

A visit to an ancient Roman bakery

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Farrell Monaco: We are standing at the entrance of the Molino del Silvano, which is the largest bakery at Ostia Antica.

Jeremy Cherfas: That's the ruins of an ancient town that was the port for Rome down the Tiber River and on the coast. It was a day I'd been waiting for for at least two years, to get the wonderful Farrell Monaco, known online as Tavola Mediterranea, to show me around Silvano's bakery. It was Farrell who successfully recreated the famous Roman bread known as panis quadratus, the round loaf that you can see in frescoes and amazingly as beautifully preserved specimens recovered from inside the ovens at Pompeii. Who better, then, to show me around this ancient bakery and tell me how it worked?

Farrell: It's massive actually, and there's eight mills inside. If you want to walk through, we can talk our way through the production area, if you like.

Jeremy: That's exactly what I want to do.

Farrell: Okay. Walking through the entrance, we're in a vacant space, which more or less would have most likely been a shopfront, probably. I don't see a counter, but it looks very similar to Pompeian bakeries, which also had sales kiosks at the front of the bakery. They could be doing wholesale operations in the back, milling flour that could go to other bakeries that didn't have mills, for example. They could also be producing bread, which they did here because of the oven in the back, and selling it to the public.

Jeremy: Silvano's bakery is right opposite the aureum, the big marketplace, and storage area for many commodities, including grain.

Farrell: The grain would come into Ostia Antica from the provinces — Alexandria, Sicily, for example — and would be redistributed here. Some of it would go upriver into the city. Some of it would be reassigned to go on to the military garrisons in various ends of the empire. Some of it would be processed here for sale here. The proximity of this particular bakery to the aureum is very telling. That

if you have that high volume of grain across the street, and then eight mills, there's a possibility that this bakery wasn't just baking bread, they were also just milling for the purposes of perhaps shipping flour into the city as well.

Jeremy: The mills, they're kind of strange. There's a big fixed rock, and sitting on top of it there's a smaller rock which sort of fits. It's like there's a hemispherical protrusion on the lower rock, and holes through the top. How does it work?

Farrell: David Peacock tells us that it's made of leucitite and some of them are made out of other volcanic materials. These ones are made out of leucitite and they were quarried in Orvieto. You have the bottom piece ...

Jeremy: Hang on a minute, hang on. Quarried in Orvieto, that's about a hundred kilometres away. They're getting the best material for the purpose?

Farrell: Yes, and Pliny tells us that as well. He tells us that they were sourced in Bolsena and they were the best mills in the Mediterranean. That some were so amazing that they could move of their own accord, or with the power of the moon. That tells you how amazing these beautiful structures are. The actual technology itself is stunning. They're massive. This one in front of us right here is almost as tall as you and I are.

It's a two-piece technology. The bottom is called the meta and it's stationary and conical. The top which is the rotating piece is called the catillus and it's shaped like an hourglass. It has two large holes in the side, which a pole is fixed through that is then attached to the yolk of a horse or a mule, typically a mule. You would have one bakery labourer or slave who would whip the donkey to keep him walking around and rotating the mill, which was fed with a wooden hopper in the top, which is gone now, of course. The grain would be cracked against the two pieces of the mill and would come out the base into a catch basin, which of course is gone as well. It was organic, probably a wooden catch basin.

Jeremy: When it comes out of here into the catchment area at the base, is it fine enough to be considered flour at that point?

Farrell: That's the difficult question. We don't know, because as experimental archaeologists we haven't worked with this. We haven't worked with something that is porous like this. One of the things that I think about is, Okay, if I was given an opportunity to work with this mill and under the superintendency, with a team of archaeologists and we decided to run one kilogram of parched wheat through it, what would happen?

Until we can do that, we don't know the texture of the flour that's coming out. We also don't know the grade of the mesh, right, that they would've used to sieve. They used baskets, they used woven horsehair. The mesh that they were using, we don't know how much of the bran was left. How much was put through? We don't know how many times in, for example, commercial bakery settings, how many times did they pass it through again. Were they in a hurry, or did they do it three times to get a finer product?

The last thing that I think about is, let's say we've been using this mill for 20 years, okay. Because it's such a pocked material, very porous, good for cracking wheat, how much wheat and flour actually gets clogged into the inside of this mill, which then creates a smoother interior. Perhaps it lubricates the mill and lets it move better. Perhaps it also slows it down, right. If it gets wet, what happens?

