Visualizing the Roman City: Viewing the Past Through Multidisciplinary Eyes

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Abstract

Visualizing the Roman City, a two-semester colloquium currently offered at the University of Arkansas, targets honors students at the undergraduate level and seeks to teach principles of 3D data acquisition, processing, and digital reconstruction. The scope of the course required that we move beyond traditional disciplinary boundaries, drawing academic expertise from faculty in archaeology, architecture, classical studies, and geosciences to create a more holistic means of exploring and imaging the past. Using Ostia Antica, the harbor city of Ancient Rome, as its test case, this course provides an overview of the social and architectural history of Ostia, and imparts basic understanding of laser scanning, photogrammetry, and architectural drafting and 3D visualization software. In addition, the course addresses the theory and evaluative criteria of 3D visualization, encouraging students to reflect critically on the value and pitfalls of digital reconstructions as an approach for imagining and analyzing Roman urban life. It is our hope that *Visualizing the Roman City* will continue to nurture this collaborative interdisciplinary effort, fostering in our students a useful set of software skills, but more importantly a critical understanding of visualization as a means toward interpreting the past.

Keywords

3D visualization, digital reconstruction, pedagogy, interdisciplinary, collaborative learning, undergraduate

1. Visualization and the past

Visualization, simply stated, is the process of graphically representing ideas and objects (cf. Wileman 1993). This process, however, requires a conceptual "picture" of the subject matter, a sort of mental image to be transferred to and illustrated in a graphical medium. When the subject matter is not an aircraft part or office block, but the past, visualization becomes ideologically charged. As Hartley famously put it, "the past is a foreign country," and in interpreting the past, the construction of visual models makes our implicit assumptions explicit. Earnshaw and Wiseman (1992) have noted the analogous (if often troubled and deceptive) relationship between 'I see' and 'I understand,' and while digital reconstructions can communicate very efficiently because of their visual impact, their very persuasiveness can lead us to mistake our interpretive assumptions for the "reality" of the past.

2. Digital reconstructions in the classroom

While the role of visualization is growing in the research arena, until very recently digital reconstructions have played little role in student training. There are, of course, a few courageous exceptions (e.g. Flaten and Gill 2007; Flaten 2007), but generally, when visualization has appeared in university curricula, it has been at the level of short, graduate-level training courses (Hermon and Niccolucci 2007; Forte 2008). Very few undergraduate programs include courses covering the aims, theory, methods, and software for digital reconstruction or visualization in their curricula. This paper examines the interdisciplinary utility of an advanced undergraduate course in archaeological visualization, using the University of Arkansas' two-semester interdisciplinary Honors Colloquium, *Visualizing the Roman City*, as a test case. While the course focused specifically on reconstructing several sections of the ancient Roman

city of Ostia Antica, we believe it demonstrates the value and potential of digital reconstruction as a central element in academic pedagogy in the fields of Archaeology, Classical Studies, History, Historic Preservation, Art History, and Architecture, as well as other fields.

Until recently, most academic descriptions and interpretations of the past have been made via traditional media for representation: prose, line drawings, and photographs. While three-dimensional digital reconstructions should not replace these methods, because of their potential for interactivity they can provide additional academic insight. Some of the intellectual objectives of visualization might include:

1. providing a setting that encourages the development of multiple alternative reconstructions from a given body of data, leading to richer, more nuanced understandings (Murgatroyd 2008; Abernathy 2006),
2. permitting a deeper assessment of complex ensembles, rather than detached objects, such as by reuniting sculptures or paintings in their original architectural contexts (Stumpfel *et al*. 2003),
3. engaging a wider range of student "intelligences," especially those students who are very spatially and visually oriented (cf. Gardner 1983),
4. facilitating the cognition of large amounts of data (Ware 2004; Snyder 2003),
5. promoting the perception of unanticipated emergent properties (Ware 2004),
6. clarifying the relationship of large- and small-scale features (Ware 2004; Snyder 2003),
7. aiding in the formulation of hypotheses (Ware 2004; Abernathy 2006), and
8. to highlight problems in data quality (Ware 2004; Abernathy 2006).

Techniques of digital reconstruction impart additional lessons and skills to the student beyond what is traditionally taught in a classroom. The reconstruction of past built environments requires students to be active and creative while retaining their regard for standards of evidence and argumentation. Ideally, digital reconstructions should function as a sort of social and aesthetic reverse engineering. Rather than taking a Roman wall painting, mosaic, or sculpture as a given from which a discrete meaning must be explicated and then memorized, as in traditional academic discourse, a student engaged in a digital reconstruction must first consider the built, often urban, environment (which is composed of its own materials, constructed via certain techniques, and is imbued with specific meanings), and then evaluate how the given painting, mosaic, sculpture, etc., creates, contributes to, or nuances meaning within that broader environment. This process allows the student to appreciate the creative tensions and contradictions between various components that contribute to the same environment, whether it be an insula, a temple, or an entire city.

