MFS new transcript 3

Continuity: How To Grow A Human: My Frankenstein Summer with Dr. Philip Ball episode three, Giving It Life.

Dr Philip Ball: The one thing everyone learns at school about Boston is that it was here that the American war of independence kicked off with the famous Boston tea party of 1773,

where crates of tea were tipped into the Harbor by rebel colonials, protesting against the taxation imposed by the ruling British government.

You can re-enact that rebellion today here in the dockland district. It's one of the most popular tourist attractions, as well as being one of the few places. Ironically, for this Brit that you can get a decent cup of tea.

In the last episode we heard how rather like the fruit and vegetables in this marketplace. One day human tissues and organs might be grown and sold for use in medicine to replace ones that have malfunctioned or stopped working.

Victor Frankenstein didn't of course have access to anything like that, which is why he had to scavenge the body parts for his monster from Crips and morgues, a business that even he found filthy

Passage reader: my limbs now tremble and my eyes swim with the remembrance, but then a resist Euless and almost frantic impulse urged me.

I seem to have lost all soul or sensation, but for this one pursuit,

Dr Philip Ball: but if a modern Frankenstein would go shopping for organically grown body parts, there's one that might be particularly troublesome to get hold of the. We can already grow tiny brain-like structures, so-called brain organoids from other cells. And I explained at the start of this series that I've even had one grown from a part of me, but we've always looked at the brain as something rather more than a meal organ.

It's the seat of the self where our own consciousness rises. It's what holds all our hopes and dreams and memories. If we were to make one from scratch. Where would he get those from

when I arrived in Boston, I just happened to see in my local library, a book that looked right up my street, it was called the biological mind and it set out to rebalance our assumptions about the brain as something unique and almost mystical. No, this book said the brain is a many ways, just like any other organ squishy and fleshy, a wash with blood and embedded in the rest of our body.

The book's offer was neuroscientists Alan Jassenoff. And to my delight, I realized that he was right here at the Massachusetts Institute of technology. So I called him up and set up a meeting to talk about his view of the brain and to find out what we might be able to do to bring one to life.

First of all, what I wanted to ask you, I'm going to outline the case that you're making in your book for why we need to think about the brain as part of the body. And the mind also is something that is mediated by the body. Can you sort of expand on that?

Alan Jassanoff: Yes. Well, I mean, I, I was really motivated by two concerns.

So one was from within my field that I perceive a good chunk of neurosciences as being sort of, let's say, overly abstracted from the, um, you know, the, the sort of biological and even environmental fabric that governs what goes on in our brains. And, you know, one example of this for instance, is that, uh, you know, a lot of people who, whose, whose papers, I read a study brain dynamics as a means for, uh, for instance, diagnosing diseases or, um, trying to understand what goes wrong in people.

And often that, um, view of what's going on in the brain is actually divorced from what might be going on in the body. And I think that that limits the way that. Think about these biological phenomenon. I think that limits the way we study them as well. So that's from within the field and then, um, from outside the field, you know, I think, uh, I'm sure you like me have, have seen just this sort of enormous, you know, deluge luge of popular neuroscience, uh, kind of percolating through the universe really sort of exalting the brain in a, in a kind of unnatural way.

And actually in the book, these kind of pictures of brains with a glowing blue stuff around them and lightening bolts. And so, you know, it's pretty easy to find pictures of these. And I, I think, you know, there's this sort of tendency in the world at large to reduce a lot of the problems of human behavior to problems of the brain.

And I think that, uh, limits in the public. How we think about problems. And so, you know, I devote the second half of my book to sort of thinking about a few ways where public policy might, uh, you know, intersect with misconceptions about the brain. And you suggest that this really goes right back to the old idea of a separation between.

And body or between body and soul. Exactly. Yeah. Yeah. So I think that, um, you know, the tendency to think of the brain as, as somehow special, somehow different from the rest of the body and disconnected, uh, at least in a causal sense from, um, you know, what's going on around. It is very much like the way we think of Descartes and actually in a cartoon that appeared in his own book, it's sort of a cartoonish representation.

Uh, one can think about that with a smile on one's face, but back in the olden days, people, uh, you know, thought of the soul is somehow hovering outside the body somewhere where you couldn't touch it and directing what we do. Um, and it somehow has access to everything that's going on in the body and it controls what's going on in the body, but it's not influenced in the same way it has free will.