You're dealing with the inside of this; the grinding surface between the meta and the catillus would have been different when it would've had say a decade's worth of compacted flour and bran shoved into all of these pocks, right. This is a big question. We don't know the texture of the flour that they produced because we don't know what this does yet. Until we can work it for a year or so, that's when we'll be able to give a solid answer.

Jeremy: Is that even on the cards?

Farrell: I certainly hope so, but I think that would take a fair amount of work and pleading. [laughs]. There's certainly enough mills in the former empire to, say, experiment with one, perhaps even one of the small ones, but it would require the permission of Bene Culturali or the superintendents here at Ostia or Pompeii to actually give it a whirl. You would also need donkey labour, right?

Jeremy: I'm willing to volunteer the push this thing around.

Farrell: Someone is going to have to smack you though, because it's going to be quite a hard job.

Jeremy: There'll be others.

Farrell: It's a hard job.

One day, then, we may just possibly know whether those mills grind exceedingly fine. There's a whole another story about how the mills were made and how they were shipped down from Orvieto. In the bakery, how were they maintained? And there are eight of them.

Farrell: These are one of the Roman mysteries. They had the ability to accomplish so many amazing things. This is one of them. The ability to quarry this and to make this is brilliant. Transporting it? God only knows.

Think about this bakery now, put yourself back into the production environment of the day. Think about the clapping of eight mules walking around these mills. The sound of their behinds getting whipped. You think about the heat that would be in here when there's a roof on this structure. The oven in the back is massive. It's the biggest one that there is in commercial bakeries in the Roman settings. The environment in here would've been noisy, busy, smoky, hot.

Jeremy: What are they using for a leaven, do we know?

Farrell: Yes. There's several examples that Pliny speaks of, the most prominent example, the one that we go on the most, is bread dough from the day before. When you consider again that there's no refrigeration, it's a humid environment, they are likely leaving a large mass. If you think of the possible output of this bakery, and the size of that oven. They would have to be leaving quite a sizeable mass of bread dough from the day before in one of these two large containers in the back, which are typically used for washing the grain, or they could be for storing grain as well. You would have to leave a mass of starter somewhere the day before in order to pay it forward to produce the amount of bread that they're likely producing in this.

Jeremy: Okay. We've got a starter, which we've leftover from the day before, and we have to turn that into today's dough. Where does that take place?

Farrell: Okay. This bakery has an unusual setup. At Pompeii, you'd be lucky to find one kneading machine, maybe two in a bakery, some of them don't even have them. You have to consider that in some cases the breads were kneaded by hand. In the kneading room, which is a dedicated kneading room — which you don't see at Pompeii as well, which is amazing — you have 1, 2, 3, 4 5 kneading machines. One looks like it was actually popped in here. You see how the base, there's actually a space in the walkway.

Jeremy: Yes.

Farrell: In between the tiling stones, where the kneading machines are sitting, that one looks like it's been dropped in.

Jeremy: Yes, it's sitting on top of the ...

Farrell: But I could be wrong. Let's say we got five kneading machines in here. That's a lot of dough on the go, it really is.

Jeremy: Yes, because the inside of the kneading machine is a cylinder. It's the size of small dustbin, a small trashcan. I can't really say how many litres it might be, but it's pretty big.

Farrell: Yes, it's massive actually. What does that look like? It's hard to say. It's a large, like, janitor's dustbin, like a garbage can.

Jeremy: I'm going to guess 50 litres, maybe more.

Farrell: Okay, so 50 litres and then you've got five mills, so 150 litres. Is that right? 150 mil litres of dough on the go?

Jeremy: 250 litres. Well, we're only guessing here anyway.

Farrell: Yes, so a lot of dough.

Jeremy: A lot of dough.

Farrell: Yes.

Jeremy: How does a kneading machine work?

Farrell: My understanding is that you've got a tall wooden peg that is fixed into the base of the cylinder. At the side, you have two holes that are pushed through where you would have, again, two stationary pegs of wood that would be put through it that act like stationary

paddles. Then the pole that is fixed into the base has a paddle fixed onto it at a right angle, which when you rotate that, paddles the dough and bounces it about against the two stationary pegs that are fixed into the side of the cylinder.

