

The Age of Bronze Digital Scanning Project

As part of its scholarly, conservation, and educational initiatives, the Nasher Sculpture Center teamed with Van Duzen Archives, a private digital imaging company, to create a fully three-dimensional digital map of the plaster cast of Auguste Rodin's *The Age of Bronze* in the Raymond and Patsy Nasher Collection. The process involved capturing a series of images of the sculpture using a 3-D laser digitizer which records the size, topology, and color of an object up to 300 microns (0.3mm) in detail. These images were then combined to make up a full, three-dimensional image of the sculpture. With this information, the Nasher Sculpture Center hopes to record the object's condition to monitor changes and aid in restoration in case of damage, as well as compare scans of different casts to more accurately determine variations and, perhaps, start to recreate the chronology and family tree of the casts. A brief presentation at the *Variable States* conference by Nasher Sculpture Center Assistant Curator, Jed Morse, served to introduce conference attendees to the study and its potential usefulness, as well as present some preliminary findings.

With the permission of the institutions who lent the bronze casts of *The Age of Bronze* to the *Variable States* exhibition, the Nasher Sculpture Center made complete, 3-D scans of the casts from the Philadelphia Museum of Art and the Fine Arts Museums of San Francisco, the two known lifetime casts in the exhibition, for comparison. By mapping the deviation between the two scans, we were able to examine more closely the physical differences between the casts. When the scans are aligned at the base, the deviation mapping shows that the San Francisco cast is slightly taller than the Philadelphia cast, and the Philadelphia cast leans farther forward than San Francisco's. When the two scans are aligned for a "best fit" overall, we discover that there is very little deviation between the two casts (less than $\pm 0.763\text{mm}$), but that it is the way the figures are mounted to their bases that accounts for the difference in height and forward lean of the cast from Philadelphia.

In addition, scans of the right shoulder of each cast, including the posthumous cast from the Cantor Center for the Visual Arts at Stanford University, were compared to try to determine the relationships, if any, among the casts and to determine variations due to environmental conditions. First, the scan of each bronze was compared with the scan of the plaster from the Nasher Collection. Preliminary comparisons showed standard deviations of 0.03” with the San Francisco and Stanford casts and 0.07” with the Philadelphia cast. Comparing the right shoulders of the casts from San Francisco and Philadelphia, we expected to find that the Philadelphia cast, which had been exhibited outdoors for much of its life, had eroded and thus would have less material on the upward facing surface of the shoulder than the San Francisco cast, which had remained indoors. Surprisingly, the comparison of the scans indicated that the Philadelphia cast had more material at the shoulder than the San Francisco cast. Andrew Lins, conservator at the Philadelphia Museum of Art, explained that, due to the particulate pollution in Philadelphia, sculptures placed outdoors often exhibited an accretion of material, which could explain the positive deviation from the San Francisco scan.

In conclusion, Mr. Morse presented three future possibilities for the use of this information and technology: 1) to share the scan of the plaster with other institutions and continue to compare casts; 2) to design and manufacture custom packing to more safely transport the sculpture; and 3) to allow visitors to “feel” the sculpture through the aid of virtual sculpting technology.

Scroll down for images from the presentation.

Nasher Sculpture Center

The Age of Bronze

Digital Scanning Project



The Scanning Process

The 3-D laser scanner captures the size, topology, and color of an object up to 300 microns (0.3 mm) in detail.

