Shifting Perspectives

The Evolution of Value in Natural History Specimens at Vassar College

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Introduction

Given the ever-changing value of natural history specimens worldwide, this exhibit explores whether it is possible to create a 21st-century cabinet of curiosities, or wunderkammer, within the context of Vassar College. This project initially started as an exploration of science communication: searching for ways to make science accessible to a wider audience. Ultimately, with this focus in mind, I decided on creating an exhibit that would allow for a more visual, tangible approach to science by showcasing and recontextualizing some of the remaining specimens from the deaccessioning of Vassar's natural history museum over the years. More specifically, my project aims to approach biology in such a way that allows those within and outside of the discipline to use these specimens as vehicles to consider and better understand the ethics of collection, as well as critically think about their role within the broader history of science.

The aim of the exhibit is to prompt the viewer to rediscover a sense of curiosity, wonder, and observation. While the objects within these cases may be similar to those you walk by in the hallways of Olmsted Hall, you should take the time to examine the specimens within this exhibit, which are rarely displayed due to their condition and a lack of space, and allow yourself to explore the questions that naturally arise from the study of the array of objects presented. I invite you to speculate on what these objects are, how they may have come to be in this cabinet today, and what their history might be. The text herein is not intended to answer all of the questions that emerge, but hopefully, it will provide some context and begin to address some of the questions that emerge from the objects.

Given that every viewer will bring with them their own experiences, backgrounds, and biases to this exhibit, each interaction between them and objects will inevitably be unique. It is my hope that the differences in interactions with and interpretations of the exhibit will promote conversations exploring the themes and concepts discussed here in other disciplines and contexts that the viewer might be more familiar with. Ultimately, I hope that this project is one of many ways that the Vassar community will continue to question, consider, and think critically about the intersection between our own disciplinary histories and those of our institution.

The earliest engraving of a wunderkammer in 1599 by Ferrante Imperato.

A Brief History of Collection

Throughout history, humans have been innately curious about the world around them. Driven to explore the mysteries of the natural world through multi-sensory experiences, humans throughout the world have felt the need to document, observe, and classify objects for centuries. This can be seen in the records of early botanists collecting seeds or plant material, archaeologists collecting antiquities, and colonialists bringing back stolen artifacts. This desire to collect has led to the development of natural history collections, whose purposes have shifted in terms of both use and undulating value, throughout scientific history. Ultimately, these collections have played, and continue to play, a pivotal role in scientists' understanding of the surrounding world and their place within it.

In considering the evolution of the natural history museums that we are familiar with today, one often thinks of the early modern European "wunderkammer", which literally translates from German to mean a "room of wonder", but is often referred to as a cabinet

of curiosity.[1] However, considering the sole predecessors of modern museums to be these European wunderkammern disregards the abundance of collections whose stories have been lost or rewritten in a history of colonialism.

Natural history collections likely evolved simultaneously and independently throughout the world across a variety of civilizations simply because, not only are mineral, plant, and animal collections beautiful, but they could provide the insight into the natural world that people sought, regardless of location. These acted as precursors to the wunderkammern, which often consisted of a single person or family's collection of natural history specimens and antiquities, obtained throughout multiple journeys throughout the world. These collections, despite being referred to as cabinets of curiosities in English, were often not limited to a cabinet, but rather to entire rooms containing overflowing cabinets and shelves, as well as specimens hanging from the ceilings and walls. They were intended to shock, inspire, and amuse house guests while also allowing researchers and students a chance to handle specimens directly so as to not have to rely simply on others' written or spoken descriptions of objects. Since the early modern period, these cabinets evolved into our more modern understanding of a natural history museum, which can now be found throughout the world. At the core of both early and modern collections, however, was the importance of first-hand observation and the ability to promote pondering about an object's place in the natural world and its purpose.

