

Magnifying the Past

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Introduction

So you've dug up an object... but how do you know what it was used for? Microwear and use-wear analysis is a growing sub-field within archaeology looking for microscopic traces on artefacts which might give us clues on how they were used in the past – or what might have happened to them once they were abandoned. Join us on this month's episode of #FinallyFriday for a deep dive into the world of microscopes and experimental reference collections.

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 micro- and use-wear analysis.

Matilda Siebrecht is a professional archaeologist and journalist. Matilda has been a member of EXARC for many years, volunteering in several roles, such as being one of my lovely co-hosts on the show, helping organise conferences and events and since the beginning of 2024 has taken over the role as EXARC's director. Outside of her EXARC responsibilities Matilda is a microwear specialist. Her master's research focussed on amber and ground stone analysis and her PhD research at the University of Groningen examined use-wear on ivory and bone tools from the Arctic Historic Populations of Canada.

Éva Halbrucker is a use-wear specialist and postdoctoral researcher at the University of Ghent. As part of her PhD, Éva used use-wear and microwear analysis on flint to examine the Neolithic-Mesolithic transition of northwest Belgium. Éva is now doing similar research as part of the ROAM, a Regional Outlook on Ancient Migration project, examining the lithic material from the Mesolithic in the Meuse Valley in southern Belgium. Additionally, she is also part of an international research project of a Bronze Age tell site in Hungary, as a stone tool specialist.

So a really huge welcome to both of you. Thank you so much for joining me today. I'd like to start with the basics. I've got a couple of questions that all link together and they're all quite basic. I'd like to start with: what are use-wear and microwear analysis and what kind of information can we gain from using these techniques? And are these two names for the same thing or are they different things?

Éva: The two names use-wear and microwear analysis are kind of used as synonyms, but they not exactly mean the same thing. Use-wear really refers to the traces that are caused by the use of the tool. And microwear should also include post-depositional damages or after-treatment like in museums and the production of the tool, the traces of the production. So all these things are supposed to be in the microwear and not really in the use-wear. In bigger publications or like theses we always explain the terminology, of course, and what are the differences, but in the real world they are used as synonyms.

Matilda: And I would add to that even the word microwear, because it has the term 'wear' in it, sometimes also some people claim that it only refers to the use, because it's the sort of wear of the object during use. So depending on which papers you read, you might see microwear, you might see use-wear, you might see microscopic traces of manufacture and use. You might see microscopic analysis...

Éva: The other part of the question is what kind of information we can gain. This explanation of the terms also kind of included that we can gain information of the biography of the object, mostly focussing on use, but also including production and afterlife of the tool. It's mostly

what kind of material was worked with the specific tool in our hand, in what kind of motion.

Matilda: Out of curiosity, you always did use-wear, right? You always looked at the use of the objects first?

Éva: Yes. It's also because I am looking at lithic tools, the whole production part and stuff that's really for the technology. It's much more separated than I think what was for you, especially with the ambers. It's data too. Now there are some newer studies that actually look at the micro traces caused by production of the stone tools. During my PhD there was one person doing the technology and I was doing the microwear and sometimes we discussed our results, but it's two separate disciplines, basically, in lithic analysis.

Matilda: Because I started off doing manufacturing traces. That was how I first started doing microwear. And then at some point I had to learn the use-wear side of things because you do it... we're getting very technical now... but to try and keep it simple... what I'm saying here is the very, very simplified version, but you can use low power microscopy to look at things like traces of manufacture. For example, I was looking at amber beads for my master's thesis, and I was trying to see what kind of tool material was used to drill the beads. So whether the drill bit was made from stone or antler or metal and so for that I just needed to use low power microscopy to look at the tool marks on the inside of the hole of the perforation inside the bead. But then when you're looking at use-wear, so for my PhD I was looking at, for example, needles and then you had to use high power analysis. So that's, I guess, what Éva has always been doing, is looking with the high power analysis. So you're looking, what is it, like maybe around up to a hundred times magnification -ish for low power microscopy and up to 100, 500 and then up to like thousands of times magnification for high power. So even within microscopic - or microwear, use-wear, whatever you want to call it - analysis, there's lots of different subtypes of analysis as well. So whether you're looking at manufacture, whether you're looking at use, whether you're looking at other kinds of things.

