Episode 1

Dr Victoria Sainsbury on: *'Did the Romans Recycle?'*

There is a Latin maximum: *'Fortune is like glass, the brighter the glitter, the more easily broken'*. Leaving aside fortune for a moment, glass is very easily broken. So, what did the Romans do with all their broken glass? Welcome to the *University of Oxford, School of Archaeology* podcast *'Digging for Meaning'*. I'm Dr. Victoria Sainsbury, and I'm here to answer two questions: Firstly, did the Romans recycle glass? And secondly, why do archaeologist care?

So, I'm going to cheat a little bit and give you the answer first, which I'll then explain. So yes, the Romans did recycle glass. But how we know that and what it means is a little bit tricky. So, we'll start with the second question. Why do archaeologists care just care about recycling? Archaeologists care about recycling because it changes the archaeological record or the past, we can read it from the material culture of the societies that we study. Archaeologists, for the most part, study rubbish we study what societies leave behind. However, if something's recycled, it isn't left behind. Or rather left behind is something different or other.

This means two things for the archaeological record. Firstly, that something that could have been there no longer is. And secondly, that something new is there. This means we might perceive an absence in one century of a certain material or object, in this case glass, and an abundance of it 100 years later, when, in reality for the lives of the people using those objects, they all had access to glass. It's just that it was the same glass being recycled over and over again. So, to assume that 100 years they had glass, 100 years they didn't, is wrong.

Understanding recycling can tell us a lot also about the societies about how they traded how they organize their industry, how wealthy people were, what they owned, whether they own things that all. Understanding recycling really helps us understand as well how people perceived materials, how they thought of them. If you reuse something because it belongs to your mother or your grandmother, that can be really important, far more than its perceived material value. All of this reuse and recycling can also offer us insights into our modern research, what we do well and what we could do better.

By a lot of standards, the Romans were a very cosmopolitan people: they had a lot of stuff, and therefore they create a lot of waste. The Roman Empire at its height, around the end of the first century AD, was extensive. It went from Spain in the West, to the Persian Gulf in the east, from Scotland in the north, right down to Sudan in the south.

And this is it was highly monetized. Most people could purchase goods from across this entire expanse. But obviously all this distance adds cost much the same way it does now. It can be very cheap to produce something in one area of the world, and much cheaper than to produce it locally,

but there's an added cost of bringing it to you. Sometimes that outweighs the cost of producing it locally, and sometimes it doesn't. While presently, our recycling is often concerned with sustainability, the environmental cost of moving these things or producing something new. The Roman recycling seems far more driven by the economic cost of this movement. As well as access whether or not they actually could move this material.

At various different points in time, these networks that crisscross the Roman Empire were more or less successful at trade. So, across this large Empire, the ingredients for materials are obviously not always widespread. Roman glass requires primarily sand. And while sand is relatively widespread, the best quality sand is along with Syrio-Palestine, and Egyptian coasts. And it's here where the Romans produce their glass on a massive scale. Then they broke it down into smaller pieces, and that was shipped around the Empire to be made into jars, glasses, bottles, bowls, jewellery, much more. Excavations of these large glass factories in Israel show the size of some of these batches around nine tonnes at a time, which is about one and a half African elephants. This coastline supplied the entire Empire, but this first production of glass is very labour intensive. A very high heat is required to turn sand into glass, but then the heat required to make that glass liquid enough again to blow is much less.

This means that there are two elements that make glass recycling attractive in the Roman world. Firstly, it removes the transport costs from again moving material from the Syrio-Palestine coast to elsewhere on the Empire, but also reduce the fuel cost of this high temperature production. To put this into a concrete material example, glass is made in Israel and then shipped to London, where it's made into a jar. You buy this jar, you use this jar, and then because it's glass, you break this jar. You need a new jar! Obviously, you can buy a jar that's produced in exactly the same way as the first. But you could also buy a different sort of brand-new jar. A jar that was made of pieces of many broken jars. This broken glass is usually called ‘cullet’. And the advantage of it is, again, it's already in the right Province, the energy has already been expended to turn the sand into glass. So, to make a new jar requires only a much smaller part of this long production process. And visually, it's usually impossible to tell whether or not a jar has been made of recycled material or whether it hasn't. In the same way that if I took you into a supermarket now, I'm not sure you could tell me which wine bottles were made of fresh or recycled glass.

Once in use glass often broke, but it could be reheated and remade over and over again. We have some archaeological evidence of this sort of production from recycling. A small workshop was found under buildings a Bassinghall Street in London, and they show production from broken glass. In literary examples Latin satirist use a trope about people buying up broken glass in the same way someone now might say 'Big Issue Seller'. The problem is understanding how much recycling was going on. How important was it to Roman glass production?

We can get an answer this by using scientific approaches, we can understand *how* recycled material is, in fact, what we come to learn is that in some cases, the Romans seem to be recycling their glass at a far higher rate than most present industrialized countries. Using these chemical approaches. We look at patterns of recycling, which tell us about the practices performed by people what they did with their material, which led to this chemical signature.