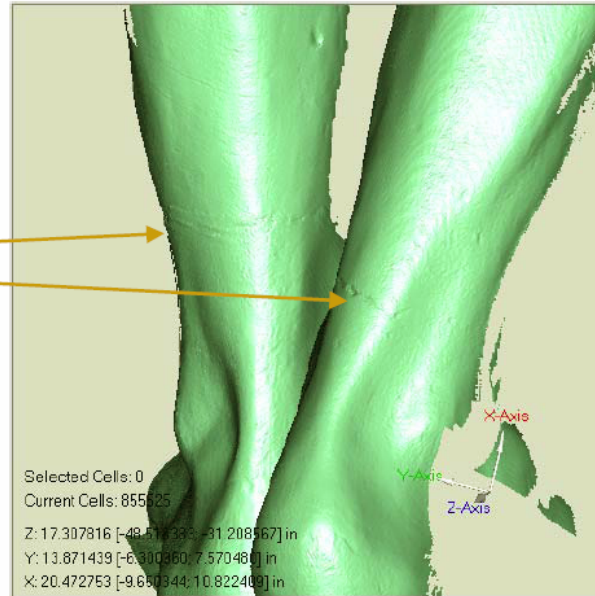


3-D Laser Digitizer

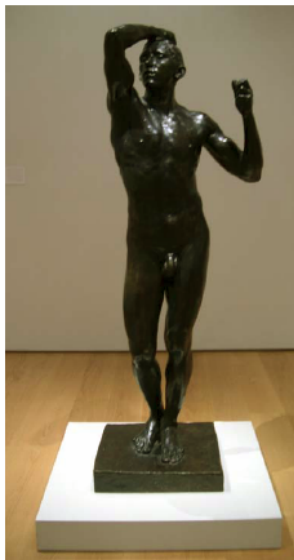
3-D Condition Reporting

360 degree digital capture of sculpture can document problems more accurately than a digital photo.

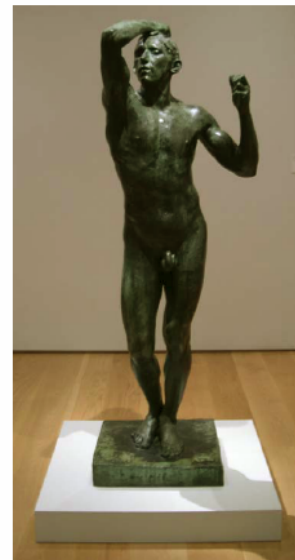
Hairline cracks around the plaster sculpture's ankles are recorded in 3-D.



Deviation Mapping and Comparison Study



Fine Arts Museums of San Francisco



Philadelphia Museum of Art

Deviation Mapping and Comparison Study : San Francisco and Philadelphia

The SF bronze is shown in gray, the PMA in blue.

The scans are centered vertically on the floor and laterally on the big toe of the front foot.

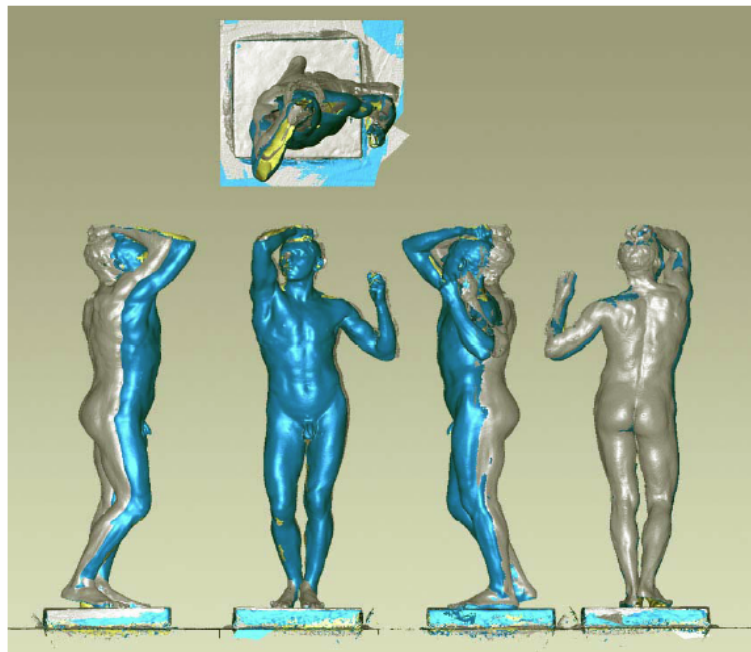


Deviation Mapping and Comparison Study : San Francisco and Philadelphia Casts

The scans verify and expand on our visual findings.

The SF cast (gray) is slightly taller.

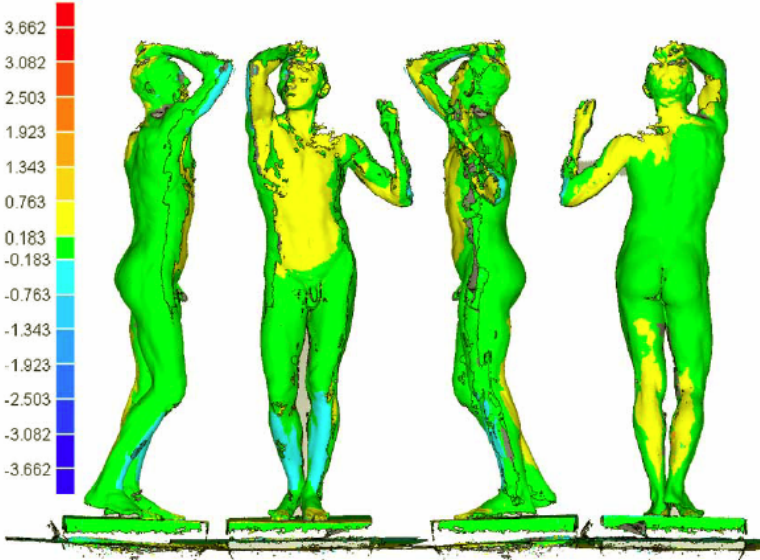
The PMA cast (blue) leans forward.



