101. 3D Printing and Other Good News

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Future Sense is a podcast edited from the radio show of the same name, broadcast on BayFM in Byron Bay, Australia, at www.bayfm.org. Hosted by Nyck Jeanes and well-known international futurist, Steve McDonald, Future Sense provides a fresh, deep analysis of global trends and emerging technologies. How can we identify the layers of growth personally, socially and globally? What are the signs missed; the truths being denied? Political science, history, politics, psychology, ancient civilisations, alien contact, the new psychedelic revolution, cryptocurrency and other disruptive and distributed technologies, and much more.

This is Future Sense.

Nyck: You are tuned to *Future Sense* here on BayFM, and on podcast via www.futuresense.it or your usual platform; or possibly you are listening through the www.BayFM.org website here, with myself, Nyck Jeanes, with Steve McDonald, my co-host, and our special guest this week, Mitch Schultz, the Texan Elf, going back to Texas tomorrow.

We're going to talk about a few other little pieces today that have drawn our attention to some positive news.

Steve: Yes, some positive news about developments in manufacturing and 3D printing. I've got to say, when we were watching that *American Factory* movie and seeing all the Americans, in particular, being so unhappy about the hours, the low pay and just being generally unhappily unhappy at work, it kept screaming out to me like, 'why are we still making people do this kind of stuff when we've got robotics, for example, that could do this production-line kind of work?' And then, of course, towards the end of the documentary, that was exactly what they were doing in China, was introducing robotics.

Mitch: And in the American factory. That's where they were filling it out, saying 'we're getting rid of these American workers; we can now make this very easy and just put in a robot.'

Steve: Yes. Of course, the unspoken thing there is what to do with the workers. There's a huge need there for governments to plan for these sorts of things and to make provision for their exit from those jobs and retraining and replacement into ...

Nyck: Caring about the little people. There's an idea.

Mitch: If we can get our governments to stop fighting and start paying attention a little bit more to the people, that would be great.

Steve: Absolutely, and that's one of the challenges we face large-scale at the moment is the rapid change that's going on in society and the sort of inward focus of politicians and governments at the moment. It's kind of like they've taken their eye off the ball, isn't it?

Anyway, there's a great article that I've got in front of me here about 3D printing. It's from www.nature.com, and it's talking about how 3D printing is becoming faster and producing larger products (https://www.nature.com/articles/d41586-020-00271-6): "Scientists are coming up with innovative ways to print and are creating stronger materials, sometimes mixing multiple materials in the same product", so it's becoming a lot more capable. There are a couple of factories in the US, or research organisations in the US, that they're highlighting. One is in South Carolina, where they're using a "3D printing technique referred to as 'additive manufacturing', because instead of chopping or milling a shape out of a larger block, or casting molten metal in a mould, it involves building objects from the bottom up."

Nyck: This itself is quite a big change, just this piece, isn't it?

Mitch: Just that thinking.

Steve: Yes, it is, and you know, we've had machines called CMC machines for many, many years. I can remember seeing one for the first time back in the 80s, where you would put a block of metal in the machine together with a computer-based pattern, and the machine would basically carve whatever you wanted out of the metal block. The guy that showed me the machine back then was saying that if you wanted to, you could reproduce pretty much anything, like car parts or whatever, and so the machines were being very carefully controlled because they could easily be used to defy patents and those sorts of things to make car parts, etc.

Anyway, the technology has gone much, much further than that. The advantage of this new technology that I started describing is that it creates less waste and it has the ability to print custom designs, such as intricate lattice structures that are otherwise very, very hard to create. What's also interesting is they're using different frequencies of light together with resin to help create these things. At *3D Systems* in Rock Hill, South Carolina, they've developed a way to print light-sensitive resin up to 100 times faster than conventional printers. It uses a stage submerged in a vat of resin and a digital projector shines a pre-programmed image up at this stage through a transparent window in the floor of the vat. Isn't that interesting? It's like a holographic kind of a set up. The light cures an entire resin layer at once, and at this particular lab, they've made an advance on that technology by

making the window at the bottom of the vat permeable to oxygen, which is really interesting. This kills the curing reaction and creates a thin buffer layer or dead zone just above the window's surface so that the resin doesn't stick to the bottom of the vat each time a layer is printed. Then the stage—when they're saying a stage, it's like a little platform that sort of descends down onto the resin and then whatever is being printed is attached to the stage—they pull that up and it gradually pulls the completed part of whatever it is up through the liquid. As it's pulling it up, it's forming new parts of it, so it's kind of like a very interesting continuous process; the thing's printed as it's being pulled up out of the resin. Quite fascinating.

