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FODI || THE IN-BETWEEN

EP 07: John Rasko & S. Matthew Liao

The In-Between theme music

S. Mathew Liao If we only live for 90 years, then I think most of us like we could care less about, you know, being able to get to Mars, right? Because life is so short. But if you can live for 900 years, then maybe after you spend about 300 or 400 years on Earth, you think, Well, OK, this is pretty good, but you know I'd like to have something different.

John Rasko We may be at the cusp of the age of regenerative medicine and of controlling our own genetic destiny. But the very example of Dr. He who now remains, rotting in a Chinese jail because of the unapproved experiments that he undertook on human beings in China confirms that we are falling far short of the ethical tools, the moral tools, the compassion and even, dare I say, love that is required to take on the weighty responsibility of genetically engineering all of our descendants.

Danielle Harvey: Welcome to The-In Between, an audio project by the Festival of Dangerous Ideas, presented by the Ethics Centre. I'm Festival Director, Danielle Harvey.

This podcast was produced on Gadigal land. We pay respect to Elders past and present, and extend that respect to all First Nations people listening.

From the ancient tale of Gilgamesh to Mary Shelly's Frankenstein, the dream of immortality has long captured the imagination of writers. Which, in turn, has captivated the world of scientists.

Today, human organs can be 3D printed, the concept of moral machines feels more believable than sci-fi, and, in many parts of the world, human life expectancy is only growing.

How close are we to conquering death? Have we entered the age of regenerative medicine? And in the future, could we engineer our species to life on another planet?

For this conversation, we sit between John Rasko and Mathew Liao.

Matthew Liao is a philosopher and widely published author, including *The Right to Be Loved*, *Moral Brains*, and *The Ethics of Artificial Intelligence*.

He currently is the Arthur Zitrin Chair of Bioethics, Director of the Center for Bioethics, Professor of Global Public Health, and Affiliated Professor in the Department of Philosophy at New York University.

John Rasko is a clinical haematologist who leads the Gene and Stem Cell Therapy Program at the Centenary Institute, University of Sydney.

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He heads the Department of Cell and Molecular Therapies at Royal Prince Alfred Hospital and recently co-wrote *Flesh Made New*, *The Unnatural History* and *the Broken Promise of STEM Cells*.

This conversation was recorded in October 2021, and is moderated by FODI Co-Curator and Director of the Ethics Centre, Simon Longstaff.

Simon Longstaff Matt, John, welcome. I wonder if you could help us get a bit of a sense of where you are. So maybe if I can begin with you, John, whereabouts are you? Can you describe the room you're in? What's going on around you, particularly during this time of pandemic?

John Rasko I'm sitting in my study at home in suburban Sydney after a relatively long lockdown. We're starting to emerge and I'm looking out over some beautiful green parkland. There's some birds in the background that you may hear from time to time. And in my office, I'm surrounded by things that I love. Many books, a small collection of microscopes that allow me to be reminded of the history that we all stand upon. And of course, I'm enjoying speaking through this technical marvel that allows us to record things from a distance.

Simon Longstaff And Matt what about your room? I imagine if it's a microscope for John, you've been in philosophy, you've got a particularly ancient pencil or something? (John laughs)

S. Mathew Liao Laughs. I am currently in my office here in New York City, and because of the pandemic, the office. Even though it's absolutely brand new, it's completely empty. Most people are now working remotely. I only came in here because I'm doing this recording, so normally I work from home, which is not too far away. So it's very interesting that the pandemic has really changed the way we work and the way we engage with people.

Simon Longstaff It's been called the age of regenerative medicine, and there's a lot in that concept. What's the foundation that you think we need to build upon in terms of our understanding of our cells? The origins of life, we're emerging and what it's actually going to look like in a reasonably prospective future around the possibility of regenerative medicine.