Éva: In an ideal world or a work, you can analyse everything that you see. But of course, most of the projects we have to do include so many tools and it's quite a time-consuming method. So if you spend a whole week on one object, you're never going to finish the whole thing. You just don't have time to do everything on every tool. That would take forever.

Matilda: Especially like ceramic specialists, they have to work through so much material in one go. Not use-wear analysis, but if you're looking at the patterning, if you're looking at the type of pottery, et cetera. But they can go through so many objects in such a short space of time. And I'm like going 'how?' because for me, it's a couple of hundred objects over a few weeks maybe, if I'm on a good roll. Different kinds of analysis, I guess.

Éva: Yeah, you also did now both the low and high power and see it's so much faster when you only use the low power, just for edge damages or production traces and stuff. It's like 'oh ok I have, I don't know, 15, 20, tools a day'. And then when you go to 200 times

magnification, like a tiny, two centimetre long blade - I'm talking now about lithics - it takes almost a day because what I see... what are the connections...

Matilda: I actually was always really happy if I had a piece and it's like 'oh no, I can't see anything. What a shame! I have to put this one away'. You look at it for maybe half an hour or so and you're like 'nope, it's just too degraded'. Or it's too, I don't know, something. And on the one hand, yes, that's annoying because it's a piece that you can't get information on, but at the same time you're also a bit like 'oh, thank goodness. Okay, I can move on to the next object now'.

Éva: Yeah, I agree. When I was looking at post-depositional damage during the PhD, I was also like 'oh, now I actually really have to focus on if I really don't see anything. Okay, this takes even more time'.

Matilda: The worst ones that I had actually were the needles I looked at. They were excavated in like the fifties. So they'd been covered in a lacquer of some sort, I guess to preserve them. But of course when you try to look at that under the microscope, it's basically like someone's just put a sheet over the entire object, you can't see any traces. It was a bit annoying because you were also looking at it and it's like 'is this the object or am I just looking at the layer of glue now on top of the object?' and then you'd find one millimetre or something that was the original object and you're like 'ah, right. Okay, cool. This has traces I can use'. But the other part is just unusable, so it's always very time consuming.

Éva: I also had to discard almost full assemblages because they just wrote the find number on the back of the tool and varnished it. Basically the whole edge was gone.

Matilda: Especially if you're working with small objects, right? I had that with so many of the needles and it's a tiny needle and they've written all over it. And you're like 'Aargh!'.

Éva: They also draw the tools and then it's so full with pencil marks, something that you cannot remove, and they really obscure the microwear traces. So if someone draws objects, touching them with a pencil, that's really a pain in our... butt. I'm sorry!

Matilda: I was at a particular museum and I was using pencil and then they said, no, I want you to use pen because they didn't want the graphite or something to contaminate something or other. But then it's really annoying because, I dunno if anyone else has this, but whenever I use biros and stuff, I inevitably get ink all over my fingers, like the little globules of..., or they get stuck in places and I was so paranoid that I was going to get ink all over the blooming objects. Because also you have to wear... at that one I had to wear gloves, the sort of plastic gloves. So if you get anything on that glove, you have to chuck it and use another glove, which is very unsustainable.

Éva: Yeah. Those are really subtle things that makes the work a bit more challenging sometimes.

Matilda: I also had somewhere where they had tied the object number to the hole of the needle. So it had a string going through the needle. In some cases the hole was so small and they just pulled it through and you couldn't even see the hole anymore.

Éva: Yeah, there are things always to consider what is better or what's worse, but especially with all the collections, they never thought of this kind of method being used later on.

Phoebe: So is use-wear and microwear analysis... does it have a long history as a discipline or is it quite a new thing?

Matilda: So this one, I actually remembered this question when you sent it through, and I have my book here, which is Prehistoric Technology by S. A. Semenov, which was released... and let me just check, unless you know it off the top of your head, Éva...

Éva: '57, it should be '57.

Matilda: So in Russian it was '57 indeed. English translation was '64, and that's basically the first common archaeological application, I guess you could say, of the method. So the full title is Prehistoric Technology: An Experimental Study of the oldest Tools and Artefacts from traces of Manufacture and Wear. I think he mainly focuses on stone in it.

