

# EAC12 Q&A Session 5

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Hello, everyone. Welcome to the live question and answer session for Session 5 of the EXARC Discord YouTube conference. This session will be recorded so you can access it later on YouTube, along with the rest of the conference. And we're going to start with Sam.

**Sam, would you be able to make a core out of chert or other materials or would the flaws in the rock make it difficult?** Thank you for the questions. So, the milling machine is able to handle material that has a pretty high hotness measurement. So, even with variation among raw materials, the shape will come out to be identical. But what's important is that these flaws or internal inclusions will be exposed onto the surface, on the core. So the shape will be identical, but these material variation will still be represented among the cores. And that's one thing that's quite important with this process is that we need to increase our sample size, to really look at how these variations influence a flaking outcome in our experiment. Thank you. And, a question that's for both of you and for Li Li.

**Could you use different tools to impact the rock? So for example, using a hammer stone or an antler.** So for the drop tower set up that I am using, I'm using [steel] ball hammer as a proxy or as the hammer to make flakes from the cores because of how it's designed, because I'm using an electromagnetic switch, meaning that if, let's say, if I use an antler, I will have to figure out a way to somehow make it work with the switch so I can still release it and they can free fall on to the core. And also, it may be possible, but I just have to find a way to make it work with the current setup. Iso because I'm using gravity to drive the hammer. If the hammer morphology is very different from what it is now it might not be able to freefall precisely on where I want it to fall on the cores. So, that would be... I would not say it's impossible, but that will definitely take some work to figure that out. Sam: So for my part, in contrast to Li Li, drop tower design, we can definitely use different materials for the hammer attachment. All it takes, really, is to produce the hammer from different raw materials and then bring it to our wonderful engineering workshop to say, can you make me an attachment? And they will do it. So currently we're using... we're making a copper hammer for example. Oh, fantastic, thank you. Back to Li Li.

**How do your results compare with more traditional flint knapping knowledge? Do they agree with the ideas of experienced flint knappers or are they more counter-intuitive?** So in this experiment that I present in my poster, I mainly examined the influence of angles' blow on some specific features of the bulb and to my knowledge, I'm not sure how much it agrees with the results from replicative experiments. I can say that it definitely validated some of the earlier results from the control experiments specifically conducted by [John ...] in the seventies. I would say it's in agreement with what he felt, but I'm not so sure about how much it would agree with what a flint knapper says, because, one thing is that the bulb percussion it's, it hasn't, to my knowledge, it hasn't been, really, what should I say, systematically investigated in many of the studies. So, I don't have a definitive answer for that question. Thank you, very interesting.

And, a question for Conor:

**Are there also potential dietary differences between modern bats diets versus bat diets in the past which could affect the acidity?** That's a very interesting question. So insectivorous bats have much more acidic guano than fruit bats. In terms of whether their diet was much different in the past that's very hard to tell. We assume that similar species of bat, the Eastern Horseshoe, or very similar species to the ones that we investigated probably had a similar insectivorous diet. I think in the pleistocene that probably didn't change too much. We specifically picked the species of bat, the Eastern Horseshoe, because they are a good analogue for... they're distributed widely, or similar species are

distributed widely throughout Asia. And so we felt that they were a good analogue for the bats whose poo we were digging up.

Cool, thank you. A question for [Ivan](#) and [Spyros](#). So I'll read this out and you can work it out as I go along, this person said: I'm excited by the bow experiments in this paper.

**Was the square hole in item A used to hold the piece in manufacturing? I think it would have compromised the limb if used for attachment, is the first part of that question.** Do you want to answer that first and then I'll continue on? Well, it was very hard to make these parts and especially with the Bronze Age tools. We were working with a very experienced master, Klim Abramov, and he using the bronze saw for the work and it is very interesting that in the materials of the Sintashta culture in which burials we have these details we have these examples of the [little] saws. These saws of course were not for wood only for the horn, for the antler. He spent maybe eight hours for every example of these eight in A, it's very hard with the carving. He knows the techniques, how to make the horn more soft and he using them. He boiled these details, but not so much, to not make the structure very mild. So he spent a lot of time with producing this. My friend, what do you think about this [Spyros](#)? Yes, I don't know if I understood the correct question. I think I heard the comment about the hole in item A. The hole in item A was a special construction to hold item A on the bow. So we had to make a special..., let's say, a special pin on the bow shaft, in order that item A will be placed on the limb of the bow. As we described in the text we decided not to put item A in the inner side of the bow, we decided to put in the other side, otherwise we would face problems of..., that for example the item A would be detached from the bow shaft and may cause an accident. So with this special pin on the end of the bow limb, we attached item A, we used natural glue and sinews and item A was attached firmly and we didn't have any problem.

Cool. Thank you.