Natural History at Vassar College

From early in the plans for Vassar's conception, Matthew Vassar intended to create "the most comprehensive 'cabinets' of natural history possible." With these goals in mind, Vassar College created a natural history collection that was quite substantial at the time of its founding in 1864.[2,3] In a book published just three years after Vassar's opening, historian Benson Lossing described the collection as already having several thousand specimens that included "mammals, birds, reptiles, fishes, insects, crustacea, shells, echinoderms, acalephs, corals, and sea anemones."[4] Still, the collection was constantly increasing in magnitude, and specimens were of the highest quality.[5] Benson remarked, "Vassar College will doubtless soon possess the most extensive and valuable museum of Natural History in the country."[4]

This collection was, from the beginning, crucial in realizing the curricular mission of increasing access to the source for the women at Vassar. As such, students were encouraged to explore and wander the cabinets. This museum was intended to be central to student life in the early designs of campus, as the museum was purposefully placed in Main Building, which was home to an abundance of academic, residential, and recreational purposes, so as to promote casual, everyday interactions with the museum's specimens.[6] This proved to be successful, as Frances Wood, a student in 1909, recounted one of the times in which she wandered to look at the cabinets and stumbled upon Matthew Vassar, who claimed to also often come up to the fifth floor to look at the specimens.[7]

More formally, however, the collection was integral to many classes taught at the college. The natural history department combined the studies of geography, botany, zoology, mineralogy, and geology and often used specimens for observation and study. The department's goals was to "arouse the spirit of inquiry, to cultivate a habit of observation, to fix attention upon resemblances and differences, and thus to teach the student to teach herself."[8] Even beyond the scope of the natural history department, Hannah Lyman, who acted as the college's first "lady principal" often used the collection while providing maternal advice to students.[6]

The natural history collection in Avery Hall (left) and the study of geological specimens in New England Building (right). Both images courtesy of Vassar College Archives and Special Collections (Ph.f3.28 and Ref#3.1520).

As the college and its collections continued to expand each year, the display rooms in Main Building began to be overcrowded and free space for newly arrived specimens began to dwindle.[5] In 1874, the natural history museum was moved to Avery Hall (currently the Vogelstein Center for Drama and Film) and later, in 1918, New England Building opened to the public as the college's natural history museum, where it remained until the dismantling of the collection in the 1980s. The three floors were adorned with collections that included specimens from throughout the world, as well as various teaching exhibits centered around zoology, embryology, and the slightly contentious topic of evolution and artificial selection.[9] While Vassar's first professor of natural history, Sanborn Tenney, based much of his work on creationist theories and intended for natural history collections to convey the power of God, his successor, James Orton, moved away from this line of thought.[2] A Darwinist, Orton conducted expeditions to South America, where he would collect specimens and research for his comparative studies and exploration of evolution.[2]

While in New England Building, the collection continued to grow as a result of similar expeditions to those of Orton. Aaron Treadwell, curator of the natural history museum from the late nineteenth century into the early twentieth century, traveled to the Caribbean, Hawaii, Fiji, and Samoa and contributed some of the specimens he collected and mounted to Vassar's collection.[2,10] However, during its time in New England Building, the collections experienced a shift in value and use. While the quality of the collection was still increasing with the number of specimens, its value as a teaching collection was beginning to dwindle; this was furthered by the separation and branching of several departments, such as biology and geography becoming more independent courses of study while ethnography and archeology were incorporated in the study of anthropology.[2] With these departmental divisions came a shift away from the study of natural history and decreased use of the specimens, causing the collection to begin to be seen as less central to the students' studies and their lives. No longer were the days in which students would wander through the collections simply because they were located in the spaces above their residential quarters.

In 1937, geological specimens were separated from the rest of the collection and moved to the Warthin Museum in Ely Hall, providing them with more room for display and storage, while also ensuring that they would remain central to the geology department's studies.[2] This allowed for the preservation of these specimens, while the others continued to age with little use.

By the time biology professor Margaret Wright began as the museum curator starting in 1968, there was little that she could do to prevent the museum's demise. Within a few years, Vassar's introductory zoology course was replaced by a general biology course and the biology department moved from New England Building to Olmsted Hall.[2,11] At this point, it appears that many students were unaware of the museum's existence. One student wrote about the sights within the museum in the Miscellany News, describing it as only occupying one room, but containing amazing and beautiful specimens. Ultimately, though, she described it as being "dusty and neglected" before questioning the future of the museum due to a lack of time and money dedicated to its preservation.[11]

