SARAH PARCAK INTERVIEW PART THREE

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Hello again, Ars Technica listeners. This is the third and final installment of my three-part interview with with astroarchaeology pioneer, Sarah Parcak. I do hope you enjoy it. We start in mid-conversation, with Sarah talking about the fabulous, but terrifying experience of giving a major talk on the main stage at the TED conference.

TRANSITION MUSIC

Rob Reid: So, it's a couple of days into Ted, right. When the talk was made?

Sarah Parcak: That's like Tuesday. So it's the first big day.

Rob Reid: It's the first big day. That's good. You get it out of the way a little bit earlier.

Sarah Parcak: Yes.

Rob Reid: The year that you and I both spoke when you gave your brief talk. I was the

second the last day.

Sarah Parcak: Oh man.

Rob Reid: I was a bummer. I was going to be the opening session and then something got

switched and that would've been really nice because then I wouldn't be able to chill, but okay. So second day, I'd imagine the first day is nothing but tension,

right?

Sarah Parcak: Oh, I sort of remember it and I sort of don't.

Rob Reid: Yeah, yeah, yeah. So you've been rehearsing and rehearsing. Now I'll say

something. I loved the way which anybody can access if they want. I love your wardrobe choice on the day that you gave the talk because you came out looking like a swashbuckling archeologist. I mean, is that a fair assessment?

Sarah Parcak: Yeah. I mean definitely a little more color, a little less stable.

Rob Reid: Than Indiana Jones.

Sarah Parcak: Yes.

Rob Reid: But it was a very clear Indiana Jones. You had the fedora right? You had that

cool hat, right?

Sarah Parcak: Yeah I put that on the stand, it was this play, I had my cool leather archeology

boots.

Rob Reid: Yes.

Sarah Parcak: Yeah.

Sarah Parcak: I had my cool leather archeology boots. Yeah, little explorer vibe going on.

Rob Reid: So there's an explorer vibe and correct me if I'm wrong but I would imagine

because you have this fascination with Egyptology and with archeology you must have gone through an Indiana Jones phase as a kid. Of thinking this is the

bomb, right?

Sarah Parcak: I mean phase is a significant under statement.

Rob Reid: Got it.

Sarah Parcak: Yeah. I can pretty much cite verbatim all, well the first movie and the third

movie, the second was a little bit of an [crosstalk 01:06:30].

Rob Reid: We won't talk about the second one, yeah.

Sarah Parcak: So yeah, the mid '80s the arch movie comes out. I was able to rent it. Every

Friday night my family would do pizza night, I think it was pretty common back then, and watch it again and again. So yeah, I credit that movie with being one

of my inspirations for going into the field of archeology.

In fact a lot of people in my generation ended up studying archeology because

they were inspired by Indiana Jones.

Rob Reid: That is so cool because many people who get into astrophysics cite and interest

in science fiction so this actually in no way surprising. And George Lucas and Steven Spielberg are both in the archeology adventure and science fiction

category. So that is really cool.

So you've had this history, now you're getting ready, it's moments before the

talk. Describe your mental state as we're in [Comptown 01:07:20] land right

now.

Sarah Parcak: Yeah, I'm a basket case. I am an emotional wreck. So to make a wish like this, I

felt like I was putting my professional neck on the line. I've been working for years and years. At this time I had tenure. I kinda been moving towards mid career-ish. Not super established but fairly established in my field. To make this

wish to change the world, I thought, what am I doing, this is insane. I'm throwing my whole career away.

Rob Reid:

Yeah.

Sarah Parcak:

So yeah, I went ... My husband was with me so I had to go back to my hotel to get changed and get ready and I'm blubbering, I'm in tears, I'm just a mess and my husband is being his usual wonderful self, he's trying to calm me down, I'm inconsolable. I pretty much think my entire life is about to come to an end. And I just kind of looked off into the distance and I said universe I need a fist bump. I need a sign to show me that I am not doing something that I will live to regret to my dying day.

And so, we get in the elevator in this hotel. We're gonna go back down to go back and get hair and make-up down and we get to the bottom of the elevator and what you're about to hear is true, my husband is the witness, the door opened up and there was Harrison Ford.

Rob Reid:

That is awesome. TEDster Harrison Ford.

Sarah Parcak:

Yes.

