Hey everyone, it's Tristan. Today, we have a bit of a departure from our regular content on this podcast. As you may know, we've spent the last few months working incredibly hard to deal with the threat of the AI dilemma, which we outlined in a previous episode, and to help pause and redirect the resources of the race to deploy runaway AI into something that would constitute moving at the speed that we can get this right. As I've said before, we're not opposed to AI or artificial intelligence. In fact, Aza built an entire nonprofit that's using artificial intelligence to learn how to communicate with animals. It's called the Earth Species Project. In this special episode, Aza is going to tell you all about that work. Okay, over to him.

Hey everyone, it's Aza and you probably don't recognize that sound. It's the communication of orcas recorded in Antarctica. Studying animal communication is part of my work with an organization I founded back in 2017 called the Earth Species Project or ESP. What we're aiming to do is to decode non-human communication, basically learn how to talk with animals. The goal is to transform the way we communicate with and relate to the rest of nature. In this case, I like to think of AI as a kind of telescope that opens the aperture of the human mind. Why is that so important? Well, if we could draw down all of the carbon out of the atmosphere tomorrow, that may help ameliorate climate in the short term, but it doesn't solve the core problem, which is human ego. I think of Earth species as one of many different types of projects to try to patch human ego.

Now, we know through our work on AI and exponential growth of this technology that it's going to be in the next 12 to 36 months that we should be able to imitate whale or crow communication in such high fidelity that we will be able to build a synthetic whale or a synthetic crow or synthetic beluga or synthetic seal that they won't know is not one of them. That's the plot twist. We'll be able to have a conversation before we know what we are saying. With that ability comes a great responsibility. We talked about that in our recent episode about the three rules of technology and it very much applies here.

A quick reminder about the three rules. Rule number one, when you invent a new technology, you uncover a new class of responsibilities. Two, if that technology confers power, it'll start a race. Three, if you do not coordinate, that race will end in tragedy. How does that relate to talking to animals? Well, we need to think about who might gain power by using this technology. One example might be ecotourism operators where they'll be in a race with other ecotourism operators to attract animals for their clients. That'll start a race, probably ends in tragedy. Poachers are going to do this too, and animal agriculture is definitely going to want to use this. We are going to need to, before we put out this technology and invent it, figure out how to coordinate.

ESP is of course developing this technology both to shift the way that we relate to the rest of nature as a species, but also accelerate conservation research.
We're hoping to be able to listen and learn from species that have cultures passed down for 34 million years to expand the human imagination. We think of this as a hopeful use of AI because we believe that someday soon when we cross the language barrier, it could lead to a moment that superpowers a movement, specifically it could lead to unprecedented coordination, the kind we are going to need to avert mass extinction. The true hope I think of AI is that it helps us understand ourselves and the world around us better so that we can better care for it.

Not too long ago, I did a presentation about Earth Species' work at the World Economic Forum in San Francisco and we wanted to share that with you here.

Earth Species Project, seems sort of crazy to get to say this, we're working to decode non-human communication. That is to say, can we talk to animals? We get to work on this now and it's credible. The goal is to say, can we unlock communication to transform our relationship with the rest of nature? I want to start with this audio. Does anyone know, who's not on our team, what animal makes this sound?

I heard krill and it's not, and whales, which it's not, also not beluga, also not a bird, it is seals. That was this guy's mating call. If you hear that and you get excited, now you know where to go. What I love starting here is the sounds of the natural world are so diverse, but we're mostly unaware of them. Earth Species, the original idea for it came in 2013 from an NPR piece about gelada monkeys. The researcher who's on NPR talking about them said they have one of the largest vocabularies of any primate except for humans. They swear that the animals talk about them behind their backs.

At the point of thinking about this, there's no one really working on how do you apply machine learning to decoding an animal language. Then the person that started Earth Species, co-founded in 2017, when we started, there were very few people thinking about this. It's gone from an idea in the mind to something. There's an entire field that's now working on it, which is incredibly exciting. If there's one concept I want you guys to hold in the back of your minds for this talk is that our ability to understand is limited by our ability to perceive.

What does AI do? It is opening the aperture of human imagination and the human senses to let us perceive much more. In so doing, it'll let us understand a whole bunch more. I want to start with just a couple of examples of my favorites for opening the aperture of what we even think is possible. University of Tel Aviv, 2019, this incredible study on primrose flowers. They asked this question, "Do you think a flower can hear the sound of an approaching bee?" They played different sounds to a primrose flower. They played like traffic noise, bat noise, and pollinator noise, bee noise. Only when they played bee noise did the flower respond. And it produced more and sweeter nectar in just a couple seconds. That flower hears the bee coming and gets excited. It's like, "Here, come to me."
I think that's just amazing. Actually they tried the inverse, same lab. They stressed out tobacco and tomato plants, so dehydrated them, cut them, and it turns out they emit sound and not softly. They'll emit sound in proportion to how much they are stressed at the sound of human speaking. It's just up at 50 or 60 kilohertz so we can't hear it. Here we go. We have plants that can hear and plants that are speaking, that are emitting sound and we were completely unaware of it until 2019. The world is a wash in communication. I think if we move forward and look back in time, we'll be astounded at how static we thought the world was. Just another one because I can't help it. There's this amazing plant called the boquila trifoliolata. It's a vine and it does the most amazing thing. You put it on other plants and it will mimic their leaves. Pretty amazing.