I'm going to talk about two sets of contrasting glass patterns: one seen during the Roman period and one seen during the Early Medieval period in Britain, and I'm going to talk about what that tells us about glass industry at the time. This is drawn from my project 'From Trash to Treasure' at the

University of Oxford. This project collected published data on chemical composition of first millennium glass across Britain, as well as analysing new samples from sites in Kent and Oxfordshire. This allowed me to look at how glass reached Roman Britain and how it was traded around and recycled.

The first set of patterns I'm going to talk about are only obvious as patterns because of each other. This is what happens in the first or third century in Britain. Sites in Britain usually fall into one of three categories military, civilian or religious. And while we don't have a lot of information about glass on religious sites, we do have quite a lot about military and civilian sites. I should take a moment here to point out the designation of a Roman site as 'military' or 'civilian' is a little fuzzy. It used to be thought there was a very clear line here that a site was either a military site or a civilian side, but civilians lived and traded on military sites and military personnel were deeply involved in cities across Roman Britain.

In fact, a great deal of Roman cities started out as military sites or military sites were placed on existing settlements. However, when we look at the glass found in several large Roman forts, those with perhaps the smallest amount of civilian settlement, there was a clear difference between the chemistry of this glass to that found in nearby settlements. Looking closely, it seems that the Roman army recycled their material separately from the civilian material in a highly organized system, where it seems that glass was heavily sorted and carefully recycled. While we have very little evidence of glass production on Roman military sites in Britain, we do know that they produced a lot of metal work on these sites. And again, evidence of recycling from the metalwork seems to show the same separation from military sites from what might be considered the mainstream market. These chemical signatures along with the parallels in metalwork seem to imply that a lot of glass working is going on, on these military sites, we just don't have the evidence for it. This is a general problem with glass working the evidence from other high temperature technologies such as metal Working is often quite hard to distinguish.

Turning to civilian sides, the glass is moving very differently, but across a network that is incredibly vast. This less controlled system of recycling seems to show glass moving in and out of a sort of Central messy system. small farms in Wiltshire were part of the same recycling network that stretched to Caerleon. Glass from all around the country contributing and taking from a big melting pot of material. This material also continues to be recycled centuries on end. It's only by seeing these two systems together, this civilian and military material, that they stand out as distinct as two different systems. Individually, it's quite difficult to pull apart story of recycling.

Another example using this sort of contrast to give us information, occurs in the late Roman early medieval period in Britain. In the fifth to sixth centuries in Britain, Roman influence was fairly steadily withdrawn. While this is a fairly complex process which deserves a podcast of its own, essentially, some sites show a continuation of life in a fairly Roman fashion. Other sites show more of a return previous Iron Age practices, and finally, some places show a completely new set of behaviours with the migration of Anglo-Saxon peoples across Britain. Interestingly, comparing a very early Anglo-Saxon site in Kent, Lyminge and a site which shows evidence of both late Roman and Anglo Saxon, potentially contemporaneous occupation, Dorchester-on-Thames in Oxfordshire, different forms of glass recycling is also seen.

In this period, very little fresh glass seems to be reaching Britain, so both Lyminge and Dorchester show a large proportion of recycling. However, there's a clear difference in what they're recycling. In the fifth to sixth century Dorchester is recycling, fourth and early-fifth century glass. However,

Lyminge is recycling glass from the first to third centuries. That is Dorchester seems to be recycling relatively contemporaneous glass whereas Lyminge recycling glass that is already 300 years out of date. This implies that while Dorchester is continuing to exploit this mixing pot of material that has been common across the Roman period, people at Lyminge are instead likely scavenging long abandoned Roman sites for material. It's worth noting that the vessels produced in Lyminge are often very fine walled thin, beautiful pieces of high-quality glass work. Whereas material Dorchester seems relatively abundant, decorative, but a little bit more utilitarian. They're heavier glasses with thicker walls, which, while it requires less skill to produce use up a lot more glass, which might imply that Dorchester just had a lot more glass around whereas Lyminge is making only high-status material for high status people.

While both these sites rely heavily on recycling, the practice of this recycling and what it means how these people use and understood this glass is very different. Again, it's only by comparing these really large data sets that we begin to see these patterns. So, what can we take away from all this? Well, certainly that the Romans recycle their glass, and especially here in Britain at the edge of the Empire. This can tell us a lot about how people used, made and thought about glass. Roman recycling doesn't really seem to be driven by the same ecological concerns as our present recycling, but they're concerned with problems of access and affordability.

The reason why archaeologists care about this recycling is because it clearly can teach us so much about these people and how they ran their industries and how they thought about their materials. But also, because it's so fundamentally alters the record that they leave behind. Making assumptions based on an absence, when we don't understand whether or not it's a material that could be mutated into something else, can leave us making very incorrect assumptions. The Roman author Petronius used broken glass as a metaphor for worthless junk, but it's clear that broken glass was anything but worthless to the Romans.

Thanks for joining me, Dr. Victoria Sainsbury, for a discussion about Roman glass recycling. If you'd like to read anything more about this or would like to listen to any of our other episodes of 'Digging for Meaning', please check us out on the *University of Oxford, School of Archaeology* website: arch.ox.ac.uk.