Rob Reid:

And there he was when the elevator opened after you requesting the entire universe, all of creation, fist bump please, the universe says fist bump.

Sarah Parcak:

Yeah, a little more than a fist bump. And he smiled at me and I smiled at him and I thought I got this. That's what gave me the confidence to go on that stage.

Rob Reid:

That is fabulous. And then he, having played that fabulous role of Indiana Jones and senior TED wish must have been as charmed by that as you I would imagine and then you ended up catching up later in the event right?

Sarah Parcak:

So even though I knew he was a TED I thought I had earned the right to go up to him and talk to him. So even though I saw he in the elevator I didn't say anything and at that point he didn't really know who I was, I hadn't given my talk. So I give my talk. The folks at TED very kindly set up a lunch between myself and Harrison and a few other people the next day.

Rob Reid:

That is fabulous.

Sarah Parcak:

So big deal, he's coming, he's coming. So he walked in and he ... People told me beforehand just be careful, don't let your expectations get up too much. He's a Hollywood actor. He's not an academic like you. Basically, calm down, don't go full out nerd on him. He's not a real archeologist. So he walks in. I know this is gonna sound a little strange and slightly freudian but I'm not joking, he looks a lot like my dad. They have very similar manner. The same exact age.

So he comes in, he's strikingly handsome. Obviously he's in his 70s now but still, he looks like he does on camera. So he walks in and he shakes my hand and he's saying all of these lovely, lovely, so touched by your talk, it was amazing, it meant so much to me. And then I got to thank him. I said Harrison, the main reason I was on that stage is because of you. I grew up watching Indiana Jones and thank you for playing that character and he looked at me and he said, you know, I'm willing to bet you know more lines from that movie than I do. For me it was just a part. I'm not a real archeologist. I said you know what, I've met you now for a minute and I can see that it was your spirit that infused that character. So it was your spirit that brought him to life and that's why I'm here. He started tearing up.

There was a picture that was taken at that moment. My hands over my heart, I'm gushing. It was very emotional. And he was just so kind and so gracious. And I think the reason people tend to read him wrong, his very introverted and he will not say something unless he has a point to make. He's a very thoughtful individual, sat across from me, he was charming and wonderful. But there's another part to the story.

So at the very end of our lunch, my husband's there, a couple of your friends were there, his lawyer was there, and randomly Jaden Smith was there. That's a whole other story. So I thought how shall I thank him? Should I shake his hand? Is that appropriate? Yeah, okay, I'll shake his hand. It's been very formal and he's been lovely, I'll just thank him.

So I go up to him at the very end, hold my hand out and say Harrison, thank you so much for coming to this lunch, it just meant the world to me. He takes one look at my hand and I'm thinking, oh my God, I've offended him. This has made him uncomfortable. He grabs me, spins me around, puts me in his arms and kisses me in front of my husband. It was like not a full lip, it's like a [inaudible 01:12:05].

Rob Reid:

A movie kiss, a movie kiss. Yeah yeah.

Sarah Parcak:

So I remember there was an inside the actor studio with Karen Allen, with the three women that starred in the three Indiana Jones movies and he kissed all of them at least once and the inside the actor studio host asked all the actresses what was it like being kissed my Harrison Ford and at the exact same moment all of them go ... And they all just looked off into the distance. And I thought entwined in his arms, i too now. It was amazing.

So I'm wrapped in his arms and he looks up at my husband, smiles, and says I just kissed your wife. It was amazing and that was it, that was my Harrison Ford moment.

Rob Reid:

That was it. Well this can't possibly compare but because I'm a VR geek I now need to add that after that you got to go to the temple of doom.

Sarah Parcak:

That's right, that's right. There was this amazing VR experience where, I kind of don't remember fully my experience in the temple of doom being slightly overwhelmed by Harrison Ford kiss.

Rob Reid:

Yeah, I'd imagine, I'd imagine.

Okay but I've got to interject because I am a VR geek exactly what was going on. So they have this fabulous installation by a company that's based in Salt Lake City called the Void, which is a top of the line virtual reality installation. They do all the wonderful things that great VR artists do with presumably, I don't know their budgets, but presumably hundreds of thousands of dollars in budgets between the amazing hardware and then all of the artwork and software that they do. What the Void does, if anybody has an opportunity to visit one of their installations, that puts it over the top, is on top of all of this incredible technology and artwork and hardware and gear, they add a few hundred dollars worth of plywood and what that means is you walk into the virtual environment and in this case it was a Mayan temple. Am I right?

