

Burning Questions

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Guests

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Introduction

How can archaeological examples of cremation help us understand the past? How do we even identify a cremation? Join us in this month's episode of **#FinallyFriday** where we're joined by two experts focussing on cremation to find out the answers to these questions and more! **Tim Thompson** is a professor of applied biological anthropology and Dean of the School of Health & Life Sciences at Teesside university in the UK. **Yannis Chatzikonstantinou** is a PhD candidate at the Aristotle University of Thessaloniki, Greece. His research uses macroscopic and analytical methods, including experimental archaeology, to study burnt human remains from the early Minoan Age in Crete.

Transcript

It's the first Friday of the month, which means that it's time for the next episode of **#FinallyFriday**, bringing you insights and discussions from around the world focussing on experimental archaeology, ancient technology, archaeological open-air museums and interpretation.

Phoebe: Hello and welcome to **#FinallyFriday**. My name is Phoebe Baker and today I'm joined by two specialists from our EXARC community focussing on cremation. Tim Thompson is a professor of applied biological anthropology and Dean of the School of Health & Life Sciences at Teesside university in the UK. Tim has research interests in a number of areas, but has a primary focus on the archaeology of cremation. As part of this, he has advocated for the application of analytical forensic and scientific techniques to improve our understanding of the changes that bone

undergoes whilst burning. Tim has studied cremation in many different time periods and places, including Anglo-Saxon and Roman. Yannis Chatzikonstantinou is a PhD candidate at the Aristotle university of Thessaloniki, Greece. His research uses macroscopic and analytical methods, including experimental archaeology, to study burnt human remains from the early Minoan Age in Crete. Experimental archaeology was also a core technique used in his earlier master's thesis, which examined the use of fire in the treatment of the dead during the Aegean Bronze Age. Yannis is also a member of the TEFRA archaeological research project, which aims to examine the effect of fire on human remains throughout the Aegean.

So welcome both of you. Thank you very much for joining me. I think this will be a really interesting episode. I have a quick question to start you off. Well, maybe it's not so quick, but how do you actually identify cremation? Tim, would you like to go first?

Tim: That's a really good question. I think from my perspective, my background is very experimental in my approach to studying what happens to the skeleton and the body when it burns. So I tend not to go out looking for cremations myself. I tend to have other people have found an interesting context and have found bone then kind of come to me. Where I do get a bit more involved and a bit more hands-on it tends to be the forensic contexts, which are a little bit more obvious in terms of where those areas of burning might have been. From my perspective, from the forensic context, I think it's a relatively straightforward thing to identify where cremations have been because oftentimes they've been seen. I think it might be much more challenging for the archaeological context and that might be where Yannis can come in and give us some expertise there.

Yannis: In archaeology, we have the final result of a deposition. So when we examine human bones, we have bones that need to be analysed carefully in order to understand how they were manipulated in the past. So when we have indications of burning, we try to reconstruct the ritual that took place many years ago. We study bones, but the bones are not actually burning from the initial fire. When we burn a body the fire comes in contact with the flesh and the soft tissues of the body. And after the destruction of the soft tissues the bone comes in direct contact with the fire. It's a very complicated question to answer. So there are many different answers to that question, but, yes, in archaeology we have actually the chance to decode a burning body and burnt human remains.

Tim: One of the interesting things about fire and burning is that it's a transformative process. So as Yannis was saying, when we look at the body and the skeleton, we're looking at the changes that we're seeing in there, but we're also, when we think about other things and objects associated with this, whether it's the pyre wood, or whether it's artefacts put with the body in the fire, they all change even though the soil and the dirt around the fire changes as a consequence of that burning. So when we are trying to identify a cremation or identify a site where a body's been burnt, we are looking for change and something that's a bit different from what would normally be expected.

Phoebe: They were really interesting answers. And that kind of brings me on nicely to my next question, which is more of an extension of what you were just saying, Tim, is what actually happens to bone when it's burnt? It sounds like you can definitely tell that bone has been burnt.

