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What Makes Humans Special? | Dr. David Lahti & Dr. Andrew Berry

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The Veritas Forum

Dr. David Lahti, Evolutionary Biologist of Queens College at the City University of New York and Dr. Andrew Berry, Evolutionary Biologist of Harvard University discuss the biological developments that make humans unique. Recorded from the stage at Harvard University. If you find this and other episodes meaningful, please subscribe, share and review this podcast.

Transcript

(upbeat music) - Welcome to the Veritas Forum. - This is the Veritas Forum Podcast. - A place where ideas and beliefs converge.

- What I'm really gonna be watching is which one has the resources in their worldview to be tolerant, respectful, and humble toward the people they disagree with. - How do we know whether the lives that we're living are meaningful? - If energy, light, gravity, and consciousness are a mystery, don't be surprised if you're going to get an element of this involved. - In today's episode, Dr. David Lottie, an evolutionary biologist at Queens College of the City University of New York, and Dr. Andrew Berry, an evolutionary biologist at Harvard University, take to the stage at Harvard to discuss what makes humans special.

(audience applauding) - As an undergraduate at that famous institution that's been mentioned already a couple times or tonight in England, I was a visiting, so Dr. Berry belonged there. I was just a visiting student there when I was an undergrad. And as a visiting student, you're not allowed to go to the balls and the fancy undergraduate events.

But I got invited anyway by a friend of mine from St. John's College. And so I went to, I knew I wouldn't be allowed in the front gate, so I went to the back gate and there were no porters there, no lights. And I made a bad decision, 'cause I'm not telling you that you should do this kind of thing, but I made a bad decision.

I tried to get over the gate, so I climbed up to the top crossbar and then tried to squeeze my way in between these raw iron uprights to end in the little arrows. And I don't know if it was my belt buckle or what, but I'm stuck right in between with one leg on one side and one leg on the other when I get a flash of light in my face from inside the grounds and this voice says, "Well, that's novel." And so he let me go and as I was walking home, I kept saying that word novel. I was trying to get the English accent right, novel, novel.

And I'm trying to, and thinking about what it actually means and it wasn't the first time that I had been cast and adjective by a Brit and didn't have the cleverness to know exactly whether it was a compliment or an insult. Who knows, maybe it'll happen tonight. But my point today is that the human race is in that same predicament where intriguing, that's another adjective is, intriguing, different, special, we humans, but it's not all good news.

We're novel in an ambiguous sort of way. People often ask how humans are different and of course there's several ways to answer that question. As an educator, one of the first things we should mention is that the last 50 years of biology is, at least partly a series of discoveries that shows us that we were wrong or at least exaggerated in many of the things that we thought were unique about humans, humans have tool use, humans create tools, humans use tools to create tools, humans have culture, humans have theory of mind.

Now all of these to some extent are participated in by other organisms. And so we have to be, I'm clearly we're ahead of the competition in all of these areas, no question, but we have to be a little bit more careful than we were in the past about precisely how we distinguish ourselves from other species. So like for instance, take language.

We have language, but at least half of all birds, well about half of all birds and cetaceans, so whales and dolphins and a few bats and a few other species learn rather than inheriting how to speak and they pass on their manner of speaking onto their offspring. But no animals use their vocalizations to string together a series of symbols that represent just about everything in their experience like we do. So as Terry Deacon says, we live in nearly a different world from any other organism because we do that because we live in a world of symbols to some extent.

So for instance, birds use their songs as diverse and as beautiful as they are. They basically use their songs to say only two things. Get out of here and come over here and mate with me.

Now I know in a lot of Boston bars it pretty much boils down to the same thing too, but at least we have the capability of saying a lot more than that. So learn vocal communication is one of several traits that can be seen as differing as people say by degree rather than kind between humans and other animals. But that can be a little misleading to say it that way because language is so different from birdsong and whale

song.

So as Alfred North Whitehead said, the distinction between men and animals in some sense is one of degree, but the extent of the degree makes all the difference. So sometimes a quantitative distinction or quantitative difference can be so great that it can essentially be a qualitative difference. So the biggest example of this is a combination of our flexibility or plasticity and extraordinary intelligence, which is absolutely beyond dispute of course.

And there are a whole host of things that go along with that intelligence that are either unique or very rare among our non-human relatives. And a lot of them we don't even really very often think about. So for instance, we have an extended juvenile period.

