



Annie Goh & Miriam Kolar: Performing Archaeoacoustics

[00:00:23] INTRO

Duška Radosavljević: Hello and welcome to the Salon.

Our guests today are Annie Goh and Miriam Kolar, who think collaboratively across acoustics and anthropology.

Annie Goh is an artist and researcher who works on sound, space, electronic media and generative processes within their social and cultural contexts. She completed her PhD at Goldsmiths College, University of London in 2019, where she was also a Stuart Hall Foundation PhD Fellow. She co-curated the discourse program of CTM Festival Berlin 2013-2016 and is a co-founder of the *Sonic Cyberfeminisms* project. She is currently a Lecturer in XD Pathway in BA Fine Art at Central St Martins and an Associate Lecturer in Sound Arts at London College of Communication.

Miriam Kolar's research integrates acoustical and auditory science into anthropological archaeology and the study of human-environmental interrelationships. Since 2008, she has led [archaeoacoustical and music archaeology] investigations at the UNESCO World Heritage Centre, Chavín de Huántar in Perú. Her Andean project on Inca sonics began with acoustical fieldwork at Huánuco Pampa, Perú in 2015. She is currently a Visiting Scholar at Amherst College, and a co-organiser of the project 'Digital Preservation and Access to Aural Heritage Via A Scalable, Extensible Method' supported by the National Endowment for the Humanities in the United States of America.

Annie and Miriam's exchange for the Lend Me Your Ears Salon focuses on archaeoacoustics, in particular in relation to one of the sites of Miriam's research, Chavín de Huántar. The two discuss the role of the sonic and of 're-sounding the past' in the tension between preservation and imaginative speculation.

This conversation was recorded on Zoom, on 6th November 2020.

[00:02:25] SALON

Annie Goh: Hi Miriam. It's so wonderful to see you on Zoom, and I'm really looking forward to our conversation today. So we're recording this as part of the Salon of the project Oral/Aural Dramaturgies, which I was invited to speak at. And I really wanted to invite you into the conversation, partly because I admire your work so very much, and also because since we began working together so many things have unfolded that are so rich and interesting, so I just really relished the opportunity to talk with you at a bit more length. So, just to explain to our listeners, the reason we met each other was during my PhD, which I undertook at Goldsmiths College in London. I started in 2015 and the project itself was a cultural examination, almost like a kind of anthropological examination, of the field of archaeoacoustics – so, acoustic archaeology. And as I began interviewing the main protagonists of the field – in total I undertook 20 interviews in the course of my PhD, and of course you were on my list of people to interview as I had come across your work, other people had mentioned your work – and I was very keen to speak to you after having read some of your publications. I remember it being actually such an engaging conversation. I think we ended up talking on Skype for about three hours the first time! And it was just very validating for me to find someone with whom I could address some of these core questions around archaeoacoustics in a manner that also aligned with my own preferences, or my own ideas about what good scholarship is in archaeoacoustics. I felt that we bonded over a certain ethos – even though we are in our positions quite different, as I in no way identify as a practitioner of archaeoacoustics. I don't do any of the experiments myself – but the purpose of my PhD was to analyze the field of archaeoacoustics within the questions of sonic knowledge production, and how listening and sound figure and configure knowledge production [2020]. So although I am a practitioner as a sound artist, I'm not an archaeoacoustician – I was interviewing many archaeoacousticians and you were one of them. That was a really significant conversation, and at the time I had planned into my PhD research definitely doing a field trip because I thought sound is such an embodied experience in



