59 Paleontology data and NPS collections: unbounded resources, or, between managers and scientists

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Introduction

Curation is at an interesting crossroads in the National Park Service (NPS). Museum collections in NPS are, in effect, divided into two main categories: (1) The culture and artifacts of one species *(Homo sapiens)*, and (2) everything else in the universe. Natural history collections make up less than 2% of the national catalogue, reflecting inattention to these elements of natural resources management, and a disregard resulting from the lack of professional scientific curators. The majority of the policies and procedures in use were designed by culturally attuned museum professionals, with limited input from scientists.

Is NPS headed in the right direction with natural history museum specimens? There is uncertainty over the status of collections and the desired role of other national repositories for the tremendous variety of biological and geological objects. Has the agency become so procedurally rich and knowledge-poor that it is alienating national museums and scientists? Perhaps paleontology, one of the more esoteric disciplines within natural history, can provide perspectives of interest to neobiological curators concerned with NPS collections programs.

Paleontology and natural history collections

The subject of paleontology is a useful lens for scrutinizing many natural history collections issues. No discipline relies more completely on systematic museum collections as the field of paleontology, particularly vertebrate paleontology.

Paleontologists prospect in time for representatives of ancient ecosystems, bringing evidence back for curation in systematic storage. The ancient biotas are entombed in strata reflecting depositional environments, absolute ages, lithologies, and much more. These associated inorganic materials are deposited in collections as "geology" specimens. The collectable fossils range from enormous materials weighing many tons, to microscopic trace fossils visible with scanning electron microscopes. They include preserved material from virtually all higher taxa of organisms, the vast majority of which are extinct. But, like modern ecological assemblages, taxonomic samples are only a small part of the collection effort. Associations of taxa; variation in spatial communities; temporally continuous records of clades at various evolutionary stages; paleoclimatic indicators, such as paleosols; and hundreds of things such as trackways, coprolites, dental tartar, pollens, and much more—all inhabit museum cabinets.

Detailed notes accompany any collecting. These typically are catalogued as "archival" materials. The fossils are "prepared" in a laboratory and then stored systematically, either by taxonomic hierarchy, locality, stratigraphic height, or a combination of all of these. Much of this is analogous to natural historians dealing with modern biotas, and many of the principles associated with their collection and conservation are similar. Early paleontology collections in NPS were primitive, not unlike the current status of many neobiological collections, but paleontology curation has evolved.

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Pre-1980 NPS paleontology collections were often poorly documented and catalogued, the quality varying in direct proportion to the educational background of the collections manager. Amusing if grotesque misidentifications, collections more closely resembling curio cabinets than scientific compilations, and inappropriate methods were scattered in many park units—when fossils were collected at all. Separate categories for paleontological data were not furnished on Servicewide catalog cards; thus many of the fields were nonsensical. This was not particularly remarkable in that there was only one paleontologist in NPS at that time, but such explanations cannot be justifications. Paleontology simply was not a Servicewide priority.

Today, paleontological collections at many parks are vastly improved. Careful curation of correctly identified materials permits subsequent analyses and anticipates research questions. Fields specifically designed for paleontologists have been integrated into the Automated National Catalog System (ANCS+) software. Curators from major national repositories are satisfied with the system they observe in many park units. Unlike neobiology, the reluctance of visiting scholars to deposit important specimens in isolated park museum collections is fading, with the realization that in many cases the park collections *are* the major centers for study of certain kinds of materials, particularly in fields such as biostratigraphy and taphonomy.

What kinds of lessons have NPS paleontological curators learned "along the way" that may prove useful for neontological curators? One is an honest recognition of the limitations of any "blanket" curatorial system. If knowledgeable workers thoroughly curate material in adherence to discipline standards, and afterwards comply with Servicewide methods, one avoids a disservice to the science. Another lesson is to analyze a number of widespread assertions. Due to space limitations, only four of these statements are discussed below; which may be considered as "true or false" questions:

1. Natural history data do not fit into "mandatory" NPS catalog database fields.
2. Cultural and natural history museum "mindsets" are completely incompatible.
3. NPS curators often aren't scientists.
4. "Your museum or mine" is a good question.

Natural history data do not fit into the NPS mandatory software?

This assertion is partially true. For example, most taphonomic data cannot be queried via ANCS+, nor is it straightforward to retrieve critical temporal and stratigraphic information. Many neobiologists and geologists have similar concerns, as well. Part of this problem is the software itself: like many proprietary data products, it was out of date before it shipped—and it shipped a very long time ago, as software half-lives go. The contracted software relies on an archaic engine and the non-intuitive interface is troublesome for those versed in graphic user interface (GUI) databases that use standard pull-down menus. The architects of this scheme certainly meant well. But should NPS be contracting out nearly all of its curatorial data management instead of building its own expertise?

