

2016 Conference Transcription

Date	Friday 1 April, 2016
Session Title	Life
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Moderator	Matthew Cobb
Speakers	David Benque, Abi Aspen Glencross, Andy Miah
Notes	n/a

Intro	<p>Hello and welcome to FutureEverything 2016 Festival Podcast Series. Over two days, in Manchester's iconic Town Hall, we task designers, artists, scientists, and many more, to rethink our resources from life, earth and intelligence, to community and uncertainty, our speakers ask what we might need less, and more of, in our near future.</p> <p>In this panel discussion we heard David Benque, Abi Aspen Glencross and Andy Miah further discuss Life as a resource.</p>
Matthew Cobb	<p>So I'll kick off by asking something that was asked on Twitter, and that struck me, Abi, when you were talking. So can a vegetarian eat your meat?</p>
Abi Aspen	<p>I get asked this quite a lot. It totally depends why someone is vegetarian or vegan. There are quite a variety of reasons now. It was always to do with animal ethics.</p> <p>If it's because you don't like the killing of animal, then no, because essentially we still use fetal bovine serum and a lot of tissue engineering, and our lab works on non-fetal bovine serum as well. But in the end then, hopefully we wouldn't have to kill an animal at all for this. So if it's just killing an animal, when the product comes to the shelf one day, then you could eat it. If it's because you don't like using animals in the food system, because you still have to take a muscle biopsy, then no, you can't eat it.</p> <p>If it comes from an environmental perspective, so if you're vegetarian because you want to decrease your footprint on the earth because animal agriculture, the</p>

	<p>way we do it now, does have a massive impact on the earth. Then yes, it has a decreased impact on the earth. So if that was the reason then you can. It totally depends. That was a really non-committal answer.</p>
<p>Matthew Cobb</p>	<p>Is there any timescale for your Dutch supervisor for when they think they're going to be able to scale this up? As you said, we've seen these burgers being eaten on TV. They're all kind of tiny, and people go, 'it's alright' but no great enthusiasm, I've sensed. How soon could this actually happen?</p>
<p>Abi Aspen</p>	<p>So again, another thing we get asked a lot. The only answer is, the more funding we can get to do this sort of work, the quicker it will be. At the moment, one girl in a lab in the UK can only do so much, and a spattering of people all over the world... it's progressing, but not as fast as it could. So I can't make a projection.</p>
<p>Andy Miah</p>	<p>Can I just follow up, because I wonder also at what point does the industry respond, or has it responded to this? I guess it's not significant enough to be a threat to how agricultural typically works, but I guess that's part of the conversation?</p>
<p>Abi Aspen</p>	<p>So that's when you have a [inaudible 03:04] because it's things that have gone a bit awry. Things like GM, because it came to our shelves and then we started having a conversation about it ten years later. With cellular agriculture, we're having the conversations now. So I actually go and visit farms and chat to farmers and see what their thoughts are, and how maybe you could integrate cultured meat with systems that are currently in place, so that it diversifies their animal portfolio. So if they get disease on their farm, they still have a way of making money. It's hard, because with technology, the people that are going to take the technology the quickest are going to be the really efficiently thinking farmers, which go hand in hand with factory farming. So it is a very, very difficult balance, and the conversations have started. I think that's why it's good that it's in the media quite a lot. It's keeping that there and addressing how it's going to help everyone in the best way possible, or at least be fair.</p>

