

MARY LOU JEPSEN INTERVIEW PART TWO

Hello again, Ars Technica readers. This is the second and final installment of a two-part interview with entrepreneur Mary Lou Jepsen. If you haven't yet heard part one there's a link on the page where this player's embedded, and I strongly suggest that you go back and listen to it before this one.

And with that - back to my conversation with Mary Lou Jepsen.

Rob Reid: As a prequel to talking about how much you might be able to discern with this technology, it'd be interesting to take a brief side journey to Jack Gallant's work at UC Berkeley, which I've seen you speak about on the TED stage and I've seen you speak about online. Could you describe that briefly, this amazing stuff that he did? It was in 2012 with far less sensitive technology than yours. Then we can extrapolate what might be doable with your technology.

Mary Lou Jepsen: Yes, he's a professor at Berkeley and doing really cool work in neuroscience, and what he did after working with macaques and all these other animals for a while is he took his subjects to be graduate students, and he threw them in MRI machines for hundreds of hours, and made them watch YouTube videos and then more lately, Moth Radio Hour stories, and he made recordings, fMRI recordings of their brains reacting to the YouTube videos or the audio.

Rob Reid: So they're looking at a boat and their brain lights up in this manner, they're looking at a blank screen and it lights up in that manner, they're looking at a green screen, it lights up in this manner, and over hundreds of hours, I'm sure there was a machine learning algorithm on the background, started inferring when the brain lights up in this way, this particular grad student is looking at a Christmas tree, or something like that.

Mary Lou Jepsen: Right, so it was his best way to get more data on how we react to things. Using that data store, when a new image sequence was shown, the computer could guess what it thought the grad student was looking at, and the result was a grainy version of what the grad student was actually looking at.

Rob Reid: Yeah. I'll put the video on my website in the show notes of this because it is astonishing to see. The grad student might be looking elephants walking across a plain or somebody being interviewed on CNN, and the video that you shared at TED showed on one side exactly what the grad student was seeing and on the other side, what the system inferred the grad student was seeing based on the brain patterns, and it is a grainy image of it. That was mind blowing.

Mary Lou Jepsen: I thought the brain mapping people were kind of like modern day phrenologists about 20 years ago, and I saw this in 2012 and I'm like, "Whoa. They did it. We need to up the resolution and really go for this," and so I pitched that to Sergey when they were starting Google X as like, "Okay, let's do it," and that's, I think, where my TED Talk came from. It was effectively my job talk. I didn't know it

was a job talk at the time. Then Sergey acquired my company at Google, and I thought I was going to be working on this, and he's like, "No, no, no, no, no-

Rob Reid: You're doing moonshots.

Mary Lou Jepsen: ... I just wanted to see that you were creative and kind of crazy, and I need you to do this other stuff," so I didn't get to do that at Google. But I started reading pretty widely about this, and saw that there were dozens of research groups working in this area using fMRI scanners all over the world this has been replicated, and that work that we just discussed, that was in 2012 or 2011, and so things have progressed much further, it's now we're sitting here in 2018 today, and still they're stuck with these very expensive, very big, kind of uncomfortable, if you think of laying in them for hundreds of hours, machines. How do we get higher resolution and lower cost and put it in a wearable to enable us to communicate with thought?

Rob Reid: And more than that, too, right, some of the replicating work or subsequent work can figure out what song somebody's thinking about, can detect whether or not they're in love, can detect whether or not they're paying attention. It's a diversity of things, not simply what they're seeing, but all this is with very, very low resolution apparatus compared to what you believe you can build using your new technology.

Mary Lou Jepsen: Right.

Rob Reid: Is there any reason why you could not, with the technology that you're developing, if everything goes right, do a far, far deeper and more precise higher fidelity vision of what I'm looking at, and then pump that over to the internet so that somebody can see what's coming out of my eyes right now?

Mary Lou Jepsen: There's no reason you couldn't do that, but why not what's coming out of your head? That might be more interesting.

Rob Reid: Right, so next step, let's say I go to sleep and I have a bunch of dreams. Is there any reason why you couldn't record my dreams in very high fidelity and play them back for me in the morning?

Mary Lou Jepsen: A Japanese group just did that with fMRI.

Rob Reid: Really?

Mary Lou Jepsen: Yeah.

Rob Reid: Oh, interesting.

Mary Lou Jepsen: It hit the news, I don't know, a month ago.