Another significant advantage of the *Visualizing the Roman City* course arises from its interdisciplinary quality. This type of endeavor involves many different kinds of expertise, ranging from the analysis of Roman economics to art history, and from archaeology to geomatics. With so many moving parts, for any one instructor to attempt mastery of them all would be both impossible and a disservice to the students and course objectives. For *Visualizing the Roman City*, faculty were included from the Departments of Anthropology and Geosciences, the School of Architecture, and the Classical Studies Program of the University of Arkansas. Creative dialogue and friendly disagreement between professors (and their disciplinary points of view) is exactly what students should see and benefit from in a multidisciplinary setting.

Geospatial and archival data are the primary sources provided to the students in this course to use as a basis for their visualizations. These data include high-density survey data collected via laser scanners, photogrammetric quality high-resolution digital images, and traditional archaeological plans, excavation reports, and photographs. The value of students working with primary data sets, in the largest sense, is that they witness and participate in the process of creating interpretations from data. The extent of their understanding is displayed when students synthesize the various kinds of evidence into three-dimensional digital representations. When working with the laser scanning data, students must consider which parts of the ruins are original and which have been reconstructed. For example, in reconstructing the Capitoline Temple in Ostia, students had to consider whether a given column fragment standing on the podium of the temple actually belonged there, or was simply placed there during excavation. As part of this process, the students learn to appreciate high-density survey data

collected with a precision instrument such as a laser scanner, but they also gain an understanding of the inaccuracies of the data. Noise and sampling bias are part of any data set and cannot be dismissed from the process of representation and interpretation. The students also become aware of the discrepancies between the "Ostia" found in site reports and plans, and that represented in the high-density survey data; on numerous occasions, the laser data and the published plans of the site did not agree. This illustrates to the students that any plan is an abstraction of reality and that elements are sometimes excluded, or included, without an apparent (or at least articulated) rationale.

Obviously, this course has a role-playing component, encouraging students to think broadly and actively, like members of Roman society, when engaged in reconstruction. For example, as they construct walls and arches students must consider the techniques of the original craftsmen (How did they build it?), the pace of construction (How much could they build in a day?), and the skill levels of those involved in the construction process (Which workers were highly skilled? What is the relative social value of a sculptor of capitals versus a brick layer?).

The laser data itself often allows students to consider these questions. It shows the materials used in wall construction (reticulate work with tufa, opus testaceum with brick, opus vittatum or mixtum using both); students are therefeore able to evaluate relationships between the type of material used and the thickness of the wall and its load-bearing function. The laser scan also shows put-log holes or capping marking the end of a day's work. By keeping track of this data, students can develop a sense of how quickly different parts of a building were constructed. Finally, by careful analysis of short-range laser scans of column capitals and other carved architectural details, students can appreciate the time and technique required by the sculptors of capitals, pediments, and other ornamental features in comparison with the laborers who worked with the standardized shapes found in opus reticulatum and imperial brickwork.

The students must also consider the mindset of owners and/or renters of different residential and commercial spaces. What decorative choices did they make, and why? How do they express the various ethnic, religious, or gender identities found in a cosmopolitan city like Ostia Antica? The students also analyze the Roman urban environment in an integrated way, considering (for instance) the relationship between wall thickness and building height, and therefore the density of a given neighborhood, or the frequency of doorways penetrating a stretch of wall and therefore the quality of the street as commercial or residential. They must consider the location of frescoes, mosaics, and graffiti and how they help distinguish static space from circulation space, and define rooms of higher and lower status.

Finally, *Visualizing the Roman City* encourages students to think critically about the assessment of digital reconstructions. The "success" or "failure" of a given reconstruction involves multiple evaluative criteria, and it is obviously important for students to understand that no visualization of the past is ever complete or final. The importance of accuracy, verisimilitude, aesthetics, ambience, and the expression of multiple vocalities and viewing positions are considered, as well as the combined effect of these criteria. Students must decide, for example, if they should maximize ambience at the penalty of accuracy for the purposes of their reconstruction, or build in multiple perceptions of the same model as a reflection of the different social classes and interests of the Roman viewers. Initially, students have tended towards maximizing one of these criteria over the others. In time, however, they begin to appreciate the ongoing balancing act required between these multiple evaluative criteria. They also become quick to identify the weaknesses in reconstructions that don not perform this act very well

Simply constructing models of buildings in Ostia is not enough; for midterm and final projects, students in Visualizing the Roman City are required to present written and oral explanations of their models. These explanations must consider how their model reflects assigned reading on Roman art and architecture, which parts of the model are relatively more secure with respect to existing evidence, and which parts are more hypothetical and creative. Often, the degree of uncertainty rises as the model moves beyond the ground floor to the higher stories; students must be explain how their reconstructions of upper stories, while more hypothetical, are still plausible, given existing evidence and current scholarly discussion. The grades for midterm and final projects are split equally between the quality of the model and the quality of its explication.

Although the question is ultimately unanswerable, they are repeatedly asked to consider, "Would a Roman recognize your recreation?" (cf. Favro 2006). They are also pointedly reminded that "any 3D program is ultimately about fakery" (Romero 2006). However, while they may all be "fakes," not all digital reconstructions are therefore equal, and their creation and assessment has opened up compelling new avenues of approach to that foreign country of the past.

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