Another report from the *University of Michigan* who are also working on this kind of technology where they have a printer that inhibits the reactions using the same kind of resin-based process by using a second lamp, emitting a different wavelength of light—and I find this quite fascinating, that we're playing with different wavelengths of light here; I think there's a lot of promising that. "By varying the ratio of the strength of two different light sources, they can control the thickness of the photo-inhibited zone, allowing the creation of more complicated patterns such as surfaces embossed with seals or logos" and those sorts of things. Very, very interesting.

Mitch: Just thinking about what the impact will be down the road on this—and we're talking about localisation and manufacturing and things coming back to the local level—imagine what happens when we can start producing building materials, car parts, any number of different objects that get shipped around the world and use petrol and any number of things. We just download the programme, go ahead and print it at your local place, and you're good to go. It's not that simple, but there's something that's going to be profound in the near future about this new technology.

Steve: Yes, extremely disruptive, though. When you think about the set-up that we have at the moment and all the companies alone, all the intellectual property and the patents, it's all got to change.

Nyck: It's interesting, in the same article, the world's first 3D-printed concrete pedestrian bridge was made by researchers at the *Institute of Advanced Architecture of Catalonia* in Barcelona in Spain, and installed in a park in Alcobendas near Madrid in 2016. It features that sort of lattice structure that you're talking about, or part of that sort of technology. But I've also seen recently—I haven't got it in front of me here—the printing of hempcrete buildings, which is pretty amazing, especially in this era where accommodation is becoming very hard to find, very inappropriate for many people, and out of the purview of economics for many of us. But the idea that we can actually print affordable housing in some way is pretty amazing.

Mitch: Imagine if Gaudi would have had that printer, talking about Barcelona, we would have been done with that [Basilica de la Sagrada Familia] a long time ago.

Nyck: Although that still isn't finished.

Mitch: It's still under construction.

Nyck: It's a true piece of art, it's never finished.

Steve: It's interesting, I know somebody who stayed in a hempcrete building, which is set up as an AirBNB just recently, here in this area. They said it was very interesting; it had an interesting vibe to it. I think it was hempcrete and wood, and what my friend actually said was that they felt like they were sitting in a temple. It's quite interesting.

Nyck: Beautiful.

Steve: So, robotics, automation and 3D printing, certainly, I think, are the ways of the future, and as you said, Mitch, the relocalisation of these things is, I think, inevitable. It just makes sense, particularly in light of what we've been saying about government and the problems with government that are emerging, and the need to create resilient communities that are self-sufficient in many ways. Because what I'm sure we will continue to see, and we're already seeing, is the breakdown of federal-government-level infrastructure and spending on that infrastructure. We've gone through this huge process of privatisation globally where the governments have found that they can't afford to keep maintaining this stuff so they have to privatise it, and now, of course, that privatisation is changing as well in many cases because it's not commercially viable for companies to maintain infrastructure in the same way that the government used to, where they would just spend money without worrying so much about efficiency. Now, companies that are trying to make money out of it are letting things go. We're seeing that here in Australia with things like the electricity grids and maintenance of poles and wires and those sorts of things; movement to solar power, which means that people are drawing their own power from the sun and they're not necessarily using the grid so much ...

Nyck: And potentially exchange it with one another house-to-household. That's coming online—being experimented with—in some places.

Steve: Exactly. All these sorts of things are going to change the way that we live and the way that we govern ourselves. They need a lot of planning at all levels, and they also need a lot of

change management and retraining of a lot of people who might find themselves without a job.

