Advanced modeling software explores whether Augustus Caesar really transformed Rome

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A computer model of Augustan Rome shows marble buildings in pink, buildings under construction in yellow, brick buildings in brown, white buildings in travertine and gray buildings as randomly generated infill buildings. Credit: UCLA

With degrees in Etruscology and Roman architectural history, Diane Favro has traveled to every corner of the Roman Empire, from Algeria

to Germany to Lebanon, and written several books on the subject matter as well as worked on a long list of digital research projects that explore the ancient world. But the answer to one question about Rome during the reign of Caesar Augustus eluded and intrigued this UCLA professor of architecture and urban design.

According to legend, the founder of the Roman Empire once famously boasted, "I found Rome a city of bricks and left it a city of marble." Was he telling the truth or making an empty claim? Did Augustus really transform the eternal city from brick to marble, Favro wanted to know.

To find out, Favro decided to uncover the truth behind Augustus' famous declaration by using advanced modeling software to reconstruct the city of seven hills in its entirety and observing how it changed during the period when he was in power.

"Many scholars have looked at Augustus' claim from a political standpoint, as a metaphor for him transforming a republic into an empire," Favro explained. "I wanted to see if Rome literally transformed under his rule."

Favro has previously worked on digital projects that have focused on Rome as well as Karnak, one of the world's most expansive temple complexes in Egypt. She helped develop The Digital Karnak, a comprehensive website that details Karnak's political, religious and architectural history.

"I have worked on digital projects for a long time. With technology, I can be more experimental and adventurous in my own research," said Favro. "It is also a way to help fund my doctoral students because the grants you can get using digital technology are so much larger."

Building the model

Working with her doctoral students Marie Saldana and Brian Sahotsky, Favro recreated Augustan Rome algorithmically using a technique known as procedural modeling. Scholars have tended to study the transformation of individual buildings in Rome instead of focusing on the transformation of the city as a whole because they lack the data needed to do so. While procedural modeling "has not been widely used as a tool to reconstruct ancient cities," Favro said, it has been used by urban designers to create contemporary cities.

The approach she used is based on rules for generating architectural forms. If Favro changes one rule in procedural modeling, the model of Rome will automatically regenerate, saving time and energy. "The model is changing all the time, and that fluidity gives it an experimental aura. Rather than having one beautifully rendered model that looks so good you never want to change it, you have a model that can easily be changed as new research takes place," she explained.

To further save time, Favro used massing models instead of hyper-realistic models to reconstruct the buildings, which involve a lot of hypothetical components and are highly labor-intensive. All of the buildings in the model are color-coded: Marble buildings are pink, brick buildings are gray and buildings under construction are yellow. Using a time slider on a working website that Favro and her team are developing, people can travel from 44 B.C. to 14 A.D. to see how Rome changed.

Similar to Google Maps, users will be able to view Augustan Rome from above or from the street. "I am interested in experiential technology, in architecture as lived space. Instead of always studying ancient cities like Rome from above, I think it is important to go to the ground level and move through a city space," said Favro. With modeling software, "I have control of the experience, the movement and the viewing angle. I can approximate the experience of what people saw in 44 B.C.!"

So was Rome transformed into a city of marble?

After carefully studying the model, Favro found that only a small proportion of the buildings in Augustan Rome were converted from brick to marble, and the marble buildings that were erected proved difficult to see in the cityscape.

"Given the literary descriptions and artwork, I thought these glittering marble temples on high would be very visible, but they were not." she said.

Favro now has a theory to explain this puzzling observation.

An illusion of transformation

Just before Augustus came to power, the Carrara marble quarries on the northwest coast of Italy were opened, and the Roman world entered an era of relative peace, known as the Pax Romana. With the availability of local marble and absence of war, Rome's first emperor was free to begin a massive construction project throughout the city.

Augustus commissioned several large marble structures, some of which took 40 years to complete. As a result, massive marble blocks were constantly being moved through the city, causing congestion in the streets. "Because they saw construction taking place constantly, I believe people really did think that Rome had been transformed into marble," Favro said. "But in reality, the city did not greatly transform."

Marble-paved public spaces, which used to only be found in sacred temples and houses of the elite, were also added throughout the city. "Suddenly, everybody moving through the area could find themselves walking on marble, so they felt like they belonged to this more elevated status," said Favro.

But it was mostly an illusion, said the scholar.

Moving forward

With the answer to her question in hand, Favro plans to continue refining this project. She will also continue to serve as the co-director of UCLA's Experiential Technologies Center (ETC), a collaborative, interdisciplinary center that promotes experiential research in the digital age.

"The ETC is grant-driven, so anybody on campus who has a grant and wants help with 3-D modeling can partner with the ETC, and we will make software suggestions and direct them to experts," she said. "We try to stimulate ongoing projects and new projects and push the envelope a little bit."

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