Rob Reid: But again, the consequence of doing that at a thousand or a million or a billion times the resolution is overwhelming, because you could really see an HD video of precisely what you dreamed the night before. That is nuts.

Mary Lou Jepsen: That's why I left my cushy job at Facebook to go for this.

Rob Reid: And what are some of the other applications? You've talked about telepathy.

Mary Lou Jepsen: Well, I think we'll start to work just with our whole brains. I mean, right now, we talk to get ideas out of our head or we type. But what if we could get the complexity of how we're thinking of things out and share our minds with each other? The speed of thought. There's all kinds of ethical and privacy and legal issues involved, but what could we be capable of if we could share our brains with each other?

Rob Reid: Yeah, to put it in computer speak, there is a major IO issue that we have, input/output issue, because we can take in the equivalence of gigabytes of information with our senses very, very rapidly, but we can really only output a couple hundred words per minute if we speak very quickly, and a few dozen if we type very quickly. And you had an example that you used in one of your talks that I thought was very evocative. You said, "In a way, we're all Stephen Hawking." I mean, first of all, let's think about what it could do for him, because all the amazing things going on in his brain and his output rate is even slower than ours, but in a sense, we're all Stephen Hawking, because our ability to output what's going on inside of our brains is so slow compared to our ability to take it in.

Mary Lou Jepsen: Yeah, and there's other things. I just read a paper yesterday about turning off anxiety. We know how to do that invasively, so a lot of people suffer from anxiety, right? So what if you could just performance enhance your brain? I probably do that, because I had a brain tumor, so I take a dozen pills every day for the last 23 years, and I do, I think performance enhance myself because I have to decide how I want to be today. I don't make any hormones. Cortisol is a hormone, adrenaline's a hormone.

Rob Reid: So you have to onboard your hormones, and cortisol's what causes stress, adrenaline is what causes us to surge-

Mary Lou Jepsen: To go into adrenal failure if you don't take it, you die, so you have to-

Rob Reid: Right. Which you've got to avoid, yeah.

Mary Lou Jepsen: Yeah, yeah. So what if you could amplify human excellence? We talk about the two billion people who have brain disease, but there's seven-something billion people on the planet. What if we could make ourselves better, and define what that means?

Rob Reid: Okay, so this is getting to one of the crazier and more intriguing things about your technology, which is you believe using infrared light, you could not merely monitor the activity of neurons, but you could cause neurons to fire, correct?

Mary Lou Jepsen: Right.

Rob Reid: How would you do that, first of all? How would the physics of that work?

Mary Lou Jepsen: Right, so once we map, we know where the neurons are.

Rob Reid: You know where they are, yup.

Mary Lou Jepsen: I just got someone who just finished her PhD on this. It's quite controversial, but her results are very clear, and we're working on it in the lab.

Rob Reid: In theory, if you went down that path, you could maybe even implant memories or implant desires into people. I mean, it can obviously become a Black Mirror episode very quickly.

Mary Lou Jepsen: Make them into a suicide bomber, whatever, right.

Rob Reid: Whatever it is. So let's talk about these ethical issues. Most startups, when they're at your stage, are very, very quiet about what they're doing. You've been extremely open about what you're doing, almost from the beginning, because you do want to trigger this important dialogue about ethics, correct?

Mary Lou Jepsen: Right, and I think one of the problems is a lot of people don't believe until they see it that it's going to happen. They're like, "Yeah, sure," but actually, in every program I've ever done, I talk about it early, almost to get the people really interested in giving their eyes and teeth to work on this project to beat a path to the door to join the project, to make the vision happen responsibly. In some ways, talking about it early is having that effect in a small way, while we probably show a system this year that allows you to dump your thoughts out in some way.

Rob Reid: This year?

Mary Lou Jepsen: Yeah.

Rob Reid: Wow.

Mary Lou Jepsen: We haven't decided exactly where and how, but we'll probably do that. And then I think people will get it, but right now, we're trying to define what that means. Our system will only work if you want your thoughts to be read. We're going to add in sex and violent filters, so if you don't want to communicate any thoughts of sex or violence, but even as a personal creativity tool, to be able to dump the things in your mind out to your computer with really good crypto, so

only you can see it, or share it with your spouse. I mean, it might be more intimate than sex, to be able to share the intricacies of what you're thinking, the raw emotions, everything.