David Benque	There's been a huge backlash from the egg industry in the States, for example. They've gone after food bloggers who are covering the work of start-ups that are creating eggless egg whites and stuff like that. So your question about the industry becoming threatened about this, I guess it's starting to happen on some fronts at least.
Abi Aspen	I spoke to a farmer the other day and he said he went to a conference in Brazil. It was a big farm, something like six hundred and fifty thousand cattle. They said to him 'what's the biggest threat that you perceive to your industry in the next ten years or so?' Before anything he said 'cultured meat'. He doesn't know about the technology and where it is, but people are threatened already and that is why we need to have these conversations now before it becomes a commercial [inaudible 05:04].
Matthew Cobb	There's a question at the back.
Question 1	You implied that the environmental impact of lab-grown meat would be significantly less than that of traditional agriculture. I've done tissue culture, basically a day in the lab is a giant stack of plastic containers. Do you have information on the environmental impact of doing tissue culture at that kind of agricultural scale?
Abi Aspen	Yes, I think in my slides, I can always send it to you, is the most recent life cycle assessment of it. It's where a lot of these technologies have been scaled and the processes made efficient. I know exactly what you mean. I killed forty million cells the other day, but when these processes become a closed system as well, that will totally change. So this is modelled on medical upscale of stem cell engineering and food technology combined, from what I can gather. Again, like with any new technology, life cycle has to be done before the actual process has been done itself. So that's where it comes from. The rose tinted glasses view has changed, I think it was about 2011 when the first LCA was done, but check out that paper. It does help.

<p>Matthew Cobb</p>	<p>Any other questions? No. If not, I'll ask David a question about Synthia. [Pause]. So Synthia is Venter's new version of this artificial life form, which he's created. Can you tell us a little bit about that? In particular, what I was interested in, is in this latest version, they've reduced the number of genes that they think the microbe needs to survive to around about four hundred and fifty, and there are a third of those genes that they don't know what they do. They know they're essential for life, but we don't know what they do. So I think that's very interesting in this mixture of design, and in fact, life being rather recalcitrant when you try and design it to do things.</p>
<p>David Benque</p>	<p>I'm glad you picked up on that, because it was actually in my notes, but I didn't mention that in the talk. I think for me, as a designer, and the work that I do, Synthia is really interesting as a story. As a story that allows people like Craig Venter to say that they've created artificial life before all of it is actually understood. So we have this code, but we don't really know what it says, but 'hey, here's artificial life'. To me that's fascinating, and that's the gap between the narrative and the reality, where I find the most interesting stuff.</p> <p>I guess this reflects the contradictory title 'Blueprints for the Unknown', which is exactly what we set out to do with the project, was to explore the gaps between this engineering narrative and the promises that go with that, but on the other hand, the actual unknown of 'how does this stuff actually work', because we still don't know that. Also, what happens when you start using this artificial life and that gets into the hands of people with different interests or motivations, and it gets into the real world?</p>
<p>Matthew Cobb</p>	<p>One of the interesting things about Venter's project is that it in fact embodies a lot of the ideas about life being simply a DNA code. So what they've done, is to get the DNA code from one particular species of microbe, reduce it to what they think is the essential and then injected that DNA into a cell of a different species, then said 'we've created a new organism'. In fact, it's still a great achievement, but all they've done is changed the DNA.</p> <p>So DNA on its own won't do anything. DNA needs a cell and it needs lots of things in that cell to actually work. So they've kind of cheated, because on the one hand they've designed this DNA code, but then they've used this microbe. They've emptied it of its DNA, but they've used all the gubbins that was in there, that evolution over four billion years has put in there. So they haven't entirely designed it all. It's not a completely synthetic life form and we're still, I suspect, some way off that.</p>
<p>David Benque</p>	<p>The language around it is still the language of computers and reliable machines. So they've booted the cell, you'd hear stuff like that. They've inserted the programme and they've booted it up and it works. So that's the way that this stuff is getting into our culture, is with these languages of engineering, of software, of computers which are really comfortable for us, because we've invented the stuff. We know how that works. So again, this is the stuff [inaudible 10:18].</p>

