Audio Transcript: From Arachnophobia to Arachnophilia

Solana Chehtman:
Hello welcome. My name is Solana Chehtman. I'm the director of creative practice and social impact here at The Shed. And I want to welcome you all to *From Arachnophobia to our Arachnophilia*. Our fourth encounter as part of our ongoing conversation series, *Matter(s) For Conversation and Action*, taking place in conjunction with the exhibition *Particular Matter(s)* by artist, Tomás Saraceno on view at The Shed through April 17. I want to start as always by sharing the points of access that are available today. Live closed captioning is provided by Marie Villarreal. To turn it on, please click the CC button in the bottom right of your Zoom window. We also have American sign language interpretation provided by Lavender de Julia and Selena Flowers, who should be visible at all times and feel free to connect with our team with any comments or requests regarding your participation through the chat feature, to the right of the screen. And please also feel free to add your questions for the panelists throughout the conversation, using the Q and A button. That's also at the bottom of the Zoom window. We will try to get to most of them towards the end of our discussion.

We organize this series, *Matter(s) for Conversation and Action* as a way to dig deeper into Saraceno's work. And at the same time as a way to center some of the main contemporary discussions related to the climate crisis including the human made capitalist driven non liability of our planet. It's disparate impacts on different populations, particularly taking on environmental racism and soon on indigenous stewardship of the land, and throughout it all, what we can do individually and collectively to enact change, how we can collaborate in a multi and transdisciplinary way and what we can learn from different practices, knowledges, and from each other. This way of working resonates quite a bit with the work that Saraceno has been doing with the Arachnophilia community, an interdisciplinary network of spider web enthusiasts that seeks to weave our relationship between scientific, philosophical, cultural images and stories that describe the entangled relations between humans and spiders over thousands of years. In this same spirit, today's conversation invites a group of amazing and multidisciplinary speakers to share their own practices, not only researching and understanding, but also learning from, valuing, paying homage, and actively collaborating with spiders in building in weaving a safer and more equitable future for our planet.

We couldn't be more grateful to our outstanding set of international speakers for joining us today. Markus J Buehler is the McAfee Professor of Engineering at the Massachusetts Institute of Technology, and director of MIT's Laboratory for Atomistic and Molecular Mechanics. Peggy Hill is an ecologist and professor emerita of biological science at the University of Tulsa. Eric-Paul Riege is an artist based in Na' nízhoozhí, Gallup, New Mexico, working across media with an emphasis on woven sculpture, wearable art, and durational performance. David Zeitlyn is a professor of social anthropology at the University of Oxford's Institute of Social and Cultural Anthropology. And finally, our moderator, Cynthia Willett is the Samuel Candler Dobbs Professor of Philosophy at Emory University. Before having them join, I want to thank our partners, The Columbia Climate School, and the Studio Saraceno for the co-conspiration in putting together this series. And I want to thank, very specially, Ford Foundation for supporting in making this series possible.

I want to invite you all to check out our website, TheShed.org for more information about upcoming conversations, for recordings of past ones if you missed them, and to get tickets to come see the exhibition in person, if you're in New York. And if you have any young people in your life, I would love to also invite you to check in on our by-teens-for-teens programs with a special shout out to *A Science Affair*, an event that will take place at The Shed on Saturday, April 2 and that is free for everyone to participate in. And now, without further ado, I want to introduce my wonderful colleague, Alix Schroder from Columbia's Climate School. And then I'll ask Alix that you pass it on to Markus, Peggy, Eric-Paul, David, and Cynthia. Thank you.

Alix Schroder:
Great. Thank you so much Solana and hello everyone. My name is Alix and I'm the associate director of academic initiatives at the Columbia Climate School. I've had the great pleasure to work closely with Solana and The Shed team to shape this public programming series, which connects to and builds on the incredible and thought provoking art of Tomás Saraceno. So thank you to both The Shed and Studio Saraceno for your inspiration and hard work on both this exhibit and the event series. So I'm really pleased to be here tonight on behalf of the Columbia Climate School. Our school aims to provide the scholarship needed to tackle the climate crisis and related problems. And we also have a huge emphasis on interdisciplinary and interdisciplinary partnerships. And this pro-public program series is a truly great example of the power of interdisciplinary collaborations and partnerships. This, these discussions bring together a diversity of panelists to explore a range of critical topics, connected to climate change, the environment and environmental justice. So on that note, thank you to everyone for joining tonight. I'm pleased to hand it off to tonight's moderator, Cynthia, and the other panelists. So thank you again and enjoy this panel.