Tim: No, for sure. For me, this is the key question, what happens to the body when it burns? If you're not an archaeologist, if you don't deal with human remains kind of regularly in that sort of way, and you might maybe head off to a museum and have a look there at the bodies that are laid out there, I think it's very easy to kind of think about the skeleton as this inert, kind of dry material that doesn't change, but actually in life and just after death, the body is very malleable. It's very reactive and so the burning process changes the body fundamentally. And throughout both the kind

of structural side of things, but also down to the chemical side and the crystallography as well. The first thing to bear in mind though, as Yannis mentioned earlier, is that the skeleton and the soft tissues, the hard and the soft tissues, are intimately linked together. Actually you can't talk about what happens to bone without thinking a bit about what happens to the soft tissue and how that dehydrates and contracts and how that ultimately starts to be destroyed and disappears. And then as it exposes the skeleton, we start seeing a number of changes as the body goes through a dehydration phase, then decomposition, then inversion and then fusion. And through those four key stages, we see the fundamentals of the bone, whether it's the crystal structure, whether it's the chemical composition, whether it's just the physicality of the bone, is changing and transforming throughout all of that process. And what we try and do is study that and explore that and try and get a bit more creative in that. I think one of the things that we've seen more recently is, as our understanding of these processes has improved over the past 20 years or so, what we're able to do is just be more and more nuanced in our understanding and interpretation of those sorts of changes as well. So we're starting to look at things like stable isotopes now and how do they change within the body as it burns? My preference is that we don't think about fire as destroying the body. We think about it as transforming the body because the material that's left behind, although transformed and changed, it's still very usable. It still tells us something about that individual and that process of burning. Historically, it was always viewed that cremated remains, burnt remains, were useless, couldn't tell us anything about anyone. And in fact, they weren't studied. They were just disregarded and tucked away or lost. But actually we know that that's not true. And from my perspective, everything that you can work out to determine from a standard skeleton you can do from a burnt, cremated skeleton as well. It's harder and more challenging, but you can still do it.

Yannis: But it's more interesting in my opinion, compared to normal skeletons, if I can say that. When I started my master's some years ago and I was to choose a topic for my master thesis, I was thinking to choose something innovative. So I tried to choose something related with bones, but something different. And I discussed with my supervisor Sevi Triantaphyllou and she told me that maybe you have to check cremations and study some cremations. So when I was young, I had the perception that, when we are talking about cremations, we don't have bones. We have only ash, like nowadays when we burn someone, after the thermal episode, we have an urn with the ashes inside. But I was wrong and I realised that after cremation, the body is destroyed, but it's not totally destroyed. We have the bones, we have fragmented bones, of course, but they are pretty well preserved if they don't manipulate it in a way that they will destroy. And they have many things to say to us when we study them. The thing is that, as professor Thompson said before, they are very difficult to be analysed because they're very fragmented and they're not very well preserved compared to the non-burnt bones. The main difficulty, in my opinion, is that there are not many protocols that are suggested only for the cremated bones. And most of the protocols are suggested by Tim Thompson. He's one of the first that tried to understand how burnt bones can help us in archaeological questions. Now we try to explore and find more ways to understand better how we can study them. Because they have some difficulties in the approach compared to the non-burnt human remains. They have many things to answer related to taphonomy, to funeral practices, archaeoethnology, beliefs about death and ancestors and many, many others.

Tim: Yeah, I would absolutely agree with that and I completely agree as well that they are far more interesting than an unburnt bone, but just picking up that topic about protocols just for a second. Cause I think that's really interesting. It shows the development of the study of burnt bone over the past 10 years or so. Certainly when I started looking at cremations, there's a real lack of methods and SOPs and protocols to use for the study of burnt bone. So you started using just methods and approaches that were used on unburnt bone and just tried to transfer them across. And I was finding that that's a really frustrating process because it just wasn't working and it wasn't giving

useful results or you were having to do all these kind of manipulations of the methods and the protocols to make it work. I think what we're doing now and this is, again, some of the exciting work that Yannis is doing with his colleagues, is that we are developing methods specifically for burnt and cremated material. And I think that has allowed us to open up all these exciting new avenues of potential for study.

Phoebe: That does sound really exciting. And I was wondering actually, could you expand on what are some of these methods that you're starting to apply to cremated bone?