We live for a longer proportion of our lifespan with our parents, not just people your age, but even for thousands of years, hundreds of thousands of years, then our relatives do. We also play group against group. A lot of animals play, it's been a subject of recent research, but only humans it is thought, play group against group.

We also have a very early birth by one estimate if we were to be born at the time when a typical primate is born, we'd be born at 18 months, not nine months, but of course try to get that head out. And then speaking of giving birth, human females are actually more unusual in terms of our physical traits than human males are. I'll just give a few examples.

Some of you might have noticed that human females have breasts even when they're not nursing, and that's unique to humans. Human females conceal their ovulation. They don't even know when they're, well with the benefit of modern science, we can tell when people are fertile, but whereas most primates will advertise when they're fertile, human females conceal it.

And then there's menopause, and it's not just a wearing down of your reproductive system, it's a programmed halting of reproduction at a time when women are still active and healthy. So it turns out that all of those things that I mentioned, both the intersectional things and just the things that are just particular to females, can be integrated into a single explanatory framework. They all enabled or fostered our extraordinary and predominantly social intelligence.

Now I'd like to talk about how they all do that, but right now I'll have to move on to things that, from things that facilitated our intelligence to things, features of our mind and behavior that came about because of it. Two general categories of this for instance are the extraordinary range and rate of cultural evolution. Our music and languages and art and science and technology, it's obvious.

And then our niche construction, which is a relatively recent term that refers to the way

that we drastically change our environment to suit ourselves instead of just dealing with the impact of an environment on us. And of course, if you just look around, you don't have to be in a city to notice the extraordinary impact that we've had on our environment. But the two features that I'm most impressed by that came out of our intelligence are morality and religion.

What George Washington called the twin pillars of society. Now with regard to morality, of course animals cooperate. They can even sacrifice themselves for each other like when a bee stings to protect the hive or when mothers are defending their offspring.

But an evolutionary theory explains when and to what extent we ought to see this happening in nature. But we don't call that morality because animal cooperation doesn't involve an ideal, a notion of the good or the right, an abstract conception of the way that an individual ought to be or the way the world ought to be. In fact, it's difficult to imagine how we would actually have that kind of conception if we couldn't discuss it with each other.

So arguably, we need language in order to have this morality and express it. So that means that the full flowering of morality would have to be thoroughly a modern human phenomenon. As for religion, that removes us even more culturally from other animals.

We're now able alone among any organism on earth to ask what this whole thing is about. Is there any reason for this big universe? Do we have a purpose? Is there anything out there bigger than us beyond our reach? Are there any stirrings in our heart that would intimate something, some grander narrative than one that we know so far? It's like we're like ants trying to think about or wonder what's beyond the ant farm, but that capacity is the religious capacity. Our answers are religious answers.

Even if our answers are no null set nothing or whether or not we ascribe to any organized religion, humans are religious in this very broad sense of wondering what it's all about. And attempting to imagine and engage with reality at the deepest and most fundamental level. So finally, I wanna get back to that ambiguity of the human condition.

Alexander Pope wrote a great poem called The Essay on Man when he talks about us as in an isthmus of a middle state of being darkly wise and rudely great, in doubt to act or rest, in doubt to deem himself a god or a beast. We're nouveau riche in the animal world. We don't quite know what to make of ourselves.

And our extraordinary intelligence, extraordinary intelligence has yielded an ability to see the ideal, the difference between who we are and where we ought to be. And there comes the ambiguity, right? It can create disillusionment, it can create disappointment, create anxiety. It's ironic in a sense that as we rise, we look at ourselves as fallen.

Now, the things that make you angry or sad about humanity or society, those things

we've been doing ever since they're natural to humans. We've been doing them ever since we could do them. The difference now as our morality and religion attest is that ideals have risen in us.

It's like we've looked in a metaphysical mirror and seen ourselves now. Like Neo seeing the matrix for the first time. So, I guess what I'm saying is that what it means to be human is like, is sitting up there on a fence a bit precariously and a bit uneasily, but novel.

Thank you. (audience applauding) - What a pleasure it is to be here. I'm Andrew Berry from Organismic and Evolutionary Biology.

And I'm not a philosopher, I am not a theologian, sorry to disappoint. So, I'm gonna just drag you through some evolution. Okay, let's go back seven million years.