Mary Lou Jepsen: And so how do we use this? Do we let children use it? Will children figure out a way to use it? What are the implications of that? How do we design a system from the beginning that can't be hacked, the consensual part can't be hacked? It has to be consensual. If the police or the military put this ski hat on your head and want to know what you're thinking, or your parents, when you come in at three in the morning, how do you make it only work if you want it to work?

Rob Reid: So you're clearly committed to having a deep conversation about the ethics before you even ship and creating a product that will have safeguards on it so it hopefully cannot be used unethically, but if it does, in fact, work as intended, the negative consequences are essentially inevitable. People are going to do whatever can be done with these things over time.

Mary Lou Jepsen: Is it an international bill of rights around the next generation of technology that include CRISPR and other technologies, as well, [inaudible 00:45:22], and what is the responsible thing? Do we just keep the resolution low right now? Do we make sure these aren't permissible in court? Right now, even using fMRI, people have gone to jail and been convicted for things that we indicators that they were lying, or-

Rob Reid: Really?

Mary Lou Jepsen: Yeah, there's a great book called I Know What You're Thinking, which talks about the legal status of just these simple, relative to what we're talking about, mind reading machines and how they've been used in courts to incarcerate people.

Rob Reid: Because I know that traditional lie detectors are almost useless. They're so easy to fool and it's 1920s technology, but I guess MRI as opposed to a traditional galvanic skin response lie detector, that's interesting, it's been used in court?

Mary Lou Jepsen: Yeah.

Rob Reid: Wow. So you can get a warrant already, I guess, to go after somebody's thoughts.

Mary Lou Jepsen: In some countries.

Rob Reid: In some countries, yeah.

Mary Lou Jepsen: And then they've been, in some cases, exonerated later.

Rob Reid: Animals. Could we find out what our beloved dogs are thinking?

Mary Lou Jepsen: Does your dog love you, or is it just hungry? Maybe both. You think of babies, should you do this to babies? You have a baby and you don't want to break the baby when you bring it home and it's crying all the time and just won't sleep, and could you do this? Is that ethical?

Rob Reid: Right.

Mary Lou Jepsen: Don't know, but we need to answer that.

Rob Reid: Big questions. Well, with you demonstrating some version of this, I think a lot of people are going to be talking about this. Is there anything we have not covered?

Mary Lou Jepsen: Yes. Peter Gabriel named my company.

Rob Reid: He came up with the name Openwater?

Mary Lou Jepsen: Yeah, and he called me like every week for six months trying to convince me to quit Facebook to do this independently so that we could have these kinds of discussions.

Rob Reid: Oh, interesting. So you were thinking about doing this within Facebook. Peter knew this and he said, "No, do it on your own so you can have your hand on the wheel a little bit more."

Mary Lou Jepsen: Well, mostly to open up the conversations, because large companies really control the nascent technology that they're working on. They don't want to announce, usually because it is nascent, they don't know if they'll ship it, all kinds of reasons. Plus, the best reason I heard is, at Google somebody told me, "You know, we have so many products as it is. We'd like to focus on the ones that we're shipping [inaudible 00:47:37]," but in order to talk about it as we were developing it, like we did at One Laptop per Child, seemed important and the responsible thing to do in this case, because it feels like the implications are a modern day kind of nuclear bomb.

Mary Lou Jepsen: So Peter called me a couple weeks ago and he said, "You know, I know a lot about the music industry," and like yeah, Peter, yes, famous rock star, musician, he knows a lot about the music industry.

Rob Reid: He knows a lot about the music industry.

Mary Lou Jepsen: As do you.

Rob Reid: As do I.

Mary Lou Jepsen: Editor of Listen.com, and he said, "You know, our industry really transformed with something you are responsible for," which is digitally streamed music. Totally changed it fundamentally so everybody had access to any kind of music.

Rob Reid: So a little background, I've mentioned this in prior episodes, but I'm sure some people, this might be their first episode. My background is I founded a company called Listen.com. The name of the company is forgotten, but the name of the product is not. It was called Rhapsody, and we were the first company to get full catalog licenses from all the major record labels and hundreds, even thousands of independent labels. We also were the first to create the unlimited, on-demand streaming model that is now best personified by Spotify, but has also been emulated by lots and lots of other companies. We were the first to do that. So that is very flattering that Mr. Gabriel says that this was transformative to music. I certainly believe that, because the access did change radically.

