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Thinking in 3D: Utilizing the Future to Reimagine the Past
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Florida State University
William Johnston Building
Rose Library

Exhibition Catalog
We acknowledge that the William Johnston Building at Florida State University is located on land that is the ancestral and traditional territory of the Apalachee Nation, the Muscogee Nation, the Miccosukee Tribe of Florida, and the Seminole Tribe of Florida. We pay respect to their Elders past and present and extend that respect to their descendants, to the generations yet unborn, and to all Indigenous people.

We recognize that this land remains scarred by the histories and ongoing legacies of settler colonial violence, dispossession, and removal. In spite of all of this, and with tremendous resilience, these Indigenous nations have remained deeply connected to this territory, to their families, to their communities, and to their cultural ways of life. We recognize the ongoing relationships of care that these Indigenous Nations maintain with this land and extend our gratitude as we live and work as humble and respectful guests upon their territory. We encourage you to learn about and amplify the contemporary work of the Indigenous nations whose land you are on and to endeavor to support Indigenous sovereignty in all the ways that you can.
Thinking in 3D: Utilizing the Future to Reimagine the Past

Exhibition Catalog
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New and innovative technologies like 3D printing, 3D modeling, virtual reality (VR), and augmented reality (AR) have drastically impacted the way museums, libraries, and universities engage with increasingly diverse audiences. Utilizing digital technologies and scholarship that utilizes 3D data, museum and library professionals have been able to experiment with and create unique edutainment experiences — combining entertainment with practical educational concepts. However, the impact of the COVID-19 pandemic continues to devastate the museum world, and many institutions, already facing financial constraints, are now under pressure to increase accessibility to their exhibitions, both physically and digitally. In addition, these institutions, which have historically restricted minority groups from accessing their exhibitions and collections, are now grappling with the consequences of lower engagement and attendance from the communities they claimed to serve.

This exhibition, *Thinking in 3D: Utilizing the Future to Reimagine the Past*, was curated in response to conversations surrounding the newfound responsibility museums and digital humanities centers have to digitally preserve objects in their collections. Featuring 3D printed objects and artifact replicas from the fields of Classics, Archaeology, and Art History, *Thinking in 3D* utilizes 3D modeling and 3D printing technologies to explore the capabilities of these tools for research, education, and entertainment. In contrast to traditional exhibitions, the audience is invited to directly interact with the objects on display — engaging with the items in a way traditional museums often cannot allow. With mounting pressure for these institutions to digitally preserve and ultimately repatriate objects in their care, this exhibition aims to provide viewers with a broad understanding of the applications of 3D digital technologies in museum spaces and beyond.

As museums and cultural heritage centers respond to shifting political, economic, and social environments, these institutions must begin to consider the necessity and importance of incorporating digital technologies within their exhibitions and public programs. Ultimately, *Thinking in 3D: Utilizing the Future to Reimagine the Past* examines the potential promise of using 3D digital technologies for audience engagement, research, and education while additionally considering the ethical and social challenges of adopting these technologies, both now, and in the future. — *Yatil*
02. what is digital humanities?

Although digital humanities may appear to be novel, the origins of the field began in the 1940s and 50s through the work of American poet Josephine Miles and Italian priest Roberto Busa. While Busa is often credited as the founding scholar of computational humanities with his work producing the Index Thomisticus, “a massive attempt to encode nearly 11 million words of Thomas Aquinas on IBM punch cards,”¹ Miles arguably pioneered the field through her work creating a computational concordance of the poetical works of John Dryden — publishing it 17 years before the first volumes of the Index Thomisticus.² Over 60 years later, the term digital humanities arose from the book, *A Companion to Digital Humanities*, and has since been heavily adopted in the United States.³

What originally began as a niche area of interest, the field of digital humanities has witnessed rapid growth and change since the creation of the Internet, widespread use of personal computers, and the proliferation of 3D digital technologies. Modern technology is drastically redefining how people interact with cultural and historical narratives, and many museums are taking note of this continuing trend. Ironically, this abundance of digital tools and technology continues to complicate what it means to perform digital humanities work. While digital humanists regularly differ on what is and what isn’t digital humanities, the term does not represent a unified field, but an array of convergent practices that explore a world in which print is no longer the exclusive medium for knowledge production, and where digital tools, techniques, and media have altered the production and dissemination of knowledge in the arts, human and social sciences.⁴

Placing an increased focus on the capacity digital technologies have to preserve cultural histories, artwork, artifacts, literature, and more, museums and cultural heritage centers are using creative and innovative tools to increase audience participation and remove barriers of access in the museum. Museum professionals have begun navigating through many of the challenges associated with their collection, preservation, and exhibition practices, turning to technology to expand the reach of their collections and educational programs, and similarly, establishing digital projects that are designed to engage with unique and diverse audiences.
Three types of digital technologies that museum professionals are adopting in exhibitions and research collections are 3D modeling, 3D printing, and extended reality (XR). These tools are being used to create digital and physical replicas of objects and to increase public accessibility to exhibition and collections spaces in the museum.