Éva: Yes, it should be stone and low power.

Matilda: Yeah, so that's the first use of it. There was also a lot of discussion in the eighties. I can still remember during my masters having to do The critical review of microwear analysis and there were a lot of studies in the eighties that were doing blind tests, sort of double checking the accuracy, I guess you could say, of doing use-wear analysis and microwear analysis. So you had a lot of experimental tools. They were provided to the researchers. The researchers had to say what they thought they were used for and based on that it was seen how correct the final assumptions were and there was a lot of criticism of it after that.

Éva: Yeah. It's not a quantitative method. Especially when more quantitative analyses were also starting to be available for archaeological research in the eighties, a lot of criticism around use-wear and also the reference collections, also the assumption of typological names for tools. I remember some studies that also interfered with the interpretation. They gave them tools that were called drills and the use traces were actually not on the top, so they didn't even look at. So that was also something that since then we try to do a whole scan of the artefact before we decide where to look at more.

Matilda: And then it was tried to be developed further. And then in the nineties you had a lot of people who were trying to quantify it. There was kind of a surge in attempting to quantify use-wear. It sort of depends on country a bit as well. So for example in the Netherlands you have professor Van Gijn, who was our supervisor, for both Éva and me, and she's... not the founder of microwear, but she's one of the big names of microwear analysis, and she's one

of the reasons I would argue that microwear analysis is used more commonly in general archaeological research, these days. So for example, in the Netherlands, it's quite often in commercial archaeology or like cultural resource management to also do microwear analysis or use-wear analysis on the tools, whereas, for example, where I am here in Germany, it's not common to do it. So it depends a lot on the country as well, how commonly it's used and how much it's developed. I don't know if you'd agree, Éva?

Éva: Yeah. I think it's also Annelou was one of the first ones who started doing it in Europe because she studied in America, from Keeley. He was the first who really wrote about use-wear in English. So not just a translation as Semenov. Also he started using high power and Annelou learned from him and brought it back to Europe. She and Patricia Anderson and maybe Andrefsky, they were the first ones using this technique in Europe. I think it's the labs that they founded and their few first students founded, those countries now have a better system of using use-wear analysis, also on commercial projects and in general archaeological research. Countries where no one learned from them don't really have this tradition yet.

Matilda: Which on the one hand is kind of nice, but on the other hand... it's so dependent on if you've learnt... it's like a big family tree coming down from those first few who learnt it. But hopefully...

Éva: I think it's getting better, we are definitely on that.. to spread this...

Matilda: You're continuing in academia as well, so you're teaching others, hopefully. You'll have the next branch of the family tree.

Éva: I think it's a good comparison, the family tree. It's getting bigger and there are more researchers. It's also getting more known of. And there's a more, maybe not need, but at least a look for specialists who would work on materials from countries that don't really have the tradition yet.

Matilda: One of the main focuses of my PhD research actually was - because in at least Canadian Arctic archaeology, I think there were two, basically, researchers, so Genevieve LeMoine and Christian Gates St-Pierre who focussed on microwear. So there were other studies that had done a little bit of microwear as part of it, but they were sort of byproducts of the research process rather than the main focus of it. So I was trying to show that you could actually get a lot more information or you could even get different information if you did microwear analysis and these sort of deeper forms of analysis. Hopefully now in Arctic Canada, they're also like 'ah, great, we'll use this all the time'. But indeed, as Éva said, I think something that wasn't... not that it wasn't considered useful, but it wasn't considered a necessity or something that could be of use. But now indeed in some countries it's kind of like 'oh, well let's do it. Let's do this as the sort of extra part of analysis. Maybe it'll give us information, maybe it won't'.

Éva: I think it's also because you need quite expensive microscopes and especially in the eighties, nineties, they were not necessarily available for archaeological research in many countries. You also need someone who goes to someone who knows how to do it, to learn, because you cannot really learn it from a book...