Cynthia Willett:
Thank you, Solana. And thank you, Alix. It's a pleasure to be here and I'm especially excited for this conversation with Tomás' collaborators on his larger vision. And the focus of our conversation today is on what we might learn by attuning ourselves to other species. This is also a question that's been very interesting for me in philosophy because of our over-emphasis on reason and language as seemingly unique to humans. It's this over emphasis that obscures possibilities for ethics and for knowledge. The kind of possibilities that come from being more open to attuning ourselves, to tones and rhythms, vibrations -- all that makes for that kind of rich nonverbal communication. The kind of communication that doesn't make humans, in some ways, exceptional, but that we share with many other species. It's through these attunements that we might feel our way into another creature's life despite fundamental differences between us.

I'd like to start, David, with your work. Your work has taught us a great deal about spider divination. These are traditional practices in Cameroon and elsewhere. It seems like in modern cultures, we've lost anything like these practices. That we've stripped ourselves of communicative channels between us and other creatures. And we've lost as well, our sense of, of the divine. But it's also commonly sad that in secular cultures, art has replaced religion. In fact, as we see from the collaboration in The Shed, it's not just artists, but also

scientists and Markus here I'm thinking of your work as well. Artists, engineers, you all are in some sense, our designers. I'd love to know what it is that you all think we need to hear now. If we could only reopen channels of communication across species. And David, if you could start by explaining to us what you have learned from spider divination practices.

David Zeitlyn:
Thank you so much. I, so I come at this from a slightly different point, I think, from most of the other panelists, because I'm a cultural anthropologist. I work in a small village in Cameroon, in West Africa, near the Cameroon/ Nigerian border. And I've been working with people like Bollo and Tango, who you can see on the screen here, for nearly 35 years. And what I love about spider divination is the way that it makes people make their concerns explicit. Because to do divination, you put a stone and a stick near the hole of the, in which these earth living spiders living and you associate different questions with the stone and the stick. Here are some examples. So when, when I was last in the village, actually with Tomás Saraceno in late 2019, one of the questions we asked was about the upcoming American election and the thing about making it binary, cause you've only got one stone, one stick is it doesn't force the, you can still leave questions open.

So we are able to say, if the Americans will choose the current president, choose the stone, if they will a new one, not saying who that new one would be, choose the stick. And often in divination, you leave an open auction associated with one of the two polls. And if that is chosen, you can then ask subsequent questions. So looking at the flow of questions, the sequence, it gives a real idea of how particular concerns are well, elaborated and investigated. So it's a way of studying indigenous intellectual activity. And I just point out that this is a very rare photograph showing what I like to think of as a mother spider teaching a baby spider, how to divine, but you can't actually tell the genders.

So, one of the other things that's come out of this is that with Tomás we've now got a website coming out of his visit, and it's possible for other people to ask to, to send questions to the village when there will be a delay, but I can interpret what people want to ask to the diviners such as Bollo who you saw earlier. And eventually I can give you an answer back. And, and it's, it's about externalizing. It's about losing control in a constrained way. That's the main set of lessons that I've learned from it.

Cynthia Willett:
Yeah. Very interesting. Would anyone like to add something here? Beause Peggy, I think of your work and it's very interestingly focused on vibrations. In fact, you've really taught us how channels of communication might be open by attending to vibrations. I, you know, when I laid in the giant web that Tomás installed at The Shed, I felt through its vibration, some sense of what it was like to be alive for a spider. At least that's what I thought I felt. And it's not as though I felt like I was becoming in any sense, a spider, it was more that there was this way in which I felt like I felt that spider sense of aliveness next to my own. It it's something like when I give a friend a tight embrace and I can feel their heartbeat, their pulse against mine, I and I even, and can feel their mood or sense in a way, get a sense of things for them. Peggy, could you explain how vibrations work and their significance for spiders? I think Peggy, I think you

Peggy Hill:
Muted, excuse me, excuse me. I, I thank you. But this is a tall order and, and I'll do my best to, to convey as much information as I can that's really pertinent to the discussion in the shortest time. But first of all, all matter in our universe is, and is in motion. Every everything vibrates. So vibrational behavior, which we study in this new scientific discipline of biotremology to the best of our knowledge evolved along with the evolution of animals, after sponges. So we're, we're talking billion years ago. The vibrations used in this behavior are produced with any movement, but also created by animals as particle motion in mechanical waves rather than individual vibrating bits of matter. So the, so the things that we're looking at are waves of vibration. Okay. So animals communicate with mates or offspring, colony members.

They warn off predators with vibrations that they create through specific mechanisms, three of the four most common ways of producing vibrations by animals all require the evolution of special structures. Were already functioning at least 230 million years ago. So three of the four ways that animals, these days produced vibrations were already being used 230 million years ago, and only two types of wave forms of all those out there are used across the planet in almost all known examples of animal communication and other vibrational behavior. There are other mechanical wave forms, but we've just not yet found whether they're associated with vibrational behavior, but they may be. So use of vibration and communication in avoidance of predation and more is incredibly ancient on the planet. Signals have been refined and specialized along with the development of receiver organs to detect these vibrations. And we haven't found any major.