Rob Reid: When I was a small child and a medium-sized child and a big child and a young adult, almost every discretionary dollar that I had went into music, because that is vital to my daily happiness, and having saved up every dollar I could throughout my adolescence, I had a few thousand songs on tap. It was almost like I had my own little water tower of music and all of my friends had their own little water towers of music and we all had this little tiny sliver of the catalog of music, and what excited me most about the streaming model, as we started thinking about it, was that all the friction that stands in the way of any particular music lover exploring any particular song vanishes. There's no marginal cost to it. You don't have to go out and mow another lawn or shovel another driveway, which was how I earned music back in the day. There's the instantaneous access. There's all the hyperlinking between it. And yeah, the friction vanishes.

Rob Reid: So I'm delighted that he said the accessibility changed. I think it changed by many orders of magnitude in a way that the experience that we have with music today, we couldn't even fathom it back then.

Mary Lou Jepsen: Right. So his next question is, how do we do that with healthcare? How do we digitally stream healthcare? I think this segues to something you were talking to Paul Allen about?

Rob Reid: Well, the Paul Allen thing, I've only met Paul once and it was many years ago and it was very much in the context of the music, but I think that this hopefully will touch on what we do with healthcare, and I think it touches on what you're doing. And so the anecdote with Paul was, I was presenting at a conference that George Gilder put on shortly after or right before we released Rhapsody, I forget which one it was, but I described this in detail at this conference and when I was done speaking, two people came up to me, and one of them had a name tag I could read, which was Bob Metcalfe, and I was like, "Wow, Bob Metcalfe-

Mary Lou Jepsen: Who's Bob Metcalfe?

Rob Reid: He created Metcalfe's Law, he's one of the biggest thinkers in networking, he started the company 3Com, and he's a very witty and urbane writer. I'd read a lot of his articles. He's a very insightful writer, but there would always be these funny little jabs and quips, and I just delighted in his writing, so I'm like, "I am meeting Bob Metcalfe." Not only that, Bob Metcalfe is coming up to talk to me after my talk, and there's this other guy, whose name tag I can't read. So the other guy obviously knew Bob, and he started asking me some really, really smart and probing questions about Rhapsody and then other guy, whose name I don't know yet, says, "Why don't the three of us get lunch?" The buffet was open, right, so we sit down and I realize at some point this is Paul Allen, co-founder of Microsoft.

Rob Reid: He described to me the music infrastructure that he had built in his own home or compound or whatever it is, and it had involved thousands of CDs, having lots of people encode those CDs very carefully, acquiring extravagantly expensive hard drives because this was some years ago to store all these gigabytes of data, hiring people to type in the names of the songs and all this other stuff. I think he might even have done something crazy like put a cellular tower in the middle of his home to broadcast it wirelessly, and he basically said, in a playful way, "I put X million dollars," I forget what X was, "into this system, and you're about to make that available to anybody in the world for 10 bucks. That's why I love this industry."

Rob Reid: And that's what technology does, is it moves down the curve of Moore's law and as that trillion-dollar infrastructure that you and I have discussed in Asia, that creates things cheaper and cheaper and better and better, that's what happens. A billionaire's music experience can become available for 10 bucks a month.

Mary Lou Jepsen: It's the hospital. So he made a hospital and how do we digitally stream the healthcare like you did at Listen?

Rob Reid: Yeah, now I don't know if we can digitally stream everything. I mean, certainly hands-on care would be notoriously difficult to stream.

Mary Lou Jepsen: But we can do surgery without the knife with our system, right?

Rob Reid: Right.

Mary Lou Jepsen: And the diagnosis on the medical imaging side.

Rob Reid: That's what's so exciting about what you're doing is that suddenly, it does digitize a lot of things that are currently these big, radically expensive rooms. And the other side of it is, things that are unaffordably expensive at first, once that trillion-dollar infrastructure in Asia starts working on it and great minds start working on it and Moore's law starts operating, the billionaire's music

collection does become a \$10 a month product and then eventually free, probably, but we have to worry about how musicians get compensated.

Mary Lou Jepsen: Right.

Rob Reid: I mean, you're talking about radically changing access to medical imaging.

Mary Lou Jepsen: All of healthcare. We know that AIs are better radiologists than a lot of radiologists, and that even a radiologist on a different day will misdiagnose versus diagnose. There's all kinds of studies shown on that. But there's three continents that don't have enough doctors. It's sort of like the One Laptop per Child problem again.