Matilda: And you need the reference collection as well. So basically in order to know what you're looking at - because it's all very well to look under the microscope and say 'ah, yes, there's some traces here'. But in order to know what those traces mean you need to have a reference that you know has been used for a particular task. So that's where experimental archaeology comes in and experimental archaeology is then very tied into microwear analysis. It's sort of an essential part of it, really. So you've done your experiments with certain tools, doing certain things on different materials. To give an example, I was for my PhD research sewing, using needles made from bone and ivory and antler on different kinds of skin and I knew what those skins had been. I knew then what each of those needles had been used for. I knew how long they'd been used for. I knew what adjustments had been made, so I could look at those traces under the microscope and then I could compare that list of characteristics against traces that I saw in the archaeological collection, and that's basically what microwear analysis is. It's comparing the traces you see with either traces in a reference collection or most of the time if you've looked at enough reference pieces, then you kind of have built up a little mental library, shall we say, of traces that you can then see and then depending on how experienced you are with different materials... For example, Annelou can now basically just look at an object and she knows what that trace means. She doesn't need to refer to the experimental collections anymore because she's just looked at so many objects. Whereas for example, if I were to look at lithics, I haven't done as much analysis of them, so I would definitely either need to collaborate with Éva or I would need to refer to reference collections a lot more to be able to understand what I'm looking at. So you need, like Éva said, an expensive microscope, someone with the knowledge, a reference collection with all of the possible options as well. Which I think a lot of people don't think about, right? It's not just like 'oh, here's a needle. Cool. Well, it was either used on wool or leather'. No, it could have been used on this or this or this or this or this and it could have been used in this way or this way or this way. That's just a needle. I can't even imagine with lithic tools, Éva.

Éva: That's why experimental archaeology is also really important to do because when you want to start trying to replicate tasks that 'okay, this was used as a knife or to cut something'. Then when you start cutting the material... okay, well, it also could do this or this motion or this motion. It also opens up your eyes to 'oh but what if...', oh, this is also possible' and also really good to talk with bushcraft people or people used to work with older types of tools, not automated tools.

Matilda: Like craftspeople you mean, or professional hunters or...

Éva: Yeah, or just old men who still use a handheld sickle to harvest or something like that. All these things are opening up your view of what could be, because sometimes with time, as Matilda said, you build up your mental library and then you look at the tool and think 'okay, I think it's this material, but it's so weird motion, or something is not adding up'. And then if you think of more possibilities, it's easier to try to understand or try to make more focussed experiments to try to replicate what you see and cannot understand.

Matilda: And that's what you were doing for your PhD, right? You were basically building up..., you were doing tons of experiments to build up a reference collection. Is that correct?

Éva: Yes. I am the first one who's doing use-wear here in Ghent. I didn't have anything to get back to if I couldn't understand the trace. My option was going back to Leiden all the time, but that's not very sustainable, or I had to start building up my experimental collection. The first three years of the PhD, at least 80% of the time I was doing experiments on all kinds of material and trying to replicate all possibilities of Mesolithic and transitional activities, collecting the right raw materials and all those things.

Matilda: Which is kind of fun, you have to use your imagination a lot as well, like 'what could it be?'

Éva: I do miss the experimentation from during the postdoc. I can do a bit of experimentation now again, because I also started doing residue analysis and now building up my own residue reference collection, so....

Matilda: Do you find it very different approaches, doing the residue analysis versus microwear, or is it the same?

Éva: Well it's not very different, but also not the same. You already mentioned working with gloves, that's a very important part of it because you cannot avoid all contamination because I'm also working with older collections or at least things that have been stored already, and touched. But yeah, you try to minimise contamination. So you work in rubber gloves. The other parts, it's also first low power to try to identify locations and then high power to document and stuff. But then there's an added step. You most of the times try to extract the residue. Because I'm mostly focussing on organic residue, so not glue or adhesives but more collagen fibres or feathers and that kind of stuff.

Matilda: Like what it has been cutting?

Éva: It's basically what kind of animal... and then you try to extract and then put it under the transmitted light microscope. That's very different from the reflected light that we are used to. The reflected is, when you have a solid object, you look at the surface of the object and the light that comes through the microscope reflects and that's how you get the image. And with the transmitted light, you have a glass slide and you have some kind of liquid that you only

see the stuff that are solid, basically, because everything else just goes through everything else. And then you can see photograms of collagen fibres or muscle tissues... this is also what is in biological microscopy mostly used.