Five years later, Wright attempted to find members of the community willing to do the "dirty work" necessary to keep the museum functioning, such as cleaning the cases and dusting specimens, by posting an advertisement within the school newspaper.[12,13] As a full-time biology professor with a limited budget, there was little that Wright could do to maintain the collections by herself and she hoped that there would be a more formal curator position that included the museum in their responsibilities.[12]

The 1970s also brought a wave of vandalism to the collection, as the museum could not be locked without violating fire safety regulations. During this time, one-quarter of the museum's warbler eggs were stolen and multiple specimens were stolen by students to be used in pranks; one taxidermy gorilla was brought to the bell tower of Main Building before being thrown off, while students also brought several other specimens to various locations around campus. This included several monkeys, which were placed in a tree outside of the College Center, and a complete kangaroo (including a baby in her pouch), which was brought to the library, where an unlit cigarette and newspaper were placed in her hands.[14]

A photograph by Isabel Chenoweth of a kangaroo specimen in the library (left) and a photograph by John Delorey of a gorilla specimen on the bell tower of Main Building (right) due to student pranks.

Ultimately, these acts of vandalism were the last straw that caused the final shift away from the collection. In 1979, Wright, who was now professor emeritus of Biology, declared that "because of vandalism [the Museum of Natural History] would have to be dismantled altogether."[14] With the official closing of the museum came the difficult task of deciding what to do with the specimens, which appears to have fallen to Wright.

Some of the bird specimens were donated to the Audubon society, while others were given to Dutchess Community College for teaching and two California Condors were returned to California via the Los Angeles County Museum.[2, 14] Meanwhile, Wright also decided to donate the shell and egg collections, which were especially well-cataloged and historically important, to the American Museum of Natural History.[2] While some of the mammals and other specimens were dispersed elsewhere, most specimens' outcome was undocumented.

Many professors recall the disposal of much of the collection, either in the months following the decision to disband the museum or in the decades that followed. It appears that the specimens selected for immediate discard were those that had been poorly preserved or maintained. In discussing the destruction of the gorilla specimen brought to Main Building during the students' prank, Francis Ranzoni, a biology professor, remarked that he was unsure of if it was good fortune or a conscious decision on the part of the students, but the gorilla specimen likely would have been discarded due to its poor condition.[14] It is unclear how many specimens were disposed of, but given the proportion of specimens that were documented as being transferred to other institutions and the number of specimens that remain at Vassar, there must have been many. Surprisingly, the practice of specimen disposal was not uncommon, as Brown University similarly experienced a shift away from its natural history collections; most of its collection was disposed of in the University's dump in the year that the museum closed.[15]

Those that were not quite in a state that prompted their immediate disposal were placed in storage throughout Vassar's campus. There, they collected dust and, because they were rarely used as teaching specimens, they continued to disintegrate due to a lack

of attention and maintenance. Periodically, when the need for more storage arose, specimens would be discarded in waves. Professor John Long recalls pulling items, many of those displayed in this exhibit, from discard piles, saving them from a fate in a dump. Many faculty and staff similarly attempted to salvage any specimens that appeared to be either in good condition or potentially important and rare. The majority of these rescued specimens found themselves sitting in faculty offices and on shelves in lab spaces. With few faculty having the knowledge needed to maintain a complex taxidermy specimen and with no funding dedicated for their restoration, it was difficult to use these as common teaching materials. These professors, however, saw a value in the leftover collection, whether it be aesthetic, scientific, or simple curiosity.

Professor of Biology Kathleen Susman and Warthin Museum curator Richard Jones founded the Vassar College Artifact Project (VCAP) upon discovering the wide array of specimens left behind and wanting to prevent their disposal. VCAP arose from conversations that started as early as 2011 with the renovation of several science buildings and the demolition of Mudd Chemistry in anticipation of the new Bridge for Laboratory Sciences.[16] With many of the remnants of the natural history museum housed in these buildings, the future of the remaining objects was unknown before Jones and Susman stepped in. For two years, they explored the forgotten storage spaces of the science buildings and collected the seemingly abandoned artifacts, as well as their stories. With the help of Marianne Begemann, Dean of Strategic Planning and Academic Resources, for the first time since the museum's closing, money was going back into the natural history specimens. With this funding, VCAP was able to "save, research and restore forgotten artifacts in the teaching collections on campus."[17] Today, the results of this work can be found in exhibits throughout the Bridge for Laboratory Sciences, Olmsted Hall, and Sanders Physics, where the objects, once again, strive to teach students and campus visitors.