<p>Matthew Cobb</p>	<p>In fact, these analogies with computing go back to the very beginning of the ideas about the genetic code. The very idea of a code itself and genetic information, these are all words that in fact came out of technological developments in the 1940s. Many of the pioneers of molecular genetics, were inspired cybernetics, which was invented by Norbet Wiener in the late 1940s, to use these analogies to try and see if there were similarities between how genes and organisms, and animals and humans... Norbet Wiener wrote a fantastic series of books about this in the 1940s and 50s, and about where we were going in terms of technology for human jobs, as well as for developing new organisms. Those ideas directly inspired many of the founders of molecular genetics.</p> <p>I'd like to ask you, Andy, about the hubris that there is associated perhaps with some of these ideas. You showed at the end the picture of the beetle that's had electrodes put into it. In fact, you can fly one of these insects, you can fly an insect around the room by controlling it electronically. When people discuss this, they tend to get quite upset. I think it's interesting that when I've talked to our students about this, because you can buy the kits over the internet... in the States you can buy a cockroach. You can put electrodes in its head and you can move it about, and the students are generally quite repulsed by this prospect, and I suspect many of you might be. Why is that?</p> <p>So we may be unhappy about seeing cows in sheds, but we live with it. On the other hand, the idea of being able to buy a beetle and stick electrodes in its head and make it do things is weird and unsettling. What's going on there?</p>
<p>Andy Miah</p>	<p>A few things to say. One is, at the moment, until the twenty eighth of April, the British government has an open enquiry into science communication, the context of which is a report published about a year ago. One aspect of it and one significant concern, I guess, for the government, but for the science industries more broadly, is that the public don't trust scientists, and I'm not sure they ever should, frankly. In fact, I have some [inaudible 12:38] to ramp up that trust relationship, but I'm not sure it's actually the point where you'd want to be in.</p> <p>When I hear about Venter's Synthia, I remember back, when in the 1990s, the human genome project was getting close towards completion, and we have the splintering off of the public project, within which Venter was a part, and a new commercial company that he then led, Celera Genomics, which then we had this race to map the genome, and eventually publishing about the same time. The point is that scientists are very egotistical, and in fact, we shouldn't trust them very much at all, partly because of this relentless pursuit of discovery. Back in 2007, Craig Venter, three years before Synthia was born, is that the right word, or booted, we had a headline front page in the Daily Mail with Venter advocating his work, but also claiming the achievements already. Three years before we see the first life form actually in existence.</p> <p>What's recognised very widely in the 90s when that word engineering which David mentioned is now a bit of a dirty word in this world was used to describe what was happening in genetic science. We had a complete catastrophic failure of scientists to communicate well about the work, and a widespread recognition</p>

	<p>that, in fact, this set back genetics significantly over that decade or so. It was the bad era of science communication. Now, if you ask people what they think about synthetic biology, which in principle isn't so different from how we thought about genetic modification then, people are a bit more indifferent, I think. That might be because those scientists have become much more sophisticated in how they manipulate the media and get messages out, in order for us to become more complicit in those initiatives. I think that's one aspect of the anxiety.</p> <p>One aspect is certainly this worry that we are literally controlling nature with a remote control device in this case, but I think that aspect of fearing that society is out of our control is why we find ourselves in this position, where there's now an enquiry. Ultimately, despite a decade and a half of claiming that science should be more connected to society, despite the fact that we have more science festivals around the world now than ever before, science is still going about its business mostly without much public intervention. So I think when people see those beetles, it exemplifies this disconnection, because I think most people would see that as inherently problematic, and a perfect exemplar of what's bad about what we do.</p>
Abi Aspen	<p>I think that the media, as a journalist myself, takes stories that are interesting, and people can hold onto and people not relate to but that are going to create news and showcases that science. Also, scientists do get quite a tough time, in the sense that if you're funded to do something and get results, social engagement is not usually on a lot of scientists agenda. It's not something that they're going to gain anything from to get more funding to carry on doing their work. I'm very lucky that all mine is open source. I'm funded by a philanthropist. It's all very lovely and I'm very, very privileged to do that.</p> <p>I think that from one side, the media showcases the side of science it wants. I went to a talk the other day and they showcased an American scientist who had created a jellyfish like structure from mouse cells and that would flow like a jellyfish. Then another one who was making meat, it was like they had chosen two of the very extremes of science. I work with guys that are working on small bits and bobs to get towards vascularisation for cancer, and so I don't think you can tar all scientists with the same brush.</p> <p>Also, the fact that I feel that there is a new age of scientists and engineers, there seem to be like the millennial generation where social engagement is really, really important and allowing transparency in what we're doing and where we're going is important as well.</p>
Andy Miah	<p>Ultimately, in a world where you are completely transparent about what you're doing, I don't need to trust you, I can see what you're doing. That, I think, is the key point. What are the situations in which we want to embrace a relationship that is predicated on trust, which means I think you're doing a good job, go off and do it and let me know when you've done it. Or a system where I can see what you're doing every step of the way. I think we don't have enough of the latter, and yet the discourse is still very much on former, that we should trust people to go in a certain direction. I think that's a really naive way of looking at,</p>