This is the point of which two lineages split. One went down to produce the chimpanzees and bribos and the other did a lot of doing and throwing and detouring and bushing us and resulted in us. Seven million years of evolution.

Seven million years from a point that common ancestor, we don't need too much about it, we can sort of reconstruct it, but it's more chimp-y guerilla-y than it is human-y, let me tell you, okay? So, that is some journey, seven million years. And, well, a lot happened, okay? But I'm gonna stick with two things because I've only got 12 minutes. And those two things, one that you think is really boring, the other is the obvious one, and that's sort of what David's already been talking about, namely brain evolution, cognitive evolution.

The boring one is bipedalism. Yawn, how unexciting is that? In fact, that's something which is uniquely human with the only things that do it. Chimpanzees do it from time to time, but basically they're knuckle-walking.

That was knuckle-walking most of the time. Now, if we look, how can we make inferences about events along that seven million year journey, fossil record? And about halfway down, just a little more than three million years ago, we got this fantastic famous fossil called Lucy, a specimen of ossrapithecus efferensis. And Lucy is remarkable because she's so well-preserved.

We've got a lot of material. And one thing we know about her was she was pretty damn fully bipedal. She was about as good at doing this as I am, in fact, possibly better.

Now, who cares? You're thinking, get to the bloody brain, man. No, bipedalism is big. Because you're not doing this, you're not using these as a means of locomotion.

What does that mean? It means two things. One, the hand can evolve to become a much more subtle, dexterous, versatile instrument. Our hands are much better than

chimpanzee hands.

And once more, if I wanna pick something up, a bottle of water, I can use my hands. Rather than, sorry, I'm not going to do it, my teeth, my face, which is what I have to do otherwise. So what does that mean? If I'm using my hands rather than, (growls) it means I don't, and remember, normally it's not just a bottle of water, it's an animal which is struggling to get away.

I'm trying to catch, control, kill, macerate, consume, ingest my prey, all with this, with the front of my face. So I need a big, serious set of muscles here. (growls) Right, massive muscles.

I don't need that anymore. I could do this. Pick up my animal, strangle it, break it into small pieces, cook it, eat it.

Right? What does that mean? It means that my entire face can be reduced, if you like. I don't need big, heavily levered jaws. I don't need a prognethous snout, if you like.

I don't need these big muscles. Why is that a big deal you say? Because it means I can do what I'm doing. Now, it means that I can have much finer motor control, it means I can have much more muscular finesse.

It means ultimately, I can speak. Bipedalism was super important. It was part of a cascade of events which resulted in what we are today.

Interestingly, Lucy's brain was about the same size as a chimpanzee's brain. In other words, there hasn't been notionally, it's an all of course in the fossil record, that's all we can measure, is brain size, which is a little unreasonable. It's all we've got, just from the curvature of the cranium.

But basically, we've got the first half of human evolution, no change in brain size. So it all comes in the second half. And boy, is that driven by natural selection? Even if you're sitting in life sciences 1B, listening to me drone on, completely zoned out, switched off, possibly asleep.

Your brain is still consuming about 20% of your entire metabolic budget. It's enormously expensive, this organ. So it's not something which is just sort of gonna evolve 'cause it seemed like a fun idea.

This is gonna only evolve under really strong, direct, natural selective pressure. So why did it evolve? Well, as I always tell my students, I could take each one of you, shut you into a small room for about 20 minutes and tell you to come up with a theory of a coherent theory for the evolution of large brains in humans. And if there's 100 students in the class, that's 100 closets, they all emerge after 20 minutes and they'll have 100, they'll be some overlap, but we'll have 20 different coherent theories.

All of which are perfectly plausible, all of which might be true. It was language, it was to facilitate ever better tool use. It was to expedite communication and facilitate communication in small groups, whatever.

I don't know, we might never know. I personally favor idea of group living being the key thing, small group. Now, the deal with this is that I've just killed, I've got a dead chunk of rhino here, sorry, this is before conservation had become popular.

We're in Africa. We don't, it turns out, two million years ago, have refrigeration. So this is a short-lived chunk of rhino, but David here is looking hungry.

I'm gonna give him some of my rhino, this is nice of me. But the important thing is I need to recall what I've given him and I need to recall who he is and the circumstances, right? And maybe also, I wanna have some insight, I wanna be able to actually get into his head and figure out how grateful he is, whether he's actually gonna be duplicitous and not give me stuff back. These are really complex cognitive tasks that I've just described.

