

Cultural Heritage Informatics  
&  
Computational Humanities

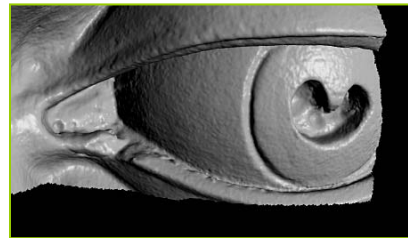
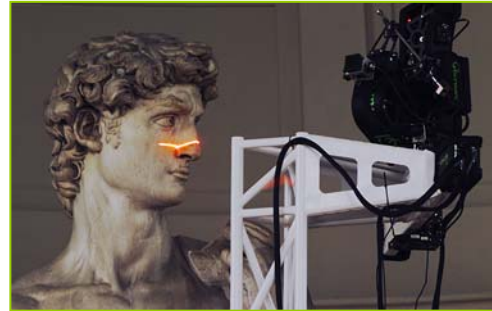


*The Great Wave at Kanagawa/Katsushika Hokusai (1760-1849)  
Modified ~1982*

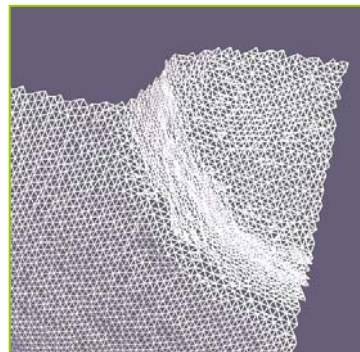
# Need to Accommodate Large Data Objects

## Example : Michelangelo's David

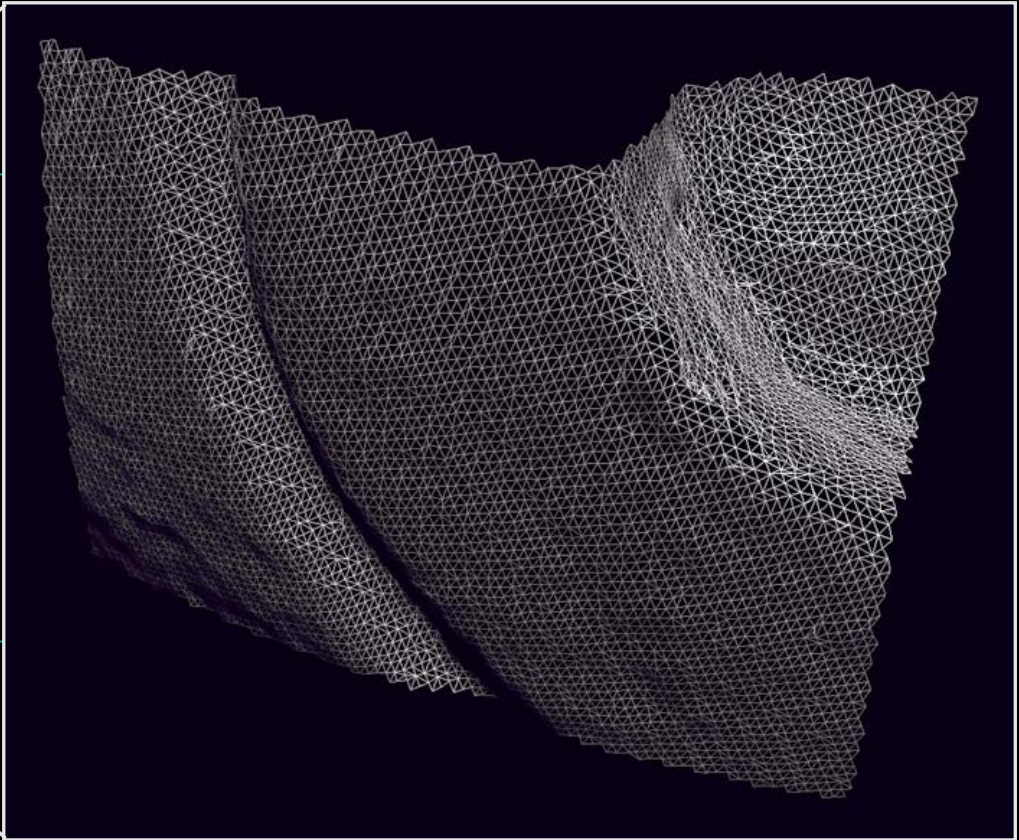
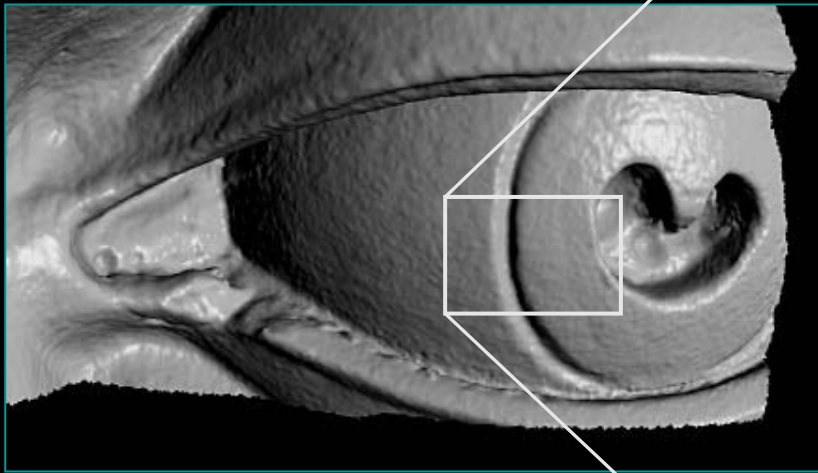
Laser scanning, digitization and computational rendering of Michelangelo's David