James John Audubon's illustration of a swallow-tailed hawk.

Birds, Ornithology, and Record-Keeping

At its peak, Vassar's collection of birds was "one of the finest ornithological cabinets in the country."[2] This was largely due to the Giraud collection of North American birds, which Vassar received early in its history and was well-known as "one of the most valuable [ornithological collections] in the United States."[18] Vassar's collection also had an extensive collection of South American birds, largely due to the expeditions of faculty such as James Orton.

The extensive collection had many specimens that were originally owned by renowned scientists, including James John Audubon, from whom the National Audubon Society derived its name. As an artist and ornithologist, Audubon had used Vassar's specimens while they were still in his collection to make the illustrations that were eventually published in his book, *The Birds of America*, which is one of the most detailed, extensive, and important contributions to ornithological study to this day.[19]

By 1871, Professor Orton wrote that the cabinet contained almost twelve hundred species and that several of these were

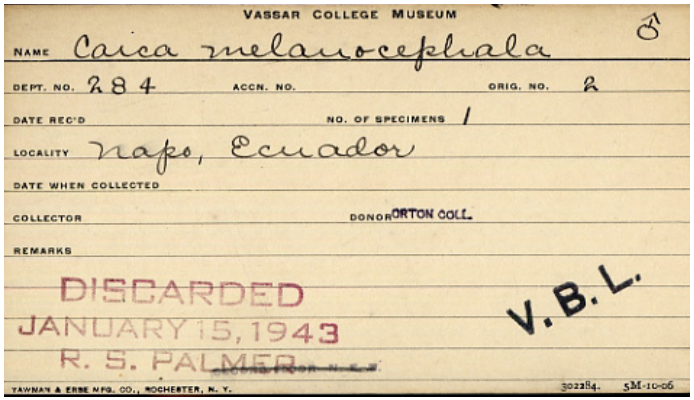
type specimens.[20] Type specimens are considered to be of utmost importance within collections, as they are the first specimen of a species to be collected, described, named, and cataloged.

However, despite the importance of this collection, many of its specimens appear to be poorly documented or tracked throughout time. With the downfall of the natural history museum, the type specimens were donated to other museums or educational institutions due to their extreme importance, but I have found little documentation of the details regarding the transferring of specimens beyond the institution that they ultimately were relocated to. Several specimens were transferred to the Audubon Society, the American Museum of Natural History, the Royal Ontario Museum, and others were brought to Dutchess Community College.[2] Likely, those that were transferred were accompanied by their catalog cards, which often state a specimen's scientific name, common name, donor and collector information, locality, and any other notes that may be helpful in understanding the specimen's story. If the specimens were types, these cards would likely contain more information, simply due to their level of significance, than those that have been left behind.

Within this exhibit are some of the bird specimens that escaped disposal and were not worthy of transfer to another institution, for one reason or another. Very few were found with their catalog cards, but those that were are representative of the scanty information present on the cards. The swallow-tailed hawk's card is almost empty, only containing its scientific name, common name, and donor.

Similarly, some cards remain without a specimen, representative of either the loss of the specimen itself or the general misplacement of both over time. The card within this exhibit also lacks the details that one would hope to see; ideally, these cards would be full of information about the specimen's provenance, line of ownership, and details from the actual collection process. However, most of these specimens displayed have lost their catalog cards as a result of time and hurried movement from one place to the other with the closing of the museum, leaving us unsure of even the species and origin information.

Alternatively, some of the cards that are not accompanied by a specimen specify exactly why they exist without their physical counterpart. As shown below, some cards were stamped in red with the word "discarded", but lack any further explanation as to why this was the case.


VASSAR COLLEGE MUSEUM

NAME Caica melanocephala ♂

DEPT. NO. 284 ACCN. NO. ORIG. NO. 2

DATE REC'D NO. OF SPECIMENS 1

LOCALITY Napo, Ecuador

DATE WHEN COLLECTED

COLLECTOR DONOR ORTON COLL.