many instances, and the kind of embodied experience of being on an archaeoacoustic site with a researcher was really important to me. But because the field is so small and there wasn't many active research projects ongoing at the time, it was really difficult for me to track one down. And the one that I had hoped to go on essentially fell through, unfortunately. That was around the same time that we had our conversation and then had the brilliant idea of applying for some funding so that we could go together to Peru and to the Chavín de Huántar sites, which is how we met. So we went there in June/July 2018, so just over two years ago now, and it was a really fantastic experience that I have so many fond memories of, as well as it turned out to be so pivotal in my own research. I was really able to appreciate the depth and richness of your research and the way that you approach the topic with both scientific rigour, high levels of technical expertise, but also such a sensitivity to some of the intellectual or yes, I guess, the epistemological questions that accompany knowledge production in archaeoacoustics. I guess the way it relates to Oral/Aural Dramaturgies is thinking of archaeological sites as stages – stages on which everyday life is performed perhaps? I'm interested to hear what you think about that. Because archaeoacoustics is the study of human behaviour, and the role of sound and listening in the human behaviour of these sites, I think there's a lot to tease out. Thinking about the dramaturgies and maybe the theatrics of archaeoacoustics, if I can be so imaginative and explorative with my terms! [*Laughter.*] And finally, in terms of introductory comments, one of the things that I had to grapple with in my investigation of the field of archaeoacoustics was the role of sound and listening and the resistance of the academic field of archaeology to absorb questions of sound and listening, and the different ways that researchers with different degrees brought in questions of sound and listening. And what I thought was quite interesting about my detailed analysis of the field was that many of the researchers who were pioneers in the '80s and the '90s – many of them were not trained archaeologists and they were doing sound-based research and had to argue for quite a long time for these questions to be taken seriously in academic archaeology. Which is often thought of and often is acknowledged as a fairly conservative field – at least in certain areas of its constitution. So that's a roundabout way of saying that, introducing how we got to know each other and that context, and I thought you could maybe say a bit about your research now that I've introduced how we got to know each other.

Miriam Kolar: Thanks, Annie! So you've said so many things that are stimulating to me. They're interesting observations about archaeoacoustics from, as you say, someone who's not necessarily an archaeological practitioner. And to me that's quite important because I started my own career in archaeology as a non-archaeologist, and now I find myself being an archaeologist, so it's been a journey for me. I think that following one of your most recent points was this idea that there's a need for an argument for such questions about the relevance of sound to be taken seriously in archaeology. Yes, there's a need for that! That has not changed since the 1980s despite a field that's been developing since then. That's one of the issues that I face in doing serious scholarship and working in cultural heritage as a professional. And I think that this distinction of working as a scholar versus working in an archaeological profession can be quite, quite deep, because the domains in which there are regulations and discourse and the kinds of social networks that have to take place to situate this work within the world – is quite interesting and quite different from a lot of scholarly or artistic disciplines. So in my own journey: I was formerly a sound engineer – I'm still a sound engineer, but I had training as an audio engineer and a composer prior to moving into anthropology and archaeology. I've seen these kinds of sharp contrasts between professional fields, inasmuch as scholarship is also a professional field, right? There are intersections, and there aren't any clean divisions. However, within archaeology and cultural heritage, because of the way in which a lot of activities and projects have governmental, institutional recognition and supervision, and intersect with real-world communities and economic structures, there's a way in which sometimes what's done in archaeology is mostly about that, rather than necessarily the research questions. And there are some good reasons why cultural heritage research and preservation needs to be done in a way that has a kind of permanence and relevance outside of academic institutions. So those are interesting questions in thinking about how archaeoacoustics works and fits, and to get viewpoints that are quite apart from that necessarily functional worldview, I think, really enriches the discussion. In the same way, archaeoacoustics really began with a lot of acousticians and people with sound and music training saying: 'Hey, how do we develop an exploration of these kinds of concerns that we experience in our lives in different ways as