John Rasko Thanks, Simon, will just say that we're all agreed on some foundational concepts. I would say regenerative medicine is a branch of medicine that aims to regrow, repair or replace damaged tissues and organs. So different therapies fall under that concept of regenerative medicine, and it's almost become a bit of a catchall. But the central one is stem cell therapy. So this idea of regenerating tissues or cells became hugely popular at the end of the 20th century. And it's when Carl Power and I, in our book *Flesh Made New*, coined the phrase "catching stem cell fever". The world seemed to fall under the thrall of stem cell fever and really start to begin to imagine the possibility of longer lives, better lives. And indeed, that extraordinary question that I'm sure Matt and I will engage on, which is immortality. So essentially so that we are on the same path. STEM cells are the master builders of your body. They generate all your tissues and organs, and they help sustain you if you get injured through the course of your life. There are two main types of stem cells. The

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adult stem cells that are in all of the organs of our bodies that, if we, for example, injure our skin, the stem cells in the skin do their job to repair that tissue. But if you go back to the embryonic origins, you find that there are these specific cells called embryonic stem cells. Essentially, the fertilised egg derivatives that can create all of the many hundreds of different tissues in our body a single petri dish, a single- in a single dish of those cells, if treated right, can produce, theoretically an unlimited supply of living cells of any kind. So to that extent, this is truly an amazing area. And so when human embryonic stem cells were invented by Jamie Thomson at the University of Wisconsin and some others, it's truly the case that the world thought that we tapped the wellspring of life, putting it at our disposal. And, of course, caused us to begin dreaming of this therapeutic promise.

Simon Longstaff One thing I think it's worth pointing out, of course, is if you take stem cells and start to use them for the regenerative purpose, what will be regenerated is what you are, as of today, with all of the benefits and burdens that your genetic profile might bring. But there's also a view here, is there not, that you could take stem cells and you could make inheritable genetic modifications to effectively remove errors or provide enhancements?

John Rasko Oh that's absolutely right, and that's a separate question, but one that really is at the core of, I think, this whole theme that we're talking about today, which is, are we on the cusp of a new age? And indeed, I think at the cornerstone of that question, if we imagine ourselves 100 years hence and ask, will, was this the age of the start of the age of regenerative medicine? One of the components of that will be: did we begin to start to consider that word that sends horrors in most philosophers and indeed most ethicists minds, namely "eugenics", do we consider the possibility of stepping in the direction towards not just correcting genetic abnormalities that cause serious human diseases in people who are alive now today, but correct their genetic inheritance that they passed down onto their children? That is at the core of the question of inheritable genetic modification and one that is currently illegal in almost all jurisdictions in the world.

Simon Longstaff Nearly all of the conversation here tends to focus on the physical nature of people, you know, their bodies, their diseases and other things. Matt, is there any reason to think that the evolutionary history, the genetic evolutionary history of humanity has any link to less physical things that-what are perhaps less physical things like moral agency? Is this something you see in our cellular development that could be the foundation for forming such agency?

S. Mathew Liao Yeah. So that's a really big philosophical question how sort of just from particles and genes you can have higher level capacities, such as moral agency and consciousness. So moral agency is the ability to respond to moral reasons, make free choices and sort of act on those reasons. And it's incredible that just from a bunch of molecules, we're able to have this higher level capacity. And in fact, my colleague Dave Chalmers calls it 'the hard problem of consciousness'. How do you go from just these physical molecules to something like consciousness? And it's a question that has puzzled and continues to puzzle a bunch of philosophers. There are a lot of people who think that maybe consciousness is epiphenomenal. Maybe it's just sort of something that's like that we just produce after the fact. It's actually not that important. And it's something, you know, there are people who think that, yeah, sort of consciousness is an illusion. So that's sort of one view now and then other people are pushed to something called panpsychism. And so that's

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the view that maybe, it would be really easy to explain consciousness if everything was conscious. And so even rocks are conscious or New York City is conscious, right? And so if everything is conscious, then we can really explain this problem of how the brain can produce something like consciousness.

