

# Session 8: **3D Modelling for Cultural Heritage**

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1. Applications of 3D modelling
2. Example projects
3. Transparency and documentation
4. Software options
5. Introduction to Sketchup

# APPLICATIONS OF 3D MODELLING IN CULTURAL HERITAGE

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Part One

# What is 3D modelling?

Creating a 3D representation of a concrete or abstract, existing or non-existing object from scratch.

- \* Computer Aided Design (CAD)
- \* Procedural modelling
- \* Virtual Worlds Platforms  
(Second Life, OpenSim)
- \* Real Time Engines
- \* Digital sculpting, free modelling
- \* ...



3D model of the Southern Palace in ancient Babylon

<http://www.kadingirra.com/palaces.html>

# 3D Modelling for Cultural Heritage

- ◆ Visualising things that do not exist anymore in their materiality or that have changed through time.

Many more applications, constantly evolving:

- \* Test and visualise light and shadows
- \* Test and visualise water features
- \* Investigate lines of sight
- \* Study planets' alignment
- \* Simulate structural strength



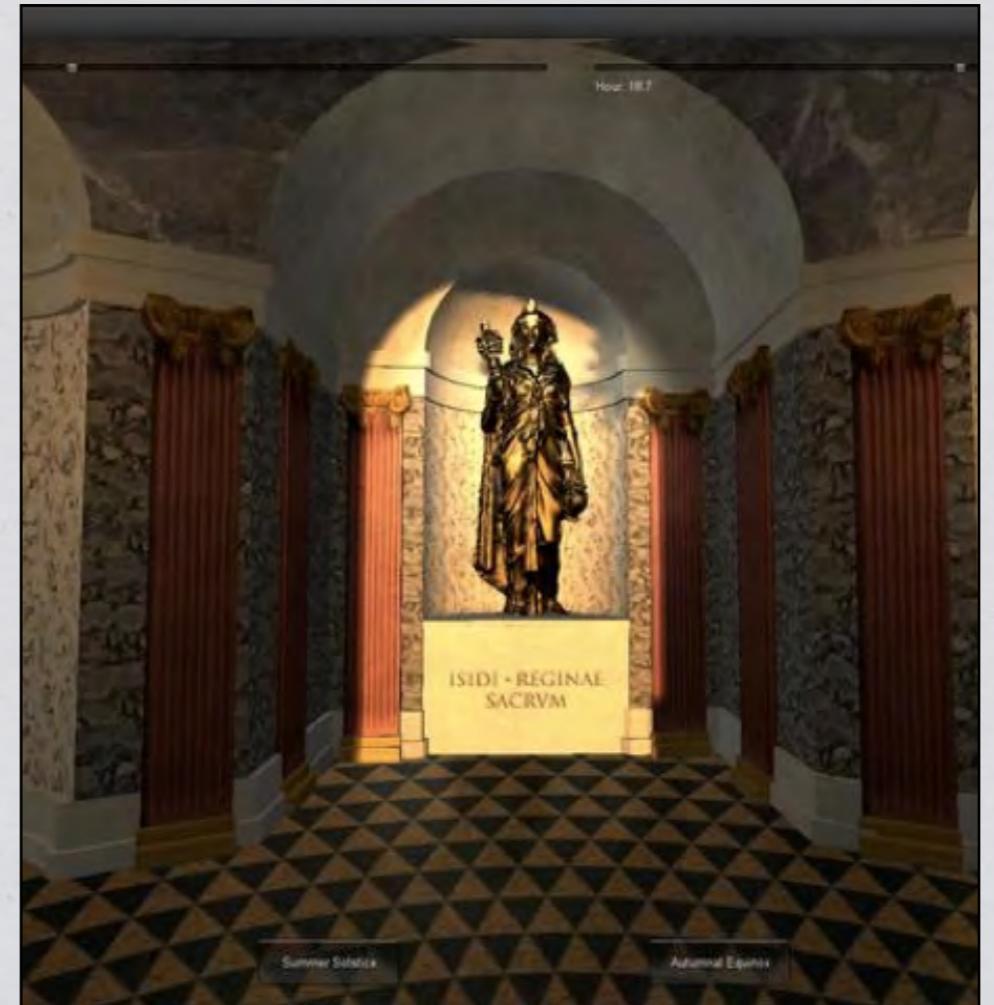
3D model of an ideal typical house in Pompeii  
[https://museumvictoria.com.au/pages/39867/House\\_of\\_the\\_Vine\\_Holding.jpg](https://museumvictoria.com.au/pages/39867/House_of_the_Vine_Holding.jpg)

# 3D Modelling for Cultural Heritage

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3D model of the Hadrian Villa in Tivoli  
<http://virtualworlds.etc.ucla.edu/wp-content/uploads/Screen-Shot-2012-05-25-at-8.51.39-AM.png>

# Some Pros

- \* Cheaper and more manageable than material restoration or rebuilding
- \* Non invasive and non permanent
- \* Potentially infinite
- \* Potentially open ended



The Palace of Knossos in Crete  
[http://i.livescience.com/images/i/000/037/875/i02/shutterstock\\_68970424.jpg?1363379625](http://i.livescience.com/images/i/000/037/875/i02/shutterstock_68970424.jpg?1363379625)

# Combining 3D modelling with other 3D techniques

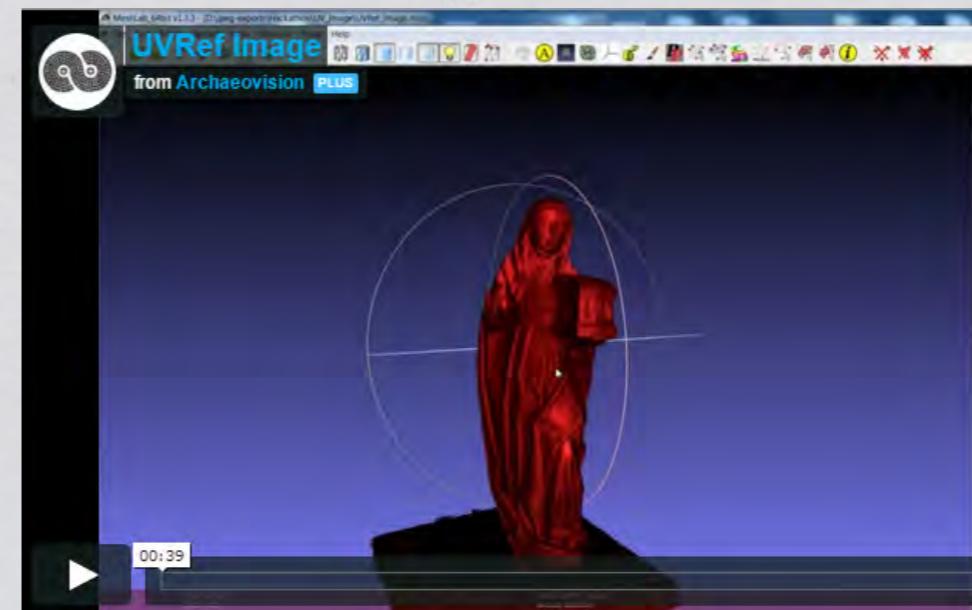
- \* Laser Scanning
- \* Photogrammetry
- \* Motion Capture
- \* Multispectral Imaging
- \* RTI
- \* Augmented Reality



