

THE NEW MEXICO MUSEUM OF NATURAL HISTORY AND SCIENCE GEOSCIENCE COLLECTION: AN OVERVIEW

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Abstract—The New Mexico Museum of Natural History and Science (NMMNH&S) has an important and extensive collection of fossils that has served as a resource for students and researchers from around the globe. The most scientifically significant portions of the collection are the NMMNH&S holdings of Permian tracks, Late Triassic vertebrates and Paleocene mammals, all of which are world-class collections. Ongoing projects include collaborations with the Bureau of Land Management (BLM) for the excavation of New Mexico's only Morrison Formation bonebed, the Peterson Quarry, and the integration (with BLM support) of portions of the orphaned University of Arizona fossil vertebrate collection into the NMMNH&S collection. Recently, the wealth of information on the NMMNH&S fossil collection has reached beyond its' walls and is now available to anyone via a searchable online database.

INTRODUCTION

The New Mexico Museum of Natural History and Science (NMMNH&S) began a fossil collection in 1983, and fossils continue to be collected by museum staff, scientific associates and volunteers to this day. Over the years the collection has grown to become one of the most important collections of fossils in the United States, with certain portions of the collection, most notably the Permian tracks, being among the scientifically most significant such collections in the world. Here, we summarize the holdings of the NMMNH collection, its strengths, its layout and note its current long-term projects.

MISSION STATEMENT

The mission of the NMMNH&S geoscience collection reads as follows: "To protect and provide access to fossil and mineral specimens from state and federal lands in New Mexico, the American Southwest, and beyond". The NMMNH&S mission explicitly states that the Museum "pursues scientific inquiry, [and] develops focused collections..." The geoscience collections are a "three-dimensional library of the history of life in New Mexico."

COLLECTION LAYOUT

The NMMNH&S geoscience collection is housed in a separate building (referred to as the "Annex") from the museum proper and the public exhibits. Along with the collection, the Annex currently contains portions of the education and exhibits departments, the primary fossil preparation lab and the various paleontology curators and geoscience staff offices. The collection itself is a large (~6,500 ft²) temperature- and climate-controlled room that is only accessible via limited keypad access (Fig 1).

The collection is divided into three sections based on the storage needs of the specimens: the oversize shelving, track shelving and cabinets (Fig 2). The oversize shelving is heavy-duty steel shelving that can support thousands of pounds and is used for any specimens that are too large to fit comfortably in the available cabinetry. Specimens on the oversize shelving are arranged by geological time interval and are spaced for ease of viewing and removal (Fig. 2A). The track shelving is also open metal shelving and is used for housing the small to medium-sized track slabs. These tracks are also arranged by geological time interval and are spaced closely together to allow for maximum storage. In order to aid researchers in navigating the track sites a number of labels have been placed on the shelving to make locating a locality or specimen as easy as possible (Fig 2B). The cabinetry is used to house the majority of the collection specimens (Fig. 2C). Each cabinet is filled with drawers and in

each drawer is a number of archival trays that house the specimens. Each specimen is accompanied by a computer-generated label with its basic catalogue information.

VARIETY OF SPECIMENS AND LOCALITIES

The NMMNH&S collection began in 1983, three years prior to the opening of the Museum building. Since 1983, the collection has grown considerably, currently including over 50,000 specimens from 6,700 fossil localities. Thus, the NMMNH has averaged over 2,100 new specimens and over 290 localities catalogued each year. Most of these specimens (~80%) and localities (~90%) are from New Mexico, with the rest coming from Texas (~5% of specimens and ~1% of localities), Arizona (~1% of specimens and ~2% of localities), other areas of the United States and a handful of international specimens and localities.

The NMMNH&S collection contains a diverse array of specimens ranging in size from the dorsal block of the holotype of *Seismosaurus hallorum*, which is a 2.3 m x 1.5 m x 1.0 m block containing a partial dorsal series of vertebrae that weighs 11,600 lbs, to various tiny mammal teeth that each fit easily on the head of a pin. Fossil mammals are the largest class of specimens represented in the collection (over 18,000 specimens representing ~37% of the collection), followed by reptiles (over 11,000, ~23%), invertebrates (over 6,000, ~12%), trace fossils (over 4,500, ~9%), osteichthyans (over 2,000, ~4%), chondrichthyans (over 1,100, ~2%), Plants (over 600, ~1%) and birds (~90, ~2%).