Nyck: As you're speaking, I'm thinking though, with regard to the old manufacturing industries of our country, as they start to fall apart, fail, and just aren't viable anymore, and this kind of technology we're talking about here—robotics, 3D printing and the like—surely, locally, this will enable some employment in local and regional areas for the very uses of getting things from A to B and doing the necessary work, so, by nature, the technology is helpful in creating more localised employment.

Steve: Yes, I think a key issue that's often not spoken about is that it ought to make things a lot cheaper. When you don't have to have something made in a factory across the other side of the world and shipped through a supply chain to buy locally, even though a lot of those things are pretty cheap, when those things are made locally, then potentially they're going to be a lot cheaper. So the cost of living is going to be far less, people may not have to work as much as they do at the moment.

Mitch: We may not have to work as much. That's the big thing.

Steve: Well, that's where it's headed. We're going to have a lot more free time and it's going to be a lot cheaper to live. That's essentially where things are headed.

Mitch: We can get out and connect with our neighbours and have conversations.

Nyck: That was the dream of the "Leisure Society" in the 50s or so, that whole idea that technology would create that leisure space for everybody, and of course, it's taken a long time to get to that point, but clearly now we may be ready for exactly that.

Interesting, just reading that last piece on 3D, in California there's a start-up called *Relativity Space* in Los Angeles. It says it's constructing "a nearly fully 3D-printed rocket. The rocket is designed to lift 1,250kg into low Earth orbit, and its first test launch is slated for 2021."

Steve: Does this mean that we can print our own village rocket once everything gets localised?

Nyck: Absolutely.

Mitch: That's what we need: more stuff in space right now above our Earth.

Nyck: Well, there is that. That's another question, and we probably all have different opinions about that one way or the other.

We'll come back with some more good news shortly here on BayFM.

Nyck: And hello to all of the listeners all around the world who are listening via the podcast, or via our website, or live as we are here in the Rainbow region of Northern New South Wales, with Steve McDonald, myself, Nyck Jeanes, and Mitch Schultz. We were talking a little bit about 3D printing, but 4D printing?

Steve: Yeah, I know, 4D printing. I'd never heard of that before, but that refers to 3D-printed objects that also have the ability to perform some mechanical action, like, for example, artificial muscles; things that can change over time, which is where the 4D comes in. "California Institute of Technology in Pasadena reported printing a submarine that propels itself forward using paddles that snap backwards when placed in warm water", so obviously responding to the warm water there. "This work could lead to microrobots that can explore the oceans autonomously" and other applications. They're talking about 3D-printed lattice structures filled with liquid that changes stiffness in response to a magnetic field, which could perhaps be used to help car seats stiffen on impact. Quite fascinating.

What else? It says here: "Perhaps the most ambitious example of 4D printing is matter that not only moves, but is alive. Currently, techniques for such bioprinting can print tissue, such as human skin, that is suitable for lab research, as well as patches of tissue for livers and other organs that have been successfully implanted in rats. But such techniques are still far from ready to integrate into a human body. Researcher's dream of printing fully functioning organs that could alleviate long wait lists for organ donors." The professor that they're quoting here feels that they're probably a decade away from that yet, but how interesting.

Nyck: A decade is not that long for that kind of technology on the other hand, though. Replacement of organic, mechanical, movable parts, sophisticated aspects of biology that can be replaced in that way—pretty extraordinary.

Bionic Mitch is coming. You still love animals, though, Mitch.

Mitch: I do, and to stay on this, the good news—because so much of this stuff here can be a little heavy at times—but I've been watching and loving these stories about other species helping other species. We've seen this in the wildfires here in Australia recently, but something that just popped up was an orangutan reaching out to help pull a man out of a river with snake-infested waters in Borneo

(https://edition.cnn.com/2020/02/07/asia/orangutan-borneo-intl-scli/index.html). I just love seeing these little stories. There was another one about a whale researcher off the Cook Islands, I think, last year.