	not just science, but actually all aspects of society. We shouldn't trust politicians, we should be able to scrutinise what they do.
Matthew Cobb	If you have a look at the hashtag, that in the other session, they're discussing known, unknowns and what we can predict, and what we don't know. I think maybe that's part of the problem, is that there are things that happen that we can't actually foresee. In particular, when you deal with living organisms which tend to behave in rather unpredictable ways when we actually let them loose. Are there any questions? Yes, here at the front.
Question 2	This is a scalable question, and I have no agenda, I'm just interested. Obviously, from the source materials of making burgers, it's quite an unpalatable question as well. How many cows need to be killed to make a burger currently, and when we get to a scalable point, what might that look like if the source material doesn't change?
Abi Aspen	<p>I think you'll get more than one burger from a cow, in general. I saw something the other day about McDonald's, saying that a cow lasts about thirty seconds in McDonald's, something ridiculous like that. I think more than quantifying that it's the way in which they're produced. Like I said, I looked at it through rose-tinted glasses for a long time, and we don't like to connect our food with where it comes from. There's been studies on this sort of thing, but when you unearth it, the conditions are not something that we like to know are there.</p> <p>In China, I think they've just commissioned a facility where they're creating genetically identical cows. They've just put, I think it's thirty million into it, to create a million cows a year, because our want for meat, or protein, is increasing, as is our population. So I think that cultured meat is one way of looking at the future. It's probably more likely to be part of a diverse portfolio of how we get animal products. I personally think that we need to look back to the start of how we create them and what's driving us to create them like that, and normally start from the beginning. So the future is uncertain, it's up to us now as society, and through government, and through consumer drives to change that timeline so it won't look just like a dystopian future, I think.</p>
Matthew Cobb	Any other questions? Gentleman at the back?
Andy Miah	Can I just follow up? Happy cow in the picture. We don't need to kill that cow in order to generate this meat. We take the biopsy, we culture the cells and the burger arrives. So conceivably, we're not killing cows at all. We could just let them live their lives. How many biopsies does the cow need to generate should maybe be one of the questions, in order to be efficient for the development?
Abi Aspen	I'm not sure. Again, because it's not a technology that it is here, it's hard to quantify. Different ways of culturing cells will give you different yields of cells at the end, but someone said, I actually can't remember who it was, said that you would have a small herd to feed a village. That could be the way of seeing it. Then also, cows are essentially going to die. That's what happens, and as they age, the proliferation and multiplication potential for their cells decreases. So at

	<p>what point do you say 'we will no longer use this cow', and this generates new conversation in, being like you, you are still going to have that cow.</p> <p>Also, animals in general are very good at land management and biodiversity if used properly. So you don't want to get rid of all the cows in the world, but then the cows that we use for certain things, like meat and milk, are genetically very similar, because we've bred them like that. So again, it's not black and white.</p>
David Benque	But you do need to kill cows to get the fetal serum which is...?
Abi Aspen	You can culture without fetal bovine serum... part of the process, but not the whole thing yet. Not my science, but things like fibroblasts you can bur again, it's having the resources to be able to put time into that part of it as well.
Matthew Cobb	Gentleman at the back?
Question 3	It's for Abi. My name's Ian Hunter. I'm from the Rural Cultural Forum, and just a question. When your dream comes true, Abi, and I loved that little slide of Cornwall, what do we do with the farmers and the people in rural communities given that livestock culture is central to the countryside and the management of the [inaudible 22:10]? Have you any idea about how we deal with the abandoned farms and the rural communities, and farmers who lose their livelihood and their culture?
Abi Aspen	<p>I think, in twenty minutes, I haven't given a total overview of how I view the future. I do not think that culture meat is the entirety of the future. I think, again, when I started the project, I almost thought, 'oh great, you won't have to use animals'. Then I went back to my roots and realised that the culture and the way that we produce animals now is a whole societal thing as well. So I hope that culture meat can be part of this future. But I want to look back to the farmers and how we produce food now and what drives farmers to produce organically. I know the word is thrown around a lot, or to use things like herbicides and pesticides, what is driving that, so we can change that as well.</p> <p>Then hopefully, culture meat, not to reshape farming, but be an addition to farming. I understand if a farm gets TB, they have to close for sixty days. It's a risky part of the food chain... animal products. So what if you could have something like this that worked alongside it, to create a more robust and a system that enabled farmers to not lose their livelihood if there was disease within the herd or something like that. It's more to diversify our animal product portfolio than to take over farming completely.</p>
Matthew Cobb	I think that, obviously, farming today in the UK is in a pretty bad way anyway because we're all complicit in the cheap milk that is bought by supermarkets at lower than cost price, and there have been a number of demonstrations by farmers. The future, whether we have meat or milk grown in vats, we've got a major crisis facing us because as you rightly say, the countryside is shaped by