Yannis: The main difference between burnt and non burnt human remains are the thermal alteration that are in the burnt human remains. So we have some dimensional changes mainly, except for coloration and other things that we will discuss later I think, that make us to explore new methods to study only cremated bones. To be more accurate we have to create new protocols in order to apply new methods, like metrics, like forensic comparisons to see how can we create protocols to have an accurate sex estimation and accurate age estimation, not related only to the protocols that are used widely for the non-burnt human remains. And the other thing that we try to do is to approach burnt human remains as a key factor to approach things that are related with pyrotechnology in the past, funeral practices in the past, the use of fire in general in the past, not only in the human remains, but also in their daily life and of course expertise and beliefs that are related with the social relationships and the way they 'used' - if we can say that - death to create social relationships in their communities. So the human remains are the initial key to approach all these topics. This is why we try to be very accurate when we study the cremated human remains, from Greece for example.

Tim: Just to build on that, one of the key developments that we've seen is, as we've understood more about what happens to bone when it burns - we understand the changes that we've just mentioned, the changes to dimension or the fractures or the colour or the changes to the crystal structure - what that's allowed us to do then is start to develop methods that specifically explore those particular heat induced changes. So we've moved from just looking at burnt bone as a whole bone and kind of trying to describe everything that we're seeing, to having methods that specifically allow us to look at the chemical structure or specifically looking at colour or specifically looking at the crystal structure. And I think that just gives us that greater precision in our data and our results.

Phoebe: Yeah, I see what you're saying.

Yannis: If I can add something that we try to do, is to combine two different perspectives. The microscopic observation, that is very useful when we examine huge samples of human remains, for example, big cemeteries with millions of burnt human remains and also more specialised and more scientific orientated analytical methods that are applied in some of the samples because we cannot examine all of them. So we try to find a way to approach in a multi proxy level the bone. We start with the macroscopic examination, when we actually try to record as much as we can from the burnt human remains, starting from the colour alterations, the presence of warping, of fractures or shrinkage. After this, we try to select some samples and to identify more specialised archaeological questions related with the structural changes and the chemical changes in the bone structure. As you can imagine, you should be very careful, you should be very well-trained and you should have a big team to achieve all this because you cannot do all this on your own. It's a very time-consuming procedure compared to a 'normal' osteological report, but, pros and cons, I think.

Phoebe: That sounds really, really good. And then kind of connected to the methodological things is, I know, particularly for you, Yannis, your master's thesis and your PhD has focussed a lot on experimental archaeology. I was wondering if you could talk a little bit about how experimental

archaeology, particularly, can help us to understand bone in these kind of circumstances.

Yannis: Of course experimental archaeology is something very useful in the archaeological interpretation, because it helps us to understand better some practical things that we are not very familiar with. Concerning cremation, during my master's, I tried to come closer to the cremation ritual, because I was not familiar with that. So I tried to set up fires in different conditions, in open areas versus closed environments, burning animal bones because we cannot use human remains in Europe. I tried to understand how fire alters the body, how much time do we need to achieve an 'excellent' cremation with calcine bones, white bones and how the extrinsic and intrinsic factors modify the final result. So I tried to create comparisons to see how the same animal is burning in different conditions. And this is a big procedure. I mean, I will do this again and again and again and again, examining new things and new factors. But in my opinion, when you examine something with the application of experiments, you can learn many things, that are not only related with the practice of cremation and the fire and pyrotechnology, but also with all the sensual activities, the smell, the heat. It's something that is very unique and something very important for someone who studies cremations.

Tim: I think that's a really important rationale for using this experimental approach in this subject and particularly for something like cremation, which is so visual and it involves all the senses when you're kind of looking at that spectacle. It's worth just bearing in mind as well that, historically, one of the problems, challenges that we've had in the study of burnt bone is perhaps that approach to experimental archaeology has been a little too loose. What there's been a tendency to do is maybe, go and do a little kind of study, take your animal analog, it's a sheep or a pig and build a pyre and burn it and then see what happens. And that's all well and good but the sample sizes that you get there are often very small. There are so many variables at play. It's hard to draw any real conclusions about what's happening to the body. From my perspective, I'm very much focussing on what's happening to the body. I've always added that we just need to make sure that we have a really strict kind of experimental approach in the laboratory first, where we are just exploring, we're taking that kind of experimental protocol and we're investigating specific individual variables under very controlled conditions. And then when we've done that, and we understand that, we can do the sort of work Yannis is doing where he is taking all that knowledge out and then trying it in a much more actualistic study. That way we can really understand the sorts of results that we are seeing because we've done these really controlled studies to start with. That we understand the relationship between heat and the bone or heat and soft tissue or whatever it might be.

