3-D Scanning on Loans for Your Incoming Exhibition Loan

In this panel, moderated by **Jacqueline Cabrera**, two senior mount makers from the Decorative Art Department of the J. Paul Getty Museum in Los Angeles, **Mark Mitton** and **BJ Farrar**, presented their experience in 3D scanning and printing for the preparation and creation of mounts for the exhibition of loaned artworks. They focused on how this technology works, its benefits, its limitations, and also the great advantages it has introduced.

The first very interesting point is the main reason why 3D technology was adopted by Getty Museum -- to minimize potential earthquake damage of loaned artworks during exhibition. Getty Museum is located in a highly active seismic region so mount makers have to safeguard objects on display producing armatures and supports needed to reduce risk. Especially with loans and temporary exhibitions, due to time constraints between shipment arrival and artwork installation, mount makers have to work in advance to create supports for stabilizing artworks in order to limit damage in case of earthquakes. For the current exhibition, Golden Kingdoms: Luxury and Legacy in the Ancient Americas, they didn't have time to find solutions and make physical supports for all 370 pieces during the short three-week installation period.

In the past they needed to gather necessary information by requesting technical and detailed information from lending institution, by traveling to view the objects in person and by setting up an accurate layout of an exhibition, wherever possible, through the use of photographic mock-ups. All these procedures are useful in preparing 3D objects or sculptures for temporary exhibitions, but don't ensure the highest level of protection and safety.

The Getty found a technological solution for advance preparation -- the 3D model. In the past, a variety of methods and materials had been used to gather the non-digital data when seeing the objects in person. Adjustable cardboard profile gauges were used against the surface of an object to get the most accurate contour. The resulting templates were used to create wax models of holding clips. Using a barrier between the wax and the object, the wax was fitted to the object. Thereafter the wax model was brought back to the museum to be cast in bronze and painted or finished with a patina to blend in with the sculpture. Sometimes the mount makers had to come back and test supports with the actual sculpture to be sure they worked well.

Very soon Getty mount makers thought it would be a nice option to do this electronically, as it is much easier to store scanned images than trucking things back and forth. As Mr. Mitton reminded us, in the eighties the earliest 3D scanners used contact probes. Objects were probed hundreds and thousands of times until the device gathered enough information to create a digital 3D model. This was an unacceptable option when dealing with museum objects due to the amount of contact required. In the late eighties, advances in optical technology made it possible to generate a scan without contact with the object. In the nineties, the increase in computer data storage capacity led to 3D scanners available in the commercial market. At that time the choice of scanners was pretty narrow because most of them were very expensive or limited to small-scale objects.

The first scanner Getty acquired was produced by a company called "Data scanner" that used a scaled gridded background, a laser and a webcam. The range of objects sizes that could be scanned was pretty versatile but soon the gridded background proved to be inconvenient especially with larger objects. After that they discovered a scanner designed to be used with an iPad that shows all features required: portable, no need for background, simple to use and affordable. The scanner worked also through vitrines so objects on display could be scanned and no damage would occur. As a low-cost system, the overall resolution was not very sharp

so there weren't any problems with large objects with less detail, however with small, more detailed objects the scans were unusable.

While experimenting with various scanning setups and iPad apps, mount makers were also looking into the practical uses of the scans. Using the program "Scan and Solve" they conducted material stress analysis in order to understand how objects respond to a specific physical stress. In designing structural supports and mounts, they used the software "Rhino 3D". For working on large objects they also used "Meshmixer" and "Mesh Lab".

The real improvement of this research occurred in 2014 in collaboration on a project with the Ephesos Museum in Vienna. Due to its fragility, a monumental bronze statue required a specially designed lifting rig and travel support. For the first time Getty had to fabricated supports remotely without the object. The Ephesos Museum had already commissioned a 3D scan of the statue and forwarded it to Getty. Using the scan with "Rhino", mount makers designed the complex support structure for the crate but also conforming supports for the installation. This turned out to be a pivotal point in understanding the potential of 3D scanning and modeling: the possibility of creating prefabricated supports using 3D printed models. They made some test forms machined from high density foam that were then sent to Vienna. They were test fitted there with good results. After that, more permanent components were fabricated, sent to the Ephesos Museum and assembled around the statue. Every support fit as planned.

After achieving this important result, they started to look into the possibility of having mounts designed and printed since of many 3D printers offer stainless steel and brass as printing options, especially useful as these materials were composite, stronger and more workable than traditional alloys.

The next big step for Getty staff was printing full scale, plastic models of the scanned artworks using the printer "Ultimaker" that runs on the slicing software "Cura". These printed models allowed the Getty staff to create mounts as if objects scanned were present and real. The Getty organized a series of temporary exhibitions with incoming loans. This afforded them the opportunity to use 3D scanning and printing methods for the prefabrication process.

At Getty they don't print models for everything -- mainly for complicated artworks. Results were usually good, but difficulties occurred related to softening and cleaning procedures.

The Getty made a commitment to Mr. Mitton and Mr. Farrar and funded the purchase of two new "Artec" scanners that ensure higher quality in mount production. The new scanners are shared between the Museum's Object Conservation Dept and Museum Preparation. The new scanners will enable a higher level of precision and will improve the ability to acquire accurate information for future exhibition and projects.

3D scanning and printing procedures adopted by museums could offer very useful information for international cooperation in case of incoming loans. The request of a scan could also be included in the loan agreement so registrars and conservation department could use them in the exhibition planning. This technique also offers lots of benefits during exhibition preparing and success in terms of safety, time, money and risk.

The session finished with a question from the audience about the possibility of recycling the printed shapes after using. The material, it was noted, is recyclable but it is not possible to create other models with it.

Submitted by Rebecca Romere, Registrar
Marino Marini Foundation, Italy