This is key. We haven't found any major modern animal groups that do not have the ability to receive and process vibrational information. So, use of the vibration really is everywhere but not audible because a sound wave, which is one type of vibrational wave, is detected by ears. And they, they sound waves are heard and detected because of pressure or differences in pressure while substrate born vibrations are detected by particle displacement. And there are an immense array of receiver organs that actually are used besides ears. So, so sound is heard. Vibration is felt. As we look at this person lying in the, in a human constructed web that's part of the exhibition half or more of their body is in contact with the threads of the web. And if we play back recorded vibrate through the artificial web, the human can then experience something like a spider would in the web the spider's constructed.

So now this web is very regular in construction and you can see the mesh of it is, is you see all these little squares with 4 points. Spiderwebs aren't exactly like this, but the is better understood if you have the chance to experience this human constructed web, which I think is great, that Cindy was able to. So in a typical spider web, and not all spiders actually make webs, radial threads run from the center to the edge and are connected by spiral threads that intersect the radials. These threads represent the substrate from which the spider gains information. Other substrates could be things like soil or plant organs or water surface or honey combs, but for the spider, it's the web, the spider constructs, the web from material produced by its own body. And each thread is surrounded by the atmosphere -- above and below, but also totally around each thread.

Energy travels along the web threads as mechanical vibrations and then transfers to the air surrounding the threads at the boundary automat by exciting particle motion, particle motion at the boundary, the wave form in the web thread changes to another type of wave --- in this case, sound. Though probably very quiet, low amplitude sounds that would have to be artificially amplified for humans to be able to hear them vibrations passing along a web thread, whether produced by a spider or struggling prey or a predator of the spider or a potential mate, or even offspring, each has its own identifiable, vibrational signature. And so information, whether intentional or not, can be detected and understood perceived by the spider the webs owner, the resident's spider can then respond to a mate or it's babies or a meal or stop moving to conceal itself from the predator. It doesn't take a big stretch of the imagination for us to consider the spiders, being able to gain information and share it with other species at this boundary between its web threads in the air that surround the threads.

But we do not yet know that this happens simply that it's theoretically possible. Communication, as it's currently defined, has to involve information exchange. We know that all life forms can detect vibrations, and that we are surrounded by these vibrations, unless we insulate ourselves. So if interspecies communication of information is beneficial to life forms, if it's beneficial, it's already happening because of evolution through natural selection. We have simply not yet detected this information exchange or been aware of its potential existence for long enough for humans to be able to decode it. We're still studying information transferred within a species or in a predator-prey interaction, but we're, we're making huge progress. So maybe is my answer, maybe.

Cynthia Willett:
Yeah. Yeah. Very interesting. And you know, in thinking Peggy, both of your work that you were among the first to really be attentive to vibrations and thinking back to David's work, that, you know, all that you brought forward David, about these divination practices. I wonder Peggy if you or any of the speakers could help us speculate on, you know, why it is that we have become so distracted in modern cultures, you know, distracted from these kinds of, I guess, you know, attunements to vibrations. Is there something that's blocked our attention to it? Is there something we could do to overcome, you know, that blocking and be more attentive? Yeah. David.

David Zeitlyn:
Thank you. I'm not sure that it's, that that characterization is right. Loads of people are doing all sorts of different forms of divination. It's just, it's massively disapproved of, and therefore kind kept to one side. So, and we, you know, going from tarot cards, the I Ching, in lots of European places, there's a tradition of reading tea leaves or coffee grounds and what, and these are kind of external props for thought. Another way of thinking about is boundary objects, if you want technical terminology, but there's an awful lot going on than you are allowing for is all, I'd say.

Cynthia Willett:
Interesting. Interesting, interesting. And Peggy, you were telling us too, something also about like in our lives, our lives are too fast paced and that maybe it's a matter of paying more attention.

Peggy Hill:
Well, since I'm from a Oklahoma, I have to mention something about the native perspective and, and Luther Standing Bear -- who's not from Oklahoma, who's Lakota in, in the 1930s, wrote about, wrote about reclining on the earth to be able to gain information and balance from the earth of elders seeking from the earth for the earth to teach them by being in physical contact with it. And, and there is sort of a respect specifically for spiders, for their patience and their work ethic in stories of many tribes. But one thing that I think is kind of key for this question, Cherokee storytellers in the area where I live often start a teaching story with the statement: "a long time ago when animals could talk." And so there still is that, I agree with David, there still is this practice out in the real world, but we humans in advanced civilizations have traded what we think is superiority and, and being able to live forever by giving up, living in harmony with the world.