professionals and as musicians and as people in the world apart from archaeological projects?' Sometimes. And sometimes integrated within them – as my work at Chavín de Huántar since in 2007 our project formed there, has been. So I think those are all such interesting ways of starting to examine what's going on. You talk about this idea of knowledge production, which is critically important when you're thinking about a kind of reconstructive practice, a practice that's forensic, a practice that takes material physical evidence – fragments of things – and as you say, tries to reconstruct human behaviour, even human cognition, human creative expression. And for me the relevance of our themes to this Salon has a lot to do with the idea that performance is this projection of human interiority to the exterior in a very selective or intentional way. And so, of course we're always performing in different aspects, and there are kinds of structures and institutional ways that performance is accepted or not. I like to think about performance with all of that richness in a functional way in different social contexts, so for me there's a performance aspect to engaging reconstructive experimental archaeology, which is where we put archaeological materials and objects and replicas and settings into use, and explore how humans actually use things, how people make sound with objects or instruments, how people respond to the acoustical feedback of environmental settings of the built environments and archaeological sites that are well preserved, such as Chavín. Things like that – there's this performance aspect of experimental archaeology that's critical to understand as performance, right? But then there are also these kinds of ways to think about the performance that was explicit – or that was intrinsic to – certain kinds of archaeological contexts, like ritual centres, religious places, places where there was a kind of administrative authority happening. So we can look at different kinds of archaeological evidence and architecture for those particular contexts. It's interesting and sort of inter-reflexive how the kinds of activities we do in reconstructive experimental archaeological practice – even in reconstructive modelling, computationally – are designed in some ways to try to reconstruct or re-enact these performances that happen in past times and places. Performances from just individual humans making sound to communicate with each other or their environments or other beings in their environments, to really express authoritative kinds of deliveries of performance that is intentional in the way that it projects certain types of agency for the performers. So all of those issues are really interesting to explore through archaeoacoustics because, for me, archaeoacoustics is so much about the fact that sound is a fundamental communication medium that humans use and also respond to about activity in the world – I mean, in such a basic way! I like Ruth Finnegan's definition of communication – 'the interconnection of humans' [2002]. That works very well and it connects humans with events in the world – things move, the medium of air or materials vibrate, and we feel and/or hear sound, so I like to call it 'sound sensing' to get away from this focus on only the aural or the ear hearing mechanism. I think, too, from this terminology of aurality – it's quite complicated, because I tend to use it to mean sound sensing, a whole body, embodied experiential activity, right? And it doesn't exclude a range of hard of hearing and deaf sound sensors as well as people who have ear-sensing mechanisms that are activated. So I think that archaeoacoustics is relevant to everybody and it's relevant to any type of archaeological site. Obviously the better preserved a setting or architecture is, the more experimentation you can do, the more certain you can be about reconstruction. But materials, objects, spaces transform and shape the way that sound is contained within them, the way that it can be transmitted. So all of those are things that are physically measurable, estimatable through acoustical science. And auditory perceptual science gives us a way of relating acoustics to a range of possible sound-sensing responses. So for me, documenting this range of sound-sensing responses is the key to connecting the physics of acoustics with the potential for human sensing. Then cultural and contextual factors that we can learn from archaeological contexts help us understand what sensing might have been more likely in a particular hypothetical archaeological scenario – that's the sort of science of it. And there's this huge space for exploration, for imagination, for human beings in our present to just go to archaeological sites or experience virtual simulations of sound and space of sites, and have imaginative experiences and relate on one-on-one terms. I think all of these things are important aspects of archaeoacoustics.

AG: Great. I was wondering if we should maybe listen to our first sound sample, and then in the spirit of storytelling I was wondering if you could set the scene for us, to explain to our listeners what Chavín is and where it is. You're such an expert of all those things and perhaps after we listen to the sound



sample you can explain how you got there from the first time that you went to Chavín, which I believe was in 2007 – is that correct?

MK: Our archaeoacoustical research project began at Stanford University in 2007, but we didn't make our first trip until 2008 to do fieldwork.

AG: Okay, 2008.

MK: So the audio recording that I'm going to play to start things off – Annie suggested that we play – is this tantalising research performance by a Peruvian sound healer, a master musician, self-pronounced sociologist. Someone who defies, I think, labels and terms, but those are some that have been used and might apply at different times – Tito La Rosa, who is an Andean, has played many different musical instruments and explored many archaeological contexts and spiritual sites in the Andes. He came to join us, the acoustics researchers from the United States, at this highland site of Chavín de Huántar in the Peruvian department of Áncash, which is a good day-and-a-half, two days travel from Lima over – in the past, some very terrible roads – now it's a little bit easier to get there. Tito came and performed on nearly 3,000-year-old marine shell horns – conch shells whose spires have been removed, filed away and smoothed to allow sound to go through the inner coiled spiral cone that's just this interior of this instrument, where the sound passes back and forth between the world outside and the mouth of the performer. It's amazing how they work acoustically. And he played them for us in his own interpretive way, and so this gave us just one example of how someone might treat the instruments, not only as an instrument of making sound, but as a kind of sacred object. He cradled them, he held them close to himself, he breathed air into them before he tried to make them sound or allowed them to sound. So he had an entire performance approach – approach isn't even the right word – he created a relationship with these ancient sacred objects before he asked them to make sound with him.

[00:20:33 to 00:21:13] Miriam Kolar's recording of Tito La Rosa playing a Chavín-excavated pututu in the Museo Nacional Chavín

MK: The breath sounds at the end were actually one of his initial ways of passing air and vocalisation through these conch-shell horns – natural horns in musicological, organological terms, but sometimes called 'trumpets', and in the Andes often referred to as 'pututus'.

AG: Yeah, It's really magical to listen to that short clip of Tito La Rosa playing the pututus. Before we went there, we did a lot of planning, and I was obviously very honoured and lucky to be able, through you, to join the archaeological team at the Chavín site.