Music bridge

Simon Longstaff So far, we've been painting a pretty rosy picture, I have to say. Ethically nuanced, benevolent scientists and medical practitioners looking to the future where they alleviate not just physical problems, but potentially refine our interior lives. But John Rasko, that's not quite the whole story, is it? I mean, haven't there been a few shonks around who made basically fraudulent claims for the science they've been engaging in, creating false hope and lingering disappointment?

John Rasko Oh, absolutely. In fact, more than a few, I think Simon, it would be fair to say and we've documented a number of those in the book, *Flesh Made New*. But we've got one special example to start with who we've called our patron saint and our patron sinner. And that's, of course, the famous and indeed Nobel prize winning French born American scientist called Alexis Carrel. He basically studied cells alive outside of the body. Up until Alexis Carrel in the early part of the last century, we had studied cells that were fixed, static under a microscope and dead that had been killed by alcohol or formaldehyde and then stained with various colours so that we could understand the relationship, physical relationship, between the cells. And that gave us an enormous amount of information and, you know, started whole departments of histology and embryology and many of the grand universities throughout the world. But Carrel's contribution to the so-called prehistory, if you will, of regenerative medicine was to transfigure our attention, that to really understand the way that humans and indeed, all animals and plants work all life works, you have to understand the functional relationships between those cells and to do that, you need to isolate cells and study them alive.

And so Carrel did this extraordinary experiment, which is famously called the chicken heart experiment. Basically, he took heart cells from a chick embryo in an egg and placed them under glass in his Rockefeller Institute laboratory, and showed that he could grow those cells for a period of time outside of the chicken. Now what actually happened was that he claimed that those cells were able to be grown if they were maintained in a sterile environment indefinitely. This was an extraordinary historical event. And as such, being freed from the constraints of the embryo in this case or indeed from any body, he could grow those cells, and they were immortal. And so he imagined the possibility of life immortal. And that was a great success in one sense, because it opened up the whole field of cell culture, so-called tissue culture. But Simon, it was a lie. It was a hoax. It was not true. Whilst he was a great scientist who did invent the concept of tissue culture, we now know and have proven time and time again - but it took 50 years to do so - That in fact, cells taken from a chicken embryo cannot be propagated indefinitely. So his famous chicken heart experiment that was made famous the world over in films like *The Blob*, starring Steve McQueen that claimed to reveal the secret of immortality within us all, and it was attributed to our cells, was bogus. And it was either very badly run or indeed fraudulent because we now know that ordinary cells are not immortal.

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Simon Longstaff But some cells are. Some cells are.

John Rasko Stem cells are. But he didn't have stem cells. Indeed, he knew nothing of stem cells that took many, many, many decades. There are many examples that seem to attract - like moths to a flame - bad science and fraudulent science. Probably our worst sinner being the scientist called Paolo Macchiarini, who is a surgeon and claimed in bogus papers published the world- over the world, and he treated patients for windpipe disease. Diseases of the trachea and voice box essentially, he claimed that he had invented the first evidence of regenerative medicine, but it was indeed like so many things, too good to be true. And he'd faked his results, and all of his patients were really just subject to a slow, cruel death. And many of his patients died, and many of the others who remained alive did so in spite of the artificial windpipes he'd given them. So, this area of regenerative medicine has as much attracted bogus science, and whilst it has prompted the imagination of everyone to pursue regenerative medicine and indeed the possibility of longevity, ageing science and ultimately perhaps extending life indefinitely. It's at the moment fallen far short of realising those dreams. And maybe we are at the start of a revolution, but it's going to take a lot longer than some of the bogus claims that we hear all the time, from direct to consumer marketing clinics all over the world.