3D model of the Trajan Villa in Lazio.  
by noreal  
<http://www.noreal.it/site2011/index.php?lang=en&Itemid=157>

# Combining 3D modelling with other 3D techniques

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Variant texturing of a piece of the Rhode altar in Tallinn  
by Archeovision

<http://nigulistemuseum.ekm.ee/blog/hackathon-displaying-scientific-images-on-top-of-3d-model/>

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# INTRODUCING SPACE

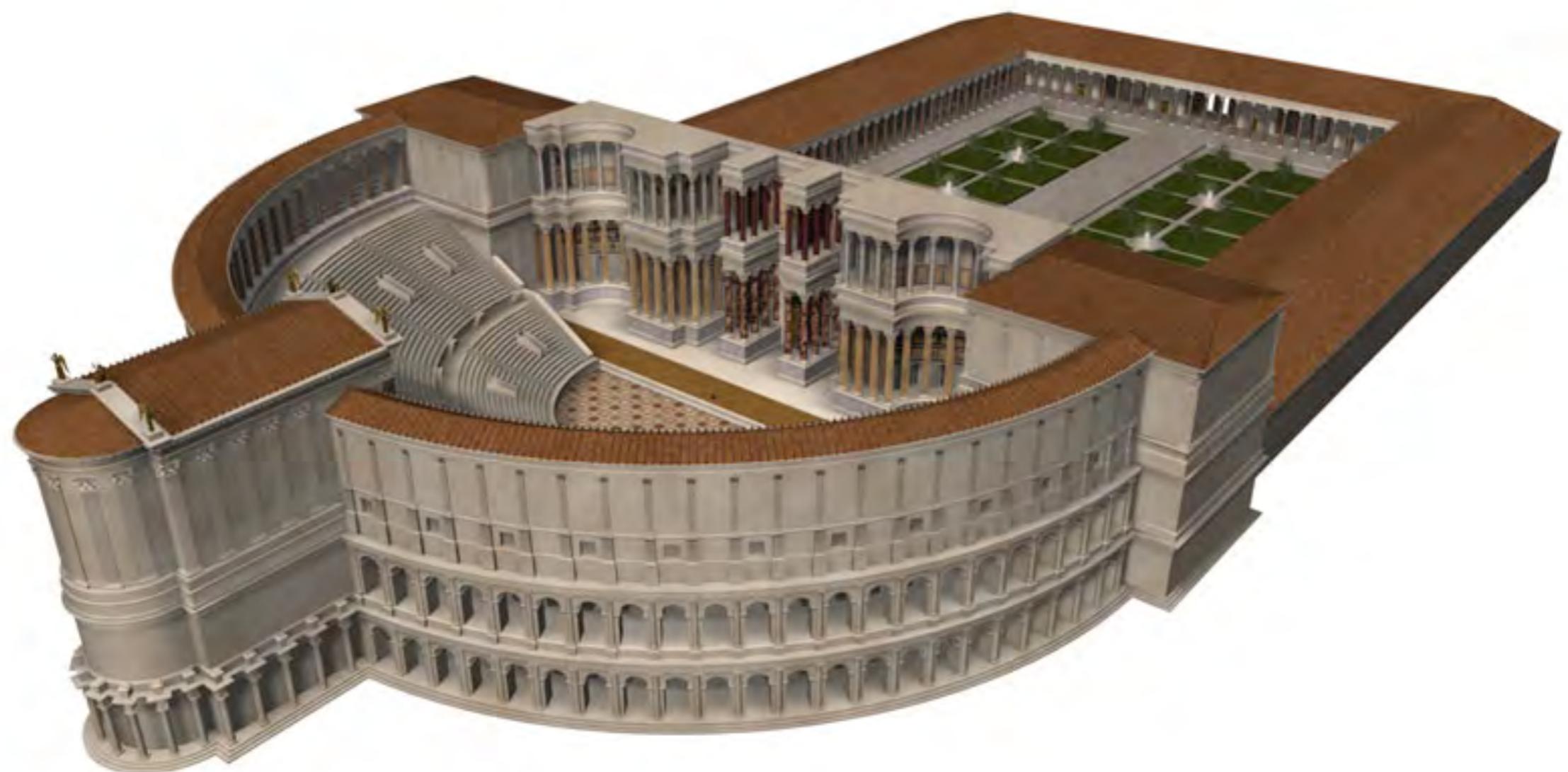
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# Scale and Location