Um, it has consciousness that somehow, uh, you know, internal. And a lot of the ways that people talk about the brain and even studying it to study it to some extent, seem to have similarities. That sort of touches on the notion that, that it's the brain that is us. If we took, we could take our brain, put it in another body, if we have the surgical skills, right.

And then we'd be in another body and you you're, you're challenging. Yes. You know, so I study the brain for living. So, you know, I obviously sign onto the view that the brain is a very special Oregon and very fundamental to, uh, you know, essentially everything we do. But I don't think it's right to think of the brain as, as self-contained.

And self-actualizing, um, in the way that, you know, I think let's say extremists in our community and, and just people who haven't really thought about it, tend to argue or tend to view it. And while I, you know, I, I certainly wouldn't challenge the notion that for instance, uh, you know, memories are largely encoded in brains and that decisions are making use of, uh, interactions between cells in our brains.

These things are true. Those fundamental, uh, activities of our minds are never divorced from what's going around us. We can have changes in our body that

dramatically affect for instance, our emotional or emotional reactions and the way that we go about making decisions. So our decisions are always made with our bodies as well as with our brains.

Similarly, the memories that we form are always memories about stuff. There are. The input that we get from our bodies and environments, and actually taking the brain away from the context that it lives in means that the circuitry in our brains, the things that make our brains do what they do are then suddenly removed from what gave them, meaning

Dr Philip Ball: this influence of the environment.

On the way we think an act is clearly in Mary Shelley's mind, which you wrote Franklin. What makes the creature run a mock isn't some fundamental floor in the design, but the creatures fury at how it is spurned by its maker and the creature's own sense of itself is formed. Partly by reading John Milton's paradise lost and discovering how Satan rebelled against his maker.

And James whale's famous 1933 film of the book, the creature played by Boris Karloff. It's shown to turn out bad because it has given an abnormal brain by mistake, that I've always felt totally confuses the message of the book, which is that we end up the way we are more because of how we're treated and raised and because of how women.

But back to the biological mind.

Alan Jassanoff: So I, it sounds as though that's kind of saying that cognition starts from the perspective that we are. Things entities bodies in an environment. But without that notion, it's not clear what human cognition means. It's not kind of somehow something that just takes in all this input and does stuff with it and sends out outputs that, you know, move our limbs.

That actually we we're, we're not just embodied, but we're actually located in an environment that cognition has to recognize that is that. Yes. I mean, that's part of it. And that actually goes back to sort of philosophical discussions about what gives, you know, for instance, language, meaning, you know, it's not just, you know, a code that emerges in our brain.

It's something that requires, um, interaction with the outside world and, uh, with other people as well. But there's also a very immediate physiological notion in which the embedding of our brains in the body and in the bladder. Uh, matters.

And that is that basically every single thing we do is done against a backdrop of physiological signals that are floating around in our bodies that are constantly coupling things that our brain to things that are going on, uh, within.

And similarly, the environment is constantly bombarding us with this sort of deluge of sensory signals that, that we can't cut off that, you know, we can't become that soul floating above the body that just uses this stuff as data we're constantly causally at his Beck and call. So say that the way we tend to think about the brain itself and to model what it's doing is.

And inorganic one that we think of it as a kind of computer, basically as a system of inputs and outputs and interactions signals passing between. No dinner network, so it could be anything. And it seems to that that is something that you think is not necessarily the best way to, you know, I think, uh, different ways to sort of model systems, uh, you know, have their purposes.

They help you think about systems in different ways. And I think it's been helpful to people. Uh, to think of the brain as algorithmic as, as a bit like a computer. And that way of thinking about the brain goes further than just thinking about the way it acts. It's also about the way it's built, uh, people think of the brain as sort of, you know, a bunch of transistor like entities.

Connected by wires. And I think the tendency to think of the brain that way is actually, uh, bolstered in part by sort of a dualist fantasy, uh, you know, a tendency to sort of separate the brain from other things, because you know, of course, thinking of the brain, like a, like a computer does make it seem more inorganic, more, um, you know, more like an object that we can.

Engineer that we could preserve in various ways, um, and in code, send it to space. And so on. There might be some truth to that, but there's also a great deal of missing space in that view of the brain and the circuit, uh, or computer life view of the brain. Of course, the brain, in addition to how. Uh, these transistor like cells called neurons.