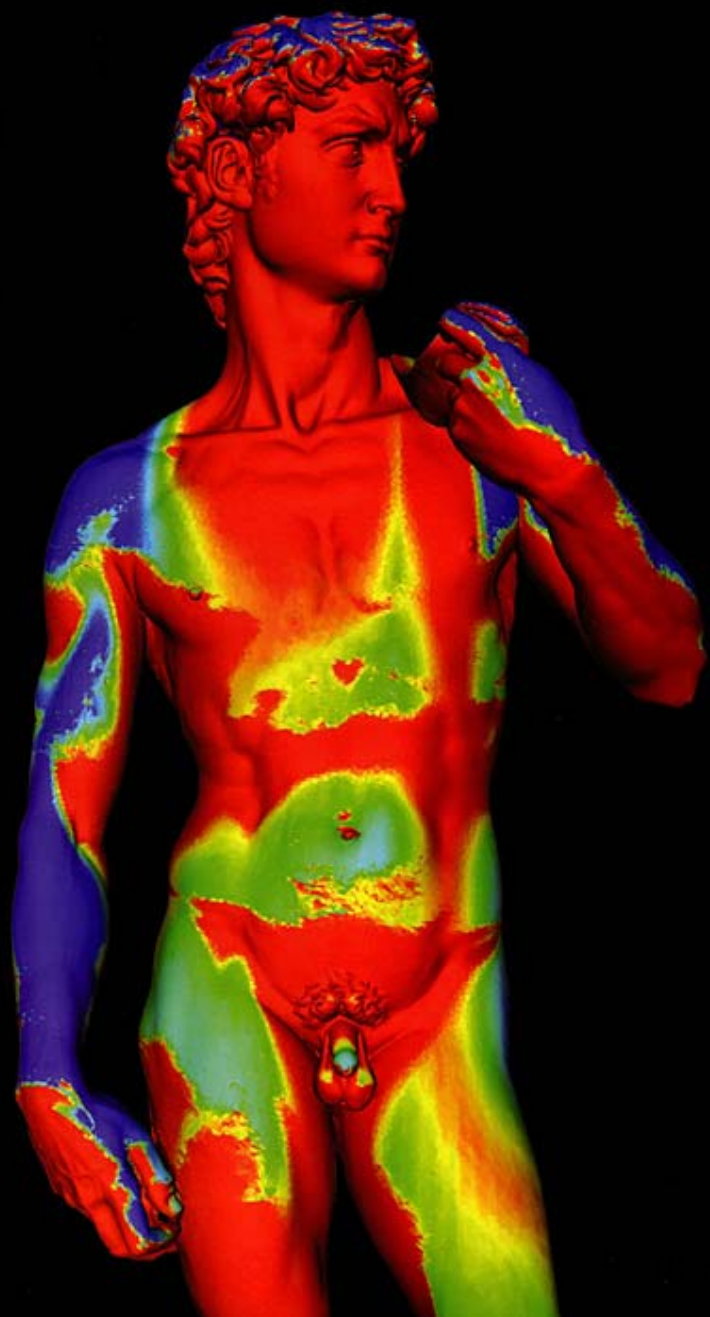


David's left eye

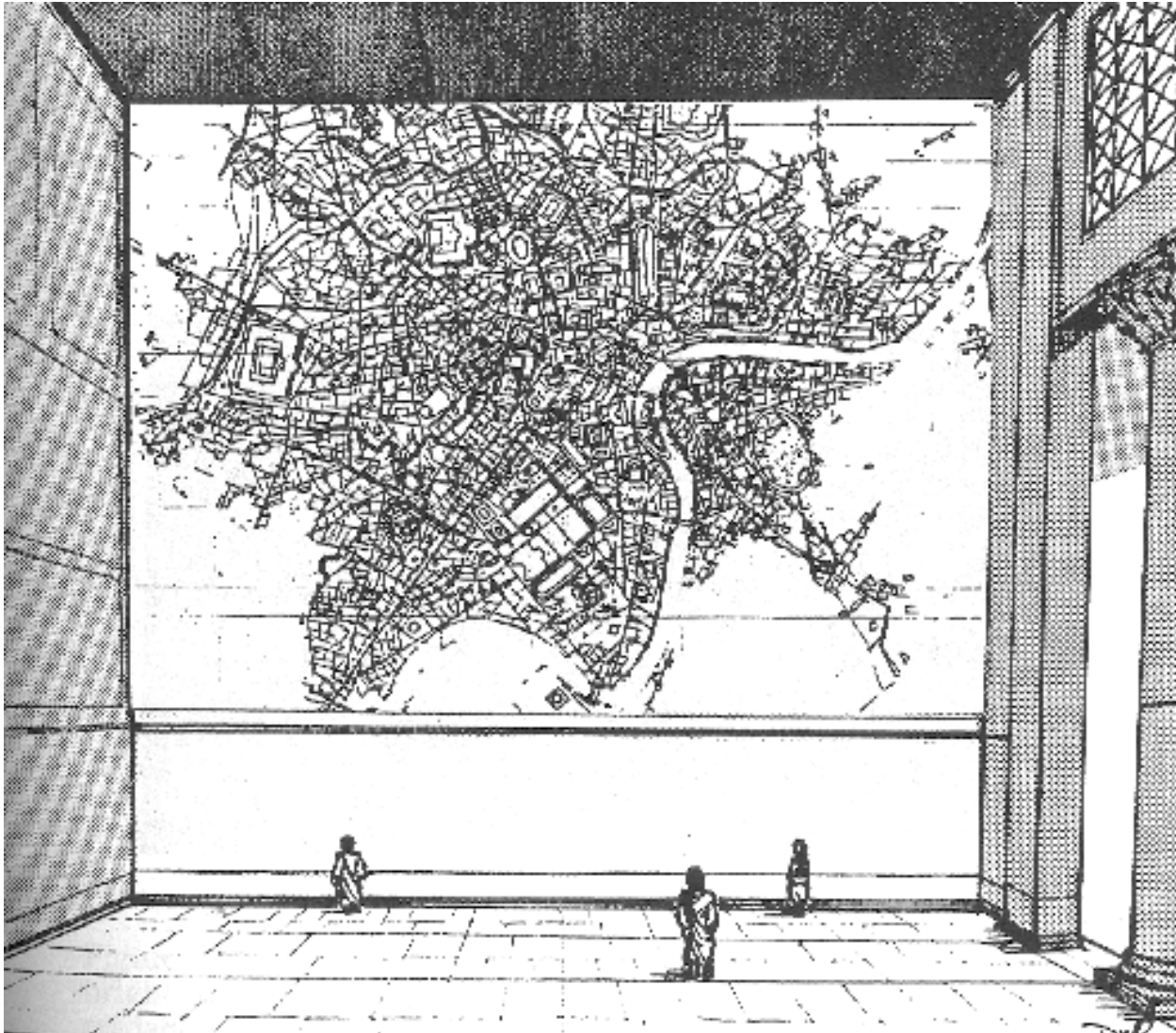


The scanning gantry is 7.5 meters high. 480 individually aimed scans were performed. The resulting 3D raw data set exceeds 250GB. The digital model, accurate to .25mm, contains 2 billion polygons and 7 thousand color images.