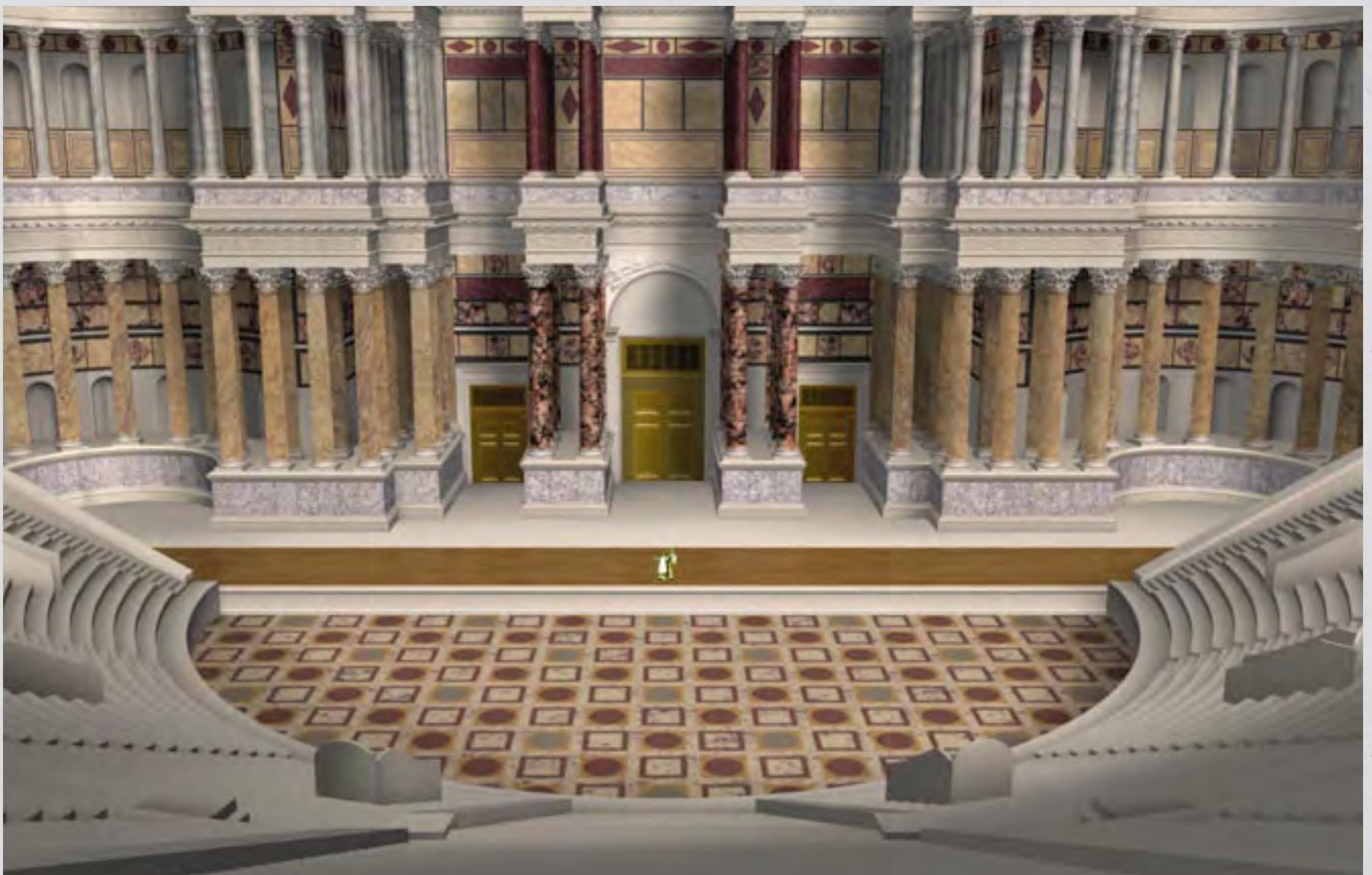


<http://media.smithsonianmag.com/images/Pompeii-street-graffiti-631.jpg>

# Visibility, Connectivity, Affordability



3D visualisation interpretation of the theatre of Pompey created by Martin Blazeby, KVL.



3D visualisation interpretation of the theatre of Pompey created by Martin Blazeby, KVL.

# Relationship between artefacts



# Relationship between artefacts

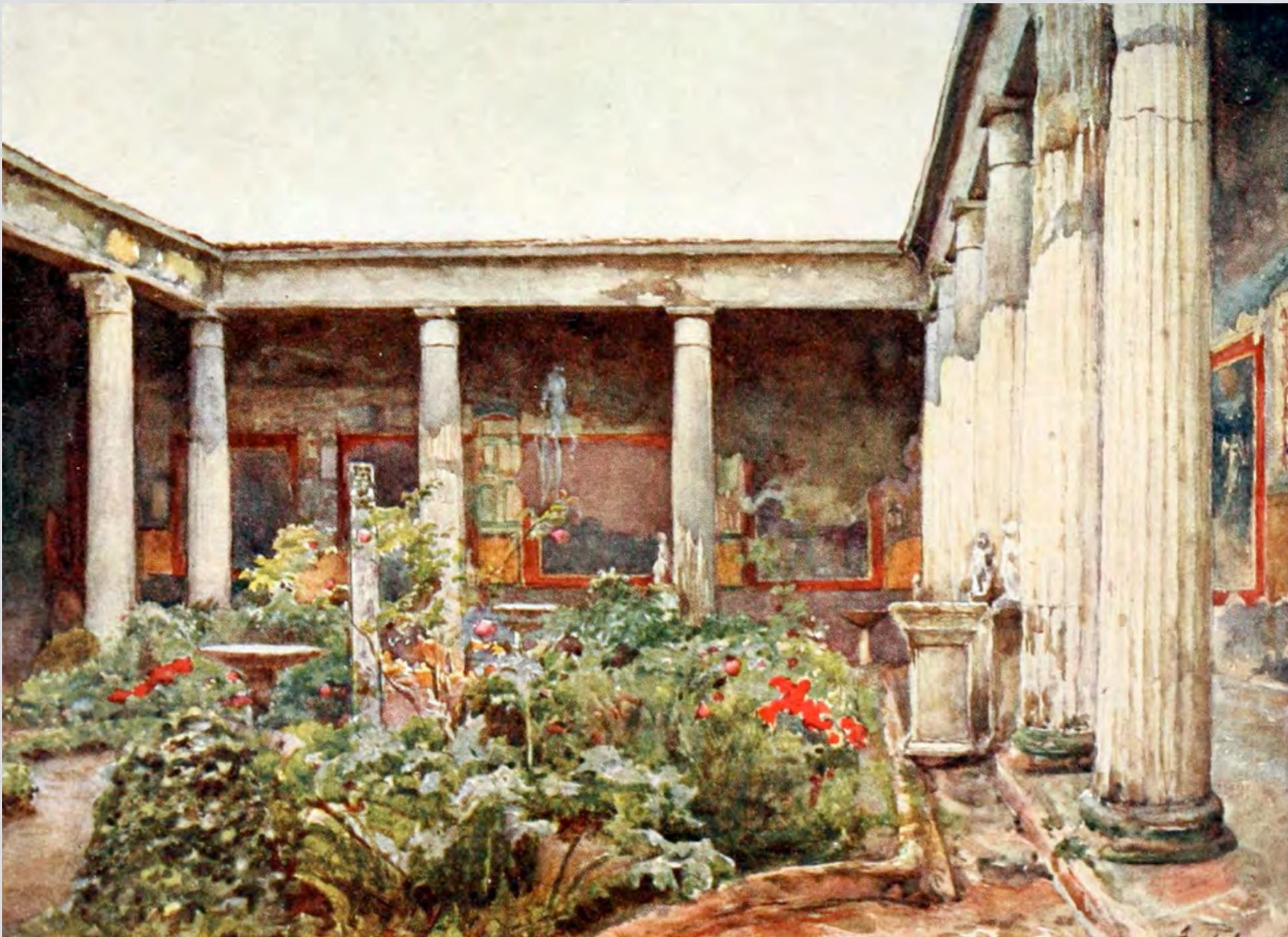


[http://ichef.bbci.co.uk/images/ic/976x549\\_b/p0168xnh.jpg](http://ichef.bbci.co.uk/images/ic/976x549_b/p0168xnh.jpg)



[http://www.indiana.edu/~c494troy/papyri/papiri\\_5dancers.jpg](http://www.indiana.edu/~c494troy/papyri/papiri_5dancers.jpg)

# Relationship between artefacts and architectural and natural features



Peristyle of the House of the Vettii. Illustration from Pompeii by W M Mackenzie (A&C Black, c 1905)

# Natural Landscape

Temple of Jupiter Anxur in Terracina



<http://www.tempiodigioveanxur.it/upload/images/visuals/visual-1.jpg>

# Cityscape



Forum Boarium.