S. Mathew Liao John's absolutely right that there are many, many unethical scientists as well. And well, and one of the recent ones is this doctor from China, Dr. He, who basically used CRISPR gene editing. So CRISPR gene editing is sort of think of as the search and replace function in your word processor, you can sort of search for certain genes, search for certain words in the word processor, and you can kind of replace them more. And basically, CRISPR allows you to do that at the genetic level. So you can go into specific genes and you can either insert certain genetic genome codes or you can cut out certain genome codes. And basically right now, CRISPR is a really great tool, but it's still kind of crude. So imagine that, you know, in your word processor, you search for the word "and" and you want to just remove the word and where you going to remove the word and. But you could also remove words like "sand" and "band" and a bunch of other words. And so basically, we don't have full control over this process at the moment.

And what Dr. He did was he didn't really get ethical approval for his research, but he basically genetically modified embryos. And so his stated intent was to remove the susceptibility for HIV. He claimed that he was trying to make an embryo more resistant to HIV, so he created these genetically modified embryos. And he actually brought the embryos to term, which we're so far away from being able to do that at the moment. But Dr He, without a lot of sort of oversight, decided to go ahead because he thought that he was doing humanity a big benefit. And so this was really controversial and frankly quite unethical.

Music bridge

Simon Longstaff So let's just project ourselves a little bit into the future now and imagine that there is an ability accurately to change genes. And so there'll be lots of things we can do. The question becomes, then are there some things that we should not do? Matt, you've argued, or at least you've explored in the past, things like climate change, whether or not genetically engineering human beings so that we are better able to adapt to climate change

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might be a better solution than, say, something like geoengineering. Do you still think that's something we should be turning our mind to you if it becomes technically possible?

S. Mathew Liao Absolutely. So climate change is such a big problem that we really don't have good solutions right now. And so some people are suggesting geoengineering, spraying sulphate aerosols into the ozone layer. Of course, we only have one planet. So you could just end up destroying the ozone layer and therefore all life on Earth. And so in that context, yeah I've suggested sort of human engineering. So this is sort of the biomedical modifications of human beings to make them better at mitigating or adapting to the effects of climate change. And here's just an example, Simon. So imagine, I live in New York, and so when I fly back in the days when we used to fly, when you fly into New York, you'll see at night that there are so many lights that are on. And that's true around the world. It's true in Sydney. It's true in L.A. and so on and so forth. There are just so many lights around the world, globally. Now, cats can see as well as we can during the day, but they can see about seven times better than we can at night. And we know that cats can do this because they have the genetic basis for night vision. And it's polygenic. There are maybe about 500 or so genes that are needed to sort of figure out what you need for night vision. But just imagine that we can give ourselves night vision, right? And in doing so, just imagine the global consumption of energy. We can sort of globally reduce so much energy in the world at night if we have better vision at night. And that's just one example. But here's another thing. You know, we talked about immortality. But you know, here's another thing like, it's going to be true that eventually the Sun will die out. That's a fact, right? Whether-

Simon Longstaff It's not for a little while.

S. Mathew Liao And not for two billion years, three billion, you know, so but at some point, you know, the sun will die out or maybe you will get hit by an asteroid or something like that. But at some point, probably we need to leave this planet if we care about the survival of the human species. Now, in order for the human species to survive in space, we have to get better at genetic engineering. And that's why I really like the work that John is doing is so important because some of these technologies are going to enable us to be more radiation resistant, for example, which we need in space. Or maybe we will be able to be better at using water, sort of be able to preserve water, or like require less water through sort of genetic modification. I think Stephen Hawkins even said that genetic engineering is something that's going to save humanity. So that's something I think that in the long term, we should really pursue and sort of explore because the survival of humanity depends on it.

Simon Longstaff John?