**And then the second part of that question was about the interpretation of item C as being an arrow rest for various distances.** The person who's asked the question says: **while it would work well as a sight for various distances, to use different levels to change the distance would change the angle of the arrow, therefore decreasing the efficiency of the draw and adding friction against the rest. They're also concerned that it would slow the reloading rates.** So I think that's two questions in here that they ask. **Did you try multiple arrows? I know it's a silly Hollywood trick, but it does work when you've got time to preset the arrows, especially when you want to get as many arrows as you can into a target in a short period of time. So essentially, did you try shooting multiple arrows? And are you certain that item C would have been an arrow rest for various distances?** Yes for the second part of the question we saw that this device, item C, can be used potentially as an arrow rest. We tested it and we saw that indeed it works as an arrest. Of course we cannot be 100% sure. But, for us, for our team we believe that it is the most possible use. It worked, it definitely worked, because we could put the arrows on the different levels and we could say that we could aim in different distances. That's because the laths of this item gave us the opportunity to shoot in a higher level or a smaller level. And now as about the other part of **the question if this device could help us shoot the multiple arrows.** No, we didn't test it, but we believe that this is some kind of, you know..., this theory of shooting multiple arrows is not historically correct [...] point of human history. So we didn't, you know, put ourselves in this question at any time. So we just focused on, of course, one arrow at the time and we used this device trying to shoot at different distances aiming at different targets each time. And we saw that it could be worked like this. Ivan: I absolutely agree with Spyros because Spyros is an experienced archer and I think this conclusion is correct. Thank you, my friend.

Thank you and now a question for [Ekaterina](#) about the reconstruction of the neolithic sanctuary: **What wood working are you hoping to do in your coming program at the museum?** With authentic methods the team built one log, one experimental log and the ends of the log will be cut with the stone tools, with the stone axes. So it is not completely reconstructed by authentic methods, but the basic algorithm, the basic moments was reconstructed by the team with the authentic equipment. And it was enough for the measuring of the work time and the results show... We know that this

sanctuary was built many times, or have minimally two layers and we know that they must, I mean, the ancient people reconstructed this many times, make the reconstruction of the different logs and rebuilt the circles but anyway it is anyway one season, one warm season to build such a structure, to build all the sanctuary.

Fantastic, thank you very much. And then a question for Diana.

**What is the most important challenge for experimental archaeology in Kazakhstan? How do you see the future?** Thank you. In my view of the main problem is the lack of experimental archaeologists and laboratories at universities. Accordingly, most of the students' research don't have an experimental part. To solve this problem in our department, my scientific advisor [...] gave me the topic of experimental archaeology for practical application of experiment in [curriculum]. For instance in this summer, we are planning to conduct a series of experiments connected to the process of building of [...]. And I believe that our attempt helps to promotional [...] direction among archaeologists. And the number of publications will increase after that.

Fantastic, thank you. Yeah, I hope to see more experiments from archaeologists.

And a question for Gábor: **Could you elaborate on how the damage to the bronze arrowheads compares to the damage on the artefacts? You said most of the arrows hitting the hardwood broke on impact (which is to be expected given such a small socket - and I wonder if it was just to save on bronze, or if it was deliberate in battle so the arrows couldn't be reused against them), but how did the bronze tips do - did they fracture, deform or remain relatively undamaged?** Thank you. I'm answering instead of Gábor. The thing is that we used an alloy, bronze alloy, which contained 12% percent of tin. And this was probably softer than the originals known from the Ukraine, for example, from the Ukrainian Albio from the province of Dnepropetrovsk. There is known that the arrowheads contained up to 20% of tin and the same percent of tin. This means this alloy was made from brass and bronze. And because of brass contains a high amount of cadmium, which is really unhealthy for living systems, it's very dangerous to cast these arrowheads, like it's a bit more poisonous than any bronze. And these arrowheads would be much more harder. I know a case when we dropped an original and it broke. So they are much more brittle than our arrowheads. So this could mean that the damages on the original arrowheads were caused by a softer surface they were hitting and it's not an easy task, because of the differences between the possible structures they were hitting. So if both would have been stronger, the arrowheads could (have) penetrated more deeper. And because the sockets are so thin, it's very likely that the arrowheads should have been broken down anyway.

Fantastic, thank you.

