

The spread of amphorae design

Simon Carrignon and María Coto spoke to Cultured Scene about their new research examining the spread of amphora production techniques in 1st-3rd century Spain.

Cultured Scene: Your project used modelling to examine the potential social learning mechanisms at work in the production of amphorae in Spain in the 1st to 3rd centuries AD. Can you briefly outline the basics of the project?

Simon Carrignon and María Coto: The goal of this study was to analyse the transmission of technical skills among potters within Baetica province (currently Southern Spain). To do that, we analysed different Dressel 20 amphorae from different amphora workshops. Dressel 20 type amphorae were used to transport olive oil during the empire and they are well known as being linked to olive oil consumption. We proposed two questions. First, how amphora production was organized and second, how the production techniques spread from generation to generation of potters. However, we had to face some issues such as the lack of relevant written sources and the high level of uncertainty in the data. So even if researchers

have assumptions about how amphorae production was organized, how pottery-making techniques were transmitted is still poorly understood.

To deal with this issue, we used concepts from an evolutionary framework in order to study the impact that social learning processes might have on pottery production. Specifically, we wanted to identify whether amphora production might show variations that could indicate transmission by social learning among potters.

To do this, we tested two hypotheses: 1. The variability in the morphometric traits would be correlated with the geographical distance (with closer workshops having more contact with one another) and 2. Techniques would only be transmitted by vertical/oblique transmission at the beginning (from masters to disciples).

What are your findings so far?

SC & MC: We used an Agent Based Model to test



To study the shape of various amphorae Simon and María measured each amphora eight times (Museum of Lyon).

Interview

Amphorae design spread

different modes of transmissions (Horizontal, Vertical and Oblique). Each model described different historical hypotheses to explain the social learning impact upon pottery production:

1. Learning was spread by itinerant potters moving between different workshops (*horizontal transmission*)
2. It was spread from master to disciples within the same workshop. Maybe it could be running within families (*vertical transmission*)
3. It took place from master to disciples with some horizontal transmission between nearby workshops (*oblique transmission*)

As a result, we can identify different patterns of amphora production using Agent Based Modelling. We also think that this study helped us show two things. First, at a methodological level, it is indeed possible to use Agent Based Models to understand different patterns of transmission of pottery production techniques. Then, at a historical level, our models tend to show that those transmission processes were very likely to be a mix of vertical/oblique transmission with some degree of horizontal transmission. As is often the case, there is no one strict answer, but a subtle mix of various processes.

How did you arrive at the initial idea for this project?

SC & MC: We are currently working in a project, EPNet (Production and Distribution of Food during the Roman Empire: Economic and Political Dynamics), that wants to encourage humanities researchers to investigate cultural processes using different tools such as statistics and computer simulation, among others. To achieve this goal, this project brought together an interdisciplinary team from different fields. María is an archaeologist and she has been working with ceramics for years. Simon is a cognitive scientist who uses Agent Based Models to understand evolutionary processes. María was testing this dataset using statistical analysis. Both of us were already studying and reading about Cultural Evolution and Social

Learning theories. We thought this gave us a good framework to go one step ahead and test which processes could generate the pattern we observed. So we decided to use social learning theories to develop different models and then we could simulate them.

Your data for this project came from amphorae made between the 1st and 3rd century AD – how did you access this data? Was it a pre-existing dataset, or did you need to construct the dataset yourselves?

SC & MC: Maybe it was one of the hardest/funniest parts of the project. We collected all the data from different archaeological museums in Andalusia (Southern Spain). The main task was basically to take eight different measurements from each amphora. The measurements were done in rim sherds because this part of the amphora is well known as a good indicator of variation. It was a total mess contacting different museums and trying to convince them about our project. The main question we got was: “Why do you need to measure this type of amphora eight times!?” In the end, they always ended up finding our work interesting, as they hadn’t seen anything similar. So finally, after months moving boxes in humid rooms at the back of museums, we created a new database with more than 600 measurements.

What are your next steps for this project?

SC & MC: Trying to understand how the standardisation process happens and how this process



Rim sherds are a good indicator of design variation (Museum of Lyon).

can change depending on cultural reasons. In archaeology, we found some ceramics designs for which forms remain for a long time leading to standardization. Apparently, these ceramics have few changes over time. By contrast, other forms tend to disappear. We want to analyse this phenomenon and understand why this occurs and what the reasons are behind the success or failure of continuity of a material form. We would like to put that in the broader scope of “standardisation” and links between standardization and cultural change.

Do you think you may be able to apply these techniques to different archaeological datasets in the future?

SC & MC: Sure. Our framework can be applied to different historical periods and datasets. Material culture such as ceramics can explain a lot about our daily life and they are also the most commonly found in the archaeological records. Traditionally, ceramic studies have been focused on describing types with a methodology based on taxonomy. However, there are not so many studies talking about cultural patterns which explain decisions such as how a potter made an amphora. To explore these patterns, quantitative methods in Archaeology allow us to analyse and test statistically a large amount of very different data.

The use of these tools in the archaeological community is increasing thanks to their accessibility and powerful computational tools. This can be useful to unveil different aspects of historical events that could not be documented by the archaeological evidence.

What were some of the biggest challenges you faced in conducting this project, and how will what you learnt in the process of conducting this project inform your future work?

SC & MC: Aside from the museum hunting challenge, one of the main difficulties was the difference in our research backgrounds. Sometimes it was really hard to work in an interdisciplinary project due to the lack of knowledge from different parts. The worst part was that the differences

between our backgrounds was sometimes so huge that it could take time to even realize that we did not understand each other.

On the other hand, archaeologists know that one of the main problems in this type of project is the high level of uncertainty in our data and the lack of written sources.

What do you think are the next big questions to be tackled by the field of social learning and cultural evolution?

SC & MC: One of the big questions could be how complexity emerges or disappears in different societies and the reasons for this.

Another challenge that remains for Cultural Evolution is recognition. We think that it still needs to be accepted by all the disciplines it encompasses, as a valuable framework that can link together disciplines that are seen as separate, in the same way that Darwin’s theory of Evolution brought together all sciences of living organisms. And we hope that in the near future, the common view that “Nothing in Biology Makes Sense Except in the Light of Evolution” (Dobzhansky) will apply for Human Behavior and Social Changes. □



María is about to complete her PhD at Universitat de Barcelona, Spain. Her research focuses on identifying dynamics of social learning processes in potters during Roman Empire, with the aim of understand-

ing how individual potters acquired and transmitted technical skills.



Simon is finishing his PhD at the Universitat Pompeu Fabra. He develops and tests models of cultural evolution to understand the impact of content dependent bias on evolutionary dynamics.

Both are working at Barcelona Supercomputing Center as part of the Epnets project.