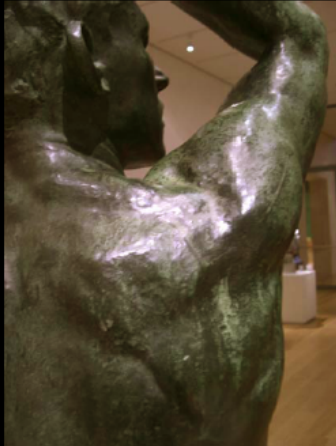
Deviation Mapping and Comparison Study : San Francisco and Philadelphia

This chart shows deviation in millimeters. The two sculptures have been re-centered, ignoring the base, and attempting for a best fit.

The bodies show very little deviation one to the other. It is the mounting of the bodies to the base that accounts for the difference in height and forward lean of the PMA cast.



Deviation Mapping and Comparison Right Shoulder



Philadelphia Museum of Art

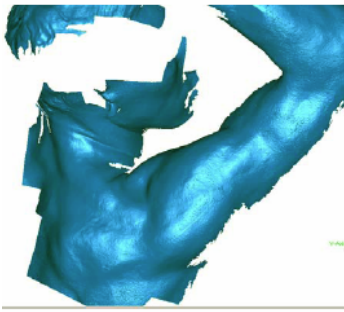


Fine Arts Museums of
San Francisco

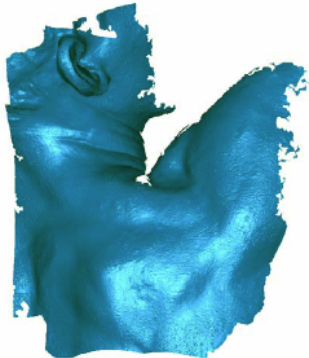


Cantor Center for the Visual
Arts at Stanford University

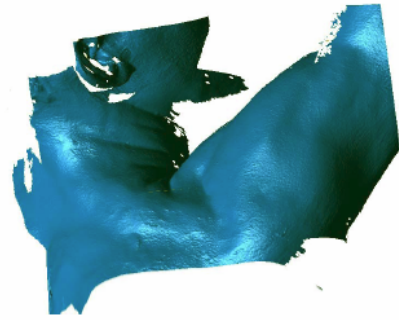
Deviation Mapping and Comparison Study: Right Shoulder Scans



Philadelphia



San Francisco



Stanford

Deviation Mapping and Comparison Study: Right Shoulder: Nasher and San Francisco

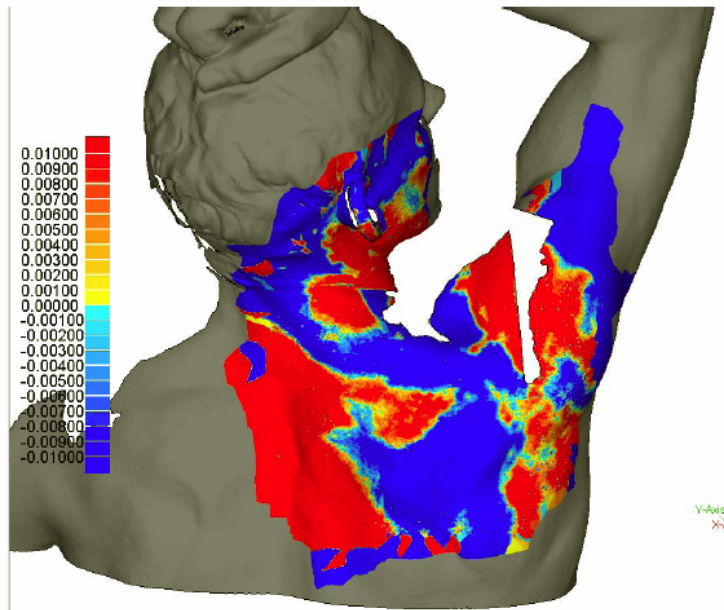
The scan of the SF cast is laid over the scan of the Nasher plaster (gray).

The standard deviation between the 2 surfaces is .03"

The red indicates the areas of maximum positive deviation.

The blue indicates the areas of maximum negative deviation.