The NMMNH&S localities are no less diverse with localities ranging from sites where a handful of bone fragments were surface collected to sites like the Peterson Quarry, where excavations have been ongoing for nearly two decades. The Cenozoic is the best-represented Era in the locality catalogue (with over 3,100 localities, ~47% of all localities catalogued) followed by the Mesozoic (over 2,900, 45%), the Paleozoic (over 480, ~7%) and miscellaneous localities (~1%). Among geologic time intervals, the Paleogene is the best represented in the locality catalogue (with over 2,090 localities, ~31% of all localities catalogued) followed by the Cretaceous (over 2,000, ~30%), Triassic (~900, ~13%), Neogene (over 800, ~12.5%), Permian (over 280, ~4%), Pennsylvanian (over 130, ~2%), Jurassic (over 70, ~1%), Mississippian (14, ~0.2%), Devonian (13, ~0.2%), Ordovician (5, ~0.07), Cambrian (3, ~0.04%) and Silurian (1, ~0.01%).

COLLECTION STRENGTHS

While the entirety of the geoscience collection is routinely being studied by both NMMNH&S curators and visiting researchers, three portions of the collection deserve special mention for their world-class

GUIDE TO THE NMMNH&S GEOSCIENCE COLLECTION

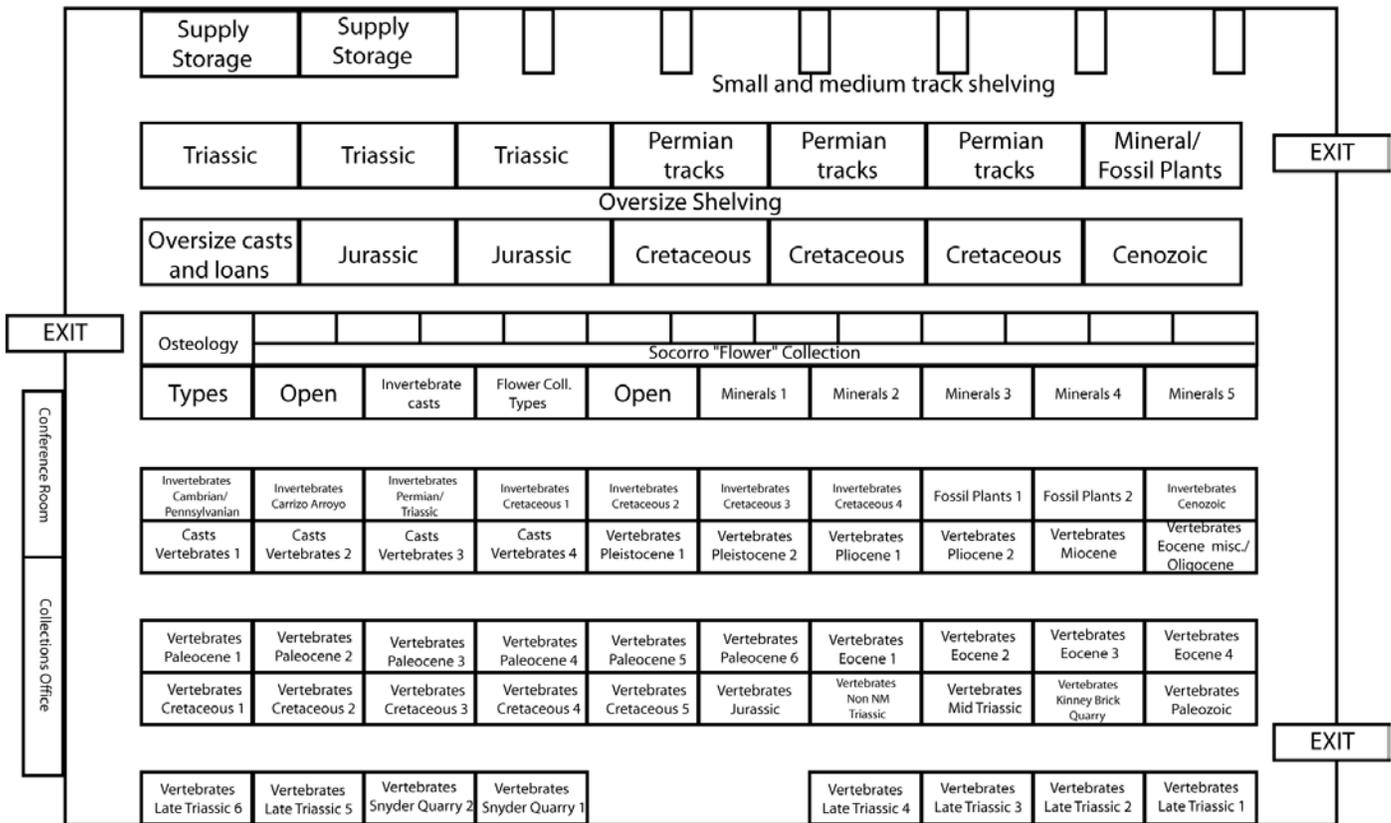


FIGURE 1. Schematic guide to the NMMNH&S geoscience collection.

status and ability to attract researchers from around the globe. These are the Permian track collection, the Late Triassic vertebrate collection and the Paleocene mammal collection.