Sarah Parcak:

Yeah yeah.

Rob Reid:

You walk into this virtual environment, the temple walls are being rendered on the video goggles that you're wearing on your head, you turn to the left it tracks and all that other stuff but what's amazing is you put your hand out to touch the wall and you feel something solid and if you touch this sort of torch like thing that they've given you and ignite something like and Olympic torch with it, they have a heat lamp that goes off and if you are ... There's spider webs where the spider webs are supposed to be. And all these haptic or all these tactile signals amplify what you're seeing in an incredibly powerful way.

Anyway, enough about VR. Let's talk about your TED wish and where it has led you.

Sarah Parcak:

Sure. So my wish, roughly paraphrased, was to create an army, a global army of citizen science to help map [inaudible 01:14:58] sites and treasures around the world to protect and preserve it for future generations.

So what my team and I built, with a number of partners, using the TED prize money, is a citizen science crowd sourcing platform called Global Explorer, that allows anyone in the world from five to 105 to look online at satellite imagery and help find ancient sites. And we launched in Peru in late January of this year.

Rob Reid:

Now for those who are less familiar with the terms citizen scientist, I guess that first came up with, was it perhaps with galaxy zoo, was that the first project?

Sarah Parcak:

I think so, yeah. So galaxy zoo, and I can't remember exactly when it started but it started at Oxford University.

Rob Reid: I think they just had their 10th anniversary.

Sarah Parcak: Yeah.

Rob Reid: It was quite recently so call it 2006, 2007 ish. Yeah.

Sarah Parcak: So there are, I don't know, hundreds of thousands, millions of pictures taken by

satellites, facing the other way of course.

Rob Reid: Looking out.

Sarah Parcak: Yes. Of galaxies that come in a set range of shapes and sizes and so what galaxy

zoo did is they put all this data online take a little bit of training, a little bit of tutorial work, and you go onto their website and what do you see? Do you see blobs? Do you see circles? Do you see squares? And you kind of go through a sort of series of choices and you help them to categorize images of potential

galaxies.

Rob Reid: This is a spiral galaxy. This is a regular galaxy. This is a gobbler galaxy and so

forth because by having a much deeper understanding of the relative populations of galaxies, much could be learned about the universe and by then it was just lone grad students, kind of like what you were describing, the three

of you looking at tens of thousands of looting pits.

Back then it was just a tiny handful of graduate students categorizing galaxy after galaxy. And I think the guy's name was Chris [Lyntode

01:16:46].

Sarah Parcak: Yes.

Rob Reid: Yeah. Had this idea of why don't I put piles of these images online and ask the

world to help me categorize them and built a system over time where I believe

galaxy zoo has hundreds of thousands of volunteers, tens of millions of

classifications over the years, far more than the entire astrophysical community could ever have done with the stuff that has to be done by people how have smart eyeballs and have been trained to identify this versus that. So yeah.

Sarah Parcak: Correct.

When this all started there was big tension in the scientific community. How could a average person off the street do good science? But you've seen time and time again, think about who wants to be a millionaire, the crowd is wise. I can't remember the percentage when the crowd votes where they're right but I

think it's an overwhelming percentage of the time, the crowd is right.

And the thing is, the crowd can be right without training, imagine training the crowd and giving them some hints and some tips. It's not like they're splicing

molecules and looking at atoms, it's pattern recognition, it's shape recognition, human beings are really really good at this.

Rob Reid:

Yes. And we were wired evolution to be very good at this kind of pattern recognition and then when you tell folks, these are the specific things we are looking at. This is what a looting pit looks like. This is what a tile of Earth that has no looting pit looks like. So you basically took this notion and decided to apply it to the field that you're in because obviously you have lots and lots of telescopes looking the other way, looking down at Earth.

Sarah Parcak:

Right.

So one of my biggest challenges, in fact the challenge that anyone doing any kind of satellite or air [basetrement 01:18:23] sensing is, we talked earlier about these millions and millions of satellite images, there is no way in a thousand lifetimes that someone like me could look at all the data. And frankly, the biggest is challenge is when you're looking at a computer screen for five or six hours at a time, you get eyeball fatigue, you miss things.

