

## Podcast interview: Amaia Arranz-Otaegui

**PNAS:** Welcome to Science Sessions. I'm Paul Gabrielsen. Bread has been a part of the human diet since the beginnings of agriculture. Or at least that's what researchers thought, until bread fragments were identified in the remnants of a fireplace at an archeological site in Jordan that's around 14,000 years old. That's at least 4,000 years before the emergence of agriculture. Amaia Arranz-Otaegui of the University of Copenhagen found the fragments and recently reported the results, with her colleagues, in PNAS. The hunter-gatherers at the Shubayqa 1 site, from the Natufian period, created the bread with a mix of local tubers and wild cereals. The discovery of such old bread, Arranz-Otaegui says, adds another dimension to the study of ancient human diets. She tells the story of identifying the bread fragments.

**Arranz-Otaegui:** We were digging this fireplace and I found tons of bones and plant remains and charcoals and seeds. And I was super happy with that. So I was very carefully sieving the soil samples from the fireplaces. I was realizing that I had some remains that I couldn't recognize or I couldn't classify. I knew that they were not wood charcoal, they were not tubers, they were not seeds. So I was very curious, I have to say, I was wanting to know more about these remains.

So I decided to go to the University College London, because the university hosts one of the largest reference collections for plant remains in the Near East. And I was looking at my seeds under the microscope when Lara Gonzalez Carretero, which is the co-author of the paper, came in. And I had these unclassified remains in my desk, close to the microscope, and she came in and she saw them and she said "Oh! That's bread!" And I was like, "No way, what? That's not possible, Lara." And she was like, "Why? I mean, this is exactly what I see in my samples. I'm very familiar with them, and this looks exactly the same. This looks like bread!" And I was, "No way, Lara, this is 14,000 years old." And then her face changed as well. And we were both shocked.

**PNAS:** The bread fragments push back the history of bread by several thousand years. Arranz-Otaegui says that further discoveries may fill in that history until the previously oldest-known bread, and that samples even older than hers may yet be found.

**Arranz-Otaegui:** We know that even in the Upper Paleolithic they were using grinding tools and they were using grasses. So there is a chance that they were making bread as well. The thing is, we haven't been able to find it. We have focused on recording flint, bones, pottery, etc. in the archaeological sites, which are of course more impressive than these small and charred and quite ugly food remains. And I'm sure that if we look also after, like 2,000 years later, I'm sure that we will find bread in more sites. I think Shubayqa 1 is not unique in that sense, but we have to demonstrate it.

**PNAS:** Arranz-Otaegui and her colleagues are now trying to recreate the bread to learn more about the hunter-gatherers' cooking techniques.

**Arranz-Otaegui:** This year, we had the opportunity to go to a lake which is close to the site we were digging in Shubayqa 1, and when we were there gathering these club-rush tubers to make flour, we learned a lot. They are very easy to gather, but they are very difficult to process. It's very time consuming as well. And then we tasted it. It has, like, a gritty texture and then it's salty and little bit sweet at the end. And of course the idea is to basically recreate this as a way to learn more about the bread remains we found. So there is still a long way to go.

It could be something similar to the type of bread they eat in the near east, like naan, this flat bread. Or it could also be something like the tortilla they eat, for example, in Mexico.

**PNAS:** Because the window for bread production is now known to be much longer than previously thought, researchers can now look for that product at archaeological sites and incorporate processed plant analysis into their study of ancient cultures.

**Arranz-Otaegui:** These remains allow us to not only provide direct evidence for the types of ingredients they used in the past, but also they inform us on the final products that they were elaborated. And this information is not possible to achieve otherwise. The key is that we have found that food remains are preserved in very old sites. And I think we have to start looking at them, try to find them, and try to systematically recover and analyze them. This is going to be the key thing in the next years, I think.

You know, in archaeology we have often focused on animal bones and these other types of artifacts. We have been characterizing diet based on assumptions sometimes. And I think that the study of food remains will be able to test those assumptions and those hypotheses and provide direct evidence. I hope that in the future we will be able to say more about this topic.

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