So, as I say, that's just one of the possibilities, one way in which human brains got super big and effective as they did. One thing is clear, and I'm gonna, sorry, opt for a rather trite analogy here. You've got the vector, which is, let's say, in favor of efficient small group social living, the vector of natural selection, making it bigger and bigger and bigger and bigger.

And maybe there's all sorts of other things going on. What I wanna tell you is that at some stage that brain crossed a threshold, when suddenly it became so much more than just a device for facilitating social living. And here's my feeble analogy.

Go back to the 1970s, most of you won't remember, not a great decade. A calculator, Texas Instruments 1.1. Here it is, it can add subtract, divide, and multiply. Ho, ho, ho, ho, and it weighs three pounds.

Okay, now that improves over time, right? There's a vector of change, which is to make it ever better at doing math, and it gets better and better and better. It can now do some long division, and it can do natural logs. And then we're into the 90s.

Ho, ho, if one of those nerdy ones that can do, you know, thine waves. Ho, ho. What have we got now? What we've actually got is a very small computer.

So that's actually got a chip on board, which is do far removed, at least for that era, from a chip in your cell phone. We've had a vector of change to improve the ability to do basic arithmetic, but we've now got something. Now this is just a computer, right? All it's doing is processing machine language, 1, 1, 1, 0, 0, 1, 1, 1, 0, 0, et cetera, et cetera.

That chip can now do all sorts of other stuff. You can put it into a phone and download pictures of cats from the internet. You can use it as a word processor, whatever.

You've had the vector in one direction. You've crossed a threshold, and suddenly you've entered, if you like, a promised land of extensive, diverse functionality. That is what happened with the human brain.

Once it crossed that threshold, suddenly you've got this amazing learning machine. And that's what David was partly talking about. It's for our facility for cultural evolution is born of having the best learning machine ever made sitting between our ears.

And what does that mean? It means we evolve culturally. Think about the difference between your world, technically, socially. Think of even the automobiles you travel in, compared with, say, your grandparents, just two generations ago.

And think how efficient this process is. I'm a biological evolutionist. If something changes in my world, I have to have a mutation, which I pass down to my offspring, which makes them better, for whatever reason.

They run faster, they avoid lions better, and they leave more offspring, and then they're offering, leave more offspring, and so on. So the whole damn process takes thousands of generations to run to 100% in our species. You compare that to a new appearance on a magazine cover in a new color of one of the Kardashian clan.

Suddenly, purple is it. We don't have to wait 100,000 years for that to slowly trickle through the population. No, it's instantaneous.

It's horizontal transfer of information. That's what makes us special. This extraordinary facility for cultural change, cultural evolution, acquisition, and accumulation of the knowledge of previous generations and innovations, novelties, from our own generation.

So what we are is two things. We are-- this is, even though it's an extraordinary thing, this is a modified great ape brain. And we've still got many great apisms within us.

But so too, it's this super brain that means there's this overlay of culture that changes everything, that there's an underpinning of biology and a veneer, if you like, of culture. So let's pick up on something David finished with, which is morality. Now, I absolutely agree with David that everything about humans is represented in some crude form in the non-human world.

And we've just taken it so much further. That's the difference. But even morality.

There are experiments, and they're sort of cute experiments. But I don't really have time to go into them, where rats are offered a choice between a piece of chocolate and rats love chocolate, just like undergraduates. Or the opportunity to help out a fellow rat that is struggling in a water bath.

No brainer people. Chocolate. No, they actually help the rat.

That's weird. Why? Well, it turns out they're more likely to help. They're more efficient at helping the rat.

If the rat, the focal rat itself, has had the same water bath experience. This is empathy. Rat empathy.

Now, you might think, OK, it's not empathy in the same sense. It is empathy in the same sense as we have it. It's not nearly as extensive, powerful, or developed as we have it.

But even some of the basic presets, if you like, of morality are already embedded in the natural world. And they're just elaborated and developed to extraordinary degrees by us in our wonderful cultural universe. Because I'm an evolutionary biologist, I'm actually required contractually to conclude any public talk I give with a quotation from Charles Darwin.

And it is. It's a beautiful quotation. And it makes exactly the point that I've been struggling to make much more eloquently.