Matilda: And I feel like the majority of microscopes are that, right? If you look at microscopes the majority are going to be transmitted light ones with the light underneath and shining up. But then we can't use that for microwear. And that's why it's so expensive, because quite often you need to buy one of those, but then take out that light and add a light up there and change this thing and adding this filter and all of these kind of things.

Phoebe: You've ticked off a lot of the points that I wanted to cover, which is lovely and it's been very interesting listening to your conversation so far. But I did want to ask you, Matilda, you have mainly worked with bone and ivory tools, whereas Éva, you've more worked with flint. How different are these when you are looking at microwear traces? Are they mainly different because they're tools that are inherently used for different things and so therefore you are going to get different traces because they're used for different things? Or are they different because they are different materials themselves? Or is it a mixture of both?

Matilda: I would say it's a mixture of both, but the main difference is the materials, but also not even the materials themselves are different, but how they react to the different contact materials is also different. So, for example, if you have a piece of flint used against a bit of leather that the leather will leave very different kinds of traces on the flint than leather might leave on a bone, for example.

Éva: I don't completely agree with this, though. I think especially if you look at the high power level, like polishes and stuff, the main characteristics should be the same on different types of material. But I think it's harder to..., at least for me... it's harder to see on a bone or ivory or an organic material because you have much more natural traces. Also the antlers or ivory you have..., ivory is so shiny naturally that I think that's why it might look a little bit different.

Matilda: See, I find it very difficult to identify stuff on lithic tools or flint at least, I guess, chipped-stone tools. I noticed when I was doing the work with the beads, with ground stone and amber and everything, it seemed that the relative - how to say it, I'm going to say this unscientifically, so don't come at me people listening, because this is not at all scientific language - but this sort of relative, for want of a better word, hardness of the different materials in relation to the contact material also makes a difference though. So, for example, if you have antler being used on an amber bead, the relative hardness of those two is fairly similar, obviously antler is a bit harder, but the traces that I saw on the inside - and this is obviously manufacture, this isn't use - were more similar to then if I was looking at a harder stone that would be drilled with then another stone tool or maybe a copper tool or something, which isn't quite so hard as or cutting as flint, but would leave then similar traces in that respect. So yes, on the one hand I see what you mean, Éva, and I do agree with you because of course if you're looking at, for example, like plant polish, that will look kind of

similar on flint and on bone. It's sort of that bright shiny polish. You still have to, I think, be aware of what materials you're looking at and what the contact materials are because it's not always going to be the same. I guess that was more the point I was trying to make.

Éva: Yeah, you cannot just translate from one to the other. You really have to know your thing. But for example, for me it's the other way around. When I have to look at either ground stones or now I was asked to look at some bones and teeth, and I was so confused because on flint it's like so much more connected. And then the other material because they are more rough, you have basically patches or especially ground stones, you have like isolated spots and stuff. For me it's much harder to understand that. I have to focus much more on that little spot, to go higher magnification to understand, 'okay, this should be the same as what I see on a smoother flint surface' because it's smoother, it's bigger.

Matilda: I think for me, I looked at indeed the flint and I'm like 'where is this stuff?' And then someone was like 'yeah, that's it'. And it's like 'wait, what?' But how do you tell, because I guess for me it's the opposite. I suppose it depends, right? It depends what canvas you're used to working on. So if you're used to that raw material you know to exclude that raw material from your kind of vision when you're looking at it.

Éva: Yeah, you have to switch your perspective. For the master in Leiden I was looking at Bronze Age flint sickles or sickle inserts and you could see the use-wear with the naked eye. It was such a clear sickle shine on most of them, that everyone was like 'oh, you are so lucky because it's so easy'. When I started the PhD and went back to the mesolithic traces that are so much less developed, I needed months to realise that 'oh, I cannot just look at this in 100x magnification. I really have to go to 200x to understand what's going on', because it's not the same.

Phoebe: That touched on something there, actually. You mentioned bronze tools. Is microwear only limited at the moment to kind of the more traditionally prehistoric materials such as flint? And although of course what you were studying, Matilda, wasn't prehistoric, I feel like other applications of ivory and bone have usually been applied to prehistoric contexts. Are we seeing microwear used in any other contexts that's slightly more historical and or not prehistoric?