MK: There's an archaeological research and conservation programme that has been ongoing for the last 27 years under the direction of Dr John Rick of Stanford University with several Peruvian co-directors, currently it's Lisseth Rojas. This project – it's a programme actually, permitted by the Peruvian government and the Ministry of Culture – has a particular role in preserving the site, making conservation recommendations. It employs local people, but the site is also a tourist site that's open to the public, six days a week except for Mondays, pretty much year-round with a few holidays, and it brings in tourists from all over the world.

AG: Yes, it was such a privilege to be able to have access to the site. But yes, there were tourists coming in on all the other days of the week. But what was so great was that there was a group of students who also became part of your research project. So I suppose my associations are with the sound of this pututu horn – even though it was played in a more ad hoc fashion, let's say! – so the students were playing replicas of different versions of the pututu horn as part of the experiments that we, as a group, were designing together. It was such a wonderful collaborative thinking and designing of experiments between us and the students which, when I hear that sound – even though I never got to meet Tito La Rosa, and he plays extremely beautifully, it's very evocative – it still takes me back to being up there, how many 3,000 metres high? How many metres high is it?

MK: About 3,180 above sea level, so it's quite a high-altitude site! I love what you are expressing about this 'being there', because I think that Chavín has always been about a journey. It's known as a pilgrimage site or a centre that drew in people from all over the Andes – perhaps even from the selva or the rainforests, from the coastal areas; a place where probably different linguistic groups, definitely different familial and social groups came together to do something. That's one of the big archaeological



questions, that there's a lot of work dealing with – 'what were people doing?' But it's always a journey and for me, too. When I first went in 2008, it changed my life. I think it changes everyone's life who visits – in a small way anyway – because it is such an epic place. It's high and it's this deep narrow valley where two rivers converge, rivers that flow year-round. In the Andes, in Peru, in a great deal of South America, there's a marked difference – at least in the coastal and in the sierran or the mountain regions – there's a great difference between the dry season and the rainy season. So these sort of seasonal changes around water, around the hydrological cycle are very, very important to the ecologies, and to the way that people interact with these sites. And so having rivers that run all year round – they're substantial rivers in Chavín – and their coming together seems to be important in Andean cosmology. At least from historical, ethnographical, ethnological accounts, there's a special sense of the combination or the coming together of opposites or of different parts to make a whole – and oftentimes this place where two rivers join is indicated by the word 'tinku' or 'tinkuy' which means this, but it means a lot of things more than that. And this gets to the point where it's so tempting to interpret Chavín – a site that was active as this ceremonial gathering centre nearly 3,000 years ago without any historical – or textual records, is what we mean in archaeology by the term 'historical' – it's so tempting to interpret it using these kinds of frames from other Andean ethnological analogies, from what we know of Andean cosmology, especially from the writings about the Inca who were 2,000 years later. And so, this is important because Andean cosmologies are always relating to the environment, to weather, to cycles – whether they're diurnal cycles, how airflow changes and the wind builds up during the day, or these wet and dry seasons; the agricultural necessities of time related to these seasonal changes are all so important. And so when you visit Chavín, you're suddenly immersed in this world where the physics of the environment around you – whether it's the people doing things in the environment, the anthropogenic stuff, or whether it's the geology or the weather, the climate, anything that's happening, the different birds that migrate through, for example, anything that is about Chavín – there are consistencies between present-day experience and 3,000 years ago. Just because of where it is in the world and the environment. Which is why some of these earth system science concepts that go into play to reconstruct ecological aspects of archaeological stories are so useful. But you think: 'Well, they have to be reflected in the material culture'. Right? They must be reflected somehow in the art or in the graphics, in the design of buildings – in things that in archaeology we have to study physically and make inferences about through the ways that human beings could have produced them or could have used them. I keep talking about archaeological theory in our discussion here, but that's really where I'm seated, and I'm seated in trying to make sense of human experience and human interconnections and human-environmental relations that happened in a place I don't live every day now. Although I did live there for about four years year-around, which was a great experience for me while I was working on my dissertation research and developing archaeoacoustics research at Chavín. But I don't live there now – so I already feel a bit disconnected! But these sounds connect me immediately in the same way that you mentioned. And I think that that's something that's really remarkable about our ability to record performances – to record sonic performances – and to share them. You know? What do they mean out of context, what are they going to mean to our audience of the Salon, for example?

