patience, persistence, and good equipment. Our new camera and macro lens, purchased as part of our recent renovation, was put to the test (and worked beautifully) in Sky's project.

BELOW: Details stand out when you're able to compare skulls side-by-side. (A) montane vole (*Microtus montanus*), (B) meadow vole (*M. pennsylvanicus*), (C) red-backed vole (*Myodes gapperi*), (D) northern bog lemming (*Synaptomys borealis*, with C1 vertebra attached).



SUMMER MARMOT MADNESS

If you've ever been hiking high in the mountains and heard a curious whistling sound on the wind, chances are it was a marmot—perhaps a yellow-bellied marmot (*Marmota flaviventris*), or, if you were up high enough, a hoary marmot (*M. caligata*). Between their clear alarm calls and tendency to act as sentinels sitting on a high perch with a good view for predators, these large social rodents are fun and usually easy to spot.

And, so it goes that they became a favorite focus and excuse for high mountain field trips for **Phil Wright** and his children **Alden, Phil Jr., and Ann**. Around half of PLWZM hoary marmot specimens—the more alpine of the two Montana marmot species—came from these family trips! In speaking with Alden over the last many months, he posed a question that had been floating in his mind for some time: how isolated and prone to local extinction are these marmots on mountaintops, particularly given past and ongoing climate change?

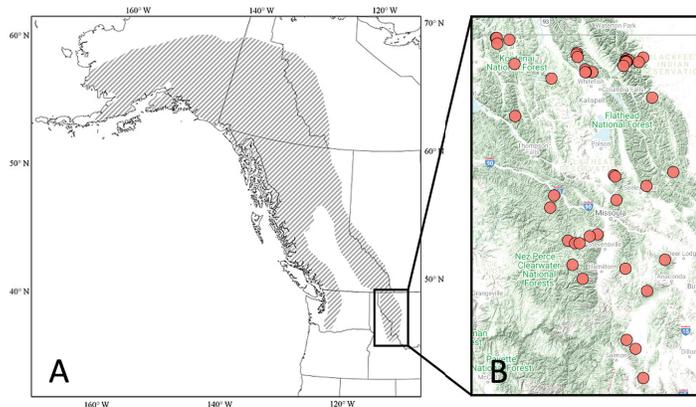


Figure 1. (A) Full range of the hoary marmot, and (B) all historical collection points (1895-1981) from the eastern arm of the southern range boundary in the Rocky Mountains.

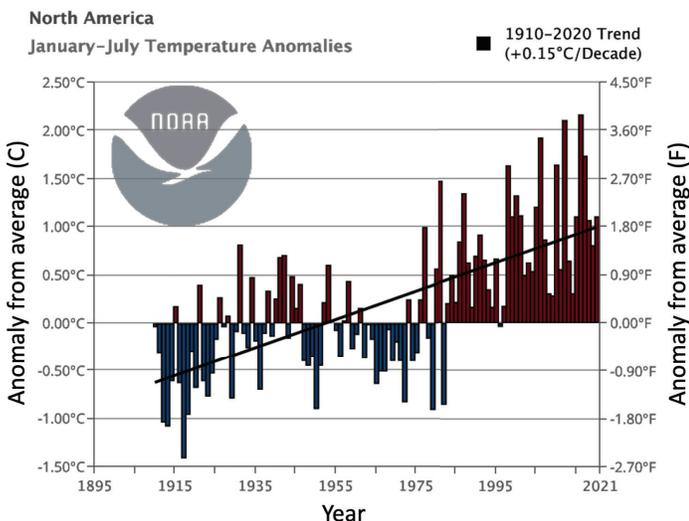


Figure 2. Land temperature anomaly in North America from 1910-2021, with trendline showing the average rate of change of +0.15 C per decade. Chart customized from NOAA data (<https://www.ncdc.noaa.gov/cag>).