# Forma Urbis: Then



David West Reynolds

# Forma Urbis: Now



- ~1,200 marble fragments (250 identified, 400 non-incised)
- Approximately 15% of total original surface area
- Fragments contain remarkable detail (all buildings, roads, staircases, etc.)
- Significant erosion has occurred, particularly along top and bottom edges

# Digitization Goals

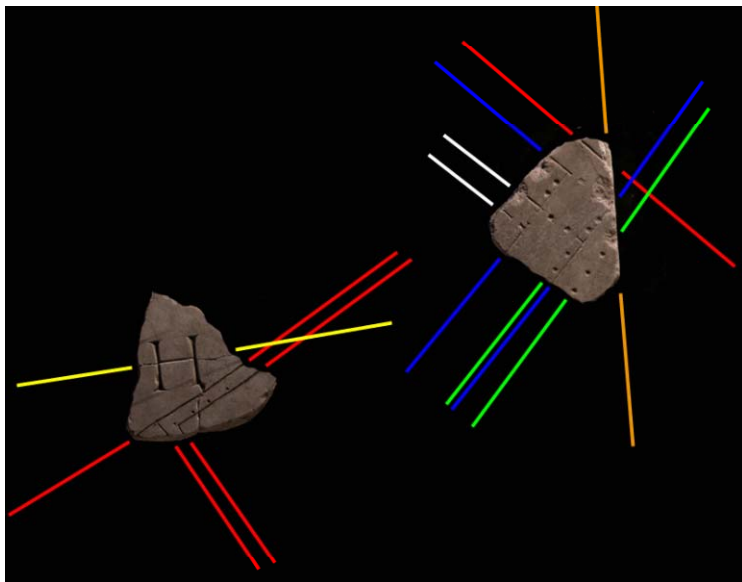


Prof. Emilio Rodriguez-Almeida

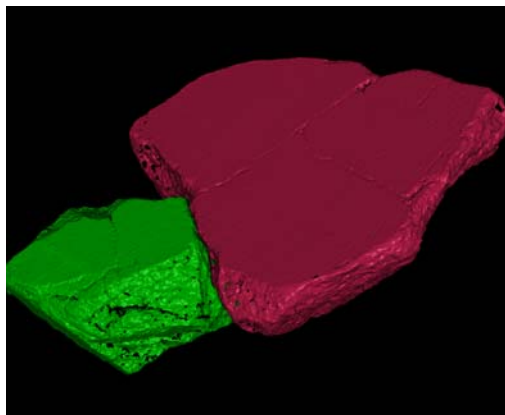
- Complete 3D archive of the extant fragments (1,100+ fragments)
- Adequate spatial sampling resolution for 3D matching and analysis (0.25 mm)
- High resolution (100 dpi) color photographs of top/bottom surfaces