Nyck: Nan Hauser.

Mitch: They came and warned her that there was a tiger shark in the area, and tried to push her up and get her to safety.

Nyck: That's right. A humpback whale played with her for ten minutes and kept on bringing her in and lifting her out of the ocean with its massive head, and "over the tense 10 minutes that followed, Hauser swam calmly around the whale as it nudged her with its head, bumped her with its belly and swiped at her with its powerful pectoral fins" (https://www.livescience.com/61380-humpback-whale-saves-diver-video.html). She didn't know what was going on, but actually, the whale was protecting her from the shark. Incredible.

Mitch: Right. I guess with these orangutans, one of their biggest predators are these poisonous snakes that are in these rivers, and this man was actually clearing out snakes so people could come down. The orangutan comes to the edge of the water and reaches his hand out to help pull him out. A little frightened, I think the man was, because they're not sure how they're going to respond to what's going on, but I think this is a common thing. Just keep that in mind when you see another animal or species in need.

Nyck: I told you guys off air, a number of years ago, some of the cetacean folk—the whale and dolphin people in my world at that time, and still—had an experience in Hawaii, I think, on the big island where they were swimming with dolphins. There was a woman who kept on being sort of nudged quite strongly by a male dolphin coming and butting her in the gut somewhere, over and over again. She went 'this is really weird, we always swim with these dolphins, what are they doing?' She got out of the water and decided there was something to it, went to a doctor and found a massive tumour right there where the dolphin had clearly sonar-ed her and discovered the tumour and was pointing to it. We are all connected, bottom line, all creatures great and small.

Steve: There were some great examples during the fires here in Australia, too, of animals coming to humans to get water, and animals helping other animals, too.

Mitch: Getting them down into their burrows.

Steve: And sharing their burrows. Really interesting stuff.

Nyck: If you've got some examples of that, you can text in really quickly. You've got a few minutes before the end of the show. I think, to me, the bigger picture of this is that we have been—most of us, most of society, especially with the dominance of Layer 5 that we talk about through Clare W. Graves's work—a great deal of disconnection has occurred for most people in our modern societies, from the native world, from the natural world, from other creatures. It would seem that that's shifting by the very in-your-face nature of nature now, with all the fires and the floods and the famines and the droughts and so forth that are occurring, that the creatures are more seen, more available, and there's more contact available to us and we are beginning to see it more. More of us are seeing it more often.

Mitch: Humans are starting to realise that we are not separate from nature. We still very much ARE nature and part of nature, and I think we can take some signs and some learning from our friends on the planet.

Nyck: In the last few minutes here on *Future Sens*e this morning, we've got a couple of other little pieces we'd like to bring attention to.

Steve: In this good news segment: "In an Australian first, a native title group in Western Australia has been awarded both native title recognition and a $450 million economic package comprising cash and assets to empower traditional owners" (https://www.abc.net.au/news/2020-02-07/landmark-yamatji-nation-native-title-declaration-in-wa/11942946).

Nyck: That's a first, isn't it?

Steve: It is a first, that those two things have happened at the same time. The Yamatji Nation claim covers a landmass of nearly 48,000 square kilometres in the Midwest. It's around the area of Kalbarri, which is just south of North West Cape, in the sort of centre of the Western Australian coast there. This *ABC News* article said: "Friday's determination was made in an emotional on-Country Federal Court hearing in Geraldton, 400 kilometres north of Perth, where the traditional owners met with Justice Deborah Mortimer", and, as I said, "the first time both native title recognition and an Indigenous Land Use Agreement have been determined simultaneously." This is quite extraordinary and I can only hope that there is sufficient expertise gathered around to help that area be developed using those assets and funds that have been granted, in an effective way that's going to serve the traditional people there.

Nyck: It "includes a cash component, the transfer of commercial land to the Yamatji nation, joint ventures, tourism opportunities and access to housing properties for sale, leasing or development revenue streams"; also from mining—might be contentious here and there—and from leasing of the sale of land located in an industrial estate there as well, "as well as strategic Aboriginal water reserve for use, for lease or for trade." So it seems to be quite comprehensive at first glance, doesn't it?