3D scanning and 3D modeling technologies are being used to digitally recreate information about physical objects in a virtual environment — gathering raw data as “point cloud” information and converting it into user-friendly file-types. There are many 3D scanning methods including structured light scanning, laser-based scanning, and photogrammetry — each of which pose their own unique situational advantages and disadvantages. Everything from archival documents, photographs, video, audio, books, and even architecture is being digitized and displayed via virtual environments. As a non-contact measuring technology, 3D scanning is incredibly useful for taking highly precise measurements without touching or damaging the physical object. Additionally, 3D models can be shared globally and used to create high-quality 3D printed replicas. As such, this technology has become a critical tool in museum and university collections for creating digital surrogates that increase access to historical objects and cultural heritage artifacts.

A graduate research assistant at FSU Libraries uses a handheld 3D scanner to digitize an object from the Robert E. Hancock Jr. Antarctic Collection housed in the Special Collections and Archives Division.
3D printing technologies are being used to turn virtual models into physical objects that can be used for analysis and examination. Although one of the first three-dimensional printers was developed by S. Scott Crump in the 1980s, 3D printing is still a relatively new technology. Basic fused deposition modeling (FDM) 3D printers work by heating and extruding plastic filament through a small nozzle that moves around in specific patterns to build layers on a printing bed, eventually creating a 3D printed model. In contrast to filament printers, more advanced 3D printers use lights or lasers to cure liquid resin into layers. These processes for resin 3D printing are called digital light processing (DLP) and stereolithography (SLA), respectively. This technology allows resin 3D printers to create highly accurate models with more detailed features and smoother surface finishes than filament-based printers.
Extended reality (XR) is an emerging umbrella term that refers to virtual reality (VR), augmented reality (AR), and mixed reality (MR) technologies. Though XR technologies have been around for some time, they have significantly improved over the years, allowing for truly immersive digital experiences. Virtual tours and exhibitions have the capability of bringing the museum to individuals and communities and can be used to help alleviate some barriers of access to these institutions. Issues such as high entry fees, limited access for individuals with disabilities, or general apprehension towards the museum can all be mitigated by incorporating these valuable digital tools.

Another benefit of extended reality technologies is that the location of the museum is no longer a barrier — audiences from around the world can access a museum's digital tour from anywhere, and at any time. Many of these tours have also been adapted to have mobile versions; this not only helps engage younger audiences with the museum, but it also increases access for marginalized communities who may not have high-speed internet access but do have smartphones. Virtual tours and exhibitions can also be used to highlight lesser-known works of art or objects in the museum. A museum can use this digital platform to add more context to pieces already on display, or feature objects that have been stowed away in collections; “valuable artworks that require proper conservation can be digitized – allowing them to be showcased, while also remaining under conservation treatments and measures.” When used in conjunction with online collections, virtual tours have the capacity to vastly enhance a museumgoer’s experience even if they have never stepped foot in the museum.
By utilizing 3D digital technologies, researchers can work to enhance preservation of rare or damaged artifacts of cultural importance. Using high-quality scanners and cameras, institutions can increase access to their collections by digitally preserving objects, with a focus on digital longevity. In addition, files of 3D models can be shared globally between researchers, cultural institutions, and 3D modeling enthusiasts alike who can use the models in their own scholarly projects and educational programming.

Another important benefit of utilizing 3D digital technologies is increased and enhanced audience engagement. Using 3D scanning and printing provides an option for people to hold a printed replica in their hands, enabling them to have a deeper experience with an artifact or a work of art. “While the 3D print (especially the small prototypes) cannot reconstruct this experience, there is potential for 3D printing (especially when an artifact is printed in its actual dimensions) to mimic some of the physical features of the original that are lost in digital form. Students, for example, can interact with it as an object (rather than an isolated image) and analyze its forms in new and critical ways.”