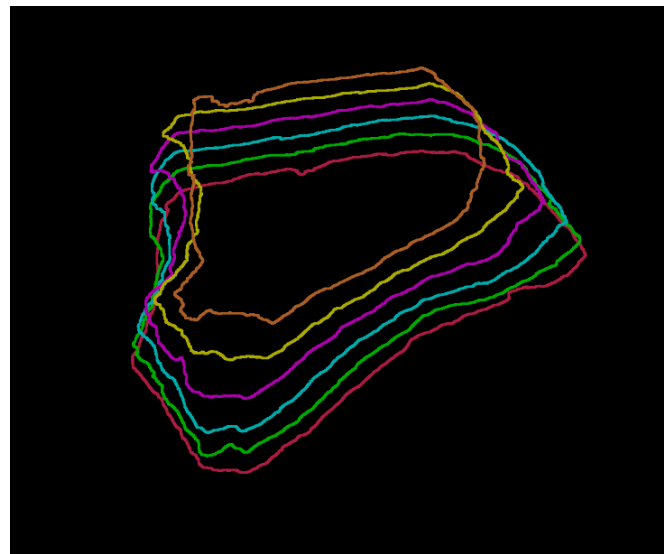
## Extension of Linear Features



3D ICP Matching



## Forma Urbis 3D Slices



Inscription Plot Depth

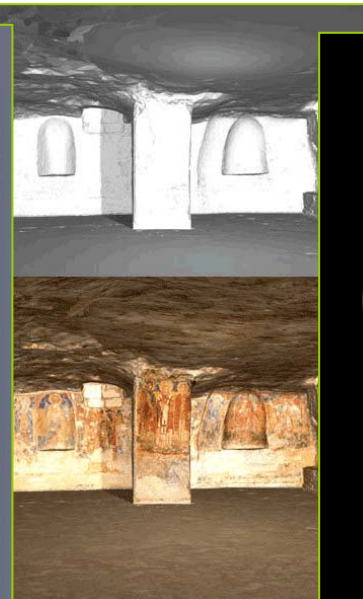
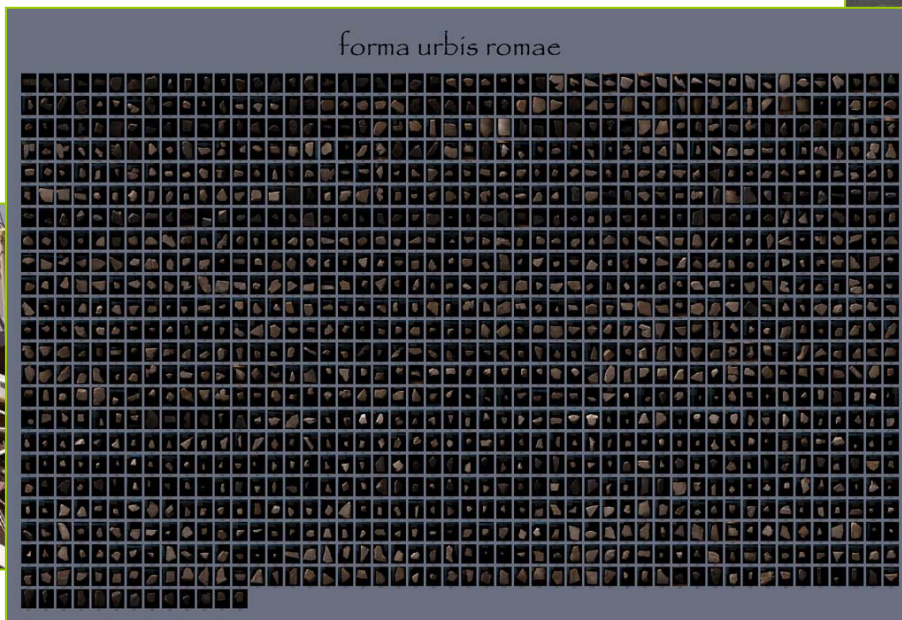


# Sizes of 3D digital archives

model

polygon count

Americo Vespuccio, commercial model by De Espona	224,000
Trajan's Forum, reconstruction by B. Frischer (UCLA)	1,950,000
Santa Cristina Crypt, Carpignano, laser scan by A. Beraldin (NRC)	12,000,000
Michelangelo's David, laser scan by M. Levoy et al. (Stanford)	56,000,000
1,186 fragments of the FUR	8,000,000,000





## Electronic Cultural Atlas Initiative



TimeMap Viewer 3.0.1.121 (©1997-2002 TimeMap Project, University of Sydney)

Sasanian Internet Publica

MapSpace Manager Layer Control Add Data

- Sasanian Seal Collection
- Sasanian Empire Sites
- Sasanian Mints
- Sasanian Temples
- Sasanian Offices
- Gazetteer of Sasanian Empire
- Sasanian Empire Extent in 5
- Sasanian Empire Extent in 2
- Map of Sasanian Empire
- Relief & Hydrology

Attribute data, Sasanian Internet Publication

Gazetteer of Sasanian Empire

LATITUDE	LONGITUDE	PLACEDIST	PLACELC	OFFICE	MINT	FIRE	NAMEQUALIT	SASANIANN
34	51.4	Certain	Certain	n	None	None	Certain	Erān-vinād Fān
36.3	50.4	Certain	Supposed	s	None	None	Certain	Zālehan
36.1	49.2	Certain	Certain	ma	None	None	Supposed	Apāhe
35.6	51.5	Certain	Certain	n	Certain	None	Supposed	Rān Perōz