So the idea was by building this platform and getting thousands and thousands of people across the globe to help look at this data we could go much much faster and identify things at a far greater rate than we could normally looking at it, typically with a small team.

Rob Reid:

With two or three of you. So that was your wish was to build a platform to bring in tens of thousands of, eventually hundreds of thousands of people to gaze at images at different, not just Egypt now, we're going way beyond that, different countries, different parts of the world, not just looking for looting but actually trying to identify sites as well, correct?

Sarah Parcak:

Correct. So we launched in Peru.

Rob Reid:

Yep.

Sarah Parcak:

And for a lot of different reasons. So first of all, it has extraordinary archeology. It's got the diversity of cultures, you've got the Inca, you've got the Mochi, you've got the Chima, you've got so many other extraordinary cultures.

And the other thing to is, with the data that I use you can't see through trees but you can identify very clearly any structures that are in desert. So in Peru it's mostly semi-arid or at least most of the country is. Obviously a lot is covered with rainforest as well. So it was an ideal place to start.

The other reason, we make sure to partner very closely with governments as part pf our platform work so the ministry of culture in Peru already had a very strong history of using drones to map ancient sites. We knew they would be very open to the possibility of using technology.

Rob Reid: Oh really, they're using drones already.

Sarah Parcak: Yes.

Rob Reid: Fantastic. So let's talk about Peru now. You've had, in the work that you've

done, is it over 60,000 people who has helped with the project now?

Sarah Parcak: Nearly 60,000, yes.

Rob Reid: Nearly 60,000 people have gotten on the site. I have gotten on the site and I'll

just describe it briefly from a user perspective. So I find it very peaceful. You are

presented with a series of, you call them tiles?

Sarah Parcak: Tiles, yes.

Rob Reid: Yeah, so tiles. What is the sort of the geographic sweep of a tile? How many

square meters is that, ballpark?

Sarah Parcak: So each tile tends to be about 300 meters by 300 meters in size in that we've

now looked at millions of square kilometers of satellite imagery and in zooming in, when you go on global explorer what you're seeing is the typical amount of zoomed [inaudible 01:20:44]. I think I may have just invented that word.

Rob Reid: That's a great word. I love it.

Sarah Parcak: Yes. That we would use typically when processing satellite imagery.

Rob Reid: And it's a very soothing process.

I actually was a galaxy zoo user probably almost 10 years ago, it's been a long time since I done any citizen science but it immediately came back to me. It's a great thing to do late at might when you're unwinding. Out on some soft music, dim the lights a little bit and outre looking at this procession of images with the notion that if you spot something of consequence, that is of consequence. And other people also look at each image. And so you have a crowd wisdom.

If I think I see a looting pit, sorta takes the pressure off. I think that might be a looting pit and I'm gonna flag that as a plausible looting pit but many other people are also gonna see it and a consensus will emerge and that consensus is

incredible accuracy right?

Sarah Parcak: That's right. I think our consensus score right is 90% so if there are 10 users that

look at an image and nine of them have to agree it's a feature or a site. It then gets kicked to us. So we get data dumps every week from our partners and we then look at the imagery really really carefully. So it's been interesting, now the

crowd has looked at almost 13 million tiles. I should note there's no GPS

information so all you know is you're somewhere in Peru. The only people that know the coordinates are my team, obviously to protect the sites.

Rob Reid: Right. It would be terrible if a intended looter is looking at these images like

wow, look at that, what's the GPS on that? All they know is it's in Peru some

place.

Sarah Parcak: Yes, that's it.

Rob Reid: Good luck finding that.

Sarah Parcak: Yeah. So out of the 30,000 or so, were calling them anthropogenic features, so

features that potentially could be something other than a modern feature. There's about an 85 to 90% correspondence between what the users say is a

site and what turns out to be a site. That's really high accuracy.

Rob Reid: That's really high. And so that has leveraged you guys beyond belief. So you've

got the 60,000 registered users. They have looked at these 12 million images, they have flagged 30,000 things, which is not an overwhelming number for professionals to look at. And now actually specialists in the field are now going

out and exploring these things right?

