Fragments from the Severan Marble Plan: Post 3D Scanning Project Interview with Ryan Knapp, Derek Miller, and Dr. Elizabeth Thill

GEMMICKA PIPER Humanities Librarian University Library IUPUI

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The Forma Urbis Romae is a large marble map (estimated as 60 x 43 feet) that was originally carved around 203-211 CE.⁷ Stanford University's Classics Department had scanned some of the fragments as part of an early attempt at creating a 3D map during the late 1990s-early 2000s. However, the project had largely gone dormant in 2006. The Ancient World Mapping Center (hosted at UNC-Chapel Hill) and the Musei Capitoli e Sovritendenza Capitolina ai Beni Culturali, major partners facilitating access to the fragments located in Rome, welcomed IUPUI as a new contributor to this ongoing international conservation and preservation project. Dr. Elizabeth Thill, Director of IUPUI's Program in Classical Studies, has become a major force in developing IUPUI's contributions to this initiative. It was her work and connections that led to the University Library being drawn into this project.

Dr. Thill gained access to the Stanford University scans of the Forma Urbis Romae (also known as the Severan Marble Plan). Seeking to continue this critical archeological work, Dr. Thill contacted IUPUI



Derek 3D scanning fragments

University Library's 3D Project Coordinator, Derek Miller in December 2018. After delving into the existing data that Dr. Thill had acquired, Derek determined that the overall quality of the scans attained was not up to par for creating highly detailed 3D renderings that could be useful for marble grain analysis of the map, as Dr. Thill was originally hoping for. Instead, Derek determined that new scans would need to be taken if this project was to come to fruition. As the fragments are located in Rome, going

into the field to do the physical work of scanning would

require some serious funding. Dr. Thill had already been pursuing a grant through the IUPUI Arts: Humanities Institute for \$15,000, which she was awarded.

With funding secured Derek Miller and his boss, Digital Scholarship Outreach Librarian Jenny Johnson, were initially scheduled to head to Rome with Dr. Thill. However, six-weeks before the trip was set Jenny became unable to go, and it was decided that Ryan Knapp, University Library's Technology Services Manager, would go to assist Derek with scanning the fragments. Working together, Derek and Dr. Thill conceived of the idea of re-scanning the fragments using 16 K surface technology so as to capture the highest quality of 3D scan possible.

⁷ Referencing the Stanford Digital Forma Urbis Romae Project description: <u>https://formaurbis.stanford.edu/</u>

While not currently widely available, 16 K produces an image quality more than 4X sharper then the 4k of today's television screens. Quality in the scan allow for the capturing of major details such as color and texture, details which were not present in the original 3D scans taken by Stanford. According to Derek, "We deliberately decided to scan at a resolution of 16k, despite it not being common right now. This is because we see technology heading towards the widespread adoption of 16K and we were concerned about the long-term sustainability of the project." Derek and Ryan, with the support of the grant secured by Dr. Thill, spent roughly three weeks each in Rome. Additionally, Derek had reached out to Online Resources inc, the company which provides the 3D scanners currently used in the Center for Digital Scholarship, and was able to field test a new scanner (Creaform Spark), which would normally cost \$1,000 per day to rent, for free. This new scanner proved invaluable in speeding up the number of scans they were able to move through while maintaining a consistent quality.

Quality is especially central for the 3D scans in order to capture details related to marbling. According to Dr. Thill, "Capturing the marbling of each individual fragment is important because it provides a unique identifier. There is a patterning unique to a particular streak and can help with determining direction and original alignment." This level of detail, or Marble Analysis, is what will allow other perspective archeologists and classical researchers to start reassembling the fragments of the map. While the initial goal was to attempt to get 200-300 fragments scanned, Derek and Ryan ended up scanning 822 fragments during this trip. This includes more than a dozen that had never been previously 3D scanned. In part, this is explained by Ryan Knapp's observation:



Dr. Thill scanning fragments

"The Museum curators and archeologists recognize the importance of 3D scanning for the preservation and advancement of understanding the Marble Map, and its potential role in helping to verify its proper reconstruction. They wanted to ensure that it's represented as accurately as possible using the best scientific information for what will be the Museums principal exhibit when it opens a year from now. As part of that, they were highly interested in allowing tourists to be able to experience a simulacrum of what ancient Rome would have been like. When we got there, we had an expectation that we would scan around 200 artifacts held by the Museum that we arranged to work with. However, once we were on site, several other Museums saw the work we were doing with 3D scanning and became interested in learning more about 3D scanning. After seeing our work, these Museums expressed interest in having their collections 3D-Scanned. For example, an un-named archeologist, had access to a collection of over 9,000 stamped bricks used in building ancient Roman's houses, guard walls, and other prominent structures. She brought us a sample for 3D-scanning. We had 3 -4 visitors from various industries interested to know more about the work

we were doing with the Marble Map museum. Having people on site who were experienced with the 3D technology was essential for getting the project done in the three-week timeframe that we had."

