

DENVER MUSEUM OF NATURE & SCIENCE EARTH SCIENCES



Howdy from your friends at the museum! We're writing with an update and thanks for an incredible year. In 2019 we connected over two billion people to Colorado's earth science. Yes—billion with a "b"! We did so through documentaries, scientific articles, media coverage of [Highlands Ranch](#) and [Corral Bluffs](#) discoveries, [Scientists In Action](#) broadcasts to rural schools, and in person at the DMNS.



Whether with kids, adults, interns or fellow rock and fossil fanatics, we pay it forward to our community, while probing the frontiers of science and archiving key records of earth history. Plus we get to play in the dirt now and then! Over the course of 2019 our team spearheaded a helicopter rescue of at-risk

dinosaurs in Utah and New Mexico, shepherded a massive orphaned collection of fossil plants from Texas, opened a [new museum exhibit](#), and chronicled our [unsung meteorite history](#). Meanwhile, we hosted dozens of visiting scholars, identified oodles of fossils and [meteorwrongs](#), and mentored 21 student [Interns and Teen Science Scholars](#).



All of this is done with your support—of our little department and *your* big museum. Thank you and we hope you have a rocking new year! Read on to learn more about our alumni and our team. Better yet... please consider [getting involved](#).



STAFF & INTERNS

Business Support Specialist [Libby Couch](#) is the newest member of our team. Welcome! Originally from Berkeley, she comes to us via Portland and Parker. Libby hit the ground running, quickly getting our financials, calendars, and logistics into shape. Libby loves exploring Colorado and hopes for more trail riding, gardening and knitting in 2020. We hope to see her in the field, too!



Curator [Joe Sertich](#) started the year by receiving the Giving Club Special Recognition Award for his volunteer-driven field research. Congrats! In between field seasons in Utah for the [Laramidia Project](#), Joe helped Teen Science Scholars digitally dissect a new Jurassic tyrannosauroid from Wyoming, and worked with the lab team on the long-awaited “Dinosaur Rescue Mission.”

The mission: helicopter out a two-ton horned dinosaur skull and duckbill skeleton from New Mexico one day, and on the very next, rescue another duckbill and an articulated horned dinosaur skeleton from Utah. Mission accomplished!





Joe is describing several new species of dinosaurs and crocodiles from the Cretaceous of Laramidia, [Africa](#), and [Madagascar](#). Twelve new taxa have been discovered by DMNS teams including [two new horned dinosaurs](#), a dome-headed dinosaur, and several small meat-eating theropod dinosaurs. Plus there's Joe's [new tyrannosaur site in Utah](#). Expect 2020 to be the year of the dinosaur!

It was the *Year of the Fern* for Collections Manager [Nicole Neu-Yagle](#). With Collections Assistant Jessica Johnson and 31 Volunteers, she photographed and databased the museum's fossil pteridophytes (ferns and fern allies) for an [NSF iDigBio grant](#). 7000 specimens in all, including a few fiddleheads! The project opens [new doors](#) for online access to the museum's collections.



With Collections Manager [Kristen MacKenzie](#), Nicole lent specimens to museums as distant as Japan, and staged several "Science on a Spot" hands-on tables for museum guests. They helped host the [Axiell Collections Conference](#), shepherded a huge paleobotany collection donation, and installed a suite of infill cabinets aimed at accommodating future collections growth.

Kristen made the impossible possible in 2019. She and her Volunteer team moved our remaining fossil jackets out of the Big Bone Room and to new storage on the second floor. 100,000 lbs of fossil jackets are now in the queue for our Prep Labs. During the move, safety issues were discovered with the oversize racks, so Kristen and Nicole had to move all our oversize collections *again*.





To accommodate repairs, each specimen had to be removed and replaced stepwise—a process made more complex because we didn't have our old storage spaces to move back into. So every inch of real estate, including the halls, were used to handle the overflow. Talk about a [15 puzzle!](#) In between, Kristen excavated at the [Highlands Ranch *Triceratops*](#) site and helped visiting researchers spend over 150 days using our collections.