REMARKS

DISCARDED
JANUARY 15, 1943
R. S. PALMER

V.B.L.

TAYMAN & ERBE MFG. CO., ROCHESTER, N. Y. 302284. 5M-10-06

A catalog card for a specimen discarded in 1943. Courtesy of A. Scott Warthin Museum of Geology & Natural History.

Given the cultural, biological, and historical significance of Vassar's ornithological collection, the state of the collection and its lack of documentation can be surprising. Even the seemingly less important specimens that remained at the College following the museum's closure were likely part of Giraud's collection or were collected during professors' expeditions throughout the world and deserved to be documented properly. The loss or lack of information has compromised the scientific value of the specimens, leaving us unable to use the specimens in the way that they were once intended.

Vassar once also displayed likely the largest collection of hummingbirds of any college museum.[18] In this exhibit, a single hummingbird is present; its wing has been broken, delicately hanging and threatening to fall with any abrupt movement, but its distinct bright coloring has fared well over time. While there are others in slightly better condition throughout Olmsted Hall, they are few compared to the abundance that the natural history museum once possessed. Like many of the other specimens, few of these hummingbirds were found with their catalog cards. Some include

information of at least their scientific or common name on the side or underside of the stands they are perched on, but most lack any information at all. John Long has speculated that the hummingbird included in this exhibit may have been collected or mounted by Professor James Orton during one of his expeditions to South America, but has few threads to pull when it comes to trying to verify this information.

Ultimately, poor record keeping has limited proper access to and use of the specimens that used to make up one of the greatest ornithological collections in North America. With little to no information about their origin, nomenclature, or method of preservation, the birds cannot contribute to research in the way that better-documented specimens could. Some of the birds within Vassar's current collections may be now endangered, or even extinct, but with so little information about each specimen, energy and funds would have to be devoted to the identification of the specimens before they could be used for research purposes. Further, even with the potential ability to identify species through DNA analysis, many of these birds' stories have been lost and their specific origins may never be known again. This goes to show the importance of proper, and preferably standardized, cataloging practices within the field of natural history, but it also leaves us questioning both what we can do in the future to prevent any separation between records and specimens, as well as what the next steps might be with those specimens whose stories have already been lost to time.

Ziegler's wax embryological models in New England Building in 1940.
Image courtesy of Vassar College Archives and Special Collections (Ph.f9.25).

Melting Wax Embryological Models

Around the time of Vassar's founding, in the early to mid nineteenth century, embryology and the study of development rose in popularity, as scientists strived to understand the origins of humans.[21] In an attempt to better understand and communicate their understanding of embryology, scientists would often commission models of the structures that they studied; these allowed for a three-dimensional representation of the various stages of development at a larger scale, as access to human fetuses or other developing organisms were often rare, small, and difficult to study. It was especially difficult to teach these topics, given how expensive proper woodcut illustrations in textbooks could be and the logistical complications of trying to show an entire class group a microscopic embryo on a slide.[21] This provided an opening for the use of models in the classroom; they were large, detailed, and showcased the latest embryological findings.

By the 1860s, any embryologist would have been familiar with the work of Adolf Ziegler, a physician turned wax modeler that specialized in anatomical and embryological models.[22] Ziegler's models were especially popular in higher education, so it is not surprising that Vassar obtained an abundance of his models for its natural history museum to be used in studies of development.