You move this thing around and eventually you have something akin to an early Roman Kitchen Aid or a bread paddling machine, like a bread mixer. It has a similar setup. The dough gets paddled, and then eventually I would assume you would end up with a nice ball of firm dough.

Jeremy: You say firm. I was thinking maybe it would be more hydrated, more liquid. No?

Farrell: No. The evidence that is visible from looking at the inside of the crumb of the bread at Pompeii ... Now this doesn't mean that here in Ostia they weren't making high hydration, fluffy, holey bread. At Pompeii all of the bread specimens that have been found are low hydration. They're lightly leavened. You can see that there's leaven in the crumb. There are small little bubbles, but it had to be dense enough to make the impressions that the panis quadratus is known for, the segmentation on top of it so that they could be broken apart and divided as portions.

If the dough was high hydration, which some of the loaves may have been, you can't press anything into it because as soon as it hits the oven, everything gets blown back out. Right?

Of course, in a perfect world, Farrell would have shown me there and then how to make a perfect panis quadratus, but I'm going to have to do that on my own. The point is that the segments, which are very obvious in the specimens and the paintings, would vanish if the dough was well hydrated, contained a lot of water. In any case, behind the kneading room is a long shallow space where the dough would be formed into loaves.

Farrell: A group of shirtless men that are working around a square table. Sometimes there's a foreman standing at the end telling them what to do. Then of course we know that they did it with their hands because there's evidence on a few of the loaves at Pompeii of fingerprints from these men, which to me was just magic. That was so moving, to see evidence of these bakery labourers that nobody writes about, nobody talks about. They're completely invisible in the archaeological record. Then, when you see their hands, their fingerprints pushed into the bottoms of the loaf, at the side of the loaf, it's like, Ah, there they are, there they are. And it's so beautiful.

Jeremy: It's a connection.

Farrell: It is to me. To look at evidence of their craftsmanship, their work, because from what we know, they were typically slaves or criminals, but they were craftsmen. They had the ability to make these beautiful loaves that were complex and the forms are so unusual and they had to use the tools that they had on hand to make this shape. They did it all day long and they produced a high volume of bread to feed Rome and they deserve recognition.

The scale of the work with eight mills, five or six kneading machines, and then this long shaping room is quite overwhelming. Then at the end of the shaping room Farrell spotted something interesting.

Farrell: Stairs down to the oven and you've got two windows here. There's your pass. You have a pass on the left and a pass on the right, which I didn't notice before, which is so beautiful. So, logically they could have been working the dough here, rising it on the shelves ...

Jeremy: Turn around ...

Farrell: Then they form it. Once it's risen they form it, because you can't do the impressions and tie off the cord around the diameter and then leave it sit, because then you lose the impressions again. Impress and create and form the loaf, turn around, squat and hand the loaf to the oven master who's working on the other side of the wall, who is loading that massive oven with probably an incredibly long palette.

Jeremy: It's incredible. It's a room four metres by three metres, I would say. Is that whole thing the oven?

Farrell: The floor is gone. I can see that somehow the base has been looted or taken elsewhere, but the size of the oven is correct because the back wall is still there. It's a lot of baking space, it's nearly twice the size of what you should see at Pompeii, perhaps even three times. That's a wood storage area in the bottom. They would have filled it with wood, fired it, swept the embers out, and then fed the bread into the oven and you would've probably had ... It would have sustained maybe four hours of baking heat in the oven. By the size of this oven floor, I would venture to say they were producing probably 200 loaves.

Jeremy: At a bake?

Farrell: Per bake in that oven, yes. This leads to the question why is it so big? If they are ... Ostia is not huge. Where is that bread going? Is it going up the river? Why is the oven so huge for Ostia? You have a small resident population at Ostia, but then you have a transient population as well, which are the merchants and the guys that come in on the ships, but do they need this much bread? Because I ask myself this question: this is a high volume bakery. Why? Where's it all going. 200 loaves per bake, and then we're doing this on the fly. We're doing math on the fly right now, Jeremy, but 200 loaves per bake and I'm speaking just about the panis quadratus, not any other typology they may have been making that we don't have evidence for. Think about where that's going if Ostia is the small town that it is.