This is the last sentence from Darwin's great book on human evolution, "Descent of Man," published in 1871. We must acknowledge, he writes, as it seems to me, that man, with all his noble qualities, with sympathy, which feels for the most debased, with benevolence, which extends not only to other men, but to the humblest living creature, with his godlike intellect, which is penetrated into the movements and constitution of the solar system, with all these exalted powers. Man still bears, in his bodily frame, the indelible stamp of his lowly origin.

Thank you. We're going to now engage in some preliminary questions. I'm going to pose a couple of questions to our speakers.

I'm going to start with a question that was posed, in a sense, through an argument by Professor Steven J. Gould, who many of you know was a very famous Harvard scholar, professor. He wrote an now well-known article entitled, "Non-overlapping Magisteria." And he argues in that piece that there is no conflict between science-- and he had in mind evolutionary biology, in particular, I think-- there's no conflict between science and religion because there is a lack of overlap between their respective domains of professional expertise and their different teaching authorities. Science studies the empirical constitution of the universe, whereas religion searches for proper ethical values and the spiritual meaning of our lives.

Both of those were touched on by our presenters in different ways. And he writes, "The attainment of wisdom in a full life requires extensive attention to both domains." And this is something that, in my teaching, students bring up continually that they feel called upon by both of these domains. And it can be difficult to integrate.

And Steven J. Gould is onto the fact that where these domains bump into one another is

where we have conflict and tension. And particularly on the question of soul. So one of the places where these domains come together is in how we understand the infusion of soul into the body.

And this was a-- and you get different arguments about that in different religious traditions and in the evolutionary biological understanding of what makes humans distinctive. So my question is, first, you agree with Gould's general position, which sees religion and science as non-overlapping magisterium. And if so, do you agree that seeing nature as fundamentally disinterested with regard to our moral truths? He argued that that-- I think he puts it-- nature doesn't give a damn about us.

And he finds this liberating. He says it frees us to conduct moral discourse in a separate sphere, in a sense, from science. But it seems to me that his position postulates some separation between the human being and our existence as evolutionary creatures.

If this divide can free us to think about moral human behavior in a different linguistic space. So long question, I'm sorry. But I wanted to pose the question of evolutionary biology and ethics with this kind of dualistic picture in mind.

Because I think it's one that is still very much alive in the discourse of religion and science. Do you want to start, David? Yeah, well, first of all, I'd have to say that Stephen J. Gould, very characteristically there. I hope I'm not offending anyone here, but took ideas from other people and then didn't cite them.

Ian Barber in the 1970s was the first person to think of this idea of religion being in two different spaces with science. And they don't interact with each other. There's one of four ways you can think of the relationship between science and religion.

But I actually like that one of the four, the least. So I don't really like Stephen J. Gould's characterization of NOMA like that. And I'll just give two examples.

One is that there are plenty of religions in the world that do postulate facts that science can actually have something to say about. And insofar as a religion does that, it's in naturalistic turf, and so it better watch out. So there will be an overlap there.

And so there will be some interaction. And then the other situation is if you have a properly non-fossifiable religion, let's say, that keeps itself in the sphere of things that science does not directly speak to, you'll still find that your way of thinking about the universe is going to influence the way you see nature. And so you can't say that, oh, religion is the province of meaning.

No, because all religions are going to make some claim about the way the universe is. So imagine if you believe that humans have no purpose. It's just blind, pitiless, indifference.

And then your morality is going to have to be, say, a social contract, just something you

all agree on. But there's no basis for you thinking that if you did something bad, like you win against the way a human is supposed to be. There's no such thing as a way a human is supposed to be.

Whereas if you do think that humans have a purpose, and that's sort of a religious notion, now your ethics is going to be different. You're going to think very differently about what's good and what's bad and what the depth of meaning that that has. So I think they do interact, even if your religion is not falsifiable.

Thank you. So I'm actually guilty, to some extent, in that I am unlike you, David. I'm a fan of Steve's non-overlapping.

Sorry about that. That was fine. I'll tell you why.

Because teaching evolutionary biology, even first-year genetics here at Harvard, I will meet on a regular basis, students who wouldn't necessarily self-describe as creationists, but who are deeply troubled by the fact that maybe even in a perfectly innocent-- and you've got to learn this for the midterm kind of way-- I'm teaching the material which they might find is, at least in terms of their background, something which is dismantling something that they hold dear. So-- and I'm not a theologian. I'm trying to teach them introductory bloody genetics.