One major problem with databases such as ANCS+ is that they are a "Procrustean bed" for data: the material must be stretched or shrunk, forced to fit the cataloguing structure, often to the detriment of the information and to retrieval of scientifically meaningful patterns. Natural history collections data need to be fluid, like a liquid: able to conform to the parameters of the inquiry, to flow from one kind of analytical software to another, and be available for sharing in a standard format. Rigid data tables "freeze" the data, casting the information into molds designed for other things. Information that cannot fit these molds is lost or misshapen. For example, natural historians urged that Universal Transverse Mercator (UTM) fields be incorporated into the system and links prepared for integration with geographic information systems (GIS) software; neither was. Paleontologists limit the data placed into the ANCS+ to the minimum, adapting other software to their needs.

Despite these criticisms, natural history data can conform with a Servicewide standard platform: with a small amount of planning, data can be imported and exported. All that is required is for the scientist to prepare the information in the software most applicable to the data, then upload this information to ANCS+ for the onerous, but necessary, accountability software.

The assertion, then, is largely false. The real problem is more a lack of computer "savvy," perhaps, and a lack of thorough training in the use of the mandatory software and what it can do—after the more rigorous needs of the science are met.

Are cultural and natural history mindsets incompatible?

At first, this assertion appears to be largely true, as well. The problem might lie in the terms themselves, and the baggage that goes along with them. The real issue is whether or not s*cientific* and cultural mindsets are incompatible; after all, most natural history assemblages have *both* scientific and cultural information in them. Indeed, all human-made collections *are* cultural: once removed from the natural setting, the introduction of collecting biases places the human stamp on the material, like it or not.

Natural history collections actually give us a sense of the "culture of the discipline," glimpses of the *a priori* biases in vogue at the time of the collecting event, and a window on early hypotheses. The collections reflect the paradigms of the times. Many "famous concepts," such as early examples of organic evolution found in the fossil record, were buttressed by museum objects.

Paleontology constantly blends natural and cultural aspects in the pursuit of science. For example, the analysis of a new specimen relies on examination of the original type material. For a taxon of nimravid (a carnivore distantly related to felids), the specimens are housed at the American Museum of Natural History (AMNH), collected 130 years ago from what is now a unit of the National Park System (see Figure 59.1). The original manuscript describing this material (see Figure 59.2) is housed in NPS collections, as a cultural artifact, and these texts and figures must be consulted. A cast of the original material was made by NPS, and both the mold and the resulting casts are catalogued (see Figure 59.3). These casts are manufactured, and thus by definition are artifacts; yet they clearly belong in the natural history category of specimens. All of these kinds of materials are necessary for preparing the peer-reviewed publication describing the new species (see Figure 59.4) collected by NPS.

Thus, one can see that there is a gradation of categories from natural history to cultural objects that are employed by practicing scientists using museum collections. It requires scientists to really appreciate these specimens and use them, but the scientific curators are required to preserve the material, anticipating questions that haven't been asked yet. Note: it is far easier to train a scientist to be a curator than vice versa—which leads us to our next assertion.

NPS curators often aren't scientists?

This statement is absolutely true, and the source of many of the problems experienced by both the National Park Service and outside investigators wishing to pursue scientific problems in the parks. NPS simply must acquire more scientists trained in dealing with natural history collections. Scientific museum collections should be housed where the scientific community can access them. On the other hand, most scientists know that they must travel to where significant collections are. Practicing paleontologists have long been accustomed to traveling to many different repositories to study material. Parks are among those collection destinations these days, and the relatively new influx of professional paleontologists to the ranks of NPS has been a very good trend for the resources *and* the scientific community. That only 1.5% of the NPS museum collections are "natural history" is a sad artifact of cultural bias in the program, not a reflection of the desired state of affairs.

Figure 59.1. Nimravid specimen housed at the American Museum of Natural History.

Figure 59.2. The original manuscript describing the nimravid specimen is itself a cultural artifact.