John Rasko (Laughs.) Well, I guess I could answer Matt in one phrase, which is slow down cowboy! (Laughs.) Only insofar as although I recognise all of the points that Matt says are valid and true for perhaps the distant future. I think the history of humankind recorded, even if it's 10 thousands of years, is a blink in the time frames that Matt is imagining. And yes, we may be at the cusp of the age of regenerative medicine and of controlling our own genetic destiny if we do decide to embark upon these ethically controversial challenges that include inheritable genetic modification. But the very example of Dr. He who now remains, I think, rotting in a Chinese jail because of the unapproved experiments that he undertook on human beings in China, confirm - based on the international shockwaves that his experiments

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created and the universal condemnation of the experiment that he did - it all confirms that we are falling far short of the ethical tools, the moral tools, the compassion and even, dare I say, love Matt that is required to take on the weighty responsibility of genetically engineering all of our descendants. And so the examples you gave like night vision? That doesn't seem unreasonable. But keep in mind, you know, the generation of humans, even if it's 25 or 30 years, in order to create a population of humans that would have this introduced ability would take many, many centuries. But I guess another area that I know is of equal interest to you, Matt, is artificial intelligence. And perhaps another way that humanity can aspire to foreverness is to download, like the show, *Altered Carbon*, our consciousness, whatever that is, to a computer and the question of the singularity, which I think is more likely imminent than the possibility of genetically engineering whole populations of humans with enhancements.

S. Mathew Liao Yeah, that's great. Maybe I can chime in here, So I just published the collection on the ethics of artificial intelligence, and I'm currently writing a book called *The Future Brain*. So there are three parts to the book. There's something like what I call 'broken brains', which is about things like post-traumatic stress disorder, addiction and borderline states of consciousness. So there are people sort of in persistent vegetative states and what we should do about them. There's a second part of the book about 'better brains'. How can we enhance ourselves in different ways to cognitive enhancement, mood enhancement and what some people are even talking about called moral enhancement? And then the third part is something I called 'beyond brains'. So this is sort of the brain computer interface that John, I think you're alluding to. And maybe even silicon brains. You know, can we upload ourselves? What does that mean and so on and so forth? But I think one thing that I've come around to with respect to is whether artificial intelligence is going to be a solution for us. And there's a very simple reason to that, which is that when AIs become really smart, they might not need us around anymore. And so there's that's a big question for us. Like, maybe, you know, we care enough about these AIs. We think they're our children, they are descendants, even though they're not they're not human, they're our descendants. And so we're happy to be extinct. But if you care about the human survival then we might need to have a different solution than just creating these superintelligent AIs

Music bridge

Simon Longstaff John, Matt, I think anybody listening to this would have in mind, Mary Shelley's story of (laughter in voice) *Frankenstein*. I mean, you know, the manipulation, bringing body parts back, investing them with life for creation, which spurns its author and becomes monstrous when rejected. Isn't that the ordinary concern of people about where we're heading? I even hear them talk about it, genetically modified foods, *Frankenstein* foods and things like that. What's to stop this becoming the story of *Frankenstein*, John Rasko?

John Rasko It's absolutely true. I think since recorded history, *Gilgamesh*, *Prometheus*, people have always been fascinated by the concept of regeneration. Just look at the fountain of youth, which is a concept of immortality that we've always examined. You know, you can see this in ancient myths like I just mentioned, but also in science fiction, not just through Mary Shelley's *Frankenstein*, which of course just celebrated a couple of years ago, the 200th anniversary. But through so much popular culture that we see everyday. *The Wolverine*, *Vampires*, *Resident Evil*, *The Thing*, even *E.T.* and *Beetlejuice* and *The Crow* and *Godzilla*. All of these different shows have highlighted the concept of regeneration, which

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inspires so many of us. So it's really no surprise that people should get carried away with a new field of science that promises to make these regenerative fantasies come true. And we haven't emphasised, but we should do so now that scientists are people too. Scientists are subject to the same foibles as every one of us, and they are also liable to get carried away. And whenever you hear that some new scientific advances fulfilled an Age-Old dream, say for immortality, you should be very sceptical. You should be. If it sounds too good to be true, it probably is.