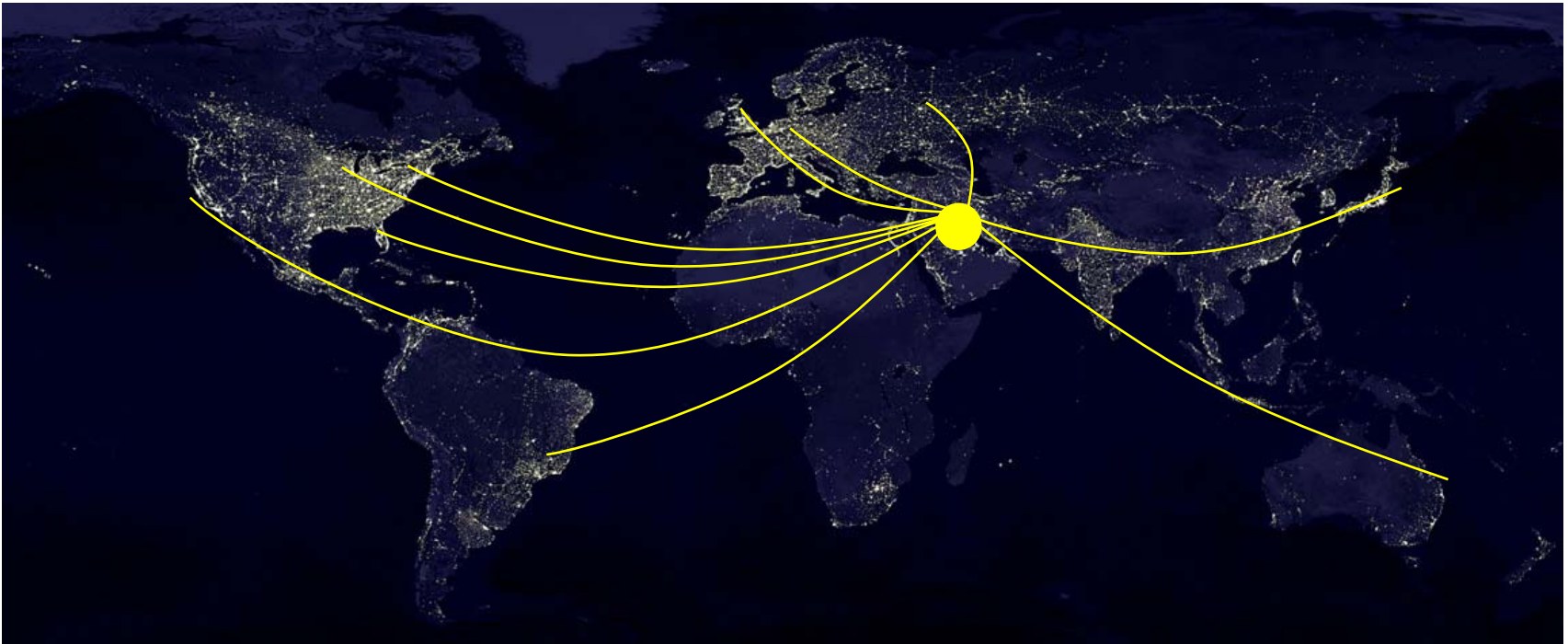
1:34 C:\Program Files\TimeMap\ECAI001\sasanian\_gazetteer.html

TimeMap view has been selected by this funded project as the best example of a time-enabled GIS viewer for historical and cultural gazetteer data.



Figure 1: Map of important early Babylonian settlements

# Plunder of Mesopotamia, from 1840s until present.



Task: Bring the pieces back together

# cdli

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University of California at Los Angeles *and the*  
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Berlin Mirror

Lead page of the CDLI

“Fat cross” archival image of same text, with cut-out. Full resolution (600ppi) on next slide





<input type="checkbox"/>	<a href="#">Compare</a>	Item Title	PayPal	Price
<input type="checkbox"/>		<a href="#">SUPERB!!! Ancient Babylonian cuneiform tablet, 2200 BC</a> Authentic artifact from ancient Babylon! NO RESERVE	 	\$111.60
<input type="checkbox"/>		<a href="#">Old Babylonian Cuneiform Tablet, ca. 2100 - 2000 B.C.</a> Exquisite Messenger Tablet		\$105.50
<input type="checkbox"/>		<a href="#">Old Babylonian Cuneiform Tablet, ca. 2100 - 2000 B.C.</a> Exquisite Messenger Tablet		\$228.50
<input type="checkbox"/>		<a href="#">Old Babylonian Cuneiform Tablet, ca. 2100 - 2000 B.C.</a> Exquisite Messenger Tablet		\$81.00
<input type="checkbox"/>		<a href="#">Old Babylonian Cuneiform Tablet, ca. 2100 - 2000 B.C.</a> Exquisite Messenger Tablet - 2 SIDED		\$114.10
<input type="checkbox"/>		<a href="#">SUMERIAN CUNEIFORM CLAY TABLET 1900-1700 BC</a>	 	GBP 21.00
<input type="checkbox"/>		<a href="#">OLD BABYLONIAN CLAY TABLET CUNEIFORM INSCRIPTION #2</a>	 	\$179.00



# Reading between the lines: Imaging the Lost Writings of Archimedes



Keith T. Knox, Boeing

# EDUCE: Enhanced Digital Unwrapping for Conservation and Exploration

A: photo of a replica Egyptian papyrus scroll

B: CT slice from Gray's scanner shows the  
flare-up of ink (the white regions).