Sarah Parcak: So when we got the data, I mean clearly 30,000 is massive so my team and I

started categorizing them, by the way, we're working very closely with Peruvian specialists, archeologists, getting their feedback, getting their expert opinion, so many hundreds of these features appear to be what we're calling large potential

sites. So hilltop fortresses major settlements.

And what we're doing now is we're parceling that data out to Peruvian archeologists specialists both in the field and in the U.S and we're having them go through it because what we don't know, we currently go off the Peruvian governments database and Peruvian publications, but if something say were found in 1957 and was announced in an obscured journal in Spanish, we are not

gonna know that that's a site.

Rob Reid: You won't be pervy to that.

Sarah Parcak: But these archeologists are going to know. And what's really interesting is that a

lot of the archeologists who are beginning to look at the data kind of turn around and go wow, I worked in this valley for 25 or 30 years, I had no idea

those sites were on top of those hills. It works.

Rob Reid: Wow. So you are in a sense helping the Peruvian archeological community set

its own agenda. I eman you're not setting it for them. You're giving them the data, amazing data, that will enable them to really coherently set agenda that

may drive the field for decades to come.

Sarah Parcak:

Yeah. It's gonna take a very long time for a lot of these sites to be surveyed on the ground so we're working with a gentleman named Professor [Luis Jimenez Castillos 01:24:23], he's an imminent Peruvian archeologist. He does a lot of amazing work with drones and so he's actually gone out and done some early drone mapping of some of these sites, the footage is amazing, I can't wait for the world to see it.

And so, yeah, it's this idea like you can clearly see a lot from space but with a drone you can see individual stones smaller than the size of a baseball.

Rob Reid:

Wow.

Sarah Parcak:

But there's this whole connecting data from space to on the ground and what phase one of the platform taught me and my team, number one, we have to make a lot of changes to the platform. We've gotten a lot of feedback from the crowd.

For example, in the future we'll have a sandbox type thing where people can go around, they're getting immediate feedback on what's a site and what's not a site and what's a discovery.

Also, what we've done because we just didn't want people to go on the site and look for features and that's it, it's a game, the whole thing's been gamified. So there's 10 levels. As you go through the different levels you unlock rewards, you unlock content, you get badges as you go up ... We're gonna be gamifying to even more for the next generation.

Rob Reid:

So let's talk about the next generation. I know that there are some things that you can't quite announce yet but tell me if it is fair to say that this amazing thing that came out of this TED wish that created these 12 million images and all of this wonderful work in Peru, is gonna be going forward into other places, correct?

Sarah Parcak:

Yeah. So I can't announce where we're going next but I can assure you it is a very very exciting place. We're gonna be partnering closely with the government of that country as well as come extraordinary groups on the ground. And so, it's evolved right? A lot of lessons learned.

So we had 60,000 users from over 200 countries. We're gonna be working on building our community. Our dream is to get our users up to 250,000, half a million, can we get a million people using the next version of the platform.

The other thing we're gonna be doing is even though the first version of the platform mobile capable, we're gonna be developing an app that will be anywhere in the world. So you're standing in a check out line and you can look for sites.

Rob Reid: Which is profoundly important because such a high number oof people,

particularly the next billion of people who get online are going to be already a

very large number of people are only on phones.

Sarah Parcak: That right.

Rob Reid: The smartphones are getting better and better and cheaper and cheaper and

they're getting to the point where they will be substantially all hands in a decade or so. So that opens up the aperture vastly to the number who people

who can actually participate in this project.

Sarah Parcak: Right. So started in Peru, expanding next year, year after somewhere else, a

couple more places, will it be possible within 10 years for us to have mapped the entire world? I know that sounds completely insane but, with things like AI, machine learning, with the additional availability of satellite imagery, I think it

will be possible.

Rob Reid: So that is your big term, 10 year, decadial goal, is to map, from an archeological

standpoint, the entire planet, all of the countries, all of the sites?

Sarah Parcak: Yes.

Rob Reid: And you'll be going at it, at least for now, country by country.

Sarah Parcak: Right.

Rob Reid: For starters. And it is fascinating you mentioned the drones, there is no reason

where your citizen scientists can't get up on the drone data as well. These drones are gonna generate massive video feeds. There's gonna be plenty of stuff for your 60,000 and then hopefully quarter million and then perhaps even

a million people to gaze at and find things.