Permian Track Collection

The holdings of Permian tracks in the NMMNH&S collection represent the largest single collection of Permian tracks in the world. Nearly all of these tracks come from localities in the Robledo Mountains of southern New Mexico (Fig. 3). Many of the track slabs from these sites preserve numerous extensive trackways on a single surface. The exquisite preservation of these tracks show numerous amphibians and early reptiles traversing a variety of substrates. Because of the quality of preservation and copious amounts of tracks, the Robledo Mountains localities have been referred to as a “Rosetta Stone” for understanding Permian tracks. This collection served as the impetus for major revisions of ichnotaxonomy, including boiling down over 100 different poorly down ichnotaxa to approximately a dozen well-understood ichnotaxa.

Late Triassic Vertebrates

The Late Triassic vertebrates in the NMMNH&S collection come from New Mexico, Arizona and Texas. These specimens include everything from partial and nearly complete skeletons of phytosaurs, aetosaurs and early theropod dinosaurs to a variety of microfossils recovered from screenwashing sites. The extensive collections made by the NMMNH&S helped serve as the basis for curators and staff here at the museum establishing the land vertebrate faunachron (lvf) system for dividing Late Triassic time using vertebrate fossils, a system that is recognized worldwide.

Highlights of the Late Triassic collection include: *Adelobasileus*, the oldest known mammal; a fully prepared block from the Ghost Ranch

Coelophysis quarry containing a complete three dimensionally preserved *Coelophysis* skull with sclerotic ring; and an extensive collection of material from the Snyder Quarry, an assemblage caused by a paleowildfire and including over a dozen skulls of the phytosaur *Pseudopalatus buceros* (Fig. 4).

Paleocene Mammals

The Paleocene mammal collection consists predominantly of microfossils, especially teeth, from the San Juan Basin of northwestern New Mexico. These mammal fossils represent some of the first mammals to repopulate the North American landscape following the extinction of the dinosaurs. The collection is copiously documented and thus serves as a primary basis for understanding the North American Puercan and Torrejonian land mammal “ages.”

ONGOING PROJECTS

At any given time dozens of projects are being undertaken on the NMMNH&S collection, however, two projects deserve special attention: the excavation, preparation and study of the Jurassic Peterson Quarry and the integration of the University of Arizona collection.

The Peterson Quarry

The Peterson Quarry is New Mexico’s most prolific, and currently only active, Morrison Formation bonebed. Since 1989, the Peterson Quarry has been excavated by NMMNH&S volunteers, including Ronald and Rodney Peterson, the original discoverers of the quarry, who collectively have spent over 6,000 hours excavating the quarry. The quarry itself is located on land administered by the Bureau of Land Management (BLM). The BLM, notably BLM paleontologist Patricia Hester, has been instrumental in assisting the NMMNH&S with permitting and



FIGURE 2. Fossil storage in the NMMNH&S geoscience collection. **A**, oversized shelving, **B**, track shelving and **C**, specimen cabinets.

logistical support needed for such a large and long-term excavation. The flow of information has been reciprocal with the BLM advising the NMMNH&S on how best to remove the fossils while maintaining the integrity of the surrounding landscape, and the NMMNH&S removing, preparing, studying and publicizing the specimens from this important quarry. Currently, one of the major specimens from the site, a partial skeleton of the theropod *Sauorphaganax*, is on display in the Jurassic

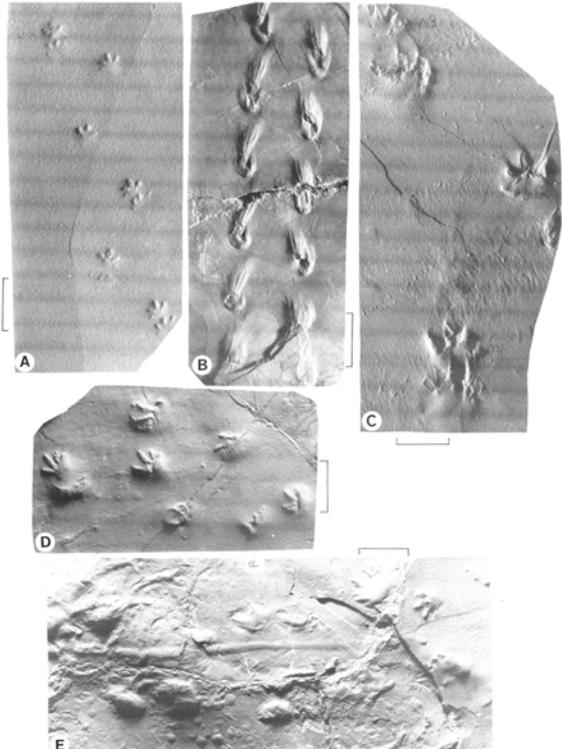


FIGURE 3. Examples of Permian tracks collected from the Robledo Mountains housed in the NMMNH&S geoscience collection. From Hunt et al., 1995.