Rob Reid: Certainly in oncology, I think it's getting rapidly to the point where radiology simply cannot be done by humans as well as it can be done by an AI, but oncology, I think that still the human role is very important.

Mary Lou Jepsen: Absolutely, but in continents where they don't have enough doctors and they do now have internet and devices, and as we make our devices and we augment with whatever Jeff Huber's doing and lots of different people, we can imagine a day where we can have \$10 a month digitally streamed healthcare.

Rob Reid: Yeah.

Mary Lou Jepsen: And we can catch things much earlier and treat them much earlier and massively reduce the cost of it, which is now 18% of the GDP of the U.S., which is incredible. And so how do we get to the vision that you created in distribution of music and access to music so we can get access to healthcare?

Rob Reid: I think that the solution to that would involve digitizing everything that we can. Blood draws would, I'm sure, be notoriously difficult to digitize. You perhaps can't do quite everything, but again, if Openwater's technology delivers on its maximum promise, you've shown this thing that I never would even have imagined before you came along, which is medical imaging, which is something that would seem you have to go to a destination and if you're in an impoverished country, you might have to go to the capital to get the one machine in the country, suddenly that can become extremely widespread and more than widespread, particularly for neurological conditions, I'd imagine that the constant monitoring that you could enable would be very, very important. I did a little bit of research into epileptic disorders in writing my novel, because that was a problem that one of the characters had, and if you're going in for your annual MRI, what are the odds you're going to have a seizure right then and there? Whereas if you're wearing a cap because you have this issue, you can do this dynamic monitoring.

Mary Lou Jepsen: And with anything with mental disease or brain disease, which affects 2 billion people, between depression, schizophrenia, epilepsy, Alzheimer's, Parkinson's,

and stroke and on and on, but yeah, if it's just the blood draw, that probably could be handled locally pretty easily in whatever passes for the pharmacy. That could be added with something that does the diagnosis, spinning down the blood and looking [crosstalk 00:56:02].

Rob Reid: All those things, yeah. And I particularly think of the developing world context because so many of therapies that we have here, obviously we'd like to push them much further so that people in countries like ours can live longer and healthier lives, but it's so tragic when you travel to places that are so much less privileged and you realize for want of a 30-cent vaccine, these terrible things are happening, and it can be blindness and it can be a lot of child mortality.

Rob Reid: But you mentioned the centrifuges. I saw a YouTube video that some brilliant people were thinking about the problems of centrifuges and hospitals were spinning the blood down and important stuff for tests and sampling and so forth, they need electricity. They're expensive, they're not very portable, and somebody figured out a way, I think looking at a child's toy, like sort of this spinning toy, to make a perfectly satisfactory centrifuge essentially with some string and some cardboard, and it's something that could be mass produced for a lot less than 10 bucks. It might've been even closer to a dollar.

Mary Lou Jepsen: So like a top, kind of?

Rob Reid: Yeah, kind of like a spinning top-

Mary Lou Jepsen: Pull a string and get the top going.

Rob Reid: And it's amazing because there's no reason this couldn't have been developed 50 years ago, but for whatever reason, the insight finally struck a brilliant mind quite recently. And so things like centrifuges, things like MRI machines, to our astonishment and delight, could become extremely widespread, and maybe Peter's notion of the streamed healthcare would be a battery of diagnostics and early warning devices and so forth, that can be distributed to people through a digital device with community healthcare workers taking the next step when it's necessary.

Mary Lou Jepsen: Right. Even with our system, we can deliver light to a point, removing the cancer or colonoscopy without the ...

Rob Reid: Discomfort.

Mary Lou Jepsen: ... Roto-Rooter.

Rob Reid: Yes.

Mary Lou Jepsen: But then also remove the polyps in the extreme. I think we're going to start with reading, but the potential there is for writing. Photodynamic therapy is amazing.

If you deliver light to some place where you're getting chemo, you can use 10% of the chemo that you would otherwise need.

Rob Reid: Really? That's interesting.

Mary Lou Jepsen: There's this combination now of using the drugs and the light, but can we move to just light? We can get this to a molecular level, so can you get rid of drugs in the extreme is a question.

Rob Reid: Well, particularly neuroactive ones, because the medicines, the molecules that we use right now to treat any neurological condition are pretty blunt instruments. They really are about causing synapses to fire or refrain from firing in certain circumstances, and if you could do that with optics, and it sounds like there's a potential with your work to do that, you could certainly replace a lot of medication.