ABOVE: A hoary marmot watches vigilantly for threats in Glacier National Park. (photo by Trougnouf, Wikimedia cc-by-sa-4.0)

This led to some talks with **Dr. Link Olson**, a hoary marmot expert at the University of Alaska-Fairbanks. And in short order, a project idea was born! While we are interested to spin this into some larger genomic and biogeographic work in the future, for the time being we decided to focus on a simple question: at this southwest edge of its range (Fig. 1), and given ongoing climatic warming (Fig. 2), **is the montane and cold-adapted hoary marmot still found in the places it was historically collected or observed?**

Most of our knowledge on where this species is found in Montana comes from the PLWZM collections, which paired with data from other museums gives us about 40 unique localities for hoary marmots between 1895 and 1981. By revisiting these sites, surveying for marmots, and comparing our results to publically available environmental data from the time of collection through today, we'll see whether hoary marmots are still found at all of these locations and, if not, whether climate or other biogeographic factors seem to be at play.

Alden Wright and family have generously funded this project so we could bring on a student, **Dennin Holmes-Mora**, to help with planning, surveying, and data processing. We are also excited for the possibility of help from "citizen scientists" to complete all sites this summer!

CURIOUS ABOUT HELPING?

Visit <http://hs.umn.edu/umzm/marmots.php> to learn more. By early June, we'll post the remaining details and open the project up for volunteers to reserve sites they'd like to survey. Set a reminder to check our website then if you'd like to participate!

If this project isn't quite your speed, but you're interested in other citizen science efforts, consider downloading the **iNaturalist app** to document the natural world on your adventures—researchers decades from now will be thrilled to have so much data to work with!

HANDS-ON LEARNING IN THE MUSEUM: SPOTTED SKUNK SURPRISE



Samantha Getty
Wildlife Biology '21
PLWZM Undergraduate Volunteer

Hello! My name is Sam Getty and I am a recent graduate of the Wildlife Biology program here at UM. I have been volunteering at the PLWZM for about a year and a half. In that time, I have helped with almost every aspect of the museum, from integrated pest control, cleaning skeletons, cataloging new accession, to specimen preparation!

While I love helping with day-to-day tasks around the museum, my favorite part is exploring the collections after hours. Over the last few months, I have been working on cataloging a new accession with a variety of amazing specimens donated to the museum by retired wildlife biologist David Shea. During this task I came across some strange damage to a spotted skunk skull (*Spilogale gracilis*). I was perplexed yet also extremely curious. I decided to dive into the scientific literature in an attempt to learn more about what caused this unusual feature. I found that it was caused by a parasitic worm, and that the external damage I noticed on the skull from David was an indication of a severe infection. **So naturally I did what any curious biologist would do, I asked Dr. Hornsby if I could explore the research collections to visualize for myself the damage that the parasitic worms could do.**

After about four hours, I had gone through most of the spotted skunk skulls that we have in the collections. Much to my and Dr. Hornsby's surprise, we have at least 129 spotted skunk skulls that show visible damage from the parasitic worm! The extent of the damage ranges from warped bone around the sinuses to large holes in the top of the skull. During this personal exploration I also noted an incredible diversity in size and shape of the skulls. While all of the skulls shared similar dental formulas and overall shapes, each individual was unique.

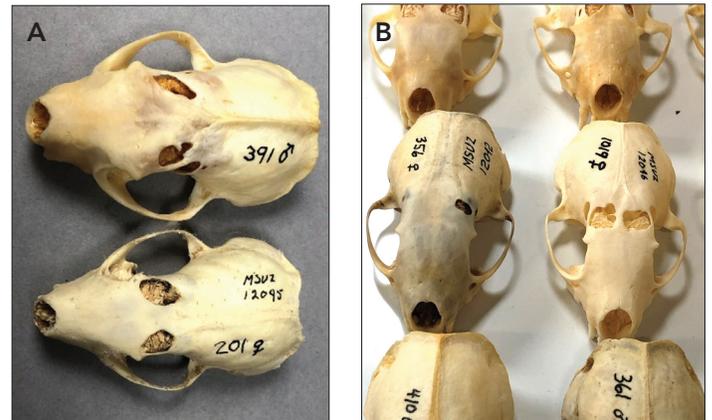


ABOVE: Skulls showing extensive damage from parasitic worms.



ABOVE: Variety of spotted skunk skulls set out for comparison.

BELOW: (A) Skulls showing the differences in size and shape in the sexes. The male (top) is larger and has more prominent sagittal and occipital crests. The female (bottom) is smaller and has a narrower rostrum and flatter forehead. (B) Skulls showing different levels of damage.