You know, for most of the history of humans, we lived as members of the community, as part of life, but beginning with agriculture, and then industry, then technology, we gave that up and removed ourselves, you know, from living in that area. And the idea is to me, we don't have to, we don't have to give up everything we've acquired in knowledge to the present, but we have to relearn how to live in a world where we respect all of the things where we see a life form and, and we kill it because it's not a human, you know, sort of thing. You've got to be able to live with respect for, and it's not just other animals, it's fungi and, you know, bacteria, all that kind of thing, not everything is a threat.

But we've forgotten how to do that because we're invincible and, we're more important, we're, we're dominating the planet and with all the destruction that we see from that. So if I think if we, individually, we could just, you know, almost like meditating or going through mindfulness. We could just be silent, and feel what's going on in our environment. And it slows our heart rate, our blood pressure goes down, we feel more rested, all these kinds of things, but we are a life form on this planet, and we have kind of said, but we're more superior. And I think if we, we pay attention to the world, we can regain so much knowledge and spiritual sort of, you know, wellbeing, and artistic vigor. You know, those of us who are not really very artistic can still achieve something from just listening.

Cynthia Willett:
Hmm. Very, very interesting. Eric-Paul, would you like to add something?

Eric-Paul Riege:
Yeah. I wanted to jump off of that, to weave with those statements, I suppose. There was something that David said that I feel like as a weaver and as a maker and having to co-inhabit space, not only with, you know, the people around me, but the places that you're gifted to grow up in, or the more than human and non-human beings that also co-inhabit your space. I feel like the image that you showed of, you said it was like a mother spider in some sort of way, teaching of a baby spider, about divination and about what it means to exist. So I always feel like when I introduce myself, I should introduce some of my family. So this is my great-grandmother, who was a weaver,. Here's me as a little baby. She lived to be about 106.

And so I had a relationship with her until she passed, but I feel like as I have come to make, and as I have come to, you know, see myself as an artist, I think about my mothers, my mothers being, you know, my mother, herself, her mother, her grandmother, so that my great-grandmother, then also the mothers of our holy figures. So Na'ashjé'íí Asdzáá, which is Dine for spider woman, who is the holy figure who taught us as Dine, how to weave. So she passed that down to other holy figures. And then, you know, this passing down and this relationship between hand and craft and storytelling for me is, one beautiful, but also provides physical survival. And I was thinking about what Peggy said about spiders. Their bodies literally take their homes with them. Their home is within their body. And so I feel like my home is within my own body.

I've taken that relationship between how you inhabit the world and how you go through the world from the idea of the spider. I feel as when I perform there is a matter of slowing down. And so we're talking about what it means to be what it means to, you know, be mindful. And so I feel like one other thing that Peggy said that all matters is in motion. And so, in some ways I consider one of my passions, a passion of weaving, but another passion of mine is motion. What it means to be still what it means to run, what it means to, you know, have repetitive motion because at the loom it's back and forth, back and forth, back and forth. There's a slow, minuscule growth of the yarn and the warp, millimeter by millimeter. And so it's, one very patient building.

My dad's not very patient. So I often tell, I need to teach you how to weave. So that way we can slow down together and really attune ourselves to the relationship with the loom, but I think about that passion of motion of, you know, the slow minuscule growth. And that's what the, the spider is with the home. It's a slow minuscule growth of their bodies creating their home. And so for me, as a weaver, my home is when I am at the loom, and when I am also creating and weaving a web.

Cynthia Willett:
Yeah, that is so interesting. It's so interesting to think of your own art of weaving is in a way like building those kind of connections that are also home. And, you know, and I, and I think of like the, the contrast that your art, which is really beautiful, poses with the kind of art that comes from more individualistic cultures, that your art really is this art of densely woven connection with past and futures, with ancestors, and with human and non-humans. And, you know, in philosophy, we're very familiar with ancient Greeks who develop their arts and their oracles torn against hubris. And hubris was the violation, the destruction of webs of connectedness. And they used their arts, which are also their religion, and they used their arts as their medicine. And I, I wonder if you could tell me more about this aspect of your art. Are there cathartic practices that, you know, that can help us clear, not just those physical pollutants in the air, but also the toxins in our ways of being. Are there healing practices that might re-weave webs of connection. In other words, can art heal? Or even looking at towards Markus' work, you know, does it have therapeutic value?

Eric-Paul Riege:
Yeah, I, for, for myself, what I'm thinking about, what it means to make as a, as a mode of healing, or as even thinking about ecology in the science of, of

connections and the web making conversations that we, we, we have, what is it, how does art, how does my art, or how does art in general fit into this conversation? And I relate that back to our gestures as we're in conversation and language right now, but in nonverbal language, what are the most kind gestures that we can do for each other? And I consider carrying the most kind gesture that humans have for other beings. We carry someone's hands are too full. So you help them with their groceries. You're carrying their groceries from the car to the kitchen counter. Someone is injured. And so now you are carrying them to the hospital, whether that's physically your body or to the vehicle.