So what I do-- it's almost, I would say, religious for me. I do it at the first lecture, a very chunk of teaching of this kind that I do. I lay out, and it is pretty damn no marish.

This is pretty damn Stephen J. Goulish, the fact that there really are two domains, and they should be kept separate. The reason being is, I think, that too many people in this country-- well, and elsewhere-- are raised on a diet of what I call dichotomyism, that either you're with Darwin, if you like, or you're with God, and never the tweens shall meet. And by the way, both sides are guilty of promulgating that point of view.

So Richard Dawkins will tell you you're a moron if you venture into a church, a chapel, or a mosque, or anything else. Pat Robertson will tell you you're going to hell if you accept the precepts of natural selection, right? So you've got this vision of mutual exclusivity being peddled on both sides. I'm comfortable with the idea of independent, material, physical, experimental, observational science world, and a faith-based world, or a spiritual world, which is only accessible through faith.

I absolutely agree that one's point of view over here is going to affect one's thinking here, but it should not affect the experiment, if you're doing science over here, that you choose to design. And so the corollary of that is the problems arise when you have the inhabitants of different domains reaching out of their own domain and making statements about the other domain. So Richard Dawkins, who's living in the science domain, is reaching out and making statements about the spiritual domain, and Pat

Robertson, vice versa.

In a sense, that's fundamentalism, in my opinion. So plenty of people describe Dawkins as an atheist fundamentalist, and certainly Pat Robertson, who proud presumably to be described as a Christian fundamentalist. That's the mindset which makes me nervous, because that is, in my opinion, a form of bigotry and rejection of whatever world view you're not comfortable with just because it doesn't accord with yours, not because you're willing to think about it, just because it doesn't accord.

So yes, Steve Gould's my friend on this one. Yeah, so very articulate responses and quite different to Professor Gould's quite famous essay. I want to pick up on something you just said, Dr. Barry, about the two domains.

And you use the example of students who are uncomfortable, perhaps, with some lectures on evolutionary biology. I have noticed that increasingly, this is obviously not just something I have noticed, but in the modern period, religion is increasingly privatized, especially in the United States when it comes to university and scholarly disciplines. So students often feel nervous about talking about their faith or their tradition in relation to work that doesn't take those narratives and those beliefs in that context to be important to the scientific side.

And in my field, the scholarly enterprise and the personal religious faith are often, sometimes, intention. But I wonder if, from an evolutionary perspective, that privatization of religion is something that is itself an evolutionary development. In other words, this division between value and meaning that is, I think, increasingly something that is set against science.

Is that itself an evolutionary development? Well, in a formal sense, it's certainly not an evolutionary development. It's an evolutionary development in the technical sense is where a new mutation is arisen, which has caused people to be less inclined to be public about their personal beliefs. So no, it's certainly not that.

But I do think you're identifying a genuine social, socio-cultural trend. So yes, it's an evolutionary phenomenon in the sense that both David and I were talking about earlier, namely, a cultural evolutionary phenomenon. And I think-- and look, I'm not a sociologist of religion.

People will be surprised to learn. But my perspective would be that we're living in a world which, increasingly-- and I'm not going to try and justify it-- values, rational, scientific, technocratic achievement and discourse. It's frickin' Facebook that's driving society forward, if you like.

We all want to get involved in tech startups and so on. Now, you compare that to 500 years ago, where the most important thing in your life was the church, or the monastery,

or certainly the sort of social structure associated with religion. So given the fact there's been a transition from primacy of religion socially to this sort of new what you might call technical society, where are you going to put religion? And I don't like your term privatize.

It makes it sound like it's being sold off by the government. I come from British where the conservatives are busily privatizing everything. But no, I hear what you're saying.

So what do you do? You retreat and it becomes more of a personal thing. It becomes somewhat more compartmentalized. Can I add something to that? I think that what happens generally, we're a species that likes to get carried away with things that work a little bit.

I mean, look at sugar, right? Look at alcohol, whatever. So essentially, to paraphrase John Locke, the things that we can be most certain about, not maybe individually. I'm more certain that I exist than anything in science.

But something that we can share certainty about. So if you make a claim, I can test your claim. So the things that we can be self-correcting about to use the great definition of science by Gigi Simpson, the paleontologist, are scientific things.