Temple of Jupiter.

Arx.  
Basilica Semproniana.

Tabularium. Temple at the Forum Romanum.

THE CAPITOL, SEEN FROM MT. PALATINE. RESTORATION.

## 2. Example projects

## State of the art

- The Body and Mask
- Rome Reborn
- Digital Karnak
- Çatalhöyük in Second Life
- (Theatron)

# The Body and Mask in Ancient Theatre Space



Virtual mask

Performance mask

- 2009 King's Vis Lab
- Performance element
  - ◆ Scan and scale masks
  - ◆ Build and perform drama
  - ◆ Motion capture and 3D scene
- Full documentation
- Sustainability?

# Rome Reborn



- 2008 Google Earth
- Huge scale (v 2.2.)
- Criticisms:
  - ◆ Too clean
  - ◆ No documentation
- No access to models
  - ◆ Images and videos
  - ◆ Project launches

# Digital Karnak



- 2008-12 UCLA
- (cf Digital Forum 2005)
- Time-maps
- Videos
  - ◆ Funerary procession
  - ◆ 3D data?
- Open, granular & bibl. documentation

# Çatalhöyük in Second Life



- 2007 Linden Labs SL (OKAPI)
- Interactive environment
- Educational: archaeology training
- Educational:
  - ◆ E.g. burning
- Open Access tools and data
- Project closed
  - ◆ Island closed
  - ◆ Dead links
  - ◆ Documentation?

# (Theatron)

- Theatron 2: <http://www.theatron.org>
- Theatron 3: <http://www.theatron3.cch.kcl.ac.uk>
- Theatron 3 Final Report: [http://www.theatron3.cch.kcl.ac.uk/fileadmin/templates/main/THEATRON\\_Final\\_Report.pdf](http://www.theatron3.cch.kcl.ac.uk/fileadmin/templates/main/THEATRON_Final_Report.pdf)
- Theatron 3 Pedagogical Project Report and Appendices: [http://www.theatron3.cch.kcl.ac.uk/fileadmin/templates/main/THEATRON\\_Final\\_Report\\_appendices.pdf](http://www.theatron3.cch.kcl.ac.uk/fileadmin/templates/main/THEATRON_Final_Report_appendices.pdf)

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# DOCUMENTATION

Part Three



# Opacity and Transparency



3D Model of the House of the Tragic Poet in Pompeii

<http://www.capware.it/>

# Documentation

**londoncharter**  
for the computer-based visualisation of cultural heritage



Enabling evaluation

## Principle 4

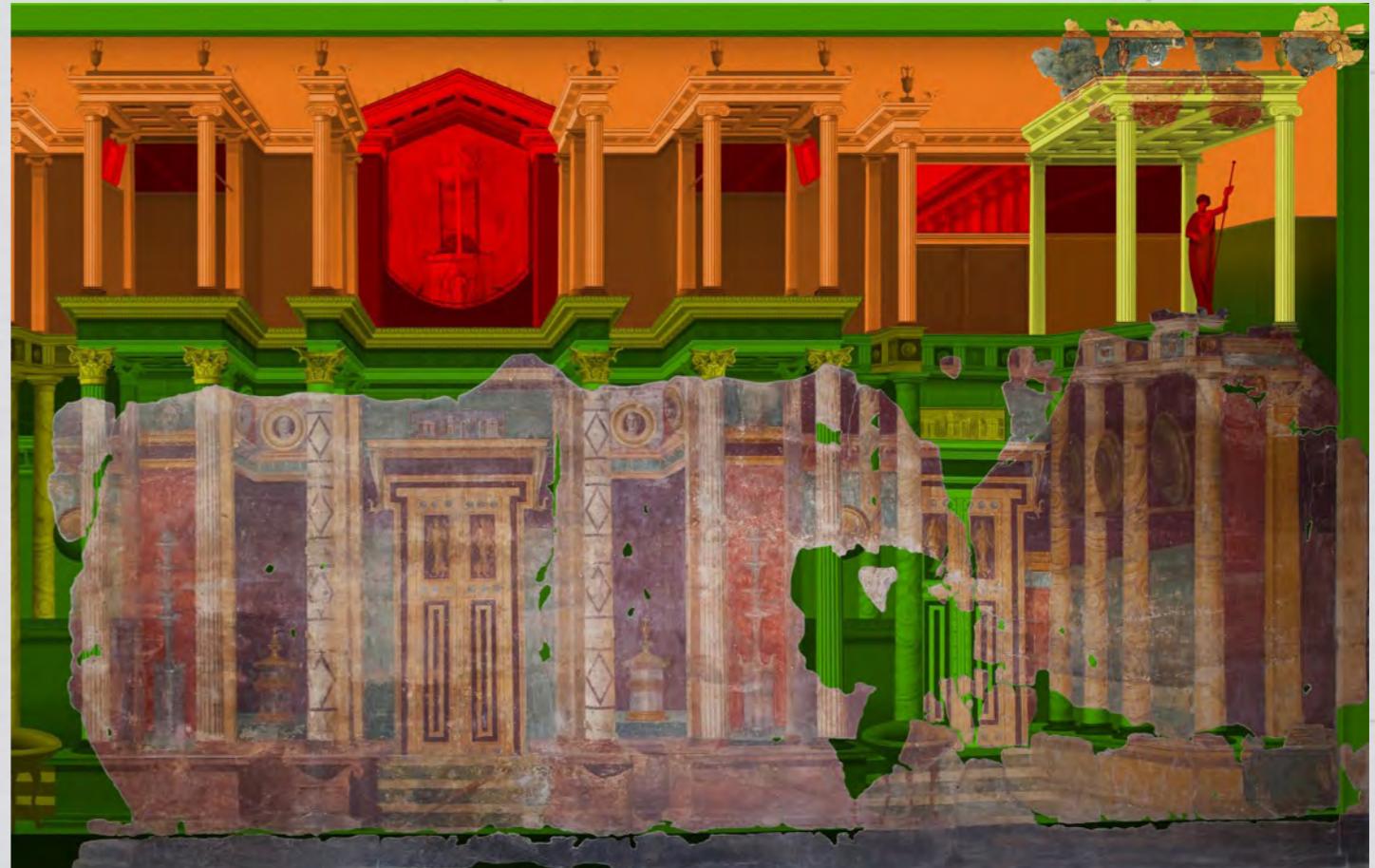
Sufficient information should be documented and disseminated to allow computer-based visualisation methods and outcomes to be understood and evaluated in relation to the contexts and purposes for which they are deployed.