Now, the car is carrying you, but you are driving the vehicle. I think about someone's telling you a secret, and now you are carrying that secret for them or carrying a burden. I think about you're in love with someone, and now you're carrying your lover to bed or carrying your baby to bed. I think about the loom as a means of carrying weaving and carrying stories. And so for me, the healing gesture, there is protection. I think about the utilitarian use of blankets. They're to keep you warm. They're to keep the floor softer for your feet. They're to keep you dry. If it's raining, they're there to protect you. And so I think about carry and, and this layer of protection between the fibers of the, the, the rugs and the blankets. And for me, that healing gesture comes into, you know, a celebration of that within itself, but then also the cradling and the caring as Dine people, we're born, we're in a cradle board.

So actually right behind me, this figure that lives within my work, he's in a cradle board. I consider him my son in a lot of ways, because did a series of performances within a web and within conversations that I've had with Spider Woman, and at the end of those performances, Hól´, which is his name, which means to exist, was born. And so now he is in his cradle board, which is also the loom. And so, yeah, cradling and, and caring for me is, through art, is the most meaningful way to heal oneself and to heal those that are viewers or audience members or collaborators.

Cynthia Willett:
Yes. Yeah, yeah. And Markus, I'd really love for you to add to this. I wanna think of your work too. How, you know, we began the conversation. We began thinking about how in a secular world, without God's artists have become in some ways our diviners and that artists can find means. And the modern age of what the modern age of reason has left as a world. That is what philosophers sometimes described as disenchanted. That is just a world stripped of vital forces, but your work, you know, studies not just vibrations and animals and spiderwebs, but also in molecules and proteins and transforms those into audible sound, into music. It's through your collaboration, that we hear the silent songs of the spiders and Tomás' webs. You've pointed out that music carries emotional meanings. Do you think there could be some rudimentary communication between us and invertebrates like spiders? And if you do, how could you speculate, speculate a bit on yeah. How, how would that work?

Markus Buehler:
Yeah. Great, good question. Thank you, Cynthia. So I, I'm gonna start maybe by connecting this a little bit with Eric-Paul's really great, you know, discussion on weaving. I think we think of weaving as the process, by which information

in, when we go back to the level of molecules and DNA and information really stored in an organism in the world, how that information is actually folded into three dimensional structures, materials in the end that you can see and touch. And so spiderwebs are one example by which such information is actually realized. Information becomes matter in that way. And this, the DNA in the spider's body interacts with the environment, you know, wherever the spider builds the web to express itself in material. So that's sort of the basis is. Now, mechanistically, and it comes back to your question. You know, this all works actually through vibrations, which are localizations of energies, and Peggy made a great point that, you know, all species use this.

And I think there are sort of distinctions in how we look at vibrations in our work. One is that you have vibrations of a string, which is sort of a non-living material in some way, a sense, at least understood, but most people believe in it. We don't know what other things are in, in that setting. Actually, we can ask those questions, but generally they're inactive producers of vibrations, and then there are active ones and the spider is one of them and we are one of them. And I think, you know, what we're trying to see is that we can, we carry insights into these expressions. Okay. So we can talk vibrations. The spider will vibrate the web, and you can experience that through Tomás, you know, amazing work and how you can feel the little bit like a spider lifts. But you know, what we're trying to do is to, to use vibrations of go back to that level of information, carrying and how it mechanistically works through localization of energy and time and spreading it out in the world.

But me asking you the question, how can we understand the additional messages carried in these signals? And that's really where the cross species communication comes in. You know, if you want ti understand how the spider speaks, we're gonna have to learn that language and the same way the spider will not understand and say what we have to say. And so there's this connection that we need to make. And this is where, you know, a lot of theory and mathematics comes in to actually make that happen. And so you mentioned the work we're doing on, on creating sounds and music and compositions from all sorts of vibrational subjects, whether it's fire, or it might be a spider, or it might be a protein, a molecule, there's some really incredible information carried, that we can take over from the signals and then translate them into frequencies. And this is what Peggy mentioned is as well we can hear.

And I, we're not special in a sense, we have special ears that work for us, right. If we wanna hear other signals and understand them, we're gonna have to go to different methods to actually translate them. And this is what we do in a lot in our work. And, but that being said, I think there, there's sort of this universality and vibrations, and you ask about the emotional aspect of music. So for example, that, you know, really is I think a function of the, the, the human creation of that. Okay. So we produce that music. We have the emotional response. You know, what I'm interested in is that yes, but also where it actually originates from and what information does it actually carry? So a lot of the work recently we've extracted meaning, and I sort of asked the question, what information is carried, really material information.