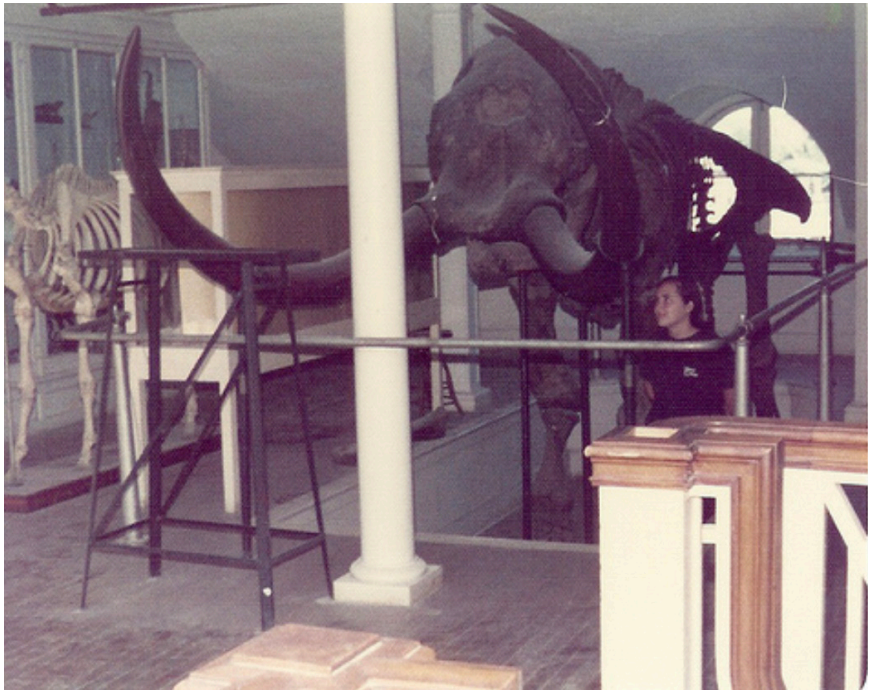
From the beginning, these models were meant to be handled and used. Students were meant to rotate them to see the display in its entirety and observe the models closely, so as to see the details of each layer and feature. However, with years of use, some of the wax models broke, while others began to melt slightly due to the heat of students' hands or by being left too close to heat sources, causing them to slide down the metal stand that they were mounted on and leaving a small portion of the metal protruding from the top of the model.

There is little information about the dispersal and disposal, or lack thereof, of these models following the natural history museum's closing, but many of them have been on display at various points in several of Vassar's science buildings.

Now, as a result of past damage and out of fear for potential harm to the rare specimens, most of the models remain in display cases throughout Olmsted Hall. This inevitably brings up questions about the intended versus the actual use of natural history specimens. In this case, the specimens were intended to be handled as learning resources in labs and in the classroom, but years of use has caused us to put them behind glass in an act of protection.

In attempting to explore alternatives, one may consider the possible restoration of the damaged models followed by the reintroduction to the classroom and then subsequent proper care and consistent conservation efforts. However, this also would require an abundance of funding that would be hard to acquire.

It is difficult to balance the desire for use with that of protection from potential harm, especially with a lack of funding, but this is central to conversations about the role of modern roles of natural history specimens. We are left pondering if teaching institutions, whose primary purpose is education, should dedicate their resources to making their specimens available in the ways they once were by allowing them to be tactile methods of communication at the risk of damage, or if this is no longer feasible and we should re-construct the methods of learning to allow for guaranteed protection of specimens.



Photograph of the mastodon specimen in New England Building.

The Mastodon

Vassar's mastodon may be one of its best-documented specimens, from its creation to its restoration at Cambridge High School. A partial mastodon was unearthed in Circleville, Ohio in 1895 and, for the next six years, the bones were mounted and any missing pieces were either recreated by casts and molds or supplied by other incomplete mastodon skeletons.[23,24] By 1902, the mastodon was on display at Vassar and quickly became a central and important piece of the College's collection. When the museum moved into New England Building, a sunken floor was constructed specifically to display the skeleton, as its large stature made it difficult to exhibit without a proper space dedicated to it.[2] Here, it lived until the 1980s, even after the biology department was moved into Olmsted Hall.[2] In 1986, Peter Charlap, a studio art professor, found a slip of paper near the mastodon instructing the janitor to dispose of it- the result of the incorrect assumption that the mastodon was not a real skeleton, but rather entirely made of plaster.[23, 25, 2] Distressed

by the idea of the mastodon being so casually disposed of, Charlap contacted the Museum of Natural History in Manhattan and, from there, was further recommended to reach out to Russel Waines, a professor for SUNY New Paltz's geology department.[25, 2] While the majority of the skeleton was transferred, its foot remained at Vassar, displayed in Olmsted before it was eventually moved and mounted in the Warthin Museum.