# The troubles with documentation

- \* Difficult to publish
- \* No one wants to pay for it
- \* Is time consuming
- \* There are no clear guidelines on how to do it.
- \* Lack of standard

# Examples of documentation

- \* Embedding it into the visual output
- \* Using blogs and apps
- \* Dedicated website
- \* Mixed publications



Hypothetical restoration of a frescoes wall in the villa of Oplontis, by Martin Blabby KVL

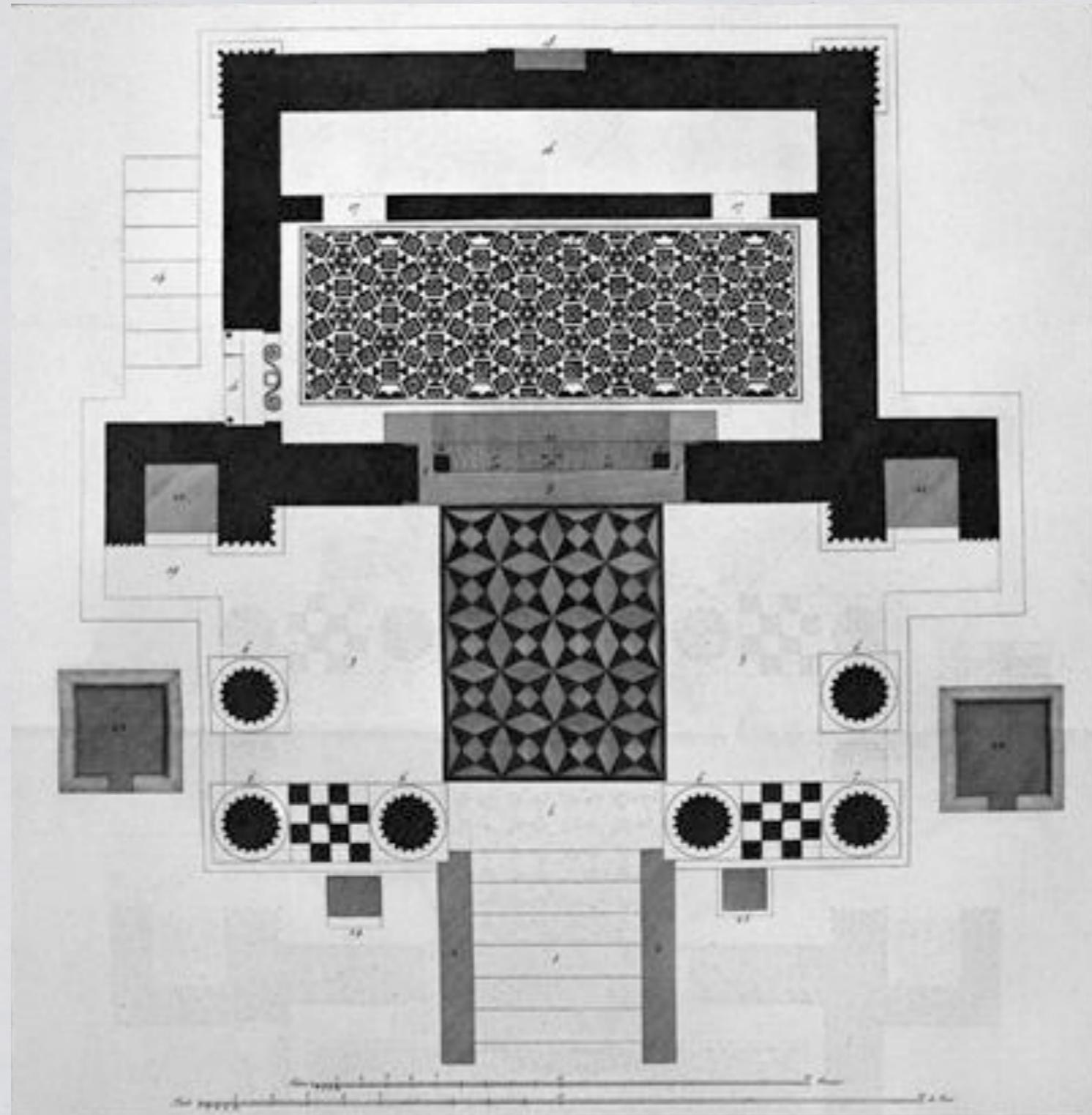
# Some more issues

- \* Authorship (of meshes and textures, and of the research)
- \* How to divide the model into smaller elements (logically and technologically)
- \* How to associate the elements with their sources (or lack of)
- \* How to differentiate between different kind of sources
- \* Declare simplifications of data
- \* And many more...

# A few words on secondary sources



Johannes Lingelbach - A Garden with an Artist Drawing from Antiquities



Piranesi, Interno del Pronao e della Cella del Tempio d'Iside  
<http://www.wikiart.org/de/giovanni-battista-piranesi/floor-plan-for-the-great-temple-of-isis>

# Fresco in the House of Orpheus, Pompeii



Photos by V.Vitale, November 2012





F. Niccolini, 1854



E. Presuhun, 1878



# A story from the Ashmolean Museum

<http://www.ashmolean.org/ashwpress/latininscriptions/2014/03/10/a-roman-centurion-in-london/>



Limestone funerary relief.