When thinking about how to effectively make use of digital technologies for research projects or educational experiences, institutions must consider:

- Why might these technologies be necessary to incorporate?
- What are the main goals of using these types of technologies?
- How can these technologies be used to support specific groups or communities?
- How feasible is the work necessary to effectively implement digital technologies?

This is not an exhaustive list by any means, however, by foregrounding these types of questions, researchers and museum professionals can more effectively consider approaches for integrating digital technologies into their work.
Art History students in the Rose Library interact with objects on display in the exhibition *Thinking in 3D*
3D modeling, 3D printing, and mixed reality technologies have become popular tools in museums, libraries, and archives for research and educational purposes, however, there are still several limitations for institutions that may try to implement these tools. Smaller museums or cultural heritage centers may struggle to adopt 3D digital technologies because of limited funding or support, lack of expertise, or issues navigating the repatriation process. These barriers often make it difficult for institutions to consider investing the time, energy, and money in incorporating 3D digital technologies within their collections, exhibitions, and programming.

Although 3D scanning and 3D printing technologies are more widely accessible now than they were a decade ago, adopting these technologies can still be relatively expensive, especially for smaller museums who do not have funding available to digitize their collections or implement virtual programs. For example, a handheld 3D scanner can cost upwards of $35,000, while an FDM 3D printer can range anywhere from $200 to $2,000. Even for institutions that do have money or project funding, an added challenge can be the difficulty in finding a qualified person or organization that can effectively create innovative digital experiences. Rather than spend money on an expensive and time-consuming digital project, it may be better to put funds into another program that can similarly accomplish the museum’s goals of increasing accessibility. An additional limitation to consider is that the particular community a museum serves might not have access to the technology required to interact with or view a virtual exhibition created by the museum. These barriers can include lack of access to reliable Internet, hardware, or software which most notably impacts those in lower-income or rural areas.

One of the largest challenges that museum professionals face when utilizing 3D digital technologies, particularly 3D scanning, are questions of cultural patrimony and repatriation. While many objects, statues, and even buildings can be 3D scanned with expressed permission, there are millions of artifacts and objects of cultural significance housed in museums worldwide that are being digitized without prior consent from the source communities of which those objects belong.
Under the guise of virtual repatriation, many institutions continue to create barriers towards repatriating many of the objects and artifacts in their collection, choosing instead to digitally return artifacts while keeping the originals. “Even if the Indigenous community obtains digital facsimiles, there may be a written agreement required by the curating institution before the community can actually use those facsimiles. There is still a power imbalance which favors the institution.”

Despite these challenges, museums can still make efforts to develop and maintain a strong virtual presence. In situations where utilizing 3D digital technologies is difficult, museums can still engage with communities through social media or virtual events. Via social media like Facebook and Instagram or applications like Zoom, museums can host virtual events, present live performances, or give tours of an exhibition space — these tools have been indispensable for museums to engage with new audiences. Email notifications can also be helpful in keeping visitors up to date on everything happening at the museum. Using these free or low-cost technologies, museums can still directly engage communities in ways that are just as meaning and impactful.

Ultimately, as 3D digital tools and technologies become cheaper, more efficient, and more widely available, museums, libraries, and research institutions should make efforts to utilize 3D digital technologies within their research, collections, and exhibitions. However, future work using digital technologies must consider the social and ethical challenges and barriers that exist, or may inevitably arise, when working with source communities and objects of cultural importance.

An Art History student in the Rose Library holds the replica Kantharos on display in the exhibition *Thinking in 3D*
Kantharos, 400 BC - 301 BC (4th century BC), Terracotta
Replica Kantharos, 2021, PLA Thermoplastic and Acrylic Paint

A kantharos is a type of ancient Greek cup used to hold wine, likely used for drinking or for ritual use. The design on the vase references the Greek god Dionysus, associated with grape harvest, wine-making, and wine. Made in Southern Italy, this kantharos was likely used as a wine cup and then stored in the tomb of its owner, where it remained intact until it was unearthed centuries later.

*Original object housed at the Fralin Museum of Art*

Stemmed Bowl, 1375 BC - 1300 BC (14th century BC), Terracotta
Replica Stemmed Bowl, 2021, PLA Thermoplastic and Acrylic Paint

A pottery stemmed bowl with two horizontal round handles and black slipped inside with traces on the outside.