Now, I don't want to say that imagination and hope are the enemies of science. On the contrary. Those two features, imagination and hope are essential for human existence and for science. But although the scientific enterprise is a rational one based on empirical evidence and inductive reasoning, hope and imagination are at the heart and soul of all great scientists. And they not only make science possible, they make it worth doing. So setting the goals that science strives for is part of hope and imagination. The trouble is that our hopes and dreams can trick our eyes and cloud our minds and indeed sabotage our science. So we get ahead of ourselves imagining, for example, that the era of regenerative medicine has already come and it simply hasn't. The promise has been there for 20 years, but we just haven't realised it. And one thing we must touch upon is the fact that so much bogus science and so many bogus clinics have popped up, claiming to offer the possibility of regeneration and immortality that now there are more of those than there are real scientists. So this expensive homeopathy and unproven cellular therapies is a major issue, a \$2 billion economy on the world, which is often directly marketed to consumers.

Simon Longstaff Matt Liao, we tend to forget that Frankenstein is actually the name of the doctor who creates the creature. It's never given a name. It's not given a partner. It's not born monstrous but becomes so through rejection. How do you think we're going to go with all of our technologies in ensuring that we don't create monsters of our own?

S. Mathew Liao Yeah. So when I think about new technologies, I like to think about it in two different ways. So the first way is sort of where are we now? Where's the current science and what are the sort of ethical issues surrounding current science, right. And so in this respect, I think John is absolutely right. Some of the ideas are there, but we're very far from sort of being able to create immortal beings. And anybody who suggests that is just lying to you. And then the other way I like to think about new technologies is, well, let's imagine that they've been perfected. So let's imagine that we really can become immortal. Right? So philosophers have actually tried to think about this question, and a number of them actually think, well, immortality might be kind of boring. You might have read all the books or you know or, you know, go to movies, but you do that a million times and so on and so forth. Now, my own personal view about immortality and about regenerative medicine is that we don't have to be immortal for things to change. People are living longer. Right? There are some people who say that there are already people who are going to live to 120 years amongst us. Right? And so you can imagine that in 50 years time, there will be people who can live to 150 years, possibly through better nutrition, better regenerative medicine and so on and so forth. And I think that actually, when we can live longer, it opens up spaces of possibility that we don't sort of tend to think about. So for example, if we only live for 90 years, then I think most of us like we couldn't care less about, you know, being able to get to Mars, right? Because life is so short. So you try to make the most of it here. But if you can live for 900 years, then maybe Mars becomes an interesting possibility. Maybe after you

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spend about 300 or 400 years on Earth, you think, Well, OK, this is pretty good, but you know, I like to have something different. Maybe I'll try to go to Mars or somewhere else, right? And so I think imagination is very helpful. It could actually open up different possibilities for humanity.

Simon Longstaff Professor John Rasko. Dr Matt Liao, our thanks so much for this conversation today.

John Rasko Very nice to meet you, Matt, and enjoyed the conversation. Thank you, Simon, for your elegant chairmanship. And I do hope we have an opportunity to catch up either in Sydney or New York or somewhere else.

S. Mathew Liao Yes, John, it was such a pleasure speaking with you, and I just loved your wealth of knowledge and details about sort of regenerative medicine. Would love to see you in person, hopefully somewhere in the world when the pandemic is over.

Simon Longstaff Well, and wouldn't it be good if all scientists did some philosophy? You know, philosophers didn't get more science.

John Rasko Hear hear.

The In-Between theme music

Danielle Harvey: Thank you to John Rasko, Mathew Liao and Simon Longstaff. Accompanying this episode is a short response in sound. It features the words of artist and researcher Guy Ben-Ary in his search for immortal music.

For our final conversation, we will sit between Naomi Klein and Waleed Aly. The In-Between is an audio project by the Festival of Dangerous Ideas. If you've enjoyed what you've heard, tell your friends, rate and review us online or subscribe for the next episode.

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