Ashmolean Museum



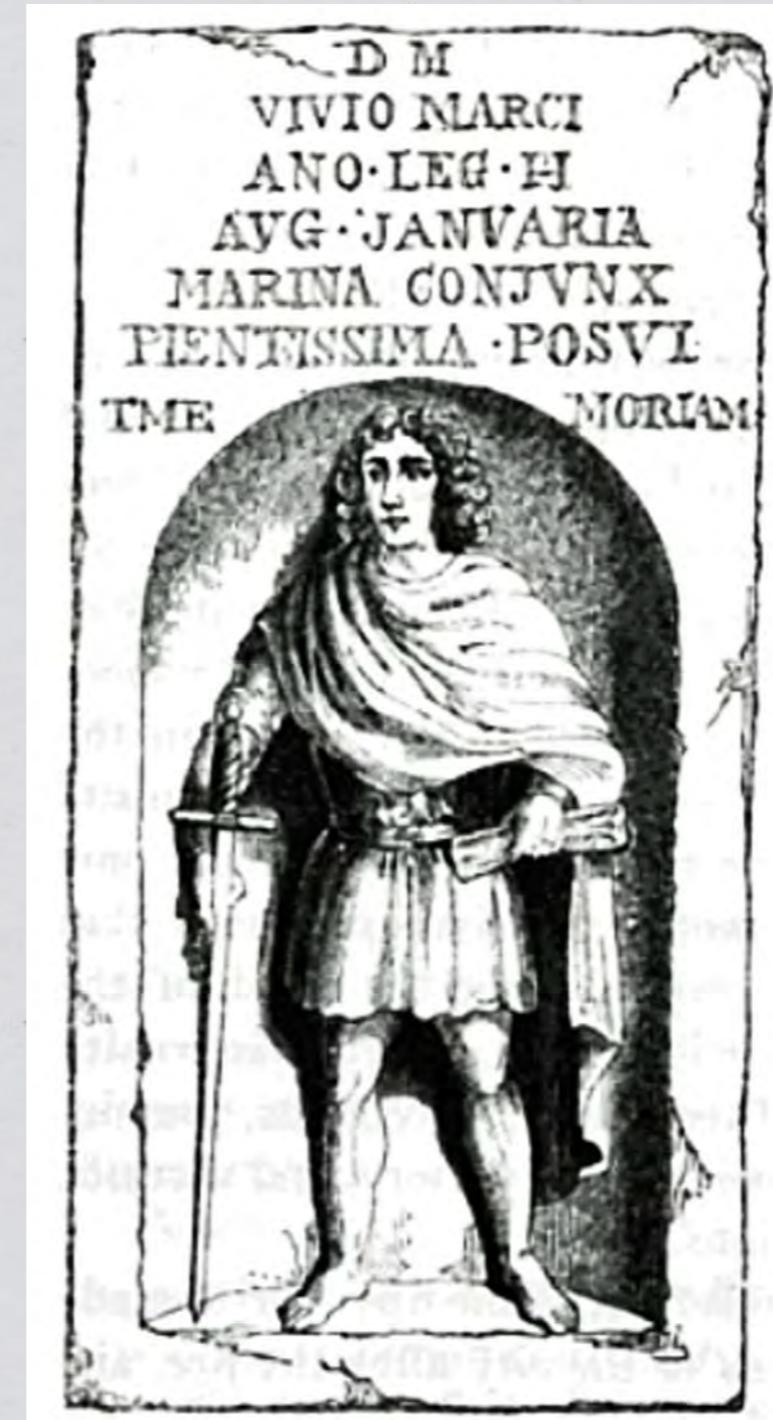
Prideaux, 1676



Gale, 1709



Allen. 1827



Knight. 1841



Knight. 1852

*“a perfect reconstruction based on historical documents and reliefs of the present ruins.”*



3D model of the House of the Faun shown at the Virtual Archaeological Museum in Herculaneum

# The temple of Isis in Pompeii



Picture from pompeiiinpictures

(VIII,7,28)

# Representations of things, Representations of representations, Representations of knowledge



Temple of Isis at Pompeii, by G.B. Piranesi  
<http://www.themorgan.org/drawings/item/142487>

# Representations of things, Representations of representations, Representations of knowledge

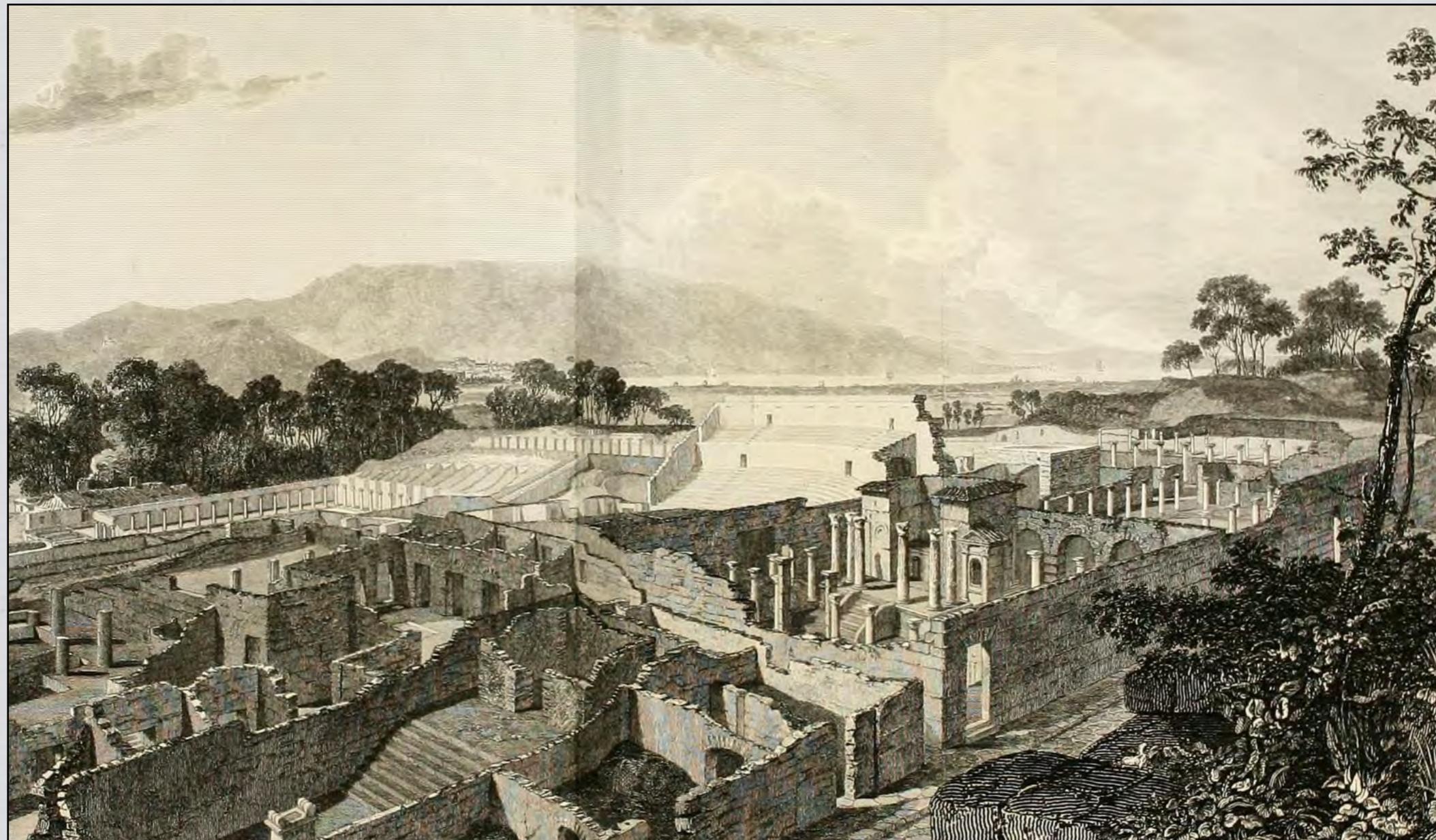


Illustration for Pompeiana : the topography, edifices, and ornaments of Pompeii.  
<https://archive.org/details/pompeianaedifice00gell>