AG: Yes. I always struggled, after coming back from Chavín and trying to describe to people where I've been and just the incredible setting of being 3,000 metres high up in the Andes. The mountains are incredible and then there's this archaeological site which was a ceremonial temple complex. There's these different parts to it, there's the plazas, there's two plazas – please correct me if I'm getting this wrong – but then there's also these internal chambers built into the mountain where there are these enclosed, really claustrophobic networks of chambers where you did your research. And then in addition to that, there's the plazas which are flanked by the staircases, there's the chambers that go underneath the plazas – there's so much complexity! And then there's the rivers that you mentioned before, which run year-round. And I guess even before going there, I was so impressed with your research in the ways that it grapples with complexity, and you – being the good scientist that you are – you identify something doable as a scientific question and you base your research around that. So I always saw it as a balancing act between the imagination and the possibilities of the sites which are just really overwhelming I think, when you get there. Not to mention – sorry, I described the spaces but I didn't describe the incredible engravings that are on the walls with these anthropomorphic figures, the



columns – there’s so much richness that I can’t even recount – and then the cache of pututu conch shells that was found there. So just to come back to the point that your research was even more impressive to witness first hand because of the way it dealt with this complexity and finding these questions that scientifically can be tested amongst many possibilities of things that could have happened at this site 3,000 years ago when it was in its stages of being built – I know it went through several stages as well. I struggled bringing that out afterwards, because there’s just so much to describe! But I suppose in terms of archaeoacoustics it is seen as one of the sites in comparison to other sites which don’t seem as convincing but in the field it is seen as a site – and your research is obviously very central within that – where it’s almost unarguable that sound and listening played a significant role in certain behaviours there, certain activities that went on there. So I was wondering if you could explain to the listeners – it’s difficult because your work covers so much and also that’s not the only site that you’ve researched, although it’s probably the one you spent longest researching – but is there any way you can just summarise in a broad sense some of your research to do with the acoustics of Chavín?

MK: At Chavín, there is this one wonderfully well-preserved architectural space. As you noted, there are these plazas, there are these stone-and-earthen-mortared buildings that are many storeys tall, hundreds of metres wide and deep, and inside they have these labyrinthine-like, maze-like structures that we call the ‘galleries’. And everything is interlaced with these horizontal ducts that allow sound and air and scents – smoke, if there were – to travel through and around; and in some cases, light as well. So there’s a very specific physical environment that acoustical science can be used to measure and document the parameters of. And so this gives us a way of creating obviously computational models – mathematical and also spatial, visual, acoustical. But by doing that, what we do is we create the possibility for exploring the spaces, the acoustics of the spaces, the functional sonic communication space however we want, as archaeologists, using these kinds of tools. And so one of the goals of fieldwork is to do this good documentation. And also, you experienced our 2018 archaeoacoustics field school that incorporated some of the larger archaeological conservation research programme participants in studies. In fact we had, I think, in the end a team of 12 and we have an upcoming publication coming out in the next few months which I’m excited about – in the *Change Over Time* journal [Kolar et al. 2021]. But anyway, we were able with this group to do some sound transmission and reception testing, which is a pretty procedurally standard thing in spatial acoustics/room acoustics. The way that we do it and adapt it in an archaeological site might be quite different, and for me it has to be responsive to ways that human beings can be in places. So that already narrows down some of this complexity you’re talking about, because, whereas in room acoustics for say a concert hall, we might be making measurements using sound source and sound listener-receiver positions all around the room – in places that human beings couldn’t be – to document thoroughly this acoustical space in three dimensions, in archaeoacoustics I’m developing a method where we look for the most likely places where human beings could be. Given the sort of architectural contours and then the social, political context that we’ve developed from archaeological study of a particular site or its context. So those kinds of knowledge narrow the experimental domains. And then there’s always the possibility of just saying: ‘Hey, what do you want to try?’ When you’re out physically in a place as a human being, paying attention to what’s around you and how the space feels to human beings, given all of our contemporary context that we have that would be different from, say, a past archaeological social context, you know, we can’t try to necessarily replicate everything. But what we do is we produce a whole bunch of different data that’s realistic, at least for the physical structures and the idea of human perspectives within them. So to me that’s a pretty important methodological basis. And then there’s so much flexibility in the tools that you might use. I also like to do multiple simultaneous forms of documentation, so we always have ground-truth sound level measures at the same time that we have audio recordings, and acoustical measurements that are made from electronic test signals that are mathematically generated, or approximations with things that are manually generated like these kinds of clapping sounds – ‘impulsive’ sounds we call them in acoustics. Also if you have sound-producing instruments or musical instruments from a particular archaeological context, why not use them or use their replica instruments? So, as you pointed out, at Chavín, especially in this particular fieldwork session, we used pututus – actual marine shell horns created from different animals, most of them the same animals – *Strombus/Lobatus galeatus*, now *Titanostrombus* I think is the new name. Anyway, the