And a question for Igor: **How did your horse react to the cheek pieces? Did he like them or did he seem more bothered by them than modern equipment?** I will answer for Igor. His horse was a very experienced guy, and he really liked these exercises because these Bronze Age cheek pieces, these Bronze Age bridle was much more easy for the horse, much more mild and more good for the humanity with the horse, to be human. And also he used this cheek pieces in many different variations. He used these for the horse riding and also testing them with the little model of the chariot. In both variations the cheek pieces show the traceology, the same traces and it shows us that they can be used in different variations. We know that maybe in these very early times, we don't see the histological deformation or don't see the deformation of the skeleton which show us the horse riding, not deformation in the men's skeleton, in the burials. But from the late Bronze Age, we have evidence of these transformations and even from the maybe 15th-14th century BC in the steppes of the Southern Ural and Northern Kazakhstan, we can start to think about the horse riding, of course not about the battle cavalry, but the evidence of early horse riding. And these cheek pieces can be used for the both variations as I said before, for the chariot and for horse riding. And his horse really liked this more than the modern bridle. And now we are also working with two horses and in this winter we're testing them for the new experiments with the chariots and both of our horses also like this equipment. So it is very good for the horses.

They sound like lovely colleagues to work with, thank you. I'll go back to a question for Igor's

research. **Do you know what type of paint he used for the wear analysis on the cheek pieces?** He used the instant marker, the marker for the boards and it looks..., it works well because it deletes very easily if you need to... work with a tool to delete this completely. We're also using this for our experiment with the bow, with Spyros. And it is a good variant because it... of course it shows you the place of activity in the use-wear and you don't need to work until you have a very big penetration. You just can wait until you delete this paint.  
Cool, thank you.

And thinking of paint, a question for Sam. **You mentioned you spray-painted the core. Did you continue to spray-paint as the pieces were flaked off and did you color-code them to show the sequence?** So the cores were only flaked once, they were spray-painted before, so we can scan them, and then sprayed again after flake detachment so we can scan again. So we get the 3d record of the entire sequence, but again, each core was only flaked once, because we want to keep the core morphology constant.

Cool, thank you. And then a question for Conor. **Are you able to determine how long a deposit would have been waterlogged for? Would it have been a result of seasonal flooding do you think?** One of the issues with micro-morphological features is that you can see micro stratigraphic evidence of sequences of environmental change due to features being superimposed on each other. But you often can't date these features because..., unless in an exceptional circumstance, perhaps where there is an orthogenic [flow stone] or something within a layer, something like that. In terms of what I think..., I think that it was waterlogged for most of the time that it was down there. And then it may even have been..., it probably..., nothing stays completely the same for that amount of time. But it was actually still wet when it was dug up. And I think that those gypsum crystals that formed might even have formed after it was excavated and dried out then. But really there's no way to tell.  
Thank you.

A question for Ivan and Spyros. **The old and highly scientific experiments by Semenov are well-known around the world. Do you see chances for experimental archaeology in Russia in a more free setting? I mean, not just with a microscope and computer, but in a workshop handling wood and other materials like you did with your boat project together with [...]. Do Russian scientists appreciate the need of being more experienced with your hands as well as having academic rigor or do most archaeologists in Russia believe that that is not scientific enough?** Thank you for the question, a very serious question, because really we have a very big scientific school or the traceology or the usewear analysis, especially for the Stone Age and maybe it makes a little bit problems with a vision of the experimental archaeology in Russia, because many scientists think that experimental archaeology, it is only the usewear and it is only the traceology. Maybe only traceology of the flint and stone tools. And when your experiment comes outside of this theme somewhere for example in archaeometallurgy, when you can't fix it all the stages of the process as an..., with a stone, or for example, with our bow experiment many, many scientists think that it is not anymore a very scientific way, that it is you're not prove 100%. For example with the bow, we have the traceological analysis, usewear analysis... that on the original details we have the traces, which prove us that it must be the bow. And of course it is important information, but for more understanding..., to take the more understanding we need to make a big experiment, we need to understand why they can construct this type of the bow, what these details give to the bow, how difficult to construct it this bow, how expensive construct this bow. And for all of these questions, we can answer only with these big complete reconstruction. And of course we never can be 100% sure that it is exactly what they do in the past, but also we don't have the 1 million bow details in the archaeology, so we have our source and I think that we..., if we will do these complex experiments more and more, we will show to our colleagues that it is important, but because anyway we have now much more information about this phenomenon, we're more closely to our task, anyway. So, my answer is that, of course, not every archaeologist thinks that experimental archaeology is not scientific, but a part of Russian archaeologists and specialists, Stone Age specialists, think that it's not very scientific and especially...

and even some people tell that experimental archaeology does not exist. It just exists only usewear analysis and it is the reason why we don't have here in Russia, very big complex projects, which include the scientific educational and touristic, for example, as a big archaeological parks, very little numbers. And our big task is to make this. So we see on the future with optimism.

Thank you for that thoughtful answer, that's fantastic.