# Representations of things, Representations of representations, Representations of knowledge



*e fantastica di cerimonia nell'Iseo pompeiano, in Saint-Non, Voyage pittoresque*

Illustration for Voyage pittoresque

## 4. Software options

# CAD and 3D software

- 3DS Max
- Blender
- Cinema 4D
- Sketchup Make/Pro
- Unity 3D (RTE)

# 3DS Max



Overview

Features

Compare

Free trial

System requirements

Case studies

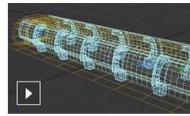
Subscribe

Support & learning

## Overview

3D design software for modelling, animation and rendering

Customise, collaborate and create 3D content quickly with 3ds Max® 3D modelling, animation and rendering software. It's packed with brand-new, user-requested features and enhancements for entertainment and design professionals.



### Overview video

3ds Max is bigger and better than ever. New tools, new workflows and feature enhancements help you to get started quickly, work better and collaborate like never before.

Watch video (1:52 min.)

## 3ds Max features



**Max Creation Graph**  
A new, node-based tool and content creation environment.



**XRef renovations**  
New support for non-destructive animation workflows.



**OpenSubdiv support**  
Create complex topology faster.

- Windows only
- Free education; \$1500/yr
- The pro architect tool
- Granular control of objects
- Export in all formats

# Blender



Features Download Support Get Involved About Donate Store



Blender is [Free and Open Source Software](#). Free to use for any purpose, forever.

## Google Summer of Code

Blender Foundation has been selected to take part in the Summer of Code, providing grants for students to work 3 months on Blender.

[Google SoC pages](#)  
[Blender Ideas list](#)

## Development Fund

Consider donating each month to enable full-time developers to work on Blender.

Blender 2016 Workflow project

## The Art of Open Source

A great introduction to Blender for a wider audience. Written for Linux Format magazine by Jim Thacker.

## Get Involved

Blender is being made by 100s of people from around the world; by studios and individual artists, professionals and hobbyists, scientists, students, VFX experts, animators, game artists, modders, and the list goes on.

[Get Involved »](#)

## Latest News

[Morning Pancakes](#)  
BlenderNation - March 22nd

[Episode 41 / Jason van Gumster](#)  
BlenderNation - March 22nd

[New University Degree: Heritage, visual](#)  
Blender Network - March 21st

[Blender Institute Podcast #2017 – Comm](#)  
Blender Cloud - March 17th

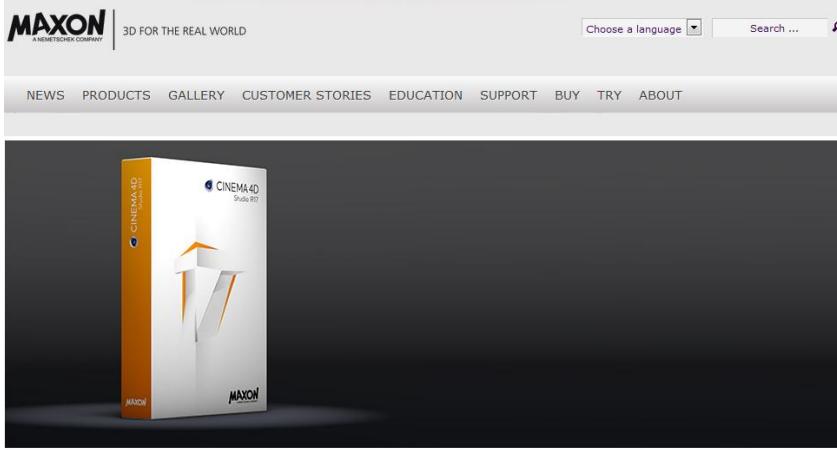
[BlenRig 5 Tutorials are arriving!](#)  
Blender Cloud - March 12th

[Proposal for Caching, Nodes and Physic](#)  
Code Blog - March 10th

[More news »](#)

- PC/Mac/Linux
- Open source software
- Redundant functionalities:
  - ◆ Extended keyboard
  - ◆ Keyboard shortcuts
  - ◆ Counterintuitive geometry
- Responsive dev community
- Export in several formats

# Cinema 4D



The screenshot shows the official website for MAXON's Cinema 4D software. At the top, the MAXON logo and the tagline "3D FOR THE REAL WORLD" are visible. A navigation bar includes links for NEWS, PRODUCTS, GALLERY, CUSTOMER STORIES, EDUCATION, SUPPORT, BUY, TRY, and ABOUT. Below the navigation is a large image of the Cinema 4D Studio R17 software box, which is orange and white with the product name and version clearly displayed. The main content area features a section titled "CINEMA 4D STUDIO - EVERYTHING YOU NEED FOR HIGH-END 3D". It includes a screenshot of the software interface showing a basketball scene, a brief description of Cinema 4D Studio's capabilities, and a detailed paragraph about its character tools. At the bottom, there are sections for "GENERAL INFORMATION" and "System Requirements".

**Cinema 4D Studio**

New in R17  
**Who should use it?**

- Overview
- Animation
- 3D Motion Graphics
- Hair
- Dynamic Effects
- Advanced Lighting
- Advanced Rendering
- Sculpting
- Customizing
- Assets
- Integration
- Short-Term Licenses

**GENERAL INFORMATION**

System Requirements

**CINEMA 4D STUDIO - EVERYTHING YOU NEED FOR HIGH-END 3D**

**CINEMA 4D STUDIO** is the very best that MAXON has to offer for professional 3D artists. If you want to create advanced 3D graphics but need a helping hand to ensure you create jaw-dropping graphics quickly and easily, then this is the choice for you.