Yannis: To be honest, when I apply an experiment, I don't expect an answer. I expect confusion, one more confusion because always I will find something that, 'ah, I should have done this, or, maybe I did it in the wrong way'. So you always explore through experimental archaeology. And that's why I love experimental archaeology because you always have things to discover. Concerning cremation there are so many factors that you have to examine that actually I don't know if someone can answer all the variables that are available outside because, for example, it will be different if we set up a fire here in Greece, in Crete for example. The result will be different if we set a fire in London, for example, because the oxygen availability is different and everything will have different values during the application of analytical methods. But despite the fact that we will not have an accurate result in the end, the application of experimental archaeology helps us to understand better that cremation is a very, very complicated process that needs much effort if you want to create a successful fire and involves many different aspects, from collecting the woods as burning fuel, constructing the fire in a way that it will be successful, 'using' the human body, fleshed, semi-fleshed, defleshed, depends on the beliefs of the society. That's why I try to involve some experimental work in my approach, but it is very difficult.

Tim: It is very difficult, but, well, that's part of the fun! I think that retouched upon a really important aspect, that kind of experimental approach that's just been described there really underlines how cremation is a process. I think sometimes when we say cremation, we think about the burning aspect, but that's just one part of a broader cremation process and I think the sort of thing that Yannis is talking about really helps you appreciate how experimental archaeology helps you to really start to understand that process aspect of things as well.

Phoebe: Yeah, for sure. Even you just talking about it kind of raises so many questions for me as well. You've kind of touched on this already, but what kind of actual information about an individual's life can their cremation tell us? I know you are both very involved in studying the actual bodies involved in cremation rather than things like associated grave goods. How do you think this affects your interpretation of cremations as we see them?

Tim: All that information that you can tell about a person from an unburnt skeleton, a buried skeleton, you can absolutely tell from a burnt or cremated skeleton. So we can talk about sex and age and we can see pathologies, we can detect traumas, all those aspects of the being of the person that make up that osteobiography we can tell from bone. We just have to be a little bit more cautious in how we go about doing that because, as we've tried to describe, because the skeleton transforms so much through the burning process and a lot of the methods that we use in anthropology are based on unmodified bones, we really have to think carefully about the methods that we use. So we're starting now to develop methods specifically for burnt bone. And again, if we think more broadly to anthropology, one of the key things that we have to be conscious of is this thing called population specificity, whereby we know that sex determination, age determination, stature calculations are all dependent upon the population that we're studying. What we are starting to do now is view cremated material, burnt material as its own population group. As a consequence, when we start developing methods specifically for that population group, we're getting much more interesting and more reliable results coming back from that. So we can absolutely say all the sort of demographic information that you would normally do. We're starting with the development of some more interesting analytical approaches. We're starting to be able to do things like stable isotope and look at mobility and things as well. That's a quite exciting development that we're starting to see. Historically, the assumption was always that we couldn't do any sort of stable isotope analysis because of the changes to the chemical composition, but that's not entirely true. We can look at some of the heavier elements. The really exciting thing now is where we are starting to move from that study of the individual - so looking at the sex and age - taking that understanding of the biology and trying to take a step into the social world, really. What can we say about how people in the past viewed the world around them from how they burnt individuals or cremated individuals? And we do that by looking at the body itself. And trying to make those leaps. We mentioned at the start this phrase 'the archaeology of cremation' and that's where the really exciting work is happening at the moment where we're starting to try and tease apart how people interpreted and interacted with the world around them, from the evidence that we are looking at, which is burnt bodies.