So we know that the DNA in the spider will produce the web, ultimately when the spider is alive and goes out in the environment. But what if you take music

that humans have created, and we find it safe, for example, emotional, but that's more than that, you know, what, what material would you be able to make from that? We translate it, human made compositions into well, into material and proteins in particular and DNA, but we can go the other way around, you know, that's sort of the more traditional way we've done it over the years is to basically take existing structures like the spider web with Tomás and fire. I mentioned, and, and all sorts of vibrating objects in the world, including silk proteins and so on. And, and try to ask a question, how would they sound like? But I wanna emphasize information goes both ways.

And I think once you have this mechanism, yeah, it becomes a human experience. So it's not just a mathematical abstraction or computational method, but we really like to put the human, the human experience in that mix. So you can actually communicate, you know, it's all about that, that experience that really brings, I think, adds a lot of richness to the world. I think if you, if you're beginning to, you know, understand how objects, systems, living systems and different scales, how they, you know, how they, how they express themselves and what meaning they're trying to convey. And this is, I guess, you know, very early, you know, fast to understand that. And, but yeah, there's lots there, I think. And you know, both from a science and artistic point of view and the question of just where do you, where do you create new ideas that challenge the paradigm, but which we usually create, which is imagination in the mind or mathematics in, you mentioned the Greek tradition of musical, you know, that's really, a lot of this was based on mathematics, right. And physics, but, well, we can go beyond that and look at different types of physics, different kinds of biology. So there's really an incredible world out there that I think we can experience, actually enjoy, but also use it really to ask questions and to see what we don't know yet, which is really the point of science and, and art probably is to, we ought push the limits of what we know and what we think we know.

Cynthia Willett:
Yeah. Very, very, very interesting. Yeah, David.

David Zeitlyn:
Right. So remember to unmute, thank you so much. I'd just like to kinda make a connection between what Markus has just been saying and what Eric was saying. I'm thinking about how conversation, and the to and fro of conversation is in a sort of weaving. I'm suddenly thinking, and I've put in the chat, a link to a recent paper where a colleague of mine in University College in London has made a 3D model of linguistic structures. And the result is I think, a beautiful bit of sculpture, but as a way of changing the representational form, we can also change the analytical framework. And I think there are all sorts of really powerful potentials in that, which I, I hope we all, and the audience will explore. Yeah, that's it?

Cynthia Willett:
Yeah. Eric-Paul...

Eric-Paul Riege:
That's, excuse me. That's amazing. I did a project with one of my professors and mentors, Szu-Han Ho, who works at UNM, University of New Mexico in Albuquerque. And she blessed me with so many gifts, but we did a collaboration one time about how the written language and how communication about art sometimes doesn't look like art. And when you write about art, I think it should look like the work, whether that's through the language, or through we decided to make it visual. And so we did a project kind of similar to what you, you just shared, where we did a series of writings about weaving that look like weavings. And so, yeah, I think about how communication and how the written language and the verbal back and forth relates to weaving itself. And that, again, the web

Cynthia Willett:
Very interesting. I wonder at this point we might, I like how we're weaving a conversation among ourselves too. And I wonder if we might invite those in the audience, any questions. Is there anyone out there that has a question? And meanwhile, while we wait for those questions, you know, I'm curious if you could clarify Markus, when you talk about the emotional meanings of music and that, you know, for the human perspective, do you understand those signals though, for, let's say spiders, invertebrates, for those who carry something, you know, emotional, you know, I think of like when psychologists write about affect attunement, they think of communication of affects, of very basic vital emotions or feelings, and that communication happens without the creature that's communicating, having any conceptual understanding of what they're doing, or, you know, anything like, even a self of what we mean, but still might be communicating something that another creature and that even, maybe we could pick up that could be... That we wouldn't always, perhaps, be mysterious. And yet we could still sense something of it. And I wonder if you've thought about kind of..

Markus Buehler:
Yeah. That's, that's a great question. I, I do not know actually, to be quite honest, I don't know. I think that in general, I would say that, you know, needs to be some learning. There, there there's probably some universal features, but whether or not these relationships are intact at the moment, or if they can be learned or relearned. I mean, that's the question I would ask, you know, if, if you, perhaps, if we spend more time with spiders, then we, we have a way of, of actually speaking to them by, by exciting that web and, and exposing the signals that we have generated as humans. And then we can hear what they have to say. You know, we can perhaps learn that as a field. And of course, in language models, that's a very active field research in computer science where you, you do, what's called fine tuning.