C: software puts the CT slices together,  
“unrolling the virtual scroll

D: detail of “unrolled” virtual scroll

F: Virtual scroll strip inset over the  
photo of the original scroll.

QuickTime™ and a  
TIFF (LZW) decompressor  
are needed to see this picture.

# "Edition Production Technology" (EPT)

Analytical tools created as part of a comprehensive "edition production technology" (EPT) for image-based electronic editions can help editors reconstruct folios from lost or damaged manuscripts. A case in point is the Napier fragment of the Alfredian Boethius, the bottom portion of a MS leaf found and lost by A. S. Napier in 1886. Assembling and displaying Napier's detailed descriptions, digital tools can not only recreate a plausible reconstruction of the lost leaf, but also throw legitimate doubt on its authenticity.



Figure 10: Detail from RamSome reconstruction of Napier fragment

## Use of optical devices by early Renaissance painters ?



Refutation of David Hockney's "Secret Knowledge"

David Stork

<http://www-psych.stanford.edu/~stork/FAQs.html>

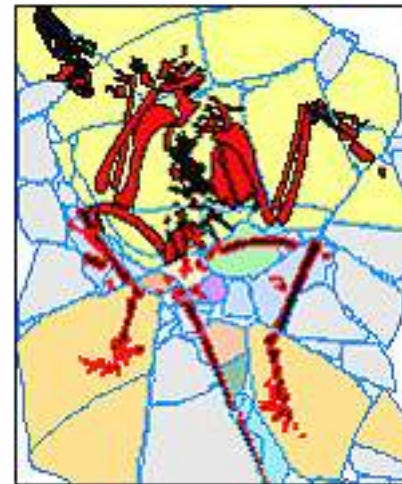
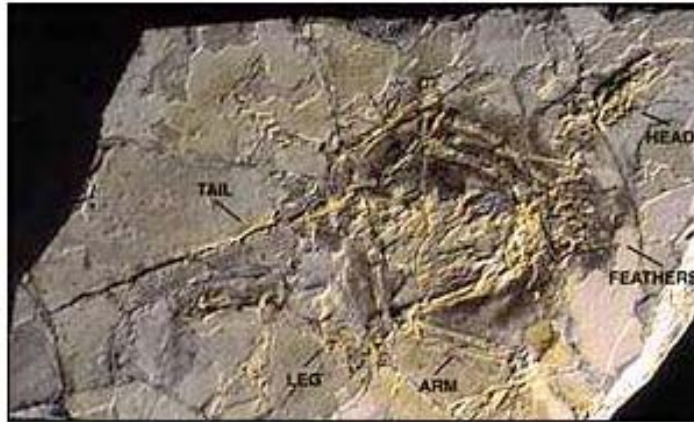
# Digital Archaeology