During my time at the museum, I have had the opportunity to practice and expand on the skills that I have learned in my classes, like skull identification from mammalogy and learning about the adaptations that separate modern birds from their extinct dinosaur relatives. Last summer I was able to participate in the PLWZM's Montana Natural History Workshop, which included earning my Montana Master Naturalist certification from the Montana Natural History Center. Since then, I have had the privilege of assisting MNHC with other Master Naturalist courses, specifically helping with the mammal and avian specimen section of the course. In that section I walk participants through the creation of a research specimen and discuss all of the evolutionary adaptations that have helped birds develop specialized flight, as well as practical skull identification and the diversity and function of mammalian teeth. So, I have enjoyed both my work in the PLWZM and all the opportunities it has led me to!

If you have a photo or story you'd like to see in a future newsletter, send it along to umzm@mso.umt.edu! This photo was sent in by **Don Forrester**, remembering his time as a new graduate student at UM.



This photo was taken at the National Bison Range in the winter of 1959. From left to right are Dr. Phil Wright, me, and Dr. Clyde Senger. Dr. Wright was engaged in the collection of a number of bighorn sheep rams to conduct some physiologic studies and Dr. Senger and I went along to help.

Babe May, an employee of the Bison Range, took the photo and also shot the ram. Here we are loading the ram into the back of a truck to

transport it to the Bison Range lab for sample processing. At the time I was a first year M.S. graduate student in the Wildlife Technology program in the Department of Zoology and this was my first experience with field work in Montana. I was beginning a study of the lungworms of bighorns in 10 different areas in western Montana, including the Bison Range.

I had the delightful experience to take Mammalogy and Ornithology from Dr. Wright and prepared several specimens for the museum during those courses.

- Don Forrester, Professor Emeritus, University of Florida

Want to catch up on old newsletters? You can read them all at: <http://hs.umt.edu/umzm/newsletters.php>



ABOVE: Close-up of a ring-necked pheasant (*Phasianus colchicus*).

BIRD DATA HARMONIZATION

Where do you go when you're looking for biodiversity data? And, *how* do you search for it?

While most vertebrate collections have some form of online database, an increasingly popular option for students and researchers is to rely on **data aggregators**: websites like VertNet and GBIF that compile information from myriad databases into one place. The major benefit of data aggregation is obvious—it offers a one-stop shop for finding data! But inconsistent formats and vocabularies from museums across the world mean that data may still be difficult to find even in the best aggregators.

How big of a problem is this? Well, for instance, say you're looking for female bird specimens. **Out of 5 million bird specimen records in GBIF, there are 418 unique values for sex!** If you wanted to find all the female birds in GBIF, one of two things would need to happen. Option one is that you would need to search using the term *female* as well as *F*, *[F]*, *F-verified*, *hembra*, *femelle*, *femella*, *feminino*, and dozens of other values that mean the exact same thing in different forms and languages. Option two is that the aggregator would need to be coded to know that all of those values are same, so it would return all specimens with a synonym of the search term *female*. And of course, it gets more complicated from there—sex may be uncertain (*likely female*, *female?*), partially female (*hermaphrodite*, *gynandromorph*), conditioned on external or internal features, etc. And sex is one of the *simpler* fields to sort!

I joined a group of about 40 bird curators and biodiversity data experts in pursuit of an automated solution for these challenges. Our focus in this phase is to harmonize bird data for museum specimens in just three fields: sex, life stage (embryo, chick, adult, etc.), and preparations (skin, skeleton, tissue, etc.). The goal is not to make one set of terms that all databases must use, but rather to develop a **thesaurus** for each field—a list of **primary terms and synonyms** for the aggregator to reference in determining all the possible matches. So, whether you search for *female* or *hembra* or *F*, you'll find all the female birds regardless of the way each museum worded their database.

How are we doing so far? We're off to a good start, having developed working thesauruses for 418 values of sex and 13,500 values of life stage, and we're working to better automate the sorting of the over 26,000 values of preparation. With similar groups worldwide working to improve data standards for various taxa and applications, in time we'll organize our way into a new era of biodiversity data cleanliness and discoverability.