And you essentially, you, you have a large model that has lots of, you know, understanding of how language works. But then if you wanna contextualize your model to answer a question, for example, you need to, you need to, well, fine tune it. You need to teach it, but here is an example, what I'm actually interested in the model, adapt and learn and self organize it's neurons to, you know, to, to solve that problem. And so I would probably, my answer would be, I, you know, if I have to guess I would probably say that there's probably gonna be some fine tuning necessary in that step, but I think we have the capacity for

sure, on both ends to do that. And, and perhaps the spiders in David's divination, you know, experiment, they, the spiders and the humans have actually, you know, either recaptured that ability or have never lost the ability. Right. You know, that maybe you and I won't have, I wouldn't have it probably, but yeah, absolutely. In general, I think the capacity is there and, and we, we might just not have access to that at the moment, but our abilities to communicate with the environment, all the pathways are there, I think, and we would be able to learn it for sure. Yeah.

Cynthia Willett:
And I have a question too, from someone in the audience, [name], who asks, they say that they've read an article about how Incas communicate through knots and wonder if the patterns of spiderwebs communicate a message. I suppose, in some way analogous to that. So if you could clarify, any of you all who might be able to clarify, that Peggy or Markus.

Markus Buehler:
Well, I can go ahead. No,

Peggy Hill:
Go, go ahead. I it's fine, Markus.

Markus Buehler:
No, no, you can go ahead. I, well, I would just, okay. I mine very quick, actually. I don't know the answer really, but the only thing I would say that I know we do know that spiders will construct webs depending on environmental cues and how hungry they are simply speaking. Right. You know, what do they feel? What's the environment like? So there's a message. And whether this message is structural functional, or if it's communicating to other spiders, we don't necessarily know that, but we do know that some spiders live socially in, in, in social environments. And so there's clearly a communication, right? So if one spider builds part of the web a certain way, others will pick up on this sign, they will hear or see, you know, or feel a sense. And there's gotta be some communication in that way, I think. But Peggy, yeah, Peggy probably has a more vigorous answer to this question. I'm sure.

Peggy Hill:
No, I don't. But I was just gonna say that, that when we are working, you know, as a biologist, as an ecologist, when we're working and discovering new knowledge, we just see the most obvious. Right. And, and we can't just assume, this is it. This is all of it. No, this is just a little surface. Something that we happen to be able to connect with that. Okay. We can learn more about, but we have to, we can never get finished with project. Anybody that runs out of something to do in a project has no imagination. You have to just, your life is not long enough to finish all the work that you're interested in doing right. And so I, I don't know about the knots, I've always wondered, you know, how they would, they would send it, you know, instead of a letter they'd send a rope with, with knots and, and how do you interpret that? Well, you have to, know what you have. The receiver has to know how to decode the message. Right. And if we knew how to decode more messages, we would certainly, you know, know a lot.

Cynthia Willett:
Yeah. So interesting. We have a lot of interesting questions and one of them, I see raises the question of consciousness. How you all think about consciousness with respect to spiders and other living beings. And they mentioned also cells and fungus, which is quite interesting to think of, since we see also like these webs of communication for fungus with trees and cross species, really interesting new research on that. This person wonders if in your understanding, each living being has their own language in life ways, if you all would like to speculate a bit on this larger question. Yeah. David,

David Zeitlyn:
Thank you. Well, a small very specific answer to that question from Cameroon, which is that throughout the south and west of the country, divination is done with spiders. In the north of the country, it is done with land crabs. And actually where I work with Manilla, they use both spiders and crabs.. And when you can distinguish, and of course the holes, if you look carefully at the holes of spiders are subtlely different from the holes of crabs. Cause spiders have bits of web around them. But the form of divination is the same. They use the same cards. So in that sense, both spiders and crabs, Manilla would say, speak the same language.

Cynthia Willett:
Interesting. And you know, David, you might see there's a question here too, that something will follow up. Julia, I see has this question, she...see if I'm reading this right. That she's been working as a ritual practitioner in her paternal tradition of Southern Italian shamanism. If you know anything about that, it seems to be based on spider divination, as well. And you're wondering if there are any connections.

David Zeitlyn:
Yeah, yeah. The, the short answer is no, no connection. I have read a little bit about Tarantismo, but there doesn't seem to be a connection. It's like another sort of un-connection is that the Chinese I Ching and the Yoruba Ifá divination have identical forms of notation. They use, you know, lines and broken lines and it's all binary. And there are 256 alternatives for that...seems to be driven by binary logic. But otherwise there is no connection. I'm sure there are people who would dispute that, but I'm not gonna get involved. Thank you.

Cynthia Willett:
And very, very interesting. And let's see, there are a few other comments and questions here, including from Christine. Thank you all for sharing your wisdom and insights. It's been mind expanding and healing to see the connections between listening and healing and other species. Are there other notable species that young spiders that you've studied listened to? And I think you all have pointed to some of those, if there's any more that you wanna say about other animals, you know, about crabs and yeah. Any other animals.