Éva: It's mostly focussed on prehistory. There are a few researchers who are trying to extend it. I have a colleague here who is now for his postdoc trying to do ground stone use-wear analysis for Roman Age and early medieval period, which I think is really cool because he can add so much more to the narrative. He always complains 'my only reference is Neolithic stuff or maybe Bronze Age, but no one really has a reference collection for iron tools used on ground stones or on any material' because yeah, that's kind of still missing. I think it's a shame and I hope more and more people are going to start doing it and also use-wear on metal tools. I know some people who started doing that, and it's also really important because first it was lithics, then it was extended to ground tools and the bone and the ivory

and antler, like organic material. And then I think, metal and ceramic were around the same time when people started doing it, but it still mostly focusses on prehistoric and Bronze Age, Iron Age. For example, here in Belgium that is not prehistory but proto-history...

Matilda: ...which I think probably is because we know a lot less about how things were used in prehistory. Whereas in more historic periods you have the history, so you have kind of documented evidence of how things were used and you have little recipes and you have all of this kind of stuff. So I guess it was always assumed that it wasn't as necessary. But I agree with Éva. I think that it's really interesting and it adds a different dimension because it takes away those assumptions. Like if you assume 'oh yeah, but we know this person said it was done this way, therefore we know it was definitely done that way'. But then maybe the use-wear analysis will show something different. And indeed, as long as you have a reference collection, that's the most important part. So you might just have to do, as Éva was saying, a ton of experiments with Roman stuff, but it should be possible to do. And I think there's some materials that are a lot harder. So I know for example, I have colleagues who work with shell and apparently that's just nigh impossible to do use-wear analysis on because the natural material itself is so responsive to the different elements. So it's really hard to say what's natural and what's use-wear from handling by humans. But in general, as Éva said, it's improving to other areas and there's even been - not necessarily use-wear studies - but that sort of thing where you see how something reacts and you use that as a reference collection. For example, Theresa Camper, who's an EXARC member, she did her PhD research on different tanning techniques and how you can identify that microscopically through the finished objects and how the different threads respond to the different tanning techniques and all that kind of thing, which in some ways is also microwear analysis. You're not looking at traces necessarily, but it's the same concept, I would argue anyway.

Éva: Those studies are very valuable for us as use-wear or microwear specialists because they explain what we see in much more detail. If we do our own experiments, we don't have the time or mostly also the knowledge to go in that detail in how materials can react to different things. So I think it's really, really good that people are also looking from that perspective.

Phoebe: So do you think that in the future this is kind of the direction that microwear will take, becoming more broad, more applicable to more things in more places?

Matilda: I hope so.

Éva: Yeah, hope so. I think we kind of going in that direction. There's also more and more studies on motorised or robotic experiments and trying to understand the kinetics behind motions and stuff like that. With new techniques developing and being available also the quantification is something that a lot of groups are trying to focus on. But to be honest, I don't think we ever can really quantify.

Matilda: I agree. I think it's going to be difficult.

Éva: I think there is a need for robotic experiments also to understand a lot of forces behind. But a robot never going to do the same as a prehistoric person did. We are never going to do the same as a prehistoric person did, because we are so much more disconnected from the natural world. They had so much deeper understanding on how things work and why things happen - not physically or chemically explained - but on a different level that I don't think we're ever going to reach that level. At least not in a world where microscopes are still an important part of society.

Matilda: To sort of expand on what you're saying with the whole robots and people. The problem is who's doing that research as well, I think, in microwear and I think that that's a big problem in archaeology in general, right? Is that it's very much focussed on certain countries, certain regions, certain classes who are doing these kinds of analysis and who are focussing on these sort of research projects. I've worked a lot with Inuit communities during my PhD and a lot of those collaborations with, for example, seamstresses and with hunters and with craftspeople from that community. They were essential in my work. And I also did a little field school with some Inuit students and I sort of taught them the very basics of microwear analysis. They were fantastic at it. I was kind of worried, I was thinking 'oh, no, it's going to, it's going to take over my PhD research'. I think trying to expand it out to different groups and different communities is also essential because everyone has that different experience and everyone has that different cultural background. And that is such a big part of microwear analysis as well, like how you see the material and how you interact with the references, when you're making the reference collection during experimentation and things like that. So yeah, I can see why robotics and this kind of thought, that way of doing it is a potential way to get rid of bias, but I think one of the ways to get rid of bias is just by incorporating a broader range of experimenters and a broader range of analysts into the topic as well.