Curator [Dave Krause](#) is ready for the Spring thaw so he can find some fossil mammals, preferably in the boot prints of legendary fossil hound Tyler Lyson. In the meantime, Dave described and analyzed a bizarre new Cretaceous mammal from Madagascar. As the most complete skeleton of its kind, it will revise our view of mammal origins—so much so that eight scientific papers about it are queued to launch later this year.



In between, Dave helped assemble 20,000 Madagascar fossils at the DMNS, reuniting fossils collected over 25 years and stored at multiple institutions. A daunting task—but now they can be studied in an integrated fashion. Schools created by Dave's [Ankizy Fund](#) are bursting at the seams, with alumni landing jobs to support their family, community and the next generation.

Digital Research Technician [Lindsay Dougan](#) started the year off with a bang, ushering baby Juniper into the world. Both have logged many hours in the museum, including a trip to Lindsay's alma mater for an [X-Ray CT short course](#). She mentored two Interns and two Teen Science Scholars this year, giving them a crash course in image processing, segmentation and modeling.





In tandem, Lindsay expanded the [Digital Research Lab](#) to 5 workstations running Dragonfly, Blender and Maya. The lab's work is even featured in the Corral Bluffs [NOVA documentary](#). See if you can spot the animation of the inner ear of the giant beaver-like *Taeniolabis*! The lab also has sweet new [Simosuchus](#)-themed T-Shirts. Give a shout if you want one. They're only ten bucks.

Always popular with tour groups cruising through the [Oversize Prep Lab](#), Preparator **Justy Alicea** spent most of the year training batches of new volunteers in micro-preparation. As our internal go-to-guy for the really hard prep puzzles, Justy has been training our team to do highly detailed work on the concretion-encased Corral Bluffs fossils. These include some of the most unusual, yet-to-be-described fossils ever found in Colorado. We can't wait until they're finished!



Curator [Tyler Lyson](#) spent less time in the field this year and more time finishing K/Pg boundary projects. Not least of which was the spectacular [Science Magazine paper on Corral Bluffs](#), ensuing [NOVA documentary](#) and [new museum exhibit](#). Tyler also named two [new Cretaceous turtles](#), one of which was the largest animal to survive the K-Pg event. Imagine a [200 pound turtle](#)!

When he wasn't gracing the pages of the [New York Times](#), [Washington Post](#), [Denver Post](#) and [Wall Street Journal](#), Tyler gave talks at SVP in Brisbane and the [EGU Galileo Mass Extinctions Conference](#) in Utrecht. To top it off, he and DMNS Research Associate [Gabe Bever](#) were awarded a \$519,000 NSF Grant to study [turtle origins](#). More frosting!





Our ace stratigrapher, teacher, digital domer, and Research Associate **Bob Reynolds** continued to connect our community to emerging and historic geology resources by doubling the scope and contents of Coloradostratigraphy.org and Turkanastratigraphy.org. For this work, he and James Hagadorn received the [RMAG Distinguished Public Service Award](#). Congrats!

Bob collaborated with [geo-artist Jan Vriesen](#) to create five new paintings of ancient Kenyan landscapes that illustrate the vistas of our ancestors. He's also working on the Fox Hills Sandstone at [White Rocks Open Space](#), integrating field observations, core, LIDAR and well logs to tie this beautiful set of outcrops northeast of Boulder into the museum's Denver Basin database.



In our [Prep Labs](#), Preparator [Natalie Toth](#) and our 100+ team of Volunteers cleaned, glued, and stabilized fossils from around the globe! These included new species of mammals, crocs, turtles, an ichthyosaur, and myriad dinosaurs. In May, construction workers hit paleo paydirt in Highlands Ranch—a *Triceratops*! Over the next nine weeks, Natalie led a crew of volunteers, with help from [Brinkmann Constructors](#) and [Kelley Trucking](#).