That's the public arena for public truths that can be tested against each other. And we have fallen in love with that so much, not all of us, but I have. And I know a lot of people have in the last, say, 300 years that we get carried away with it.

So it can only reach so far, right? We don't know how big the universe is, but we know we can reach about this far with our self-correcting tools. And when we get carried away, we want to say, OK, that must be all there is. Because I'm so excited about this high fidelity way of getting a handle on truth.

And so if you happen to be the kind of person that says, you know what? I think there might be something more. Then there might be a sense in which some other people in the room might think you don't appreciate science enough. You haven't jumped on the bandwagon of saying that's all there is.

And so I think sometimes it's sort of like a worry about the majority rule in science. And in this case, the majority rule might be jumping on the bandwagon and getting carried away with a concupisence for omniscience, with a lust for science that goes a little bit beyond its bounds. Another question that came up in some of the questions submitted by students revolves around the question of life, the nature of-- our understanding of life.

So how would you each define life if you think it can be defined linguistically or distinguish it, identify it? Is it a category that is meaningful in the same way in religious discourse as scientific? And does it always carry language of value in both of these domains if you are both of these discourses? Andrew? Well, as you said, Corning, I teach

a course with Logan McCarty with the humble title, What Is Life? And students come into the classroom, excited and eager to learn from the gray beards at the front. And we grind through the whole semester. And we actually don't come to any concrete conclusion at all.

And everyone slinks off, disappointed and bitter and mildly resentful that they've been sold a bill of good. And look, the reason is it's almost semantically impossible. And I'm just going to take this sort of trivial case.

So for example, you resort to-- OK, something that can reproduce itself. In that case, I'm not alive because I'm absolutely dependent on a female or my own species. Or if we're going to-- OK, but you can reproduce.

What about a mule which can't reproduce itself? It's sterile. Is that not alive? OK, so that's one simple one. What about capable of harnessing energy and being metabolically active? Again, now, if you look at various crystalline forms, this simple chemical reactions, they're doing the same damn thing.

They're quite analogous to living what we consider unequivocally living biochemical systems. So the short answer is it's crazy messy. What I actually resort to is a sort of slightly sloppy shorthand definition which NASA has adopted perforce because NASA-- now that it's no longer doing glamorous missions to the moon or whatever-- has to justify its existence somehow.

And the way they do that is with the mission to find life elsewhere. So we've got the discipline of astrobiology, which is actually super cool. So you're going to send probes off to Mars and wherever and see if we can find evidence of life.

Now, that really puts things in a hard focus. If you're looking for life in an alien system, you've really got to have a definition. If you're going to know what life is when you find it.

So it's a self-replicating energy harnessing system, which-- and this is the sort of catch, which is capable undergoing Darwinian evolution, which-- it's almost an element of truism there because of itself replicating. It's making errors. Those are what we call mutations in regular evolution.

But that's the best-- and it's super unsatisfactory. But that's what they're looking for out there, which is self-replicating, self-powering, if you like, and capable, at least of undergoing some kind of notional evolutionary change. Interesting.

Yeah, I agree with all that. I would say I would just take a slightly different tack on it and remind ourselves, when we ask what is life, we're asking that within sort of a historical linguistic framework. And when we talk about life, or zoe, or beos, or any language we want to use, those words developed in a pre-scientific context where organisms were

just wiggling around someplace and somebody said, that's living.

And they stopped wiggling. That's not living. And so when we're sort of coming after the fact and trying to say, OK, what are all the things that are living? What do they all have in common? But in every area of biology, nature bursts the bounds of our categories.

So when we're talking about species, for instance, another example, every organism, you can go from offspring to parent, offspring to parent, offspring to parent. You never get a speciation event. Does that mean there's only one species in the entire world? No.

But we have to apply some conventions to things. So I would say for life, the same thing. Anything you get in-- when you get into it, the word life doesn't end up being good enough anymore.

You have all the entities that are capable of evolution. I like that one. All the entities that are capable of self-replication, which is probably maybe the same list of entities, entities that metabolize, entities that are cellular.

That's the one you learn in school nowadays, right? All life is composed of cells. And then all the viral people get upset. But there are no viral people, but you know what I'm saying.