Mary Lou Jepsen: Yeah, and there's other work going on, as well, at big universities of the world, working on that problem, but how do we accelerate a lot of this work in a way that can actually get out of the research lab, is I think the bigger question, because people are dying.

Rob Reid: Yeah, they are, in vast numbers. Another interesting dimension, the winner of the TED Prize last year, I'm blanking on his name, unfortunately, but he had been born in Liberia. I think he was of Indian descent, but he had spent part of his childhood in Liberia, came to the United States, became a very, very successful doctor, and then was drawn back to Liberia after the civil war ended and realized that there was this category of worker that's very, very important but generally untrained and uncompensated, which he calls a community health worker. And it was almost like a folk practice that people would learn a few things, they'd get a thermometer, they'd get some very simple gear, and they would get out there and for very, very low wages, would enter into an economic relationship with the community where they would provide some very simple but effective healthcare services.

Rob Reid: And so his TED wish, and the TED Prize that he was granted, was all about formalizing that and helping these self-starting community health workers, getting them a curriculum that made them quite sophisticated quite quickly in a handful of front-line treatments that are most important to their community and getting them a packet, not just of training, but of gear that they would be able to take out into the villages and deliver. So the TED Prize was to enable him to expand his efforts substantially and if that's successful, one could certainly imagine it expanding beyond West Africa into more and more places. And so that kind of thing coupled with these advanced, inexpensive diagnostics and interventions that we're talking about really could radically change the equation.

Mary Lou Jepsen: It would be easier to monitor the blood without taking the blood out. I knew Andy Conrad, who sat next to me at Google, the founder of Verily, and the head of Verily now, started as Google Life Sciences, and the former CTO of LabCorp, one of the largest blood testing operations.

Rob Reid: Yeah, one of the two largest, yeah.

Mary Lou Jepsen: And as he explained it, LabCorp is the fourth-largest private airline in the country.

Rob Reid: Because of all the samples that they shuffle around?

Mary Lou Jepsen: Because the logistics of shuffling around the blood samples, and it's like-

Rob Reid: That's amazing.

Mary Lou Jepsen: He's like, "Can we just measure the blood while it's in the body, please? Can we figure out how to do that?" Because that makes it digital.

Rob Reid: Well, one of my big disappointments in Silicon Valley over the last couple of years is that Theranos does not seem to be what we hoped it would be, Theranos being the company, for those who don't know, that seemed to promise or did promise that with just a drop of blood, you would be able to run a huge, huge battery of tests, but it's been unfortunately racked by scandal and certainly a number of observers, including their significant partners and government regulators and so forth, seem to be strongly indicating that the technology was not what it was cracked up to be.

Mary Lou Jepsen: Right, but can we just skip the blood completely and monitor it in situ, in your body?

Rob Reid: Is it in vivo or in situ?

Mary Lou Jepsen: I'm sorry, in vivo, sorry.

Rob Reid: In vivo, what's in situ? My Latin is not very good.

Mary Lou Jepsen: Inside your body. Like-

Rob Reid: In situ, yes.

Mary Lou Jepsen: No needles at all. Let's just skip the needles, yeah.

Rob Reid: Fantastic. Well, I know you have a flight to make, unfortunately. I could sit here all day and look at this beautiful bay on this gorgeous day, but you have to travel great distances and I'm probably pushing it with your airport appointment as it is.

Mary Lou Jepsen: Yeah, I've got to go to Detroit.

Rob Reid: Detroit, Rock City, as KISS once said. So have a wonderful trip. Thank you for being so generous with your time.

Mary Lou Jepsen: Thank you for having me.

Rob Reid: Know we will cross paths, probably quite soon, because we seem to do that a lot.

Mary Lou Jepsen: Yeah, it's been really fun, and love the podcast and love the book. Read the book, it's amazing, After On. I was really inspired by the epetstores.com CEO. When I was walking into a tough meeting, I realized I needed to swagger more. So there's all these things that you can't say when you leave companies about what actually happens, because we all have signed so many NDAs we can't comment, but since you've abstracted it to fiction, you tell more of the truth of what actually happens in Silicon Valley, which is the amazing thing that nobody can say or they'd get sued, and that's why it has to be fiction, but it's awesome. Read the book.