They excavated and brought the skeleton back to the DMNS. It's ~35% complete and you can still see the dinosaur's cheek and upper jaw being prepared in the lab. Most importantly, Natalie brought the science of this discovery to our community—in person in schools, at the museum, and as the star of the CBS TV special, [Dinosaur Hunter](#).





Preparator [Salvador Bastien](#) tag-teamed with Natalie and Volunteers to work the *Majungasaurus* bonebed from Madagascar and completed restoring two huge articulated dinosaur skulls from Utah. In between, he excavated leaves, mammals, turtles, lizards, crocodiles, fish, and dinosaurs from the Cretaceous of North Dakota, Montana, Wyoming, Utah and Colorado.

Salvador's team rehoused our [type specimens](#) in archival cradles, including the originals of the museum's plesiosaur display. These are the 25-foot long [Loch Ness](#)-looking beasts that hang above the main museum entryway. In the Molding & Casting Lab, Salvador helped Natalie and team mold and cast three African sauropods—allowing the originals to return to Tanzania.



Former Volunteer and Intern **Ashley Lownsdale** is back as an [NSF-funded](#) Collections Assistant, focusing on the biota that will help constrain the tectonic history and biogeography of Madagascar. Most of her days are spent cataloging fossils for the DMNS and the U. of Antananarivo. She's particularly keen on this collection because there are so many taxa that are new to science, or that are just plain weird! Like plant eating crocodiles ([Simosuchus](#)) or "Pac-Man", the giant armored frog ([Beelzebufo](#)) that could have eaten baby dinos.

As the museum's first [Daniels Fund Scholar](#), Intern **Emerald Spindler** has been upping her geological game by making the first GIS-based basin model for the Grand Canyon's [Tonto Group](#). Plus, she cut a lot of rocks, inventoried our meteorite collection and did fieldwork in North Dakota, Utah, and Colorado. Soon she'll return to Brown for her sophomore year!





Department Chair and Curator [Ian Miller](#) had a fantastic year, working with everyone to produce the first two Corral Bluffs papers—on [mammal recovery](#) and [geochronology](#). Both these papers set us up for years of research to come! He also deciphered [dinosaur behavior from tooth chemistry](#) and illustrated how [ancient mountain passes were ecological filters for plants](#).

Ian worked with colleagues to describe the [only known fossil cycad seedling](#) and [the earliest fossil domatia](#). Dom-what? [Domatia](#) are "little houses" on leaves that protect mites, and one of the most common mutualisms, together with pollination and seed dispersal. What's next? Ian's hoping for an epic ski season after being locked indoors analyzing data and writing papers with Tyler and James all last year!



Curator [James Hagadorn](#) learned something important in 2019—the best geologists are the ones having the most fun! In that vein, Dr. J helped define a [new volcanic rock unit](#) in Mexico, deciphered [ring-shaped fossils](#) from New York, described [ancient sand flats from Wisconsin](#), and modeled the most cursed fossil of all—[Rafinesquina](#). With five awesome interns, he interpreted local rocks, too...including [slimy shorelines](#) at Dinosaur Ridge and [raging river deposits](#) at Corral Bluffs.

James' community scientist team filled gaps in Colorado's rock record, ranging from Cambrian strata in Glenwood Canyon to Cretaceous bentonites in Greeley. When not working on the museum's [new RV](#), James published a book on the museum's [meteorite collection](#), and thanks to [Rob Gaston](#), shepherded donation of a unique bee collection from the [Green River Formation](#).





AWARDS

Volunteers are our secret ingredient. They help our science happen—whether slathering plaster, wowing kiddos, chipping rock, segmenting fossils, databasing collections, or just plain slogging through the mud! Without their help we'd be sunk. Each year we honor a few that went above and beyond, by awarding them one of our favorite tools...a rock hammer!