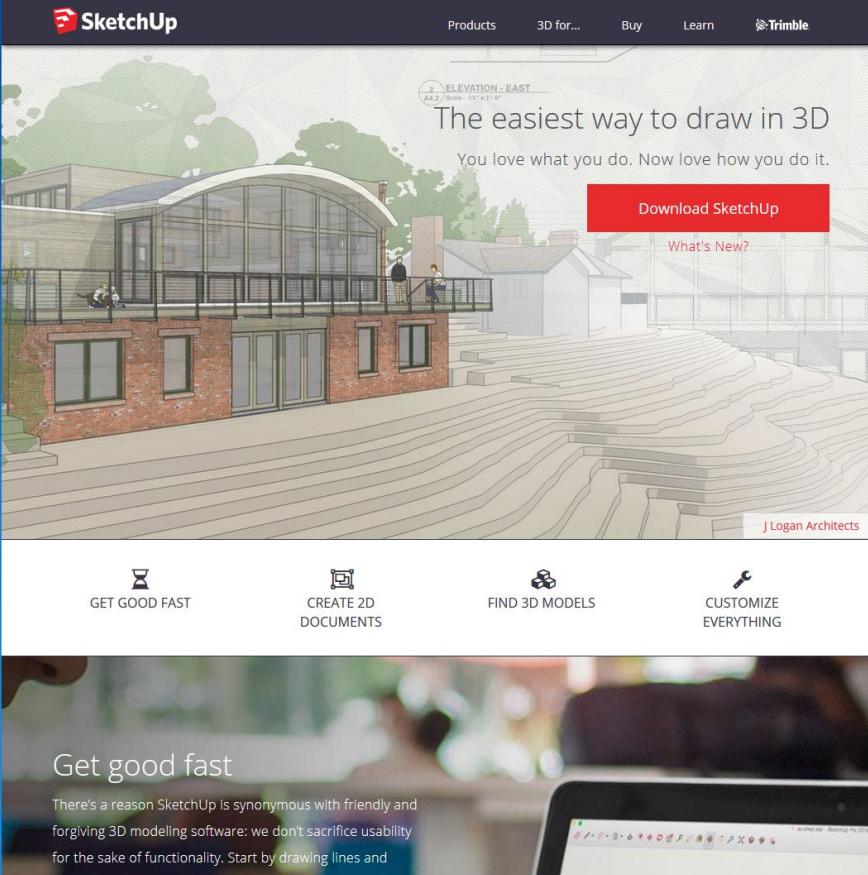
As well as containing all of the features found in Cinema 4D Prime, Visualize and Broadcast, Cinema 4D Studio adds advanced character tools, hair, a physics engine and an unlimited client network for rendering. The result is that Cinema 4D Studio can tackle any project you throw at it with ease.

Cinema 4D Studio's character tools make it easy to create character rigs and advanced character animations. Adding hair or fur to characters is fast and simple with a powerful suite of hair tools that let you grow, comb, style and animate. The physics engine makes it simple to perform complex collisions and interaction between objects, be it just a few or thousands. Network rendering allows you to take advantage of all computers on your network to help render your animations faster.

Despite being designed for advanced 3D, the extra tools found in Cinema 4D Studio are still designed to be user-friendly and intuitive. Generating advanced 3D effects such as hair is surprisingly easy and fast, with Cinema 4D doing much of the

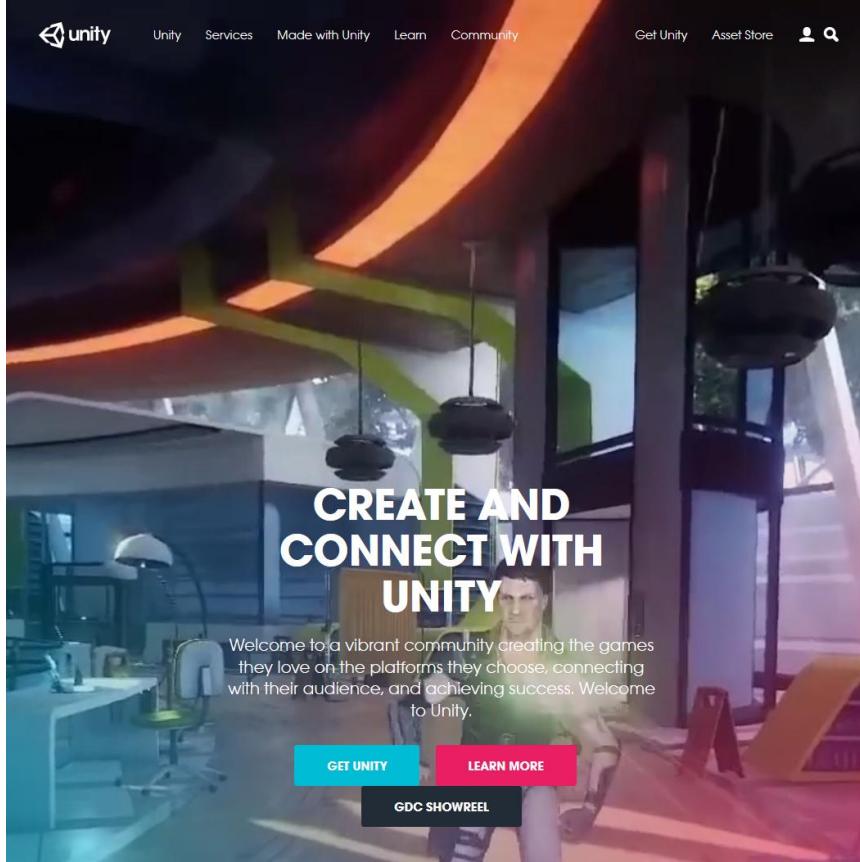
- Windows/Mac
- Student license free (18m)
  - ◆ Full \$3700
- Best tool for textures
  - ◆ Integrates Adobe CS
- Export in all formats

# Sketchup



- Windows/Mac
- Sketchup Make: free
- Sketchup Pro:
  - ◆ Student \$49
  - ◆ Teacher free
  - ◆ Full \$700
- Easy to learn
- Limited granularity
- A few export options

# Unity 3D



- Windows/Mac
- Real-Time Engine
- Personal free
- Pro \$75/month
- Not used for building
- Imports all formats

# 5. Introduction to Sketchup

<http://www.sketchup.com/download/>

[https://github.com/SunoikisisDC/SunoikisisDC-2016/blob/master/SunoikisisDC2016\\_SummerSemester\\_Slides/08\\_handout1\\_exercise.pdf](https://github.com/SunoikisisDC/SunoikisisDC-2016/blob/master/SunoikisisDC2016_SummerSemester_Slides/08_handout1_exercise.pdf)

[https://github.com/SunoikisisDC/SunoikisisDC-2016/blob/master/SunoikisisDC2016\\_SummerSemester\\_Slides/08\\_handout2\\_documentation.pdf](https://github.com/SunoikisisDC/SunoikisisDC-2016/blob/master/SunoikisisDC2016_SummerSemester_Slides/08_handout2_documentation.pdf)

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# THANK YOU FOR YOUR ATTENTION

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@nottinauta