Steve: It does, and it's been a long time coming. The claim was started in 1996 and the whole process was described by the Federal Court as "long and challenging" for various reasons, which included some overlapping claims, but they finally got there and congratulations to everyone involved with that whole process. It's really good to see. I was kind of scratching my head a little because it's not characteristic of current government attitudes, but when you look at the fact that's been coming since 1996, that kind of explains it.

So that's wonderful, and in other good news this morning, we've reported previously about changes to the law in the Australian Capital Territory (ACT) around the possession and use of cannabis, and those laws have now come into effect there. It's a very interesting ground-breaking change for Australia, because essentially what they've done is they've legalised recreational cannabis use and the growing of two plants per person, which runs counter to federal laws, so it puts us in a similar situation to the various states in the United States of America and that have had this conflict between federal and state law, but nevertheless, in the US, it's managed to push ahead. Hopefully the same will happen here.

Nyck: Although, you can grow two plants but you can't give any of it away to anybody. That's illegal.

Steve: No, and you can't sell seeds either.

Nyck: No, that's right, so it's pretty limited.

Steve: It's not perfect.

Nyck: It's not perfect but in some ways you could say it could potentially criminalise other kinds of behaviour anyway.

Steve: Well, it could do, and another one of the conflicts is that in the ACT, it's the Federal Police who are the local police there, and of course, they have to decide, I guess, whether to

enforce federal law or the ACT law. So not perfect, but nonetheless, let's hope it's the thin edge of the wedge and the end of the drug war here in Australia.

In related news, Melbourne, this weekend just gone, has seen the opening of its first cannabis dispensary, which they're hoping will be the first of many. So progress in the War on Drugs, which is good news.

Nyck: And with that, of course, we've got a couple of showings that we've talked about, where you will be a guest speaker on the panels down below here in the Byron Theatre. Two films on medicinal psychedelics, which we talk about often on this show, and of course, Mitch was very involved with all of us here on the *From Shock to Awe* film, which we showed around Australia last year. There's two coming up, one on the 27th of this month. What's that one about?

Steve: Two movies that are being put on by the *Entheogenesis Australis (EGA*; https://www.entheogenesis.org), the wonderful community-based organisation from Victoria, which incidentally was very instrumental in the formation of our first research organisation, *PRISM: Psychedelic Research in Science and Medicine* here, back in 2010-2011 (https://www.prism.org.au). They are screening two movies: *Journeys to the Edge of Consciousness*, which features the writings of Timothy Leary, Aldous Huxley and Alan Watts, which looks like a philosophical movie; and then another movie, which I haven't seen yet, called *Icaros* which is clearly about plant medicines going by the name.

Then, on the second date that you mentioned, the 7th of March, we are screening *Trip of Compassion*, which is a documentary about the Israel-based MDMA research from a few years back, which is actually the only movie out of those three that I've seen. It's a very good record of the early research that was done and the breakthroughs.

Nyck: And it does actually show footage from within the psychedelic sessions.

Steve: It does, and it is a little confronting, I must say, at points. I would issue a trigger warning for anybody who might suffer from PTSD, around that *Trip of Compassion* movie. It's a very interesting record of the research, for sure.

Nyck: That's it for the show. I think we'll finish up there. Thanks to Mitch Schultz, the Texan Elf, and God bless. You've got a bit of a goodbye; the official Texan goodbye to Australia.

Mitch: I think the only thing I'd like to say is it's always great to come to Australia. I want to thank my Australian brothers and sisters for being so welcoming and warm, and I will be back soon. Much love.

Steve: Wonderful.

Nyck: Much love indeed.

Thanks, Steve, and thanks to all of us here. We will be with you next week, on Monday from 9 to 11. As I said a few times today, you can check us out on www.BayFM.org and get the full show with music and so forth and within a couple of hours; but if you want to get the edited podcast within a couple of days, go to www.futuresense.it or to your platform that you use. We'll be with you next week.

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