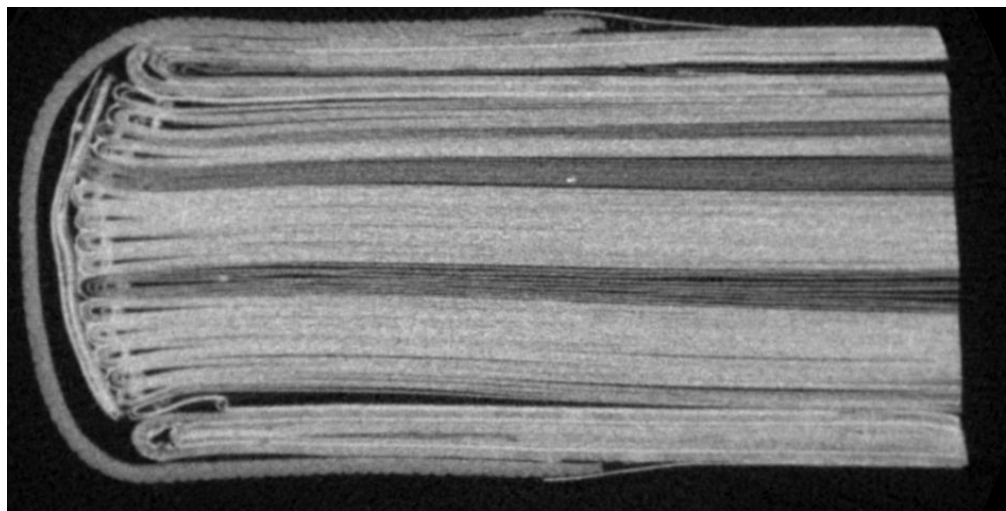
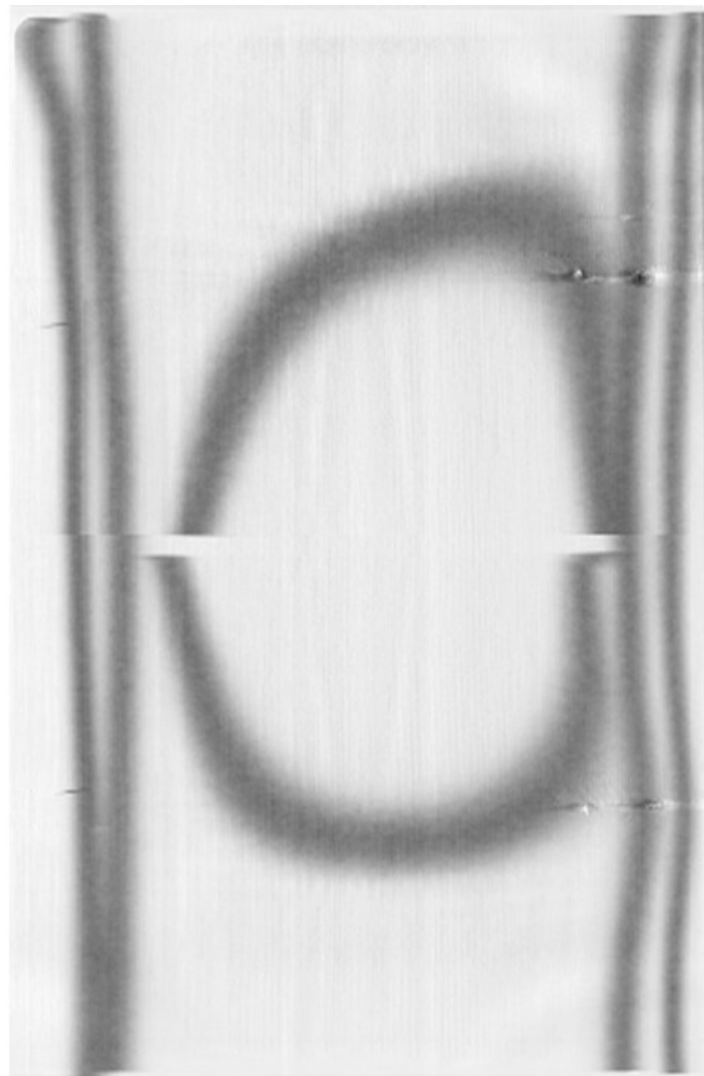
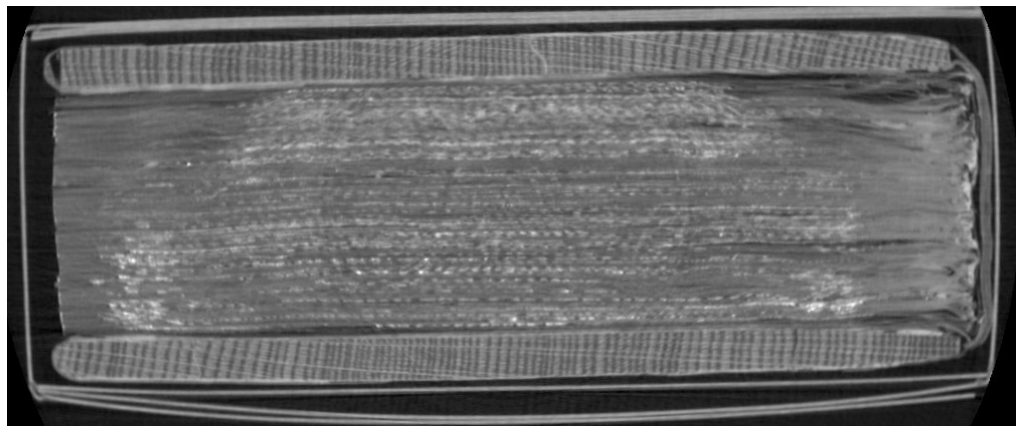


# Forensic analysis of a forged fossil



*Archaeopteryx*, captured the attention of the scientific world when unveiled by the National Geographic Society, US, in October 1999





# Some Major Coordination Efforts



<http://www.delos.info/>