Sarah Parcak: That's right. So the question is, what additional content or opportunities can we

provide our users? Because we have some amazing amazing stories from people we call our super users. So our top level of space archeologists, I mean of course

I this.

Rob Reid: Of course it is.

Sarah Parcak: Yes. But there are a couple dozen of these space archeologists from around the

world.

Rob Reid: People who have looked at the hightest number of images.

Sarah Parcak: 50,000 or more images.

Rob Reid: And how many of them are there?

Sarah Parcak: I think they're a couple dozen.

Rob Reid: Wow. So these are very committed people, they have spent many many

hundreds of hours on the platform.

Sarah Parcak: And we've gotten to meet with some of them. We interact with them. And

every single one of them has an extraordinary story to share.

One of my favorite stories I got to share at TED this year. So there's a woman

named Doris who's from Americas heartland, she's 92 years old.

Rob Reid: Wow.

Sarah Parcak: She's disabled so she can't leave her home, she's in her wheelchair but she just a

spark of amazingness and she's a total science addict so she just looks through global explorer, she loves it, she always wanted to be an archeologist, this way

she can really contribute and she is amazing.

It's funny. So when we designed the platform, we had our user archetypes. So we had the nerdy archeology student, your late 20s, mid career, early 30s professional who knew what TED talks were, your well off retiree who traveled the world, and I'm not making this up, one of our user archetypes was a disabled stay at home grandmother from Albuquerque who is a little nervous

about technology but really wanted to make a difference.

Rob Reid: and low and behold you have her.

Sarah Parcak: We have Doris.

Rob Reid: You have Doris.

Sarah Parcak: So we got it. But this to me, like making exploration accessible to everyone,

regardless of disability, age, gender, what your background is. Being a woman, kind of coming up through the scientific ranks, for the most part on the people who digs are white and male and of a certain age. Archeology needs to change, we need to make exploration accessible to more and more people. We need these eyeballs. I can't tell you how many years it would have taken my team and

I to look through the same area, but many years.

Rob Reid: Yeah.

Sarah Parcak: So can you imagine if we get millions of people around the world, from kids to

retirees, all looking at satellite imagery and you cretae this community that's connected through this passion of protecting the past. And that's ultimately what the wish was about. You don't just have looting in Syria and Iraq and Egypt, you have looting all over the world and I think the only way to stop is is to make people feel like they're contributing, they've got skin in the game. I made

that wish not to make a change today but to think about how things could be changed in 20 years.

Rob Reid:

And the other ting that also intriguing and very important about this is think of all the people whose tooth fairys lacked the sophistication [inaudible 01:30:32], right. I eman you got an amazing book at exactly the right time. There are surely already lots of people with single digit ages who have been on your platform and have started this discovery process right?

Sarah Parcak:

Yeah. My friends have their kids on and they'll send me pictures which is wonderful but think of all the kids all over the world that don't have access to museums or the ability to visit sites and this is a way for them to get, to be able to participate, to get a lot of great information and rich content. Even though my son just turned five so he was four over the summer, I would sit down with him and we'd use the platform together.

Rob Reid:

Yeah.

Sarah Parcak:

And I'd get him to hit yes or no, it was so much fun seeing him get excited about looking and trying to find things, it's for everybody.

Rob Reid:

Well, it's ... Having seen and used the 1.0 platform and I know a thing or two about building websites and about UIUX issues, and all that goes into creating a significantly scaled and scalable platform that can support tens of thousands of users, it's amazing what you guys have accomplished in that initial million dollars.

It sounds like you are expanding, presumably finding other sources of funding and it's really exciting to think of where you're gonna go. Could you tell folks where to find things online if they wanna become an explorer. And do you, this obviously is not a fundraising picture or a fundraising show but if people wanna support the organization is there a mechanism for doing that on the site?

Sarah Parcak:

Sure. So if everyone goes to globalxplorer.org and so instead of global and the word explorer, instead of explorer, instead of EX it's just X for X marks the spot. So you go to globalxplorer.org, you can sign up. There are opportunities to donate.