	our farmers. That's why we have the hills we have because they grow sheep on there, and if the sheep aren't going to be there anymore, the countryside will change. So we've got challenges in this country whatever happens, whether your vision of the future comes along or not.
Abi Aspen	I was also going to say that there are so many problems at the moment with things like cheap milk. If nothing else, even if cultured meat never becomes the thing that replaces everything, hopefully it will stimulate conversation and make people really think about where their food comes from. When they eat a steak, not see it as a commodity, but that they can really appreciate the love and the care that's gone into that from the farmers, which at the moment, it is not. People just see it as it could be anything, and it could be an animal or not. So if we can really make people think about that and give the respect back to the farmers and the way that animals manage the land, then that's something in itself.
Matthew Cobb	Any other questions? If not, I'd like to ask David, so you talked about the shift from having genetic engineers, which was the title of <i>Orchestral Manoeuvres in the Dark</i> hit if I recall, to the idea that now we're designers. So one would predict that if things don't go perfectly right, then designer will become attached to a certain amount of negativity with it. So what's the next term we're going to come up with in this continual kind of runaway, trying to avoid bad terminology?
David Benque	That's a really interesting question. I only mentioned that a little bit and I think, for me, that's a fascinating subject unto itself. Synthetic biology is about putting engineering back into genetic engineering, but yet, the word engineering has been cut out from the title. So all these kinds of dynamics and echoes, GMO failures, especially in Europe and all these kind of PR disasters and things like that... So design comes in and it's a much friendlier term with more palatable connotations, and more connotations of human creativity, and so on. I think though, that if it fails, design is blurry enough, because what is design anyway? Is it about fashion design, is it about industrial design etc.? It's a blurry enough term that I think design will mutate out of whatever biological PR failure that might happen, and keep existing.
Andy Miah	I guess scientists use the term gene transfer, which is a much more palatable concept that we're just moving one thing from one place to another. It doesn't imply modification or manipulation, although it's present in the active transfer. But yes, I think there's a whole language that scientists use that is about trying to make it more or less worrisome.
David Benque	So what's interesting to me as well, is that design is also an intention. It has many different meanings. It is interesting to replace it and so what design in that sense of the term are we following when we're trying to create life.
Matthew Cobb	So the latest genetic manipulation technology, which you may have heard of, is called CRISPR, and the way people describe that is gene editing. So it's just like you are on your word processor, you cut and paste. In fact, what you're pasting isn't actually anything physical, its information that you're going to transfer from one organism to another. So there's not actually anything physical going from one organism to another. If you've got CRISPR edited crop, it won't have the gene from another species physically put into it. What you'll do is make the