And, there's good news for the PLWZM—we are already using such a well-structured collection management system (Arctos), that our data shouldn't need any updating to match the preferred terms under development. - AH

WHO'S IN THE MUSEUM

GRAD STUDENTS: Graduate Curatorial Assistant **Erin Keller** continued to help leading Carcass Club each Friday in the prep lab—an active break each week from working on her M.S. research! **Hila Tzipora Chase** continued work on an update to our display case on the 2nd floor of Health Sciences. Anthropology student **Haley O'Brien** spent a lot of time in the research collections looking through our broken large mammal bones for use in her Ph.D. research. Even “poor quality” specimens have many uses!

UNDERGRAD INTERNS: Graslie Curiosity Intern **Sky Gennette** took hundreds of photos for her small mammal ID guides, while wildlife experiential interns **Kyle Peterson** and **Camryn Rhodes** worked on many projects. Camryn specialized on photos and video for our social media posts, while Kyle focused on large skull tagging and freezer inventories—and both did their fair share of loading scans of specimen data cards into our database.

UNDERGRAD VOLUNTEERS: **Samantha Getty** continued to lead Carcass Club with an astounding 87 specimens prepared since August 2020, and worked on all aspects of cataloging an accession of >70 specimens from **David Shea** in between prep days. Sam was joined in Carcass Club by preppers **Madeline Kleeman**, **Dennin Holmes-Mora**, **Addy Flegel**, and **Isabel Rickert**. **Marissa Italiano** became a cataloging and bone-numbering pro, and she will ruthlessly hunt down every databasing error you make! **Sydney Driver** continued her big project revamping our display cases in the Mansfield Library, and past Graslie intern **Justin Ruby** continued his work turning 3D skull models into outreach tools. **Katelyn Kline** and **Max Greenleaf** joined to specialize on skeleton cleaning and skeleton databasing, respectively.

FRIENDS & VISITORS: **Larry DePute** keeps turning out beautiful bird skeleton articulations, recently running a sharp-shinned hawk skeleton through the beetle colony. **Kara Cromwell** spent a couple of days sorting through osprey organs for an ongoing project describing their parasite communities. Undergraduate students **Taylor Coon** and **Sarah Grenfell** worked on research projects with Hila and Haley, respectively, using our specimens. Sarah and Sydney also used our specimens in their “pod-cast” projects for the spring Ornithology class. Finally, **Dalit Guscio** stopped by to photograph some bird keels for a public education module.



ABOVE: Bright bits of color on a Bohemian waxwing (*Bombycilla garrulus*).

MISCELLANY

In January, we teamed up with **spectrUM Discovery Area** to produce a short video called *Life of a Specimen*, detailing the major steps of specimen preparation. You can find it on YouTube by searching “spectrUM specimen science.”

One of our newest accessions is a set of rodents from **Ellen Adelman**, who collected them from the Rattlesnake area in the course of her M.S. work in the late 1970s. Ellen had taken great care of them in the meantime, and was even able to send along the original trap data cards!



ABOVE: Woodpecker plate number 111, courtesy of the John James Audubon Center at Mill Grove, Montgomery County Audubon Collection, and Zebra Publishing.

SAVE THE DATE! The exhibition **Avis marvelous: Ornithological Imagery in 19th Century Art and Science** will be open Sept 24 2021 to Jan 8 2022 in the Paxson Gallery at the UM Montana Museum of Art and Culture. This exhibition will bring together specimens from the PLWZM and ornithological prints from the collection of educator and archivist **Lee Silliman** in an exploration of the way artists and scientists analyzed, documented, and celebrated the avian world in the 19th century. The exhibition will explore different strategies employed by artists to create visual representations of birds for publications and other printed works of art. It will also analyze concurrent ideologies behind scientific collections and museological approaches in natural history displays. Our Summer 2021 Graslie Curiosity Intern **Spencer Kim** will be hard at work on this exciting interdisciplinary show in the coming months.



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OUR MISSION

The Philip L. Wright Zoological Museum, a unit of the Division of Biological Sciences of the University of Montana, is committed to the collection and preservation of zoological specimens for the purposes of research, education, and community outreach. We work for both current and future generations, sustaining these irreplaceable resources representing our natural heritage in Montana and beyond.



FRIENDS OF THE PHILIP L. WRIGHT ZOOLOGICAL MUSEUM

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