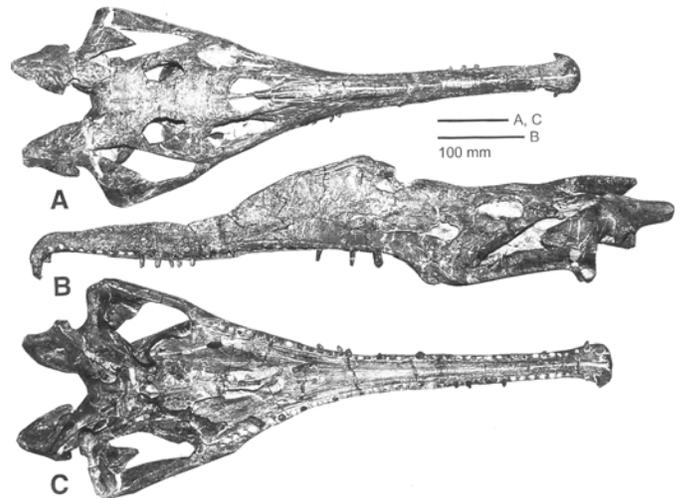


FIGURE 4. A phytosaur skull (NMMNH P-31292) from the Late Triassic Snyder Quarry. From Zeigler et al., 2002.

Hall of Supergiants at the NMMNH&S.

The Integration of the University of Arizona Collection

In the late 1970s and early 1980s the University of Arizona in Tucson had an active field paleontology and research program in the San Juan Basin, New Mexico. This fieldwork included collecting Cretaceous dinosaurs and Paleocene and Eocene mammals. Unfortunately, as the priorities of the University shifted away from the paleontology collection all the specimens, including the fossils collected from New Mexico, were kept in storage spaces that were not conducive to their study or long-term preservation. Thus, with the administrative and financial as-

sistance of the BLM, the NMMNH&S was able to have the New Mexico portion of the University of Arizona collection transferred to the NMMNH&S. The physical moving of over 10, 000 specimens from Tucson to the NMMNH&S in Albuquerque took place in the fall of 2005. Since the initial move, the UA collection has been systematically catalogued into the NMMNH&S database, including retaining all the original UA specimen numbers in our database for cross-referencing purposes. The process of integration is ongoing, as the collection is currently being physically integrated into the existing collection. This integration is being accomplished with the aid of BLM funding, which was used to purchase additional collections cabinets and specimen trays for the curation of this large influx of specimens. At the current pace, the UA collection should be entirely catalogued and integrated into the NMMNH&S collection by the end of May 2006, less than nine months after the initial transfer.

ONLINE DATABASE

The latest innovation to the NMMNH&S collection is the ability of our specimen database to reach out and have an internet presence. In late 2003, www.nmfossils.org was launched which included a

link to a searchable version of the NMMNH&S fossil database, under the "Paleo-Database" link. This database provides specimen numbers, descriptions and taxonomic information for nearly all the specimens housed at the NMMNH&S. The search engine allows a varied array of search types, including searches by New Mexico county, by any of the major taxonomic groups, by time period, etc. Accompanying the information are illustrations and over 2,000 photographs of actual fossil specimens. This tool is useful not only for researchers who are preparing for a visit to our collection but also to any New Mexicans who are curious about what can be found in their own backyards.

CONCLUSION

The NMMNH&S geoscience collection is one of the significant fossil collection in the United States and has many specimens that are world-renowned. Various ongoing projects are adding to the collections' utility and depth on a daily basis. And, while the physical collection is available to aid all collection visitors in locating specimens and data, with the advent of the internet version of the NMMNH&S paleo database, the physical building is no longer the only source for information on New Mexico's fossil record.

REFERENCES

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- Zeigler, K.E., Lucas, S.G. and Heckert, A.B., 2002, A phytosaur skull from the Upper Triassic Snyder quarry (Petrified Forest Formation, Chinle Group) of north-central New Mexico: *New Mexico Museum of Natural History and Science, Bulletin 22*, p. 171-177.