Rob Reid: Well, then also the other amusing thing I have to point out is the epetstore.com CEO has a last name very much like yours. It's Jepson, only S-O-N.

Mary Lou Jepsen: Right, the Swedes are S-O-N. The Danes are S-E-N, but yeah. But we don't have much in common at all.

Rob Reid: The Swedes and the Danes-

Mary Lou Jepsen: No, the epetstores.com CEO.

Rob Reid: Oh God, no, no. You and Tony Jepsen are completely opposite people. Well, thank you again. Have a wonderful trip.

Mary Lou Jepsen: Thank you. Nice to be here.

Rob Reid: So wow, right? Few things fascinate me more than a technology which might, if it truly delivers on its maximum promise, impact society more than the smartphone. That's a pretty high bar, and Mary Lou's approach to illuminating our minds and innards with near-visible light could just clear it. This early in the game, not even Mary Lou can know if she'll actually pull it off, and I certainly lack the technical and scientific chops to assess this authoritatively. But the video she showed at TED of that MRI-enabled software reading images directly from the brains of those Berkeley students remains one of the most astonishing things I've seen, and that's saying something, because she gave that talk way back in 2013, and I've had my share of astonishment since then.

Rob Reid: I actually met Mary Lou the night after she gave that talk, and eagerly asked her about the improvement curve that MRI machines were traveling down. She had bad news for me. MRIs were improving, yeah, but not at anything approaching the rate of microprocessors, hard drives, or bandwidth, so it seemed like it would be many years before those grainy images improved significantly, and indeed, this has been the case. There's lots of reasons for this. A big one is that the world only ships about 2000 MRI machines per year. That's trivial compared to the volumes of the consumer products whose components Mary Lou is harvesting for her own work. Now, I'm sure many brilliant minds are working hard on the next generation of fMRI, but their numbers are tiny compared to the armies of engineers racing to cram the next few pixels onto the VR lenses of tomorrow. If medical imaging can jump off of the MRI curve and onto the smartphone curve, it will be revolutionized, whether by Mary Lou or someone else.

Rob Reid: I've posted Mary Lou's TED Talk on my website, which you can find at after-on.com. Just click the podcast link at the top of the home page, and you'll find your way to her show notes. I've included a timestamp to help you jump straight to the Berkeley video if you like, but it's worth watching all of Mary Lou's talk. Among other things, she goes into more depth about the aftermath of her surgery. As she said in our interview, her brain no longer produces hormones, which is obviously bad and her daily dozen pill regime can't be much fun, but it gives her control over signaling compounds that deeply affect our moods and our psyches. She once tried out a neurohormone balance typical of guys in their early 20s. It's quite a story and puts Mary Lou's fascination with the brain into perspective.

END INTERVIEW ELEMENT OF PART TWO

So Ars Technica listeners - here we conclude the second and final installment of my interview with Mary Lou Jepsen. If you're interested in more, I actually launched my Patreon page on the same day that I posted Mary Lou's interview. I post some bonus audio connected to each of my episodes on that page -- and in the case of Mary Lou's episode, it's a smidgen under thirteen minutes. And by the way, Patreon packages all of this stuff very elegantly as an independent podcast feed that you can access right in your smartphone. There are now many hours of bonus material in total, and it's available to anyone who supports this show with \$5 a month or more. If you're interested, head on over to Patreon.com/RobReid.

If you're curious about the latest episode in main After On podcast feed – this week it's an especially fascinating conversation, which I think will really resonate with Ars Technica readers. It's an interview with a chemist and DNA architect named Floyd Romesberg.

If you have any recollection of your high school biology, you probably know that DNA is written in an alphabet of just four letters. Well, Floyd has added two new entirely artificial letters to that ancient alphabet. The science is amazing, the ramifications could be astounding – and on top of that, it's just a great interview. To hear it, head on over to After-On.com, or search for After On in your favorite podcast software.

Next week my podcast will be taking a week's hiatus from its serialization duties here on Ars to better celebrate the fourth of July. Then I'll be back the week of July 9th with a provocative and quite comprehensive examination of Fermi's paradox. Which is they mystery of why we can't see any signs of alien life in the universe - which is surprising, given the universe's vastness, it's enormous age, and the realative speed with life started on Earth. Taken together, those three factors suggest that life should be everywhere. So where is everybody?

To find out - or at least, to have a lot of fun pondering this question - please join me here on Ars the week of July 9th.