Yellow to light blue represent the closest matches, +/- .001" to .001"



Deviation Mapping and Comparison Study: Right Shoulder: Nasher and Philadelphia

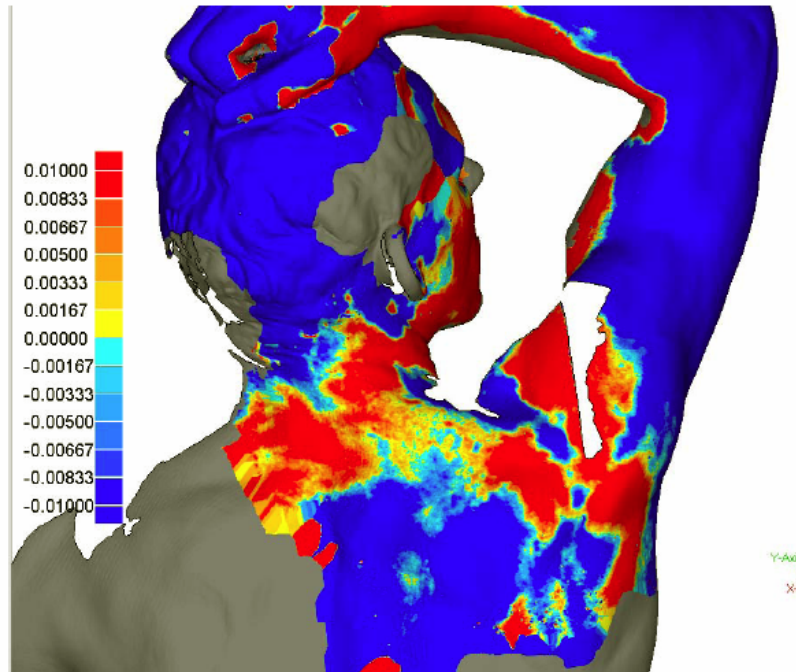
The scan of the PMA cast is laid over the scan of the Nasher cast (gray).

The standard deviation between the 2 surfaces is .07"

The red indicates the areas of maximum positive deviation.

The blue indicates the areas of maximum negative deviation.

Yellow to light blue represent the closest matches, +/- .0" to .001"



Deviation Mapping and Comparison Study: Right Shoulder: Nasher and Stanford

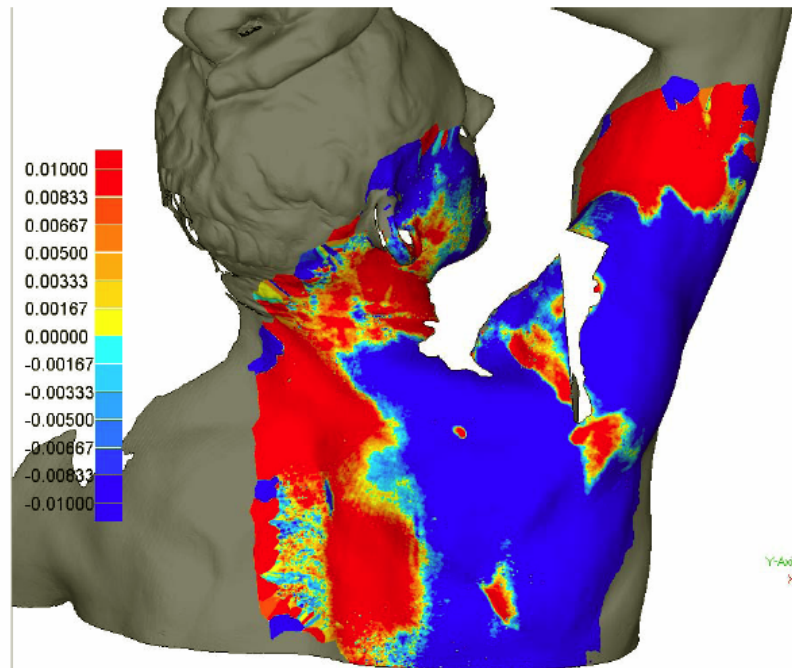
The scan of the Stanford cast is laid over the scan of the Nasher cast (gray).

The standard deviation between the 2 surfaces is .03"

The red indicates the areas of maximum positive deviation.

The blue indicates the areas of maximum negative deviation.

Yellow to light blue represent the closest matches, +/- .0" to .001"



Deviation Mapping and Comparison Study: Right Shoulder: San Francisco and Philadelphia

The scan of the PMA cast is laid over the scan of the SF cast (gray).

The standard deviation between the 2 surfaces is .02"

The red indicates the areas of maximum positive deviation.

The blue indicates the areas of maximum negative deviation.

Yellow to light blue represent the closest matches, +/- .0" to .001"