Biologists and botanists were like, well, how is it doing this? Well, it's probably detecting the chemical signatures of the other plants, and that's how it's knowing what leaves to make. They tried this great experiment in 2020 where they tried growing this vine on artificial plants and it still was able to mimic the leaves. Honestly, this is a current mystery. The current best thought is that they use ocelleti, which is a very fancy way of saying eyes, that they are seeing the plant and changing. Again, we go forward, we look back and we realize how little we actually knew. We're looking for animal language because we think it's, one, awesome, and two, a really big lever for maybe changing human culture and driving conservation.

Is there a there there? This is a fascinating study from University of Hawaii where they taught dolphins two gestures. The first gesture was do something you have not done before. That is innovate. Think about it, that's a pretty complex thing to be able to communicate and to do right. To be able to innovate you have to remember all the things you've done before that session, understand the concept of negation, not one of those things and then invent something that isn't one of those things and yet dolphins do it. And then they teach a second gesture, do something together and they say to the dolphins in a pair, do something you haven't done before together. That dolphins go down, exchange some kind of information. They come up and they do the same thing they haven't done before at the same time.

You're like Occam's Razor. It doesn't prove that there's language, but you're like, it's sort of the simplest explanation. That leads to the question, okay, maybe there is a there there, how would you go about translating a language without a Rosetta Stone? Well, if you want to understand AI, I think there's one concept to hold in your mind that's really explanatory, and that is AI turns semantic relationships into geometric relationships.

Okay. I need to break in for just a moment. What's on the screen here is a three-dimensional image rotating clockwise. It basically looks like a galaxy of
thousands of stars, but in fact it’s representing the English language. All right, back to the presentation.

This is English. This is the top 10,000 most spoken words in English. It's actually supposed to be in like 300 dimensions. We projected it down to three dimensions because I can't think in 300 dimensions. Every star in this galaxy is a word.

Words that share a semantic relationship, share a geometric relationship, so an example of this might be smelly is to malodorous as book is to tome because malodorous is sort of the pretentious way of saying smelly. If you take that, you do malodorous minus smelly gives you pretentiousness as a relationship. You add pretentiousness to clever and [inaudible 00:11:21]. It's pretty wild to play with these spaces. If you think then about how do you end up with a shape that represents a language, if you think about a concept like dog, well it has relationship to friend and to guardian and to man and to cat and to wolf and to fur. It fixes in a point space. If you sort of solve the massive multi-dimensional Sudoku puzzle of every concept of every other concept and the relationships out pops this rigid structure.

The question then researchers had and why we started Earth Species in 2017 is if you have the shape which is German and the shape which is English, they can't possibly be similar shapes can they? And linguists would say, well, they have a different history, different cosmology, different way of relating to the world. It should be a different shape. And yet when the machine learners tried it turned out that they fit. It wasn't just English and German, which share a root was languages like Japanese and Esperanto and Finnish and Turkish and Aramaic. It's not like they all have the same shape and more distant languages have more unrelated shapes, and yet there's a way that you could align them all on top of each other and in so doing, dog ends up in the same spot in both. I just think this is so profoundly beautiful that in a time of such a deep division there is this hidden underlying structure that unites us all.

Our thought was, and actually this is not the way now modern, I don't know what the right terms for these things are, ultra-modern machine learning does translation, but this is the core concept I think that holds in our head for why this thing works. Our thought was, well, can we apply this then to animal communication? If we build this shape for the way animals communicate what part fits into the universal human meaning shape? If it does, then we should be able to do direct translation to the human experience. There should be some part where their experience in the world is so different we can't translate, but we can see that there's something there. I still don't know which one is going to be more fascinating, the parts that we can directly translate into the human experience or the parts we have no idea what it is, and those are going to be the things that are outside of the aperture of the human imagination.
Whales and dolphins have cultures that have been passed down vocally for 34 million years, humans only for maximally 300,000 years. Just imagine what they might know. Why do we think there might be an overlap? Well, I'll just give two examples. This is the mirror test. I don't know how many of you guys are aware of it, but the idea is you show an animal a mirror, often you'll like paint a dot on them and when they look in the mirror, they see themselves, they see the dot they couldn't see before and they try to get it off. This dolphin is looking at its abs, which I think is a relatively universal human experience when you get to a mirror. This shows a kind of self-awareness, right? You have to have self-awareness. That's a deep and profound experience that they may well communicate about. That part of the shape might be shared.

Let me give another example. This is a lemur taking a hit off of a centipede. They do this and they get high, they go into this trance-like state, they get super happy. It turns out dolphins do the same thing, but with puffer fish. They will inflate a puffer fish in a group and then pass it around to get high, which is the ultimate of puff puff pass. Elevated states of consciousness and seeking that is another thing that is shared across a wide variety of species. So that's something where we'd expect some kind of fit.