It has other cells that are not that transistor like that are called Gloria, and that help the brain function, um, through mechanisms that don't involve, you know, little electrical impulses that, that we're all familiar with. The brain is also a very chemical organ. And that's something that of course is pretty apparent to people who use.

Uh, to treat their brains, but it's, um, pretty distinct from the view of the brain as a circuit or computer like entity in the sense that, you know, these computers, these chemicals that help brain function are, you know, sort of swirling around in ways that kind of defy the traditional sort of electrical engineers input output a way of thinking.

And so I think that thinking of the brain as a computer has its place and it, it has its truth as well. Uh, but I do think it also reinforces dualism and I think it can narrow the way we think about what the brain does for us. I don't know, I guess one direction, which that also leads is this. That it might be possible to download our brains.

If they're all, if it's all basically just, you know, bits flying around and surely we can put it in a hard drive. Yeah. And that sounds right. So you talked a little bit about that, that about this whole idea of transhumanism sort of transcending. Right. That's right. Yeah. So I'm a, a harsh materialist. So I do believe that everything in our bodies and in the universe is made up of physical stuff.

And, um, I'm not sure that we're really going to be able to sort of understand how to, how to simulate it and how to figure out how to predict how it will evolve. Just because there's so many different moving. You know, I think the, the view that we, as people can be reduced to the brain actually, um, goes against, uh, a purely physical view of how we work, because it requires separating the brain from again, the body and the environment around it.

And so if what you wants to upload through your indefinitely detailed, um, computer stored version, or whether it's on a flash drive or a. What you, if what you want to upload is you then just taking the brain is not going to be enough. You have to take everything. And I don't think that's part of the lore.

I think that, um, it could become part of the lore. In other words, people who want to live forever in a digital form could potentially adapt what they're proposing to sort of let's say encapsulate everything in the computer, but frankly, at a certain point it just becomes so complex. That it's undoable. I mean, the amount of information we can get, uh, I guess, nevertheless, that seemed to be kind of the philosophy that was initially underlying the human brain project, the European project that set out to initially to try to map out every connection, every it's sort of everything that was happening in the brain with a view to then simulating it.

Um, the idea was that, you know, maybe you can simulate a brain on. Instead of going circuitry now they've backed away from that idea. Yeah. I mean, I think the, the, the, the human brain project in Europe faced a lot of criticism and quite justly, and it's really on multiple levels. I think the most obvious level, uh, you know, under, under which the project-based criticism is simply that the amount of information that we don't know about the brain still vastly outstrips the amount that we do.

So even the goal. Simulating a brain and what it would do in a dish without anything around it is out of, uh, you know, outreach, at least with current knowledge and technology. I think, uh, you know what my book gets added, uh, not specifically in this context, but what it would imply is that even if we could simulate the brain in its entirety, even every chemical in the brain, every cell and every chemical, well, that really wouldn't be enough to do.

Most of the things that we'd be interested in. So for instance, as I kind of alluded to before, you know, if we were interested in what brain activity says about. Well, having the brain by itself, without its connection to the body, without, you know, the interactions that, you know, color all of our experiences and without the sensory connections that relate anything in our brain to something that once happened outside our bodies, uh, you know, it just not mean.

So talk about memories in the brain that touches on a, what seems to be a popular conception about memories that they're like. It's like putting the book on the shelf and it's stored there. Um, the brain's memory system doesn't really work that way. Does it, as far as I understand it, it's something much more active, much more.

Constantly being revisited and updated as well. That's true. I mean, in the sense that, you know, memories aren't static, I mean the same, this is what current science says is that, uh, you know, the same mechanisms that allow us to learn new things also unfortunately mean that our memories of things that already happened or are often being updated or recolored, or somehow reconfigured.

And that's certainly true now in a certain. The book likes view of memory, although it is of course, a lot more static is a little bit like, I think a larger truth to how the brain helps us remember things. If you think about a book sitting on a shelf, it's really not doing anything. It's not telling anybody about any experience by itself.

It's only when you plug it into a person. A person with their own experiences and their own ability to take the words in the book and sort of put them into a context of what the world is like, how to perceive the actions of people, how to perceive the actions and things. And so on. It's only in that context that we can actually make any sense from a book.

And actually in that way, the brain is actually a bit like that because it's only by plugging it into a person and having all the connections be right and, uh, you know, and meaningful that it can be interpreted.

Dr Philip Ball: Understanding what goes on in the brain relies on having methods for looking inside it.