Yannis: I totally agree with Tim. In archaeology, we try to approach the past. So when we examine cemeteries and human remains, we examine only a part of a big context. We can answer various archaeological questions through the examination of the burnt human remains, including all the aforementioned. The only thing probably that we cannot examine is the estimation of stature because they are very fragmented, but it doesn't matter. In Greece, I can say with safety, we try to understand better the differential use of fire in the human remains because in prehistory, at least, we don't have only cremations as we know nowadays, but we have a different use of fire, in different levels. We have the typical cremations that someone was burnt. And after the burning episode, the bones were put inside an urn. But also we have commingled depositions, like the

archaeological site that I examined for my PhD, where we have big phallus tombs, for example, and inside these areas, we have more than 100 individuals at the same time, at the same context. They are all burnt, but they are not burnt at the same time. So we have secondary manipulation and we have the final result of a big history. Through the examination of the human remains, we can approach all these different levels and we can understand how they manipulated the deceased in the past. Through the application of all these methods, both microscopically and also analytical, we can approach the taphonomy and how the context was created. We can estimate the minimum number of individuals, that is very difficult because we have tiny fragments and we try to apply an accurate protocol in order to be accurate when we say that, okay, we have almost a million of bone fragments, but of course we don't have almost a million of individuals, but the bones belong to, for example, 200 individuals. It's a big procedure to do this. We have to be very careful. We have to be very patient. I think that we have many, many things to answer through the detailed examination of the burnt human remains.

The other thing in Greece is that we have also a strange use of fire in rituals that are not part of cremation. We have small fires inside the cemeteries, inside the graves, or also outside the graves, where they set up small fires and they just put some bones - defleshed - in the fires for a small period of time, without the perception of cremation that we have now, but in order to use fire as something very impressive, a ritual that connects the past with the present. The final result of these rituals is fumigated human bones. We have brown bones - brown is the normal colour of a non-burnt human remains - if we have a normal taphonomical context - with black spots on the exterior surface, indicate that the bone came in contact with a fire for a small period of time. So I told all this in order to understand how many different uses of fire we have in the manipulation of the deceased in the past.

Phoebe: That sounds really impressive, really interesting. How frequently do you actually see cremation in the archaeological record? I know that you've talked a lot about how fragmented the bones are. So is it something that is a bit more victim to taphonomy than other human remains? But also like for me - I'm a really prehistoric archaeologist, I study Neandertals as my main thing. As far as I'm aware, cremation is not really something you see then. Are there spatial patterns that we can see with cremation?

Yannis: In the past, the archaeological approaches were totally different. So in Greece, when they excavated something, they were careful only for the artefacts and of course for the precious artefacts. So they didn't care about the bones. So most of the times they didn't collect the bones, unfortunately. Concerning cremations we have many examples that we don't have the human remains, but we have the cemeteries but also hopefully we have the bones, not because they were actually interested in the bones, but because the bones were inside the big pots, the big urns. So they are somewhere in the museums, in plastic bags and waiting for someone to study them. As Tim told before, until recently, burnt bones were considered as less important compared to the other human remains. Tim was one of the first who tried to do this, and now there is also a tendency to study cremations across Europe. We have the samples, but unfortunately we don't have the initial place of the samples. So it's totally different when you excavate something and you know the archaeological information and it's totally different just analysing plastic bags from the museum without the context.

Tim: Yeah, absolutely. That's a real challenge for cremated material, is the fact it has often been separated from other material from the same kind of context. I'll just add a couple of points to Yannis there. Cremations in the past are not uncommon and I'm not an archaeologist, so I can't go into details about the gaps in the record, but they're not uncommon. One of the challenges that we

have is identifying them because sometimes... if you imagine when you've got the kind of fragmented and cremated bone and the bone sometimes it's put in the grave, sometimes it's put in an urn or a pot, sometimes it could be sprinkled on the ground, it could be sprinkled in the sea. There's lots of different ways in which you can treat that material, which doesn't necessarily mean that it ends up in a nice grave cut that you can identify in a cemetery. The other thing, just to note as well, we talk about cremation a lot and the implication there is the intentional burning of bone, but also in the past, we have records of accidental burning. This is not human material, but we worked on some mammalian material from a cave where the bone was burnt, but it wasn't burnt as an intentional process. It was burnt because there was a separate fire, at a later date, that happened in that cave. And then that material happened to be in there. So again, sometimes when we're looking at burnt bone, it's not just burning from a funerary process. It's also incidental burning, accidental burning, burning involved in other sorts of things. We can also think about perhaps a bit more broadly about the use of animal bone and cooking and those sorts of things as well. And then the final point I just wanted to mention was, when bone is burnt, especially if it's been burnt at high temperature, high intensity, it is what we call calcined. So the organic material is gone and the inorganic material has started to change its nature. That material is really inert. So what we find in the archaeological record is that once that bone has been burnt, there's a good chance it won't be subject to other taphonomic changes after that. The challenge is that it's been fragmented and transformed, so it's harder to study when we have it, but there's a good chance it will survive that prolonged period of time.