Markus Buehler:
Yeah. One, one thing I become really interested recently also is not only the vibrations expressed in, you know, physical vibrations basically, but also in motions of animals. There's this a lot of the, you know, animals have movements, of course, and they are oftentimes also chaotic in some sense, or

they have certain structure to them. We've been actually studying with one of my students how we could mine that data in a similar way. We've talked about the other things I'm doing to explore, essentially, you know, what are we, what are these different species and humans as well? What are we saying by how we move our bodies, or energy localized, you know, manifestation of our DNA and everything in space and time. And so how that could be another language perhaps that, you know, could be studied potentially.

Cynthia Willett:
Yeah. Peggy...

Peggy Hill:
I would just like to comment on this thing of consciousness, I have taught environmental ethics. One of the few biologists that's taught environmental ethics, but I don't accept this idea of a divide between sentient and non-sentient. I just don't because I do feel that each life form has a life force and they have ways that they do things that we don't understand just because we're humans. That doesn't mean, you know, and it it's like, well, I'll go there and say, okay, God tells us that we are blah, blah, blah. And I'm like, what did God tell the jellyfish? You know, what do you suppose a jellyfish thinks about humans being, you know, so omnipotent and so forth. And so sentient and non-sentient bothers me, but... I've lost what I was thinking about saying, but just because we don't understand the language of these other life forms...and plants are sensitive to vibration.

So if a predator is attacking a plant, you know, an herbivore is eating the plant, the plant will release toxins. That will be, you know, drive them away. Or they, if they have a mutualism with ants, they will send signal the ants to go, you know, attack them. And so there's just a lot going on. And I think that humans have stepped out of the natural world to a certain extent, and we can step back in, but it's gonna involve respect for these life forms, respect for the soil, you know, it's like, oh, it's just, you know, no, it's alive. The soil is alive. And you, can't just, you you're destroying it, you know, by so many things that we do with ignorance.

Markus Buehler:
Yeah. Really quick to this so two points. One -- I think that the languages really depend on the sender and the. I mean, it was mentioned, and that, that really is critical. I mean, we always take this perspective of receivers and that's like a try to explain there, we have to really find a way to decode these messages and understand them and that takes a lot because we have to put something in between that. Another thing, actually, when Peggy you mentioned signaling, I thought about color, and that's another way to think about signals and patterning that oftentimes we don't really think about when we think about vibrations of signals, we think about world spider webs and, and so on, but there is a great work that Joe and Hepburn is doing, for example, in color and creation of all sorts of three dimensional or four dimensional systems that are essentially using exploring color as a space for signaling. And I think that's something that, you know, a lot of the physical sciences have explored, and I know in biology is important, but in the, in this intersection, at least for, you know, what I'm interested in, that's something that I'm, I'm also really, really keen on understanding the language of that, which is actually in the, I mentioned the

energy localization, my introduction at that level really, there's no distinction, whether there's something, a vibrational signal or color signal. Right. And, and that's really ultimately, yeah.

Peggy Hill:
I remember what I wanted to say. And it's really important. There was a project at MIT working with Gallaudet University students who were congenitally deaf. Right. And they played, they attached, you know, to their fingertips, these little electrodes where they could send in tones, right. So like an A, or a middle C or something like that. And the students could distinguish frequency without hearing it so they could feel the vibrations and in their brains distinguish frequency. And if they would lie down on an old disco floor and music was played through the floor, they could hear music in their brains that, that they really were only perceiving through vibration. So guys, we don't know very much about all of this, but it's amazing.

Cynthia Willett:
It is amazing. Think about it. Yeah. It is

Peggy Hill:
A great group. You know, this is awesome.

Cynthia Willett:
I really, I wanna thank you all. This has been such a really fascinating, fascinating discussion along with this visionary project that you all have helped collaborate with. I really, you know, I've, I've learned from y'all vibrations have been a primary means of communication. Maybe the primary means of communication for so many species for what some, you know, 230 million years. And I just, you know, you have to wonder if

Peggy Hill:
Predates hearing sound.

Cynthia Willett:
Yeah. So you just kind of wonder if those kind of, you know, silent songs, if they, and really the silent songs that, that you all have all helped to find if they wouldn't re-enchant our modern lives. Thank you all. I'd like to end by thanking Alix at the Columbia Climate School and also Solana and Sarah, the whole team at The Shed's been just fantastic through all of this. Also all of you speakers, just really fascinating insights as well as those of you and the audience who've joined us today.

Eric-Paul Riege:
Thank you all so much.

Markus Buehler:
Yeah. Thank you everyone. That's fascinating. Thank you.

David Zeitlyn:
Thank you very much. Excellent.