names keep changing because of the malacological investigations that are ongoing to help classify and reclassify these animals. But anyway, just suffice it to say: a giant Pacific conch shell that's turned into this natural horn just by cutting off the spire. Sometimes mouthpieces are configured using resin – we had a couple like that – it doesn't change the acoustics very much. So those are still reasonable proxies. My Stanford team in 2008 had the opportunity to make acoustical measurements especially with performer-computer music modelling specialist Dr Perry Cook, who worked with us performing the instruments, along with Tito La Rosa, who did not the systematic measurements but the research performance that you just heard. So we documented the acoustics of 19 of 20 that were in the Chavín museum that's at the opposite end of this highland town from the archaeological site. And then last year, I was able to work with some Peruvians and make a performance study of a newly excavated *Strombus pututu* from the site, which is very exciting. So this comes to the point that I think is really important about Chavín and these pututus – that they are an instrument that is physically designed to produce sound. It's designed to do other things too, but it's designed to channel the human vocal energy or air column into it, and then out into the world. So it becomes a sort of proxy for a human voice or breath; it becomes an extension of a human vocal column, a human vocalisation that's transformed into the world. And in archaeological interpretation, this idea of transformation of being, of performative – but performative not in the sense of superficially articulating something – but actually embodying a change of something, a transformative embodiment, a projection performed. This is so important to Chavín. Because there, as you noted, we have these wonderful lithic carvings, these graphics, these relief-carved plaques all around the site that depict human-like figures, a lot of times with predatorial non-human animal features, so they're very zoomorphic. But we have several that depict personages playing pututu or holding them to their mouths. We don't have a photograph but we have a representation that says these objects – each one is carved with a different iconography or messaging physically engraved on it, just like the stones. So we have these very special pututu objects that were all excavated in one group, and then the new one that was excavated recently was excavated in a gallery or a space right next door to this group of 20 that John Rick and teams discovered in 2001. So we have these very specific special sound-producing ritual objects, technologies of communication, technologies – I suggest in an article published last year – technologies of cosmological transformation; of cosmological projection – that align with graphics in some way. So, we don't know who the graphics portray or in what role exactly, but it does suggest a performative transformation that involves human-like figures and these instruments. Which, by the way, come from the ocean, and we're in the Andes, which is, according to colleagues like Daniel Contreras [2011] and Sadie Weber [2016], at least 12 days' journey by foot from the coast where the pututus would have been sourced somewhere near what's Ecuador now, on the coast. So to get to Chavín with these instruments would have been quite something, and we don't know if they came directly from the coast or they went from coastal origins to other sites where then people had them and brought them to Chavín. But these instruments as a group represent intentional kinds of projections of identity through these carvings that are all different. And their sounds, their sounding tones at least — the sound that most readily comes out based on the internal size and shape of this rolled up cone that's the interior of the instrument — so they sound fairly similar from a sort of textural standpoint and they have tones within quite a small range of frequencies that's also coincident with a lower range of the human voice, which is interesting, but they can be used to produce all sorts of sounds in a creative way. So in our acoustical measurements, we document all the sounds that they're capable of producing, and we document specifically what frequencies in hertz – or cycles per second acoustically – they can most readily play. You can relate this to musical scales that are known and you're comfortable with if you're a musician or whatever, but the most precise scientific way is just to document them in cycles per second, because that's a physically ground-truthed quantity.

AG: I was wondering if we should move on to our sample.

MK: Yes, we have a lot of sound.

AG: Just to set this up: we had designed together with the group of students an experiment – you'd better explain it – and then we came up with this idea of orchestrating a procession through one of these chambers, like interconnected rooms. So this recording that we're going to play now is from my recorder and I was in a particular position in one of these interconnected chambers, and you can hear just how loud it gets. There's three pututu horns being played by three different people in a procession



and they're walking at a relatively slow pace, weaving through these chambers. And the impact it made – I think we had decibel meters, we were recording decibels of three different types of pututus from different locations and that was accessible to us because there were so many of us, and we could do that. It went over 110 decibels, which is very loud, and you can actually hear in the recording the microphone struggling/breaking, you can hear that distortion. So let's listen to that.