In addition to the quality of the 3D scans, the ability for individuals onsite to interact with virtual fragments added another layer to the scanning project. The focus until this point has been on the 3D scanning aspect of the project, however, Ryan had the forethought to also bring in his wireless VR set up to Rome. Derek's trip had started before Ryan's, while waiting to come down to Rome, Ryan had created a virtual environment using the scans and photos taken by Derek. The virtual space created



Francesca De Caprariis exploring the VR

by Ryan places the viewer in the center of 26 fragments set atop of marble tables. The fragments can be picked up and examined in their true to life size and shape in the 3D space. You can also place fragments side by side in the air, and work with them in different arrangements. 20 feet in front of you stands a 5-story tall, high-resolution model of the present-day wall from which the fragments were originally attached. Overlaid on the wall is an ariel image that represents the same land area portrayed by the ancient map (4 x 3 kilometers). There's also an option to turn on a slab map overlay on the wall. Using the ariel image or slab map as templates, the fragments can be placed on the wall to line up with their original location. With the fragments in place, the map layers can be turned off to reveal the

fragments in their original place on the wall. Through the magic of VR, you can change your scale to become ~75' tall and access areas that are otherwise impossible to reach. After placing the fragments, you can return to normal size and see the structure from its proper perspective. The real marble fragments can weigh up to ~100lbs depending on their size, but in VR objects are weightless and easily moved.

Francesca De Caprariis, a curator for Musei Capitolini, oversaw the project and was networking with the other local museums before the IUPUI team had landed. Every person that came to visit Francesca was enthusiastic about having Derek and Ryan demonstrate and explain about 3D-scaning and VR-Technologies. Notably, she invited the director of The Colosseum and the Domus Aurea archeology sites, Alessandro D'Alessio, to see the work they were doing. Francesca had particular enthusiasm for the VR technology. In the words of Ryan: "I showed Alessandro the GMMR (Great Marble Map of Rome)-VR that I created using the original Stanford scans shaded by Dr. Thill. Despite the language barrier, he was able to fully explore the virtual space and took the time to learn about each component and feature I had put into the experience. For example, turning on and off layers on the GMMR-Wall. He was so impressed with our work that he invited me to meet with his VR developer for The Colosseum and the Domus Aurea as well as offered to give us a personal tour of the museums. He suggested that we continue exchanging information on different possibilities for work on VR technologies. The positive interaction and educational experience that D'Alessio had with scanning and VR together helped us to gain access to some of the fragments held at The Colosseum."



As Ryan also goes on to explain, "VR offers great potential to reconstruct historical sites. With the existing that Dr.Thill had we scans experimented with using VR as a to interact with them way simultaneously. We began to explore how it allows archeologist to digitally manipulate, collaborate, and engage with the fragments despite not being physically in the same location. VR is a useful tool for demonstrating all of the work that archeologist do behind the scenes to the general public, as it brings the collection of visual data together in on space. VR is a good tool for demonstrating science concepts, strategies, and research. The visual data acquired to advance the research can be brought together in one space." Part of Dr. Thill's research involves interpreting what Ancient Romans intended to convey when people witnessed such a large scale and intricately detailed structure. The detail of which is so intricate, it's not possible to view in its entirety from ground level. VR may help us better understand which areas of the map would have been perceivable, leading to new

insights about the intent ancient Romans had of constructing and maintaining the elaborate structure.

VR may prove to be a useful tool for researchers like Dr. Thill who hope to shed light on the intent behind the map in terms of perspective-currently unknown information which may lead to new interpretations. Since the completion of this phase of the project, Dr. Thill has brought this technology and VR experience into the classroom.⁸ The VR component allows Dr. Thill to answer one persistent question that she gets from perspective students, "who cares?" Dr. Thill believes that 3D scanning and VR adds nuance and depth to the students understanding of Rome, as well as providing them with crucial information. Students are able to see that as a field (archeology) is still growing. Next semester, Dr. Thill hopes to have students contribute to the project by providing annotations to the 3D scans, and companion website.

⁸ <u>https://iu.mediaspace.kaltura.com/media/Myth+and+Reality+in+Classical+Art+-+VR+Lecture/1 g5mepmwo</u>