This past year **Cheryl Pilatzke** (2019 Collections Award) achieved what [Bill Cobban](#) could only dream of doing. She finished cataloguing the casts of the world's most important ammonite collection. These coiled beauties are the gold standard for telling time in the [Cretaceous of the American West](#), and are used by everyone, whether they are seeking oil or dinosaurs!

Hailing from North Carolina, **Bill Wagner** (2019 Collections Award) is one of our most "remote" volunteers. In his home lab, Bill picked thousands of tiny fossils from washed residues of the Maevarano Formation, getting them ready for archiving in our collections. When he isn't identifying croc and dino teeth, fish vertebrae, and turtle fragments, he can be identified around town by his custom plates "FOSLP1KR". Cool!





Paleo Certification Program graduate **Sharon Milito** (2019 Field Award) cut her teeth in [Red Rock Canyon Open Space](#), where she superbly chronicled its [geologic history](#). She recently helped steward the conservation of unique geological and paleontological treasures of [Corral Bluffs](#), and has just completed co-authoring the second edition of [her award-winning book](#).

The DMNS has a new [MacGyver](#) in town, and his name's **Paul Tokheim** (2019 Service Award). Paul used his legendary problem solving skills to design and build us a new fleet of collections carts, oversize specimen skids, customized experimental instruments, and an Augmented Reality Sandbox. After figuring out how to embed our giant K-Pg boundary blocks, he's ready for new Earth Science challenges. Bring it on, he says!



Paleo partners **Becky Garfield** and **Sally Coulehan** (2019 Prep Awards) are the best kind of [fossil wranglers](#). They spent most of 2019 working to prepare fossils from a meat-eating dinosaur (*Majungasaurus*) bonebed from Madagascar. They not only mastered the art of coaxing the delicate bones from incredibly hard matrix, but cleaned and then reconstructed the dinosaur's tail, skull, and backbone. The ultimate paleo puzzle!

PASSINGS



As 2019 charged on, we were deeply saddened to see some of our dear friends and best supporters pass away. We're grateful for contributions by **Bob Barber, Bill Brooks, Randy Medlyn, Dick Nielson, Paul Rosen, Pat Smutz, Jack Thompson, and Bruce Young**. We miss their smiles, their camaraderie, and the lift they gave us when we needed it most. Our achievements are theirs, too. So please join us in remembering them. :-)



ALUMNI SPOTLIGHTS

Akshay Gupta ('19) is one of our newest alums. He and Andres Reyes were the first [Teen Science Scholars](#) to intern in our [Digital Research Lab](#). Akshay spent the summer learning how to convert, segment, and model fossils from digital data sets. What a springboard for his senior year at Fairview High School!





After graduating from CSU with a B.S. in Ecosystem Science & Sustainability, **Tia Ruppert** (Volunteer, '14–'16) moved to Germany with her husband where she traveled extensively. Now she's working on her M.S. at Fort Hays State U. with [Laura Wilson](#). She's putting her DMNS toolkit to work—managing the Oceans of Kansas Fossil Prep Lab at the [Sternberg Museum](#).

In between prepping marine reptiles, Tia is helping to digitize the museum's vertebrate fossil collection and conducting research on new ways to improve visitor interaction and engagement with the prep lab. This summer she's excited to be instructing the [Intro to Prep](#) camps for high school students and is hopeful to get her hands back in the dirt working in the field.