That's not easy to do while it's still working. But today we do have techniques that give us snapshots and movies of brain activity in particular, the method called functional magnetic resonance imaging, or F. I asked Allen, how we know what we know about what we know and how reliable that knowledge is.

And you said that the notion

Alan Jassanoff: that we can somehow find out everything about the brain. To in order to simulate it or not with our current technology is, is way in advance of current means. At the moment we seem to have pretty blunt tools. And one of them is the area that you work on functional MRI, you know, in the book, you you're quite critical of the way.

This is often perceived and presented in, in the media that you see these lovely gloving pictures of brains and centers lighting up. And you suggest that interpreting those images is by now. That's right. Yeah. Yes. Um, so let's say the overall theme of the book is that while we're reducing too many of the problems of the world to problems of our brains, you know, it's the idea that the brains capture our essence as people.

And what I, what I think is a fair. Fundamental problem with at least how functional brain imaging is perceived is that, well, a lot of these studies that use brain imaging techniques like FSRI are as output showing us little pictures with brightened spots of the brain that you know, are said to be the spot where the vessel and such happens, where thus and such may be, you know, making decisions or, uh, you know, watching movies.

And it leads to the view that, okay, there's this spot in the brain. Some piece of magic happens, and this is sort of a mini version of the overall problem with understanding our brains. That there's actually. That happens in a particular spot devoid of its context and the way that, uh, Fri that that brain imaging is performed and presented kind of feeds into that view.

So there's a ton of statistical analysis that goes into each one of those pictures with, uh, with bright blobs on, on black and white brain. And that analysis tends to remove, you know, for instance, any part of the brain whose activity went down when, uh, when something happened, it also usually removes the stuff that is.

Important for whatever task was being performed or whatever phenomenon was being studied, but not specific to that task. So an example would be supposing, we're looking for parts of the brain that are involved in looking at, in, uh, understanding spatial scenes. Well, you know, those places are important for understanding spatial scenes, but there's a lot of other stuff that's also important that is important for everything we see, but not specifically.

For spatial scenes. And so we might wind up with this sort of, you know, essentially narrow view of how spatial processing works, because we found a blog that seems to light up more for that than for any other type of visual tasks that we do. And, you know, and then the there's a, there's a, a more sort of biological problem with brain imaging, which is that we're looking at changes in blood flow by and large, because that's what the technology gives us.

It's an amazing technology, but. It's just pretty limited. We can't see the underlining neurophysiology, either the electrical form or the chemical form directly using these methods. And that's also limits. So, if we see one of these areas become more active in terms of its blood flow, it, would it be fair to say we, we, we know that it's doing something, but we don't necessarily know that it's doing the same thing as, uh, as it did the other time, when we saw that area.

Well, that's certainly true. Um, and it's, it's true for, for more than one reason. One is because, you know, of course the level of detail that we get on a, on a brain region with this kind of brain imaging method is, is not such that we can see for instance, what every cell is doing. And there are other techniques that try to use, uh, microscopy to see what every cell is doing, but.

Because it's microscopy, you know, generally involves, you know, opening up something. You can't do it in a person and even in an animal most animals, at

least you can't really see deep enough into the animal to see, uh, everything that's going on. So that's a significant issue with human brain imaging. And in fact, it's led to various sort of fallacies, you know, for instance, there's a famous article about loving your iPhone.

That was based on an article. I have a certain part of the brain lit up when you play with your iPhone and that area also lights up when you love somebody. And it's a very simplistic view of what the sprain imaging data tells you. And a very simplistic view. Um, how these different parts of the brain work is it possible to assign or might it eventually be possible to assign particular neurons, particular tasks to say, okay, the job of this particular neuron is to protect.

Three-dimensional information or something like that is, is the brain organized in that way that particular neurons have specific functions? Not really, at least I don't think so. For a couple of reasons. One is actually a sort of more general form of the point that I made about functional brain imaging.

That when you see a blob of brain active, uh, let's say, during a particular type of task, well, that blob of brain is never acting alone. So there's never a time. That it's doing that any part of the brain is doing alone because the brain is highly interconnected and, um, it is of course always contextualized.

So that is true. Now that doesn't mean that we can't. Uh, segregated into some sort of functional tasks at a very operational level. Each neuron gets certain types of inputs from the other cells around it and from the Amelia around it. I mean, in other words, it's in a chemical soup, that's also influencing it.