In New Paltz, the mastodon's skeleton remained dismantled and largely in boxes, while also "virtually unprotected."[25] Over the next several years, the school's geology department showed intention and desire to restore and display the skeleton once again, but likely due to a lack of funding, struggled to do so.[25]

In the years that followed, the mastodon was transferred to the NY State Museum in Albany before Steve Butz, a Cambridge High School science teacher, asked if the skeleton could be donated to Cambridge High School in 2013. There, under Butz's supervision, art and science students worked to restore the remaining skeletal pieces, as well as create a custom cart that contains educational information about the mastodon so that it could be transported and used by K-12 students.[23]

Weighing nearly 1,000 pounds and measuring twenty feet in length, clearly, there is no mastodon present within the confines of this case.[24] While one of its feet remains at Vassar, it is too fragile to be dismounted and moved from the Warthin Museum. However, the lack of this specimen may be crucial in discussing ownership, stewardship, and responsibility.

While the mastodon was at New Paltz, there was an abundance of discussion regarding where it belonged. In 2001, after the mastodon had spent over a decade in boxes at New Paltz, Betty Daniels, the Vassar Historian, and Steven Taylor, Vassar's Director of Academic Consulting Services, went to visit the skeleton and discussed the possibility of bringing it back to Vassar with Waines.[25] At the time, students, faculty, and staff claimed that it should be returned to Vassar because it is "historically Vassar" and could be "tremendously helpful" for geology courses.[25] Ultimately, though, nothing was finalized and the mastodon remained in boxes for several more years.

It seems that the Vassar community felt a connection to the mastodon, and possibly a responsibility for it, despite it no longer residing on Vassar's campus. Waines expressed having multiple, well-intended plans for the mastodon, but a former student of his said that "they will never come to fruition."[25] In thinking of this, one might consider if the mastodon was still the Vassar community's responsibility while it was at New Paltz and, if so, should we have been more proactive about trying to bring back the mastodon, restore it, and re-display it despite a likely lack of funding and space?

The mastodon is especially representative of the cycling of natural history specimens and their constantly-changing value in science; it shifted from almost being disposed of to being a source of contention about ownership and responsibility to being found by a high school teacher and re-purposed. Today, the mastodon is still often referred to as "the Vassar mastodon", despite the community's distance from it for nearly four decades, which brings up many questions about whose responsibility it is to advocate for these specimens, especially as they move to different institutions; stewardship is a large part of the care of natural history specimens and becomes increasingly difficult to allocate with a lack of resources.

Collections, including coral specimens, in New England Building.
Image courtesy of Vassar College Archives and Special Collections (Ph.f3.28).

Coral Specimens and Collection Practices

The use of a coral specimen provides a unique entrance to the arguments on the ethics of collection. Their seemingly static stature and almost rock-like appearance may cause many of us to believe that they are simply that: rocks. However, despite a lack of the features we may often associate with animals that allow us to empathize more deeply with them, corals are animals and they can provide us with both a distance and simultaneous proximity to comfort that allows for interesting dialogue.

While there appears to be little information published about Vassar's collection of coral, there is documentation of the museum having multiple specimens by the time it had moved into New England Building. One exhibition description detailed a student's successes in searching for and eventually mounting multiple coral fossils, one of which she used to describe and publish a new genus and species.[26] While most of these corals were no longer living at the time of collection, some of Vassar's collection was likely collected while alive.

The coral specimen displayed within this exhibit is small compared to others that can be found throughout Olmsted Hall, but it is likely still multiple years old given that brain corals typically can only grow a few millimeters per year.[27] Some of the larger specimens in Vassar's current collection are upwards of three feet in diameter, likely over 100-200 years old. These specimens can be too large to include in the more contemporary VCAP exhibits, but while on exhibit in the past, they likely provided that sense of amazement and awe that natural history museums strived to produce, much like their predecessors, the cabinets of curiosity.

In terms of their use in the sciences, at the time of Vassar's natural history museum, the specimens were often studied in comparison to one another; this allowed students and faculty to observe the traits that made a certain species unique, as well as document any newly found differences while recording a new species.[26] However, for these purposes, while it could be potentially beneficial to have an entire hundred-year-old coral, one must weigh the advantages against the disadvantages. In other words, at what point does the scientific value of the specimen outweigh the cost of taking the life of an organism?