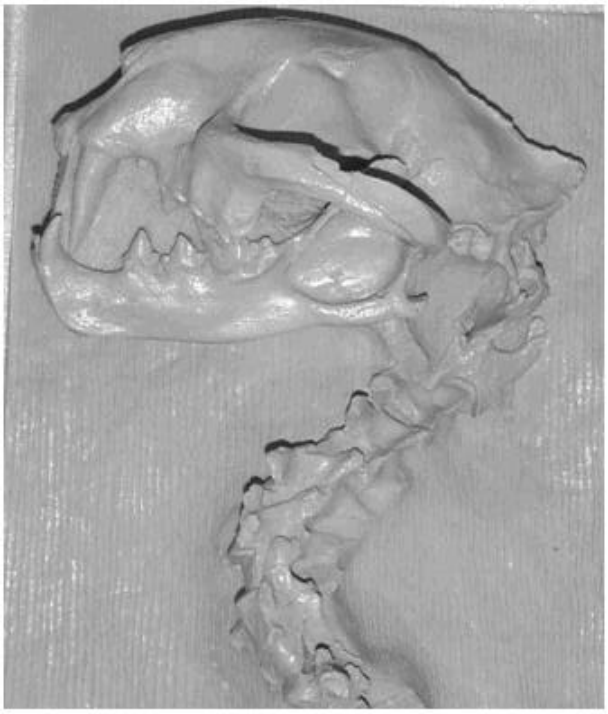

Figure 59.3. A cast of the original material, made by NPS.

Figure 59.4. All of these kinds of materials are necessary for preparing the peer-reviewed publication describing the new species.

Your museum or mine: good question?

Storage regulations should reflect what is beneficial to the resource, and NPS staff must avoid compromising storage situations simply because some naïve law prescribes it. If regulations are causing harm, they must be changed; and efforts are underway to undo some of the more arcane and inflexible regulations that have resulted in castigation of NPS by natural history museum professionals. It seems intuitively obvious that collections of type specimens should be housed where they will be available for the most taxonomists; resource management-related collections stored and available near the resource; and material collected for particular kinds of analyses housed near the analytical laboratory that performs the work. One of the contributions paleontology can make to resolving this dilemma has to do with storage methodologies, and the relevance of a particular kind of collection to a particular kind of museum.

Paleoecologists prefer material organized principally by locality. Taxonomists prefer to work with collections stored by systematic hierarchy. Biostratigraphers favor material organized by temporal units. Examples of such divergent schemes include the collections at the AMNH, where material is stored taxonomically, versus the assemblages at the University of California at Berkeley, where specimens are arranged by land mammal age, then by geographic locality. These decisions were made early in these institution's histories and reflect the curator's biases at the time. It seems intuitively obvious that collections made on behalf of NPS for use by resource management-oriented scientists be deposited within professional facilities established at that park. Lacking such a facility or staff, however, mandates that the collection be deposited elsewhere.

Many of the storage problems stem from decisions being made in a vacuum, without input from museum professionals outside NPS. While recognizing that they are understandably more concerned about their own facilities than the mission of NPS, without the involvement of these people there will not be any commitment to NPS procedures and policies or a desired future museum situation.

Conclusions

NPS paleontologists realized that the lack of Servicewide museum guidance relevant to the discipline had to be solved independently. Relative to the four "true or false" questions, these actions were taken:

1. Data platforms were developed appropriate to the science, information was put into them, and then exported into Servicewide platforms.
2. The value and quality of the "culture" of the science was integrated with the "natural history" aspects of paleontology collections.
3. A critical mass of paleontologists was established at key parks. These staffing solutions were a much more viable and effective means of dealing with the resource than simply contracting with outside consultants.
4. Working relationships with other repositories were developed so that paleontologists could enjoy "the best of both worlds," both at major national museums and NPS collections, some of which are the finest of their kind.

I recommend the same approach for neobiology collections. Appreciation and increases in the value of natural history collections may result in the "nation's leading conservation agency" actually leading museum-based conservation efforts.

Additional suggestions

1. Increase science-based curators at *all* levels of NPS: at the parks, in the regions, and in the Curatorial Services Division. Each region would benefit from having two regional curators providing guidance to the parks and their partners: a culturally attuned professional, as they all are now, and a natural history regional

curator with expertise in one of the major scientific categories: biology, geology, or paleontology.

2. The little-known Museum Management Program Council has an important role in shaping the programs and policies of the NPS museum effort. Currently there aren't any professional scientists represented. The council should seek a professional botanist, geologist, zoologist, and a paleontologist.
3. Cooperative Park Study Units (CPSUs)were a very valuable group of institutions that helped parks study resources of all kinds. NPS could establish a series of Cooperative Park Museum Units (CPMUs) that would ameliorate difficulties parks are currently facing with storage and scholarly examination of natural history collections. By "endowing a curator" at an institution such as a university museum, NPS would have a professional staff member to assure the appropriate care and accountability of NPS museum objects, thus alleviating many of the justifiable concerns these institutions have about loan conditions. In turn, NPS collections would have the benefit of a variety of specialists to examine and properly advise on the care of the tremendous variability of collections. A central repository could house many of the natural history collections and provide a valuable service to both NPS and the natural resource professional community.