But kind of go and even though technically the Peru campaign has ended you can still participate, you can still look at tiles, you can still join our community. Like I said, we'll be hiring community managers soon so you'll be a part of this amazing community of people from around the world. We have a lot of really really exciting things planned. Tons of lessons learned for me.

I should say we had an extraordinary team. We partnered with National Geographic, with Digital Globe, with TED, a company called [Mondaroba 01:32:47], it helped us to build the platform. I did not do this by myself, there

was a team of many many dozens of people. We got amazing information from game experts. People like Amy Robinson of Eyewire, really helped us to think through the strategy and helping us to build communities.

So yeah, I was telling you earlier Rob, if you had said to me two years ago, oh can you help me with my UX and UI I would have been like you might wanna go to the doctor and get that checked out and don't touch me.

Rob Reid: Actually to give Eyewire a shout out, that is another citizen science project.

Sarah Parcak: Yes.

Rob Reid: And Amy is a TEDster. Amy Sterling now right?

Sarah Parcak: Yes.

Rob Reid: Yeah, Amy Robinson Sterling, recently acquired a new last name, and so she has

been working, this is a neuroscience project, and the objective was to basically,

or is, to map all of the neurons in the eye of a mouse. Is that right?

Sarah Parcak: I think so, yes.

Rob Reid: Yeah yeah. And it is a similar thing where one can gaze at lots of tiles and in this

case they're trying to get a map of the synopses and the neural, basically the neural landscape of the eye of a mouse which is apparently is almost as complex as the entire Indus River Valley, it's just the amount of neurons that are in this

one little eye.

So that's another citizen science project that's out there and I know that she was very helpful to you because she had been doing this and was a TEDster and

obviously was very aware of your wish.

Well, thank you very kindly for being so generous with your time here.

Sarah Parcak: This has been awesome. Thank you for interviewing me.

Rob Reid: Absolutely. And best of luck with the near future of global explorer. When you

announce what's next I think it's gonna be really really exciting.

Sarah Parcak: Thank you.

Rob Reid: In talking to Sarah I was reminded of a concept Tim O'Reilly and I discussed last

week, that of combinatorial innovation. This is what happens when unrelated advances in different fields come together and enable something huge and

entirely unforeseen.

An example Tim and I discussed was ride sharing an inconceivable notion until large swaths of humanity started walking around with QA GPS devices just as mobile payment systems like those pioneered by Brain Tree, Strife and others happened to pop up. When powerful new core technologies are suddenly sort of lying around, magic almost spontaneously emerges from the least expected corners.

In Sarah's case, the same ubiquitous GPS plus digital imaging advances that look from Earth based cameras to outer space and the internet phenomenon of citizen science combined and revolutionized the ancient art of archeology in ways that no one could have possibly imagined. While the archeology market is somewhat smaller than ride sharing, the changes are no less sweeping. I mean how many full-time archeologists would it take to detect tens of thousands of new ancient sites in scarcely more than a year, as recently as the '90s, I'm gonna guess probably all of them.

This is one of countless proofs that the creation of foundational multi purpose technologies can bring unimaginable benefits as they spread and the things we do as a society to abei the development of technologies have a boundless return on investment.

And Ars Technica listeners - this of course the final installment of my 3-part interview with Sarah Parcak. In case you're interested, the current episode of my podcast is a conversation with Yale University primatologist and psychology professor, Laurie Santos. Laurie has done amazing research on cognition in animals including monkeys and dogs. And we talk about all of that.

We then discuss the ... craziest thing - which happened earlier this year. Laurie had noticed that there was something of a misery epidemic underway at Yale - something which is also quite well-documented on campuses throughout the US as well. So kind of as an experiment, she decided to launch a course on the science AND practice of happiness. To her astonishment, it quickly became the most popular class in Yale's 317 year history. A QUARTER of the University took the 1.0 version of her class this spring. Laurie discuss all this - as well as neuroscientifically proven ways that you - yourself - could become a happier person. All of this in the current episode of the After On podcast.

You can find it by visiting my site, at after-on.com. Or, just type the words after-on into your favorite podcast player, and scroll through the episodes. There, you'll also find lots of stuff about life sciences - above all, genomics and synthetic biology. Conversations about robotics, privacy and government hacking, cryptocurrency, astrophysics, drones, and a whole lot more.

Or, you could just join me next week, right here on Ars.