[00:43:28 to 00:44:42] Annie Goh's recording of replica pututu procession at Chavín

MK: I love how there's the shifting perspective. I think you were stationary in one room, right?

AG: Yes, correct.

MK: The pututu players were moving through this corridor, and they were passing different ducts – these horizontal shafts that allowed the sound to come more directly through in your direction. I love how you can hear this sort of mixing of their moving sound going through different architectural routes to get to you. It's so, so interesting. And that's one of the things that we were trying to document in our research: what is the effect of different simultaneous positions, both measurable in terms of frequency, but also, as you said, in terms of sound level and then in terms of human perception? What are the effects that shift and change? How does the architecture do that? The fact that you suggested yourself, Annie, that we do some of these moving studies where the performers are moving – because in so many of the standard acoustics techniques there's this fixed or static location of a sound source and sound listener; that's one of the ways that we can get solid data that then we can use to make these dynamical computational models and simulations, virtual reality expressions even. But, you can't get all the information that you want about human experience if you have these artificial static sounds, and static listening positions too. Which is one of the reasons why I also wanted to play back-to-back with that sound sample a sound recording made of the same event by someone walking along in the middle of the procession. So we had our colleague Brian Morris wearing small microphones to approximate ear positions on the hat brim on each side. You'll hear this very spatialised and more immersed experience of the perspective of the sound – and you get a very different effect than what you played. So here's another perspective on this same sound.

[00:46:44 to 00:47:46] Brian Morris' recording of replica pututu procession at Chavín

AG: It's interesting to get a different perspective on the event, because I thought so much about that after the fact. It was such a powerful bodily experience and I wrote about this in my field notes and I think an excerpt appears in the publication that you mentioned, in *Change Over Time*. I guess what I associate most with that event and that recording is the throbbing noise that comes from the two pututus playing almost the same tone, which gives this beating tone effects that acousticians are very familiar with. There was one pututu player who played those shorter bursts which gave it a slightly rhythmical character of a different kind. That beating effect felt like throbbing for the whole body, which was so impressive in many ways – that in addition to being in such a high altitude that I just generally did feel really light-headed most of the time. I think we were on site for seven days and even though I had adjusted to the altitude officially – because I'd gone to a certain level and stayed there for two days before proceeding even higher up into the mountains – I think it's probably fair to say that I was still feeling fairly light-headed. Just to give a bit of an impression of the rest of the experiments we had done – these were single bursts of each one of these horns, and then there was many of us in the group and we were assigned positions and we would record the decibel level, because the architecture so complex and because the sound behaves in such particular ways. That was something we wanted to find out more about through the research. But at the same time, as a group of people – many of them young archaeologists or interested in archaeology and the Chavín site in different ways – we were having a lot of conversations about what could have been the human behaviours at this site. I remember standing on one of the plazas and we had quite a long conversation about the theatrics – which relates to our conversation today very nicely – and the possibilities of this really complex architecture revealing and concealing bodies, but also perhaps at particular times, potentially during rituals, people or beings making appearances given that the channels which run underneath the main plaza are wide enough for a relatively small person to travel through. In our discussions we were having quite imaginative, speculative discussions about how this perception could have been played with about moving bodies or disappearing bodies or beings in space. The published work, I think, does refer to the manipulation of sensory experience and also the use of psychoactive substances which are also depicted in the



iconography. The San Pedro cactus, I believe, is known for its hallucinogenic effects and is also depicted, so I think that there's a strong inference there that it was consumed. So all these things. We were doing both the quite scientific recording of numbers, which you later did the hard work of trawling through, but also this performative side of archaeology which was just: 'Let's try this out, let's try a procession'...