*Original object housed at the British Museum*
Mini Skyphos Cup, 500 BC – 401 BC (5th century BC), Terracotta
Replica Mini Skyphos Cup, 2021, PLA Thermoplastic and Acrylic Paint

A skyphos is a deep-bowled drinking vessel with a low foot and two short handles. These cups are often found at sanctuaries, suggesting their use as votive offerings throughout the region. This small skyphos cup was found at a classical cemetery in the Greek Island Cephalonia.

*Original object housed at the Fitzwilliam Museum*

Eye Kylix, 530 BC (6th Century BC), Terracotta
Replica Eye Kylix, 2021, Photopolymer Resin

A kylix is a wide-bowled drinking cup with horizontal handles, usually painted around the surface depicting subjects from mythology or everyday life. The exterior of this kylix features two sets of large white eyes with a rudimentary nose in between and depicts scenes from a komos, or a ritualistic drunken procession performed by ancient Greeks.

*Original object housed at the Harvard Art Museum*
Bronze Corinthian Helmet, 650 BC - 570 BC (7th - 6th century BC), Bronze Replica Bronze Corinthian Helmet, 2021, PLA Thermoplastic, Acrylic and Spray Paint

This elegantly shaped bronze helmet is associated with the city of Corinth. The helmet covered the entire head and neck, with slits for the eyes and mouth, and was beaten out entirely from one piece of bronze. It required exceptional skill to make on the part of the bronze worker.

*Original object housed at the British Museum*

Roman Lamp 51 – 100 (Second half of 1st century CD), Pottery Replica Roman Lamp, 2021, Photopolymer Resin and Acrylic Paint

Mold-made pottery lamp covered in an orange-brown slip, with a rounded-tipped nozzle and a broken ring-handle at the rear. The center is decorated with two gladiators in combat. Below them is the inscription “ACVVIVS V HERMEROSS” identifying their names as Acuvius and Hermeros.

*Original object housed at the British Museum*
Babylonian Clay Tablet, 2500 BC (25th century BC), Clay
Replica Clay Tablets, 2022, PLA Thermoplastic and Acrylic Paint, Photopolymer Resin

Babylonian clay tablets are artifacts that illustrate cuneiform script — the oldest form of writing in the world. This ancient tablet was excavated in Babylonia (present-day Iraq) by the University of Chicago in 1903-1904 and was subsequently purchased by the Florida State College for Women (FSCW) in 1922 alongside twenty-four similar tablets.

*Original object housed at the Florida State University Special Collections and Archives Division*

Roman Silver Coins (Denarius), 211 BC (2nd century BC), Silver
Replica Denarius, 2021, Photopolymer Resin and Spray Paint

Denarius were the standard Roman silver coin, with the name derived from the Latin deni, meaning “containing ten” — 1 denarius was equal to 10 bronze coins. This coin features a Roman leader with a helmet on one side, and on the other, an image presumed to be Apollo riding a chariot, holding the reins of the chariot and a bow with arrows.

*Original object housed at the Ciudad Real Museum*
Turkey Tail Projectile Point, 1500 - 500 BC, Chert
Replica Turkey Tail Projectile Point, 2022, Photopolymer Resin and Acrylic Paint

The Turkey Tail projectile point is associated with the Late Archaic and Early Woodland Periods of the Eastern Woodlands in North America and is primarily found in the Midwest and into the Tennessee River Valley. While these objects are called projectile points, there is some debate as to how these points were actually used. Instead of functioning as spear or dart points, Turkey Tail points appear to have served a ceremonial or religious purpose and are often found in buried caches of goods.

Original object housed at the Michigan State University Museum

Adena Projectile Point, 1000 - 100 BC, Chert
Replica Adena Projectile Point, 2022, Photopolymer Resin and Acrylic Paint

The Adena projectile point generally dates to the Early Woodland period of the Eastern Woodlands of North America and is commonly found within the Ohio River Valley. Made through flintknapping, this tool would have been used as a spear or dart tip, a knife, or a multi-purpose cutting tool.

Original object housed at the Michigan State University Museum
Clovis Projectile Point, 10500 - 8500 BC, Burlington Chert
Replica Clovis Projectile Point, 2022, Photopolymer Resin and Acrylic Paint

Clovis projectile points date to the Early Paleoindian Period of North America and are a hallmark of some of the earliest inhabitants of the Americas. They can be found in many parts of North America and were used as spear points and as multi-purpose cutting tools.