Okay, how do we go about building this shape? It turns out it's really hard. Getting the data is hard. That's why we have such a long list of partnerships like Ari who's here, we'll talk about how hard it actually is to go out into the field. This takes blood, sweat, and tears. Turns out whales don't exactly just want to stick around and help you. As we started to dive into it, we realized there were a lot of really, really hard problems we're going to have to solve before we could start asking these kinds of questions. Here's another question. What animal makes this sound?

This is the beluga. This is a couple belugas communicating and to me it sounds like a alien modem. Wouldn't it be nice though to know which beluga is speaking, sort of want to separate them out into their own individual tracks? Actually one of our first papers was trying to tackle this particular problem. This is two dogs barking and we learned how to separate them using AI. Okay, so I've talked about the ability to translate between human languages, but maybe that just works because we all share the same anatomy, physiology, but actually there's something deeper going on. I want to talk a little bit about multimodal translation. Have you guys seen all of the AI generative art that's been happening recently? How does that work, Dall-E, exactly?

Here's how to think about it. You can build the shape for a language, but you can also build a shape for images because it's just the relationship between things. You then look over the internet to find all of the images and caption pairs and that learns to associate languages and images. Okay? That's a multimodal translation. You can translate between two very different sense modalities and this makes us believe that this kind of thing can work across species as well.
What kind of data do we work with? This is actually Ari in Antarctica tagging whales. You can see that the data that comes off of it is how the animals move, kinematics. You get visuals, so you get video and you get audio. You can start to translate between these. We actually were awarded one of the National Geographic Explorers Awards and the project is led by Benjamin Hoffman who is working on turning all of that physical motion data into meaning what are their behaviors. How do you categorize it? The reason why I want to do that in part is because this lets you start doing really interesting things.

Like say, "Okay, given this motion, what sound goes with it?" You could imagine saying we have two elephants coming together. You model that and you say, "AI generate me the audio that is the sound of two elephants coming together." That'll give you the affiliate calls, the contact calls, how they say their name. Or you might say, "Okay, we want to intervene with ship strikes hitting whales. Could it be possible to say to a whale, "Dive." We would then say, "What would you say to have a whale dive?" We'll generate the audio for that. Now before saying that like, "Ooh, we should just go do that." Comes with a lot of really complex ethical issues.

Are we forcing the animal to dive and it's missing food or expending energy that it can't afford? It's just like one of the kinds of things that we might run into there. This is the area that I'm really interested in exploring today. I just want to show one more video. This is with another partner of ours, Michelle Forney. This is from her very recent documentary called Fathom on Apple Television about her experiments that we're starting to work with her on.

Ellen Garland:
The oldest cultures are not human, they're from the ocean. 40 million years ago before we walked upright, before we sparked fire, whales evolved to build relationships in the dark.

Michelle Fourne...:
I'm trying to start a conversation is the most basic way you can say it. I'm trying to put a speaker in the ocean and talk to the whale and hope it talks back. Starting playback. If this work is successful, it'll be the first experiment where we have engaged in a dialogue with a humpback whale.

Aza Raskin:
The punchline is that it works. She's saying hello to the whales, which sounds like [inaudible 00:19:41]. It also apparently encodes their name and they respond back. The next question is, can we say something more complex than just recording something and playing it back? One of our researchers, Jen-Yu, has been working on building language models directly on top of audio. This is an example of that. This is a humpback contact call that hello maybe with name, a real one and then two synthetic ones.

What does this mean? This means in our domain at some point 12, 24, 36 months, we're going to be able to do this for animal vocalizations. Just like I can build a chat bot in Chinese without needing to understand Chinese that'll still
convince a Chinese speaker, we will likely, we haven't done it yet, be able to sort of pass the dolphin Turing test or the whale Turing test or the tool-using crow Turing test. It's really exciting because that means there is a kind of first contact or something that's about to happen, but not in the way I think we originally expected where we decode first and then begin to communicate. There'll be this really surprising ability to communicate before we understand.

Obviously there's some deep ethical issues here as well as some really exciting opportunities. One of our partners, Christian Rutz, who works with tool-using crows sort of commented on a roadmap and said, "Hey, humpback whales, their song, it can go viral."

A song sung off the coast of Australia might get picked up and sung within a year across much of the population. If we're not careful, we may have just invented like a CRISPR of culture and messed up or intervened in a 34 million year old culture. I think now is the right time to start thinking about when you invent a new technology, you invent a new responsibility. What are the responsibilities for acting with a duty of care for the natural world? In some ways, that's the whole point of Earth Species in the first place is how do we shift our relationship with the rest of nature? I think it's a really exciting time to have this kind of conversation because I think we think of AI as the invention of modern optics. It's like the telescope in the sense that before when we invented the telescope, we looked at in the universe and discovered Earth was not the center. Here, the opportunity that we get to look out at the patterns of the universe, discover that maybe humanity is not the center of the universe.

Thanks for listening to this slightly different episode of Your Undivided Attention. We'll have a link to the Earth Species Project and its work in the show notes. I also wanted to mention that the Earth Species Project is hiring for our Director of Research role specializing in AI. If that's you or if it's someone you know, please check out the Earth Species Project website.

Tristan Harris:

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