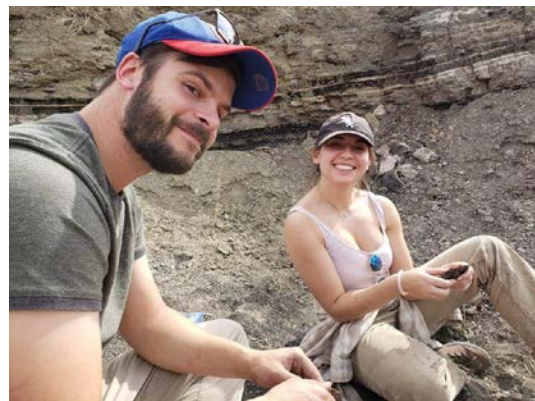
Last year **Christianne Padilla** (Teen Science Scholar, '14–'15) graduated from Wesleyan with a B.A. in Studio Art, minoring in Design & Engineering and Art History. Her thesis was a full-scale interactive installation centered on the intersections of mental health and the built environment. She's working as a communication designer at the architecture firm, [GLUCK+](#) in NYC, where she writes, illustrates and designs architectural narratives for multimedia, print and digital platforms.

Former Department Associate [Todd Green](#) ('13-'16) is finishing his Ph.D. in Oklahoma State's [Anatomy & Vert Paleo Program](#), focused on cranial ornamentation in archosaurs. Last year he traveled around the U.S., U.K. and Australia to present his research and collect data on modern and ancient cassowaries (i.e., giant flightless birds native to rainforests in Indo-Australia). Cassowaries have elaborate bony and keratinous casques atop their heads. In the wild, they're elusive and territorial—lashing out with lethal kicks if provoked. Must be tough to study these avian kickboxers!



Victoria Carbajal (Teen Science Scholar, '07) completed a B.A. in Criminal Justice at Metro in 2014. She's currently working at the DEA and at the Gaylord Rockies Resort, and last year got married in Cancun. In her spare time she's writing a book, grounded in an adventure she came up with when she was 17. In 2020 she hopes to finish this book and join her family real estate business. We're looking forward to it!

[David B. Jones Foundation](#) Interns **Stephen Finch** ('18, '19) and **Jennie Beltrame** ('19) rocked the house last Fall in the Digital Research Lab, where they virtually reconstructed the unerupted teeth of a juvenile [Ectoconus](#). Steve's journey began as a kid who frequented the AMNH. After moving west, he joined [WIPS](#) and did fieldwork with Joe Sertich in UT & NM.





Jennie's journey began as an anthropology major at CSU, where a Facebook friend and former DMNS volunteer suggested she apply for an opportunity in the Digital Lab. Soon she was knee deep in Triassic diapsid skulls and crazy Cretaceous crocodile jaws. Jennie's looking at paleoanthropology programs and Steve's about to start grad school in vert paleo at [Adelphi](#).

Jay Zeigler's (Intern, '19) mantra was "bring on the crazy projects!" He helped Nicole and Kristen tackle a medley of legacy collections needs by cataloguing historic ash, paleomag, palynology and rock samples. He helped them find homes for 104 of our old cabinets at needy peer institutions—a donation that saved them over \$300k. Now he's interning in [Denali National Park](#).



After a 15 year hiatus, **[Rich Barclay](#)** (Staff, '02-'04) is back doing paleobotany in Colorado. He gets the award for most alumnus visits, with three trips to DMNS at the end of 2019—plus many trips in recent summers for field work at Corral Bluffs! Rich's first forays into the K-Pg world was in our now-famous [West Bijou Site](#). Since leaving the museum, he got a Ph.D. at Northwestern, while spending a few months a year in Ireland working on

Cretaceous atmospheric CO₂ records. Unfortunately, *Guinness* just doesn't taste the same now that he's back state-side. ;-). Now he works at the Smithsonian with [The Big Guy](#).

Rich designed an innovative experiment to better understand the most extreme warming event of all time—the [PETM](#). For this [Fossil Atmospheres](#) project, he's growing *Ginkgo biloba* trees under elevated CO₂ to learn how changes in ancient *Ginkgos* reflect global warming. The project will soon be highlighted in the NOVA documentary, [Polar Extremes](#). Stay tuned!



Here's to a new decade (i.e., 1/100,000 epoch)!





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