So anyway, so you have to be specific about the kind of entity that you're looking at when you get into it. And you're actually studying it. The word life and what is life is probably only a good question for people who know very little about life and are not actually studying it in the primary sense, is primary science or pure science.

Yeah, wonderful. Thank you. I would love to give you each an opportunity to ask one another a question focused on the topic of the night, what makes human beings special, that perhaps occur to you as each was speaking.

Dr. Barry, do you want to answer a question? This isn't the sort of question I'm supposed to ask at a gathering like this, but I'm genuinely curious, so I apologize. Why menopause? Why menopause? Well, could you tell? Am I having-- sorry, yes, yes, yes. [LAUGHTER] I just thought it was a good idea.

No, I think it was because-- so I think there are several hypotheses, but they all greatly overlap with each other in the sense that if you spent 15 seconds on each one, they would all sound the same. So what they all have in common, it was what Sarah Herde discussed as the grandmother hypothesis. And so one of the many things that we've done as a species to be able to equip our kids socially for this extremely competitive world that you described so well in terms of reciprocity, et cetera, in addition to biparenthal care and extended juvenile period and all this kind of stuff, is females stop reproducing at some point when their offspring have offspring so that there can be a shift of emphasis in the female life history from having kids of my own to taking care of

my grandkids.

And we do tend to see this in just about all human cultures. And there is a ramping up of care that Sarah Herde is, or that her colleagues have discovered after menopause. And that's unique to humans just because we do this social piece so more intensively than any other species.

Exactly. Right. Yeah.

Dr. H. T.D. Where do you get your boots? No, I'm sorry. Australia, mate. Bloody Australia.

Spensive. [LAUGHTER] I thought my menopause question was going to be the obscure one. Sorry.

[LAUGHTER] That wasn't really my question. I want to ask another. So I guess since we're at Veritas, I would perhaps ask, how would you-- does it seem absolutely insane to you that an evolutionary biologist who studies humans could actually have a religious belief that's rather orthodox, to believe an actual god, like the Judeo-Christian god or something like that? An interesting question.

And one, curiously, you've sort of no aspects of the answer to. The answer is absolutely. I'm completely comfortable with, yes, the reconciliation, if you like, between orthodox science and orthodox religion.

I come from a Christian family. And the sort of curious backstory is my father was-- he recently died-- a professor of genetics at university college, London, for most of his career, and was partly involved or tangentially involved or whatever. He took David out for several points of beer in central London at some stage.

This is what counts in Britain as PhD supervision. [LAUGHTER] I'm partly involved with supervising David's PhD thesis, which was on religion, morality, evolutionary biology. My father was a very capable-- a good scientist-- he might be listening, so I've got to be a bit careful about what I say-- and a very completely doctrinaire scientist.

There was nothing-- there was no religion being ported into his science. But he was also a deeply committed Christian. And to the extent that-- yes, he published extensively, wrote many books about biology, various aspects of genetics and natural selection and so on.

He also wrote a book, which actually I still think is one of the-- is the best title on the topic, which is-- was an attempt to explain his point of view, which is, yes, an embrace of completely straight down the middle of Steve Gould's science domain science and an intense evangelical Christianity. How can you put those two together without too much cognitive dissonance? The title of his book was Adam and the Ape, which actually I think is kind of a cool title. That's my father.

My mother is a medical geneticist. So she has an MD and ended up actually being one of the first medical geneticists in London when the field was being born, so to speak, when Amnaeus and Teethys and so on was invented. She too is-- and she's still alive.

She's a very serious, very committed Christian. She too-- and it's curious that I'm proud of the fact my parents managed to sort of corner the hot red button issues in evangelical Christianity. So my father's writing on creation and evolution.

My mother wrote a book entitled The Rights of Life about how she as a medical geneticist. Now, often for a medical geneticist, you can do the tests. All you can do is lay out the facts to the parents, but your fetus-- we've done the tests-- has this syndrome or this prospective disease or whatever.

Now, that doesn't make her-- my mother, a professional abortionist. But you can't be in that business if you don't condone occasional terminations of pregnancy. So she wrote a book entitled The Rights of Life in which she's reconciling her evangelical Christianity with her, again, very straight down the middle of the road, standard what you might call secular medical practice.

So two people, the two most important people in my life-- people, one I love and two I admire both intellectually and morally-- have literally embodied that reconciliation that you describe.

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[MUSIC PLAYING] [Silence]