MK: And document what happens! I love the point about the fact that we're performing the space, the architecture. We're humans moving and articulating space, we're flowing through the space – this kind of metaphor that I've used in really specific ways even to suggest that ethnological evidence analogies really point to pututu players in Chavín being trancers – whether or not being fully embodied in a trance that would be completely absorbing, or just being in kind of a flow state. These kinds of performative immersions are so important – Chavín is all about immersion. As John Rick has pointed out in his writings about Chavín [2006], it really creates a world of its own. When you're down within the plazas, certainly with all of the monumental architecture intact, it would have blocked out most of the views of the surrounding hillsides and mountains. So there is this aspect of Chavín in its reconstructed sort of imagined brilliance of being this place with these polished and shiny black and white reflective stone walls and these deep plazas and this scale – as archaeologist Jerry Moore [1996] has dealt with – the scale that just fills the whole visual range. Everywhere you look, you can't see anything except for Chavín; and creating silence and creating acoustical space by making enclosures is something that Chavín does really well that we have documented and we experimented with. I think all of these things definitely point to a place where visitors came and suddenly were performing in the space – re-experiencing themselves in this new physical context, what I'm calling an 'ancient virtual world' [2019]. And so, trying to document that possibility space with archaeoacoustics is really interesting, and I really take archaeoacoustics more and more in the direction of this kind of multimodal sensory exploration, because obviously sound isn't a sense on its own. I was really interested in the new sound example that you haven't heard yet – which is Tito La Rosa performing a pututu, similar to – in the same performance, actually, as our initial clip. Except that this is a version where I've taken two recordings that Tito made on two different Chavín pututus that were excavated from the site, 3,000-year-old conch shell horns. He's playing two in the same performance, except that I have layered them in time using present-day digital audio studio techniques. So it's really interesting to think about how technologies such as audio recording and digital audio mixing can create new kinds of imaginations of performances, and do things that you wouldn't necessarily do in performance. People who work in studio recording do this all the time – and it's an interesting way to re-envision, re-listen to, think or experience the archaeological reconstructions through the medium of audio performance. So let's take a listen – and I'm really interested to hear your reaction and thoughts on that.

[00:54:12 to 00:55:18] Miriam Kolar's layered recording of Tito La Rosa playing two Chavín-excavated pututus in the Museo Nacional Chavín

AG: Wonderful. So was that a layering of two recordings?

MK: Yes, that was Tito playing two different pututus, probably in sequence in his performance, and I just literally took them and layered one on top of the other. So he was not over-dubbing himself, but, just to track his intuitive performance with each instrument. This was maybe the second time he played each one of them. He gave us this nice performance for research that used about seven of them, I think, that he had selected from some quick tests with all of the instruments.

AG: Yes, he's obviously such a gifted – I mean, it doesn't even cover it – but the way he plays is so evocative, and I feel like all the words that I'm trying to articulate don't really do justice to what he evokes in playing those instruments. But this use of digital audio technologies to layer, to make an impossibility, speaks to some of the questions we didn't quite get along to discuss – but they're epistemological questions and the positions of researchers today, because there's never just the object in the past in its purity and in its readiness to be discovered by a contemporary archaeologist. There's always this interaction between the present day and the past which is at the core of archaeology. And I think this kind of playful experimentation of auditory space that you've just played to us I feel nicely encapsulates the entanglement that researchers have with their research objects – in this case the sound and acoustics of archaeological sites. So perhaps that's a good – a nice way to round off the



conversation. I don't know if you want to add anything further about that clip or about archaeoacoustics in general?

MK: I think this point that you brought out about our relationship to archaeological materials and ideas, that it is so much based on our present and that we acknowledge that, at the same time that – as archaeologists, anyway – we're trying to provide some sort of preservation so that future people can have a relationship to the same materials and maybe draw their own conclusions based on shifting perspectives. Right? So to me, this is really good archaeological science – doing the best documentation we can with lots of annotation, but then making this space for speculation and imagination and possibility. And trying to include people who are not expressly archaeologists or opening up the ground for community-driven projects that don't necessarily happen through the same channels – things that conserve communities that are constituencies of cultural heritage are very, very important in archaeology, and I think that it's such a great privilege to be able to interact with these materials and to go to these places and to form relationships with people and collaborations in archaeological places. And so all of that for me is so much what the archaeology is about: it's about the places and the people in the places – and that is always in flux and it's always is brought back to the relationships of these actors that we are – re-performing, re-sounding the past and past life.

AG: Thank you so much for this conversation today. I think we could have gone on for several more hours as we did the first time that we spoke! We didn't cover all of what we wanted to but it's been such a pleasure to talk to you more about some of the other questions present in your research and to listen to some of those beautiful excerpts. So thank you, Miriam.

MK: Thank you, Annie!

Transcription by Nick Awde

Clips Summary

[00:20:33 to 00:21:13] Miriam Kolar's recording of Tito La Rosa playing a Chavín-excavated pututu in the Museo Nacional Chavín

[00:43:28 to 00:44:42] Annie Goh's recording of replica pututu procession at Chavín

[00:46:44 to 00:47:46] Brian Morris' recording of replica pututu procession at Chavín

[00:54:12 to 00:55:18] Miriam Kolar's layered recording of Tito La Rosa playing two Chavín-excavated pututus in the Museo Nacional Chavín

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