Jeremy: Up the river to Rome, down the river to military garrisons further afield, who knows. It's time to get to grips with the bread itself. As we've been talking, you've mentioned this panis quadratus quite a few times. I think I first learned about you through reading about your experiments with panis quadratus. Let's talk about that, what is panis quadratus

Farrell: It is the most recognised Roman bread typology in the archaeological record. The reason, and why that is, because 81 of these loaves were preserved beautifully in the bakery of Modesto at Pompeii inside of the oven. They're also visible. We know they're prominent because they're visible in Frescos, they're visible in relief sculpture, like the Romolo Relief, for example. You can see examples of this bread represented in Roman art.

Then of course it's written about as well in the literary record. And it is essentially a segmented bread. Because of the examples that were excavated by Fiorelli in 1862, we can see how prominent these were at Pompeii, for example, but we know that they were made in Rome as well.

Jeremy: They're segmented, quadratus is divided as sort of a cross on top?

Farrell: Yes. There's always a bit of debate about this, but it's four movements of the cord, or the reed. So 1, 2, 3, 4 makes 8 segments, or the loaf is quadrated into quadrants, into four, which is the other way that you see it, sometimes in more domestic settings, is just one, two.

Jeremy: How did you go about baking panis quadratus?

Farrell: I started years ago, just like everybody who's experimented with has. You start first by making a ton of mistakes and assumptions that you realise as you go along. Oh, that was wrong, this was wrong. Trial and error, trial and error, trial and error ... until you get close to a product that is similar. When I went into the lab at the museum in Naples, I studied the form much [more] closely, the crumb et cetera. I looked at the impressions and got a much better idea as to how it was put together by these men who worked in this space, and the hydration levels.

You can't tell much about the flour texture by looking at the crumb, given the fact that it's carbonised. It's been compressed and it's been shrunk quite a fair bit. In looking at it, and as a baker and as someone that understands hydrations and bake times and temperatures and the behaviour of bread, both as dough and once it's in the oven, I was able to get to a point where I could figure out, okay, the hydration needs to be this in order for the impressions to stay. The impressions have to stay because the end user, the consumer needs to be able to break the bread at those lines.

Then I used various tools that I knew were around at the time and that were being used for utilitarian purposes in Pompeii and Roman settings. Until I could come up with a reasonable facsimile.

Jeremy: That reasonable facsimile, is that an example, would you say of experimental archaeology? Does it tell you what the Romans did? Or is it an example of — what should we say — making a facsimile that may or may not be the way the Romans made it?

Farrell: There's some takes at it that are kind of like what you see online, you see people having a go at it and saying, Look, I made a panis quadratus. And that's grand, that's fantastic. If they're interested and they're spending time reading about it and they're looking at the archaeology and the history, that makes me happy. The experimental archaeologist's job is to narrow it down and get as close to producing a product that's as close to the original as possible.

You're doing this for various reasons. You're not doing it just because you want to produce a loaf that is exact. You're doing it because you want to understand the labour that's involved. What movements and techniques they used to make this loaf. How much flour and water

went into it, because there is a standard size. Once you factor in the carbonisation, the margin, you can actually look at the standard size of the dough that they would have weighed to make these loaves. Because they would've weighed it as well as a baked loaf and sold it by weight.

It's about the quantity of grain that's being fed to people, it's about craftsmanship, it's about tools of the trade, it's about the production space, like where they're working. It tells us so much. Then of course, if you find fingerprints you get to see the actual people that are involved in the process. Then for me, the most beautiful aspect about remaking is it is something that fed Rome. Some scholars believe that most of the daily calories came from carbohydrates, which came from cereal grains and breads. The fact that this bread is so prominent in the pictorial and archaeological record tells me that it's such a huge part of the Roman daily diet, along with other breads as well.

This was a large part of the Roman diet and when you factor in how many bakeries are present at Pompeii, it's like Starbucks for you and I or Pret a Manger; they're everywhere. If this oven was full of 81 loaves, that's the volume that they were producing at Pompeii with the 34 bakeries present in 49 acres of 66 — 25 hectares remain unexcavated — that's a lot of bread. Hectares not acres.

Jeremy: It's a lot of bread and Pompeii is not even a big city. Rome, at that time, I've read a million people.

Farrell: 260 bakeries. There's only one that we know about, but I'm going to find another. There's evidence of a bakery at the Porta Maggiore right beside Eurysaces tomb, the baker's tomb.

The baker's tomb is a bit of a landmark here in the middle of a tangle of tram lines and aqueducts at one of the high points in the city. I really hope I'm around when, not if Farrell Monaco does actually uncover that bakery, because I'm sure she will one day.

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