And so we can certainly think of neurons as playing function. In that context. So for instance, the view of neurons as somewhat transistor, like in other words, taking some inputs and doing stuff with them and generating an output. Well, this view is, is sort of reasonable. Now it's obviously a bit more shaded than that.

Um, in other words, it's many different types of inputs and they usually do different things with them. Whether that view can be translated into an understanding of high level. That's much more debatable. So there's a concept in neuroscience called a grandmother cell. It's the idea. Pretty speculative that there might be neurons that only fire that only do their thing.

Let's say when a very specific stimulus is presented to them. And there's actually some experimental evidence for this, you know? So in the few

instances where researchers have been able to record from human neurons, they actually do find neurons in visual parts of the brain that seem to respond specifically.

To, uh, you know, particular people's pictures now they're probably many of them, but because we can't record from very many neurons in a human brain, we can't find them all. On the other hand, they have particular responses. Now, does that mean that those neurons are actually performing the act of recognition?

Absolutely not. It does not mean that for multiple. One without those neurons being connected to some sort of output their activity is essentially meaningless. You could probably create a cell in a dish that responds in some weird way to a very specific stimulus. You know, its response properties don't have any, you know, don't have any cognitive meaning at all.

It's just a cell in the dish. And in fact, I think the, uh, you know, if you had a neuron in your brain that responds only to pictures of your grandmother, but yet it doesn't somehow convey to you. The fact that that was your grandmother. Well, then that's pretty useless. And so that's point number one and then point number two is of course the process of getting that neuron to respond to your grandmother or to whoever it is involves a ton of neural tissue.

And all of that tissue together is participating in the act of creating the percept. That is your grandmother, even if it does, you know, only if it does make it somehow to the. Finally given what you know about how the brain works, undefined, that it seems to be this clearly is this, um, sloppy chemical, incredibly complex thing.

Do you see any prospect that what we recognize as center? Could be enabled in other ways in technological ways, could it could, could a machine acquire those capabilities? I think it could. I don't know how any more than the next person and probably less than some next people. I think that, you know, in the context of the argument of the book, the main point I would make is that merely by cloning the brain, the human brain out of the.

We probably won't achieve that. Um, I highly doubt that a human brain, even if it was completely brought back to life and the way that, um, actually various newspaper articles are now discussing would have the property of sentients even

on its own. And if it did, it would be something very unlike our human form of sentence.

And, you know, I think one way to think about this is, is actually quite philosophical in the sense that, you know, when we perceive. We're always perceiving something. We're not perceiving internal patterns of activity in our brain. We're perceiving things out there. Things in here in the body colors around us feelings that we have, we're not simply.

Experiencing for its own sake. And I think with that in mind, just the idea that a human like existence could be maintained without the sort of rich surroundings, uh, that our brains are embedded in. I think it's highly doubtful.

Dr Philip Ball: It sounds like stitching together. Frankenstein's creature with homegrown parts that include a fleshy brain. It's a pretty daunting challenge. Not least because our brain doesn't get grown with. So to speak a built-in operating system, it will be a blanks.

Of course when we build our artificial electronic brains, which is to say computers, we do give them operating systems. We load them up with the programs and algorithms. They need to work once that built. So might it be that instead of trying to somehow grow a human being from scratch, we might get further quicker by making it a mixture of the artificial and the natural, a cyborg, maybe with a computer like brain could such an electronic brain ever be truly sentient.

What Alan told me, left me wondering about that brain in a jar, nabbed by Fritz for Boris Karloff flats. Outside of body is a brain. Anything more than a lump of jelly, an organ, just like any other on the dissecting table. And if so, could it ever become, again, more than that, there are companies that for a hefty fee will freeze your brain in liquid nitrogen when you die.

And the hope that one day we'll find a means to re animate it, to infuse a spark of being as Victor Frankenstein. But it's not just the coming to what Alan regards says, the mystique of the brain, maybe then what Victor and frets really needed was not a specimen in a jar, but a device made from Silicon circuitry

and the next three episodes, I'll be looking more closely at this direction of the possibility of making beings from computer bits. Or to put it the other way, machines that think will they happen? If so, how could we really know what

they're thinking or how they think and how would we interact? And what will they think of us?

Continuity: How To Grow A Human: My Frankenstein Summer is written and presented by Dr. Philip Ball and directed and edited by Keith English. This show is brought to you by Aurra Studios. Listen to the full series on Apple podcasts or wherever you get your podcasts.