In considering this question, it is possible to try and reason with some possible compromises, such as taking a smaller piece of the coral that may also be representative of all of the characteristics needed for the identification or perhaps taking one large, complete organism but doing so for fewer specimens. These considerations, however, seem to fluctuate with each different use or research question, making it difficult to set standardized practices in place.

Given that the corals that Vassar possesses now were collected before there were many attempts at standardized rules and policies regarding collection, we are left considering how we can better contextualize the lives lost through the process of collection and ensure that the specimens are well-used for their intended purposes; we cannot undo the past, but we can reflect our current practices on the mistakes of the past that we learn from.

Lost Stories

Ultimately, many of the specimens' histories within this exhibition have been lost or forgotten over time. As responsibilities over the specimens shifted, as well as their physical location throughout campus following the closing of the natural history museum, information was lost. While some have labels with their common name or small tags tied to their mounts, most of the specimens can only be identified as being from the museum because of the blue stands that they sit on. This is characteristic of the Vassar natural history specimens because, at some point, somebody decided to use a light blue paint to cover the wood below the specimens, often getting some brush strokes or splatters on the feet of the animals. While this was a bold decision and a slightly messy approach, it is one of the few ways that we can trace the forgotten specimens back to the museum without the need for catalog cards or notes. While these specimens' specific stories may be lost, we can continue to search for clues of their presence and importance in Vassar's history; with this information, we may, once again, be able to use the specimens for learning as they once were intended.

Contemporary Collections

The majority of this writing has focused on the cycles of value and use of natural history specimens locally at Vassar College, but it is also important to broaden our lens and consider the contemporary uses of collections throughout the world. At the height of Vassar's collection, the specimens were being used to represent morphological changes within groups that were visible to the human eye; students studied the physical differences between specimens to determine the differences between species, and even declare findings of new species. Within the past few decades, however, scientists have started to see and use specimens as time capsules that can reveal valuable information about the past.

An abundance of modern biological studies are centered on exploring how organisms will adapt, evolve, and acclimate in the face of a changing climate. While it may seem counterintuitive to look towards the past in answering specific questions about the future, well-kept and documented specimens can provide important information about earlier variations in species distribution and phenology (the timing of plant and animal cycle events, such as migration, flowering, and spawning) as well as genetic changes in response to past environmental changes. One study was able to use genome sequencing to find the approximate year that a plant, *Arabidopsis thaliana*, was introduced to North and South America and the mutations present in modern populations that resulted from the introduction of this invasive species.[28, 29]

Specimens can even be used to track the emergence of pollutants and pathogens, as well as the presence of nutrients and heavy metals.[29] At the Natural History Museum of Los Angeles County, one group is studying the microstructure of feathers to analyze the rise in presence of pollutants on urban bird specimens, while another group is analyzing the presence of microplastics in fish specimens to determine differences in the historic plastic consumption of fish at different trophic levels.[30]

Further, within the past decade, many institutions have devoted their energy towards the digitization of their collections. This process involves assigning a unique number identity to each specimen for cataloging purposes, standardized imaging, and

transcription of any information present on labels or catalog cards. All of this information is later uploaded to databases, which allows for users, regardless of location, to easily access some of the intangible information that the specimens can provide. This means that scientists can track the historic presence or movement of species throughout the world, as well as compare phenology across both spatial and temporal scales. It also allows for more widespread, and even cross-disciplinary, collaboration between institutions that may not typically get to easily work together due to their location.

The National Science Foundation (NSF) even started a program specifically intended to fund the digitization of biological collections in 2015, which has helped to standardize the process and increase the number of institutions that can devote resources towards digitization.[31] Since then, over 137 million specimens have been digitized and uploaded to NSF's Integrated Digitized Biocollections website, which is accessible to anybody interested.[32]

Ultimately, many contemporary natural history collections have slowly begun to recirculate into modern research. Even though some collections have been dispersed over time, the specimens left from those collections are being repurposed to make education more accessible, such as the Vassar mastodon. Today, natural history specimens provide a unique access to science which can be used on an abundance of different scales; the digitization process allows for use by anybody, regardless of education level, location, or field of study, while advancements in technology allow scientists to sequence entire genomes to learn from historic genetic variations. Natural history specimens are no longer simply objects of the past, but rather windows to understanding our future in a changing climate.

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