Original object housed at the Michigan State University Museum

Synders Corner-Notched Projectile Point, 200 BC to AD 300, Wyandotte Chert
Replica Synders Projectile Point, 2022, Photopolymer Resin and Acrylic Paint

Synders Corner-Notched projectile points are associated with the Middle Woodland Period of the Eastern Woodlands in North America and are found primarily in the Midwest. These projectile points were used as spear or dart points, as well as multi-purpose cutting tools.

Original object housed at the Michigan State University Museum
Kramer Projectile Point, 1000 - 500 BC, Chert
Replica Kramer Projectile Point, 2022, Photopolymer Resin and Acrylic Paint

Kramer projectile points are associated with the Early Woodland Period of the Eastern Woodlands in North America and are primarily found in the Great Lakes and Ohio River Valley regions of the Midwest. These projectile points were used as spear or dart points, as well as multi-purpose cutting tools.

*Original object housed at the Michigan State University Museum*

Dalton Projectile Point, 8500 - 7500 BC, Chert
Replica Dalton Projectile Point, 2022, Photopolymer Resin and Acrylic Paint

Dalton projectile points are associated with the Late Paleoindian and Early Archaic Periods of North America and is primarily found in the Midwest and Southeastern United States. These projectile points were used as spear or dart points, as well as multi-purpose cutting tools.

*Original object housed at the Michigan State University Museum*
Replica Notre Dame de Paris, 2022, Photopolymer Resin

Notre Dame de Paris (Our Lady of Paris) is a medieval Catholic cathedral in Paris, France, considered to be one of the finest examples of French Gothic architecture. In April 2019, while undergoing renovation and restoration, the roof of Notre Dame caught fire and the cathedral sustained serious damage as a result. The building has since been stabilized, and reconstruction began in early 2021.

*Original model provided by Mini World 3D*

Replica Cathedral of Santa Maria del Fiore Replica, 2022, Photopolymer Resin

The Cathedral of Santa Maria del Fiore is one of the largest churches in Italy, and the third largest cathedral in the world, boasting the largest brick dome ever built. Construction on the building began in 1296 and was finished in 1436, taking over a century to complete.

*Original model provided by Mini World 3D*
Replica Boxer at Rest, 2022, Photopolymer Resin

The *Boxer at Rest*, also known as the *Terme Boxer* or *Seated Boxer*, is a Hellenistic Greek bronze sculpture of a sitting nude boxer at rest, still wearing his himantes, a type of leather hand-wrap. It was excavated in Rome in 1885 and is one of the best examples of bronze sculptures that have survived from the ancient world. The statue is now in the collection of the National Museum of Rome.

*Original model provided by Scan the World*

Replica Winged Victory of Samothrace, 2022, Photopolymer Resin

The *Winged Victory of Samothrace*, or the *Nike of Samothrace*, is a monument that was originally found on the island of Samothrace, north of the Aegean Sea. It is considered a masterpiece of Greek sculpture from the Hellenistic era, dating from the beginning of the 2nd century BC. The statue, whose head and arms are missing, represents the goddess Niké (Victory), with its base in the shape of a ship’s bow. The statue has been on display at the Louvre Museum in Paris since 1884.

*Original model provided by Scan the World*
Three-Dimensional Mona Lisa, 2022, Photopolymer Resin

The *Mona Lisa* is an oil painting by Italian artist Leonardo da Vinci, likely painted between 1503 and 1506. Credited as the most famous painting in the world, the piece features a portrait of a woman with her arms folded who is seated in an armchair against an imaginary landscape. The *Mona Lisa* has been on permanent display at the Louvre Museum in Paris since 1797.

*Original model provided by Hae Sae*


To view a collection of the digital models used in this exhibition, please scan the QR code here:

![QR Code]

For a digital version of the exhibition catalog, please scan the QR code here:

![QR Code]
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Boxer at Rest — Andre Rivera (Scan the World)  
Winged Victory of Samothrace — Jennifer Hurley (Scan the World)  
Mona Lisa — Hae Sea (Cults3D)
Yatil Etherly is a graduate student in the Art History Department at Florida State University, pursuing a Master of Arts degree in Art History, with a focus in Museum and Cultural Heritage Studies. Working as a Graduate Research Assistant for FSU Libraries as part of the Immersive Scholarship Team, Yatil collaborates with the Digital Scholarship Librarian to expand university support of research that utilizes 3D modeling, 3D printing, and extended reality technologies. With a background in Anthropology and Information Technology, and with research interests in cultural heritage work, immersive scholarship, and digital humanities, Yatil is dedicated towards exploring the capability of utilizing digital technologies to empower historically marginalized groups within the museum and beyond.