	<p>organism itself create that information. You're programming it. Those aren't simply mealy-mouthed metaphors for what we're doing, it is actually what we're doing.</p> <p>So there's this very interesting... on the one hand people are trying to avoid the failures and the catastrophes of GM crops and [inaudible 28:55] food, and all the things we're worried about. But there is also new techniques which are qualitatively different and more precise.</p>
David Benque	<p>Absolutely. I think the idea here is to have this critical outlook on these things, but that's not to say that there's been no progress and no difference between, for example, what Stéphan Leduc was doing in the early twentieth century and now. I think it's very clear that we are breaking new ground constantly. I guess the motivation, at least for me, is to try and test out and evaluate these things and have conversations about them through these projects.</p>
Matthew Cobb	<p>Are there any other questions? People are beginning to drift off, so what I'm probably going to do is start to wind it up. I would like to ask all three of you how optimistic you are about the future. If in thirty years' time, another FutureEverything in 2046, in Manchester Town Hall, which will certainly still be here, what would we be talking about? Will be looking back and being miserable and say why did we let that happen, or will be sitting here with our special suits that can keep us warm, eating our burgers, and having very beautifully designed things? What do you think? One by one, David first.</p>
David Benque	<p>I think there is always a sense that things used to be better, and a sense of nostalgia. So I think if you asked us three, the same people, having aged thirty years, we'll definitely think this was a better time.</p>
Matthew Cobb	<p>Abi, are you optimistic or not?</p>
Abi Aspen	<p>I think it's true. I think you always look back with that nostalgic look. I think you've got to hope that what you're doing will make a positive difference. As Alice said yesterday, you can get those days where you see something in the news, or something someone's done that you just don't connect with at all, and you can hide underneath the table and just think it's going to be awful. But you have to hope that you will make a difference, and the world will make a difference, because if you give up that hope, then you'll never get up in the morning.</p>
Andy Miah	<p>I'm optimistic about the future. I think there are some key interventions and changes that we need to make in order to get here, in 2046, and feel that we've done a good job. One of them is investing into these kinds of alternative solutions. Other things are about trying to make significant changes to what are seemingly impractical problems in our society, but that could be flipped around overnight if we just changed our approach. I think one of the things that strikes me as crucial around that is the commercialisation and propriety interest that operate around [inaudible 31:44]. If we find ourselves more and more subjects to the ownership of our genes, not just ours, but other species, and simply give up to big corporations that are pursuing this, I think the implications of that, thirty</p>

	years from now, will be catastrophic and huge. I think unless we support systems that are about creating open DNA banks that allow us to make the most out of what we discover, we're going to be in a much worse situation. But I think we have the potential to change that right now. That's the key thing.
Matthew Cobb	I'd like to bat that all back to you. Which is therefore more important, politics or technology?
Andy Miah	I think at this point, politics is pretty crucial, because we have the technology. What we don't have is the processes around it that can allow us to diversify the benefits of these goods, and unless we do make these changes then... You see beginnings of it, really small beginnings, even just open access research is one example of that. Open data is repositories, places into which we can locate knowledge that others can benefit from. So there are stepping stones in that direction. As an academic, we still talk about how our work is made available, but the academic publishing world is a multibillion pound industry.
Abi Aspen	Open source.
Andy Miah	Racket, I think, is the word. That system can be changed dramatically.
Matthew Cobb	So science or politics, which is more important? Why aren't you funded? Why aren't we pouring millions into artificial meat?
David Benque	But we are pouring millions into it. Mark Post is funded by Google.
Abi Aspen	I don't think he is anymore.
David Benque	Or at least that burger was funded by Google. I don't think you can separate politics and science.
Abi Aspen	They are so entwined.
David Benque	Yes, there is no such thing as science that's not political.

Abi Aspen	It's having a voice in different places, that's why I'm here, it's not just that it's [inaudible 33:50] and looking at different things as well. So like you said, you can't separate them, they're entwined and I think that they will continue to be forever. But like you said, open source and things like that is pretty good.
Matthew Cobb	Is there anybody else want to contribute or join in? No? If not, given that people are leaving, I'm going to stop the session there. I would like to thank our panel, David, Abi and Andy, and thank you, the audience, for being here.
Outro	We hope you enjoyed this panel discussion and thanks for listening. You can hear the rest of the talks and discussions from 2016 at futureeverything.org/2016podcasts .

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