Phoebe: They're some really interesting points to add on. It really makes it clear how complicated it all is. You've both touched on this a little bit, but it sounds like interest in cremation has changed quite a lot over the last few decades. Is it growing, how are archaeological approaches to cremation changing? Are more people becoming involved?

Tim: Yes, I think, is the answer, but it's still not many, you know? You can count the number of research groups that focus on cremated material on one hand around the world. For me there are two kind of key developments. One is that the methods that we might want to use, or the analytical techniques that we might want to use are just becoming more accessible, partly as a consequence of costs, they're just cheaper to buy, but also I think it demonstrates that archaeologists are collaborating more and more with researchers from different disciplines. So although you might not have a particular piece of kit in your archaeology department, well, maybe they have in the chemistry department or the biology department, and there's a lot more kind of sharing of equipment going around. Just having access to that equipment and the expertise has allowed us to do more interesting studies and we've published those, and now because of that, people are realising that we actually, we can tell quite a lot from burnt material. The other thing is that, when we look historically, what we tend to see is an individual, an academic here or there doing, 'oh, here's an interesting study. We found some cremated material. This is what we can tell about it. Here's the cremation context, this is what we know about it. Oh, we'll just do a little experimental study here, a little experimental study there', and it's really potted. But what we're seeing now is proper research groups like the one that I've been working in or the one that Yannis is working in. There's the interesting groups in Portugal, in Belgium as well, where we are doing some studies and then building on that study and building on that study and that iterative approach. So we're getting that momentum and that mass of publications and understanding in a way that we haven't done before.

Yannis: Yes, I totally agree. We are not so many who try to understand what's happening with the burnt human remains. But the key of success is the collaborations. Because it's a very complicated topic and you have to answer so many different questions, you have to combine archaeological, biological, chemical, forensic, and other factors. We have to collaborate with each other to approach

as accurate as we can the cremation, not only for us, but also for the others that are coming. We have many things to do in the future. I'm very grateful that we discussed this topic and that cremation is 'the talk of the town' now and not something that is very difficult and something that 'ah no, they are crazy. They don't have anything better to do', I'm very happy for that.

Tim: Collaboration's really key. I've been doing this for a little while now, but when I see PhD students, postdocs coming through, that potential for moving around different research labs and different projects and really getting that much more holistic understanding of what's going on in the discipline and with the material itself as well, is so exciting. The publications and the work that's gonna come out over the next two, three, four years is gonna be genuinely kind of cutting edge stuff, which helps us to completely rethink our approach to burnt bone. It's very exciting.

Phoebe: It sounds very exciting, I look forward to hearing all about it. I've got a question that's kind of a little bit unrelated to what we were talking about, but are there any ethical issues in particular that you come across with studying human bones and perhaps with cremation in particular, that are different from ones that you might see with studying human remains in other circumstances?

Yannis: Yes, this is a very complicated issue. In Greece, we are not allowed to use human remains - modern human remains - to answer archaeological questions. But there are other labs in Portugal, for example, that are for forensics and they try to suggest new protocols using corpses from modern humans. And this is very cool. In Greece unfortunately only medical doctors can do that. So we are not allowed to apply methods to human remains. That's why we choose animal bones and we choose pigs because they are considered as the animal which is closest to human because of the nutrition and other things. Of course we have ethical issues because we study human remains and we should respect them. We should not consider them as artefacts or something that are not important. That's why we cannot apply analytical methods to all the samples that we study from an archaeological context. That's why we have to choose only some of them. But I think that all the scientists who study human remains respect them more than others because they create a different relationship. You come closer with this and you respect it in a way that is very unique. But if we want to publish something, of course we have to follow the ethical issues that are widely suggested.

Tim: Absolutely agree. Ultimately we are studying people and human remains and so we need to treat these individuals with respect. That relates from everything, from the methods that we develop through to the way we might excavate sites and in the forensic context again, how we might use that information from forensic case work as well.

Phoebe: They were great answers, thanks. I really wanted to get that question in. I've also got one more question that I think I would like to ask before we start wrapping up and that is: what is your favourite result that you have come away with so far? Tim?