Éva: I believe that someone who grew up in a remote area and had to do these kind of things with, maybe not just organic objects, but even just doing things with your hands, would be a better use-wear analyst as we are.

Matilda: Definitely. Honestly, there was this one boy who was 16 years old, and we were looking at a little bit of flint, an ulu blade, like one of the curved knives that the Inuit use. He was looking at it and I was saying 'yes. So here you can see the traces, you can see the direction it was going...'. And he was like 'okay, yeah. So then the person must have been left-handed, because look, this is how you use the ulu. You have to do it like this, but because they're going in this direction, you couldn't possibly do that with this side. Because it has to be used on this side because this is the curved one and you would never use the straight side.' He just gave me this whole thing. I was like 'you've looked at this tool for five seconds. You learned about microwear analysis as a method like five minutes ago and you already know way more about this'. I think that we are very privileged to do what we do, and I

think that, yes, on the one hand, we've learned the method and we've learned the technique. But expanding it out to other communities, to other ways of life, would be extremely beneficial to everyone involved, I think.

Éva: Yeah, I definitely agree. Maybe not the high power immediately, but as you are also working with digital microscopes a lot... like those are starting to be affordable. So hopefully, it can be spread to less fortunate communities too.

Phoebe: I think that's a really nice point to end on and I wanted to say a big thank you for such an interesting discussion. It's been so nice to kind of sit back and listen and you've brought up some really interesting points. So just as a final question before we finally fully wrap up: what are your plans for the future and how can the EXARC community help to make a difference in regards to all the points that you've discussed today? Éva, would you like to go first maybe?

Éva: I think we kind of touched on the point of how the EXARC community can be useful, like doing the experiments also with another set of mind. And then maybe providing us the tools that they used to analyse or collaborate. My plans for the future: I'm hoping to get another postdoc after this and try to stay in research for a while. I have some ideas and some possible collaborators from different countries. But, you know, academia is mostly applying for research grants. So let's see if the funding body also thinks that my research is interesting enough. The first set of goals are getting a new project after this ends.

Phoebe: Fingers crossed. I wish you all the best with that. Matilda?

Matilda: Well, yeah, I have a new job now, which might take up a lot of my time, directing this little society you may have heard of, called EXARC. So, that'll be something. But in terms of microwear, future plans are... I do hope to continue with it in some way. I was hoping to collaborate with a Canadian museum. We had sort of talked about the potential for doing, for example, little microwear workshops for people so that these communities, even if they're not able to go and qualify as archaeologists and not able to then officially do the research in that respect, they can at least have that knowledge and have that understanding and potentially do consultancy work or something. So maybe that might still come to fruition. Yeah, how the EXARC community can help. As Éva said, use-wear analysts need experimental reference collections. Without them we can't do our research. I have collaborated a lot, and I know Éva has as well, with professional crafters, professional experimenters, prehistoric technicians and all those kind of things. So if you are someone who's interested in doing that kind of work, do have a look and see if there's potential microwear analysts who might need someone. Make yourself available because we definitely need you.

Éva: May I just add that one tiny bit? If you are an experimental archaeologist who's focussing like on leather or whatever other material, but use more traditional tools or technology. Don't throw away your tools please!

Matilda: No, and don't cover them in glue or write on them!

Éva: Yeah, just let us know that you have them and we are happy to take them over.

Phoebe: Yeah, a nice point to end on that. Again, thank you so much, Matilda and Éva for joining us today and for sharing your experience and expertise. I know that I certainly learned a lot and I'm sure that our listeners did too, so thank you. And a big thank you to everyone else for listening in to this episode of #FinallyFriday by EXARC. If you'd 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.

Join us next month for another episode of #FinallyFriday and learn more all about the world of experimental archaeology, ancient technology, archaeological open-air museums and interpretation. Don't forget to follow the show through exarc.net and our associated social media channels. See you soon!