A question for Ekaterina now. **Can you tell us what difficulties you faced? Was this your first full-scale experiment and what would you have done differently or what would you do differently next time?** This is our first project for full-scale reconstruction of an archaeological site and maybe the first example of reconstruction, the full scale reconstruction of a sanctuary in Russia. The most difficult was the analysis of archaeological resources, of the reports, because reports were written in the eighties and all the sanctuary was dug in the eighties, so it was a very big task to analyze all these materials and create firstly the reconstruction on paper and the reconstruction of the 3d models and all of this. And only after this we prepared and started to reconstruct the real processes. And the second difficulty was to put the modern reconstruction parts exactly in the original places. Because of course the archaeological record and the real site is not everywhere equal. So on the ground, on the field, it was a difficult task to put the reconstruction on the original places. But on the working process and especially when we work with the ditches of the sanctuary, we saw that we completely had done it and we fixed all details on the original places. Thank you.

Fantastic, thank you very much.

A question for Li Li. **What inspired your research having tried flint knapping by hand?** Yes, so, I have only tried very few times, flint knapping by hand. My research was inspired by the...the drop towers...it's a classic setup and it has been in..., it appeared for I think over 50 (years)... for I think about 5 decades now in the experimental study of lithics. So for my study I went back to this classic setup because for several reasons, the main reason is that it's much faster to set up an experiment using this simple setup and yet it is still highly controlled. And with the results obtained from this simple set I can then apply it to more realistic experiments, like the setup that Sam is doing for his studies. So my goal is to use what I learned from this drop tower set up to a more realistic experimental setup and then to interpret the archaeological record.

Fantastic, thank you.

And Sam, I'll throw that question at you. **Have you done much flint knapping by hand?** Yes, so I've been flint knapping since as an undergraduate student through my PhD and now I routinely flint knap, and also teach flint knapping my classes. And I think this is an important point to make, and it relates to an earlier question about this often constructed dichotomy between controlled and realistic experiments. And I think increasingly there're more studies using a mechanical and control experiment. And it's not to say they're alternatives or that they're sort of dichotomies. And I think Veerle Rots made this point earlier in her hotspot study, that they're complimentary and they're important components in a coherent hypothesis testing cycle in generating archaeological inference. So I think what's important is to think about these things... is not so much as a dichotomy between what's realistic and what's scientific, but it's more that we generate ideas and hypotheses from re-enactment, right, but we need to have a way to move forward by validating or potentially falsifying some of these ideas. And this is where controlled experiments come in. The point of it is not to be realistic, the point of it is to be as rigorous as we can to clarify these questions. Thank you.

I'll ask the question again (for Olga who's here now), just to remind listeners.

**So first your patience astounds me, Olga, having carved stone with steel tools. I would have been petrified of the stone cracking. You mentioned going through many of the small bone drill tips, but how often did you have to fix the large drill bit and how heavy were the weights you added to the side of the drill?** Olga used two types of drills. One type is a wooden drill real, a maple drill and also the flint drills and the weight on the drills is not so heavy. It's near the 600 grams only, but it's enough for the drilling. The interesting moment that in the first experience with the ways that you can see on

the poster of the speech, Olga used the drill with the bone tip, a wooden drill with the bone tip and now she continues the experiments and she produced a vase, an Egyptian vase at the moment using a stone drill on the wood stick and also, important moment that she... working with a much more harder material. It is not marble, it is diorite. When Olga first time working with the base and working with marble, she used for all experiments only one leg bone of the cow, but now the material is much more harder and she is using every day the new drill, every day. And she needs lots of drills. Fantastic. Thank you so much for that detailed explanation.

And now a question for Diana. **The open-air museum sounds fantastic. Do you have a lot of interaction with the museum visitors and are they able to contribute to the research?** Unfortunately I wasn't in the museum this year, but I plan to visit the museum this summer and also ask about experiments and how.., like how many visitors visit and other questions.

Thank you. And now a question for Ivan and Spyros, **Is there a particular reason you dried the elm wood for the bow for 10 months?** Yes, of course. Anyone who is familiar with bow technology would understand that if we don't use dried wood the wood will break, it's a normal procedure every bowyer follows. So that the staff of the bow will be dried enough, otherwise, if there's moisture inside the bow shaft, the bowl will definitely break. So we waited for this particular period of time in order to have a dried bow staff. Thank you for the question.

Thank you and then the question for Gabor/Zoltan: **What was the glue used to glue the deer tendon to reinforce the arrows made out of?** Yes, we used rawhide glue, simple rawhide glue. Fantastic, thank you, nice and simple!

And then the final question I have is for Conor. **What material were the boxes containing the experiments made from? Would that have affected the experiment as it would have been a sealed environment?** Okay. It was food grade plastic, polyurethane containers, similar to those that you would get a takeaway in. We chose that material specifically because we would think that it would have no effect on the experiment, particularly at such low temperatures. Someone else asked me this question, and I've tried to think if there's any way that we could assess for any contamination, but certainly with the FTIR and geochemistry, we had no indication of a contamination from the plastic. So I think it didn't have any effect.

Great. Thank you. So that is all the questions I have for you. Thank you very much for joining.