Tim: Actually my result doesn't relate to human remains, but to some work that we did years ago on giant sloth bones that we were studying. In essence, we were tasked with answering the question, had these sloth bones been burnt at the time of death, or sometime afterwards, because it related to, potentially, how humans had come across and started to change the islands where these sloths were found. It took us four years to answer that question! And the reason it took us so long is because we - it sounds like a really simple question, but actually at the time when we started it, we didn't have the methods or the approach or the protocols to be able to answer that question - and so it took us three or four years to develop methods, to test the methods, to do the experimental work. And then we had to kind of test the material of interest itself and we had to get some comparative material. And I just remember when I had all this data together, plotting it on this Excel spreadsheet and creating this graph of all these data and this wonderful moment of realisation, after

four years, being able to answer that one fairly simple question. So that for me was really exciting, but also what it did was the process of developing that method then it has kicked off some of the other work that we've done in burnt bone as well.

Phoebe: I can see why it's a favourite. That sounds very satisfying.

Yannis: I'm glad to hear the story of Tim, because I don't have the experience of course of Tim. I am just in my first steps. But I have also a story concerning a nice result. The most impressive result that I had was in Brussels when I went there to apply some analytical methods and I realised how much time you need to understand the chemical and structural changes. I'm an archaeologist so I was not familiar with all these methods and thanks to professor Christophe Snoeck and his team and my friend Elissavet Stamataki, they tried to teach me how all these put together to answer archaeological questions. I remember my last day in the office - I was there for at least six months - and we discussed the results. I was very confused because I had only numbers in the Excel, nothing else. And I say that 'I came here because I want something to say in my dissertation, I have to suggest something about how cremation was applied in Minoan Crete and we only have numbers here and how can we use them?' They are very expertised of course and we try to discuss with very much patience that when you apply analytical methods, isotopes, FTIR analysis and other stuff, you have to be very careful and you have to take into account all the factors that are related with a result. I told them that I'm an archaeologist, I want an interpretation and I want a nice story. And we realised that lime was used and that was a nice result because lime alters the chemical structure and it creates many problems for us during the interpretation of thermal alterations. So I don't have an answer now to give you, but the nice result was that, at least in Crete, in the site that I study, in Koumasa, lime was used in different ways before, during, and after the burning event.

Tim: Well, that's a great example, that's so interesting.

Phoebe: Yeah, it sounds really interesting. So this is now my actual final question before we finish up completely which is: what are your plans for the future and how can the EXARC community help to make a difference in regards to all of the points that you've discussed today? Tim, would you like to go first?

Tim: I've been very fortunate in that I've had a really rewarding academic career and I've kind of stepped away from that kind of standard academic role and moved into the dark arts of senior leadership over the past few years. So the amount of time that I get to spend in the lab and doing research is much more limited than it used to be. But I'm very lucky in that I get to work with some really interesting different contexts. I don't have one particular period of time that I'm interested in. I like just interesting things. But crucially, I get to work with some wonderful people. The thing that I'm looking forward to the most over the next few years is continuing working with great, exciting, particularly early career kind of academics, that are coming through with these great ideas, interesting contexts, and that sense of collaboration that we mentioned earlier. Building that community, I think for me is gonna be a really rewarding and exciting part of that academic journey that we're on.

Phoebe: Thanks, Tim. Yannis, what about you?

Yannis: I have to write my PhD and edit all these tables that I have now, but I think that we have many things to do in the future. EXARC will help us for sure, because it provides us with information concerning experimental archaeology that is very useful in our studies. Also I hope that I will explore more things concerning cremation, human remains and analytical methods in the future. I

would like also to be a part of a big network with very important scientists and discover new aspects and new methods of approaching, analysing, and interpreting burnt human remains. And I think that the future is collaborations.

Phoebe: Yeah, for sure. It sounds like a really exciting future for all of research into cremation. And I think collaboration is a really nice aspect of it that you've really, really touched on today. So thank you both very much, Tim and Yannis, for joining us today and for sharing your experience and expertise. I know that I have certainly learned a lot and I'm sure that our listeners did too. And a big thank you to everyone else for listening to this episode of #FinallyFriday by EXARC. If you would like to become more involved with EXARC, why not become a member? Alternatively, you can make a small PayPal donation through the website to help support EXARC in its endeavors.

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