Missing Evidence Debate

Rupert Sheldrake, Tara Shears, Massimo Pigliucci & Philip Ball

2016

A favourite debate from 2016: We think science is based on facts and evidence. But from gravity to dark matter, string theory to parallel universes, its theories are curiously bereft of hard evidence. Is evidence less important than we think and conjecture alone capable of leading to greater understanding? Or has science dangerously drifted into fantasy?

Rupert Sheldrake: Biologist whose research into parapsychology and evolution led to the theory of morphic resonance, expounded in A New Science of Life.

Tara Shears: Particle physicist and the first female physics professor at Liverpool. "Rapidly becoming the go-to scientist to explain all things CERN" (Wired).

Massimo Pigliucci: Professor of Philosophy at CUNY and founder of Rationally Speaking, Massimo Pigliucci's most recent book is Answers for Aristotle.

Theme 1: What is evidence?
Theme 2: Has contemporary science drifted into conjecture?
Theme 3: Can we have a science without evidence?

`https://www.youtube.com/watch?v=4hU2JJYXA_k`

Host: Good evening, everyone.

The question we're looking at is the idea of what evidence means or should mean in science.

The standard view, of course, is that science relies on evidence and on facts.

But increasingly, in some areas of cutting-edge science, particularly in physics, we seem to find ideas put forward that not only lack evidence, but lack any clear way of collecting evidence about them.

So ideas about string theory, for example, about multiverses, about many worlds and quantum mechanics.

Does this mean that perhaps evidence needn't have the crucial adjudicating position that it's traditionally been given in science Or does it mean that science, or this area of science in particular, is in danger of drifting into sheer fantasy or philosophy, which I don't think are the same things.

Massimo: I don't know how to take that, but ok.

Host: Well, first of all...

I've got 3 distinguished speakers who have, I think, quite different views.

I hope there'll be quite different views about this question.

On my right, Rupert Sheldrake, who's a biologist whose research into parapsychology and evolution led him to formulate the theory of morphic resonance.

First on my left, Tara Shears, who is a particle physicist and a professor of physics at the University of Liverpool and next to her, Massimo Pigliucci, now professor of philosophy at the City University of New York.

So first of all, I'm going to give them their 3 minutes, beginning with Rupert.

Rupert: A lot of science is based on assumptions that have no evidence in their favour.

In my most recent book, The Science Delusion, I describe 10 of these assumptions, which most scientists take for granted.

They don't realise their hypotheses.

They're just assumed to be true and these lead science into complicated tissues of speculation.

I'll take first the assumption the laws of nature are fixed.

This is something built into the foundations of science, partly because of the Platonic influence on the founding fathers of modern science, who thought the outlaws of nature were ideas in the mind of a mathematical god, and therefore fixed eternally and now just built into the general Platonic assumption that most physicists and mathematicians have, that there's a kind of Platonic mathematical realm beyond space and time.

So the assumption is the laws of nature as we know them, and the constants, were all fixed at the moment of the Big Bang.

Then they have to explain why were they fixed the way they are so that we exist and so forth and there's two main theories.

Either some intelligent designer fine-tuned them to get them exactly right, but since that might involve something like God re-entering the picture, the more popular alternative is that we live in a multiverse with countless universes that actually exist of which we only can know the one that's suitable for us and this is one of the tissues of speculation.

But what if the laws of nature aren't fixed? What if they're not in an evolutionary universe, totally fixed forever? What if the laws evolve? After all, law is an anthropocentric metaphor.

Only humans have laws.

It's one of the ways in which we project our human concerns onto the universe.

In the 18^{th}, 17^{th} century, it made sense.

God was a kind of emperor.

So If the universe is radically evolutionary, which it seems to be, why shouldn't the laws evolve, because human laws evolve, or better, a better metaphor in my view, is that they may be more like habits.

If they like habits, there could be a memory in nature, they don't all have to be fixed at the beginning.

So this whole debate about why are they exactly right becomes a non-debate.

The whole of this vast issue of speculation, evidence-free speculation, can just be dissolved away by actually asking the question, the laws more like habits, you can do experimental tests to see if there's a memory in nature.

So that's one assumption that hasn't been tested but is taken usually for granted.

Another is that nature is purposeless.

This simply follows from the machine metaphor on which science was based in the 17th century.

Machines have no purpose, therefore the universe has no purpose, evolution has no purpose.

The second point I want to make in my remaining 90 seconds is that evidence, the facts don't speak for themselves.

You can have evidence that's plain for all to see, and if it doesn't fit someone's theory, they'll deny it.

In the 18th century, when peasants saw stones fall from the sky, meteorites, and described them to the Academy of Sciences, they simply said it's impossible.

These must have just been ordinary stones that were struck by lightning, which is why they were hot.

It was impossible because there are no stones in the sky.

They simply denied the evidence and the other way in which evidence is distorted is by selective publication.

Drug companies are now known to publish selectively the results that favour their drugs and not publish the ones that don't.

Then evidence-based medicine, which looks so impressive on the surface, peer-reviewed journals review all the evidence, then these drugs turn out to be very good.

It's based on highly selective publication of evidence.

This is now endemic in science, the so-called replicability crisis, which has recently, in the last two or three years, cropped up.

In some studies, up to 90% of papers in the biomedical sciences and about 50% in psychology turn out not to be replicable.

Why? Largely because people just publish their best results and don't publish the others.

Because it's important to get ahead in science by publishing good results.

Then we come to the problems that my colleagues here will be talking about in physics, where concepts like dark matter, multiverses, are put forward and are widely believed as theories, but which have left behind normal scientific criteria of evidence.

But at this stage, I hand over to others.

Tara: First of all, I would like to make a distinction between science and the scientific method.

So by science, I mean the collection of facts and laws that we have used to govern behavior and I don't mean laws as in habits, as Rupert has been talking about.

I mean mathematically defined, precise rules of behavior that seem to be obeyed again and again and again, as often as we test them.

Now, science in that sense is our best description of the universe from my point of view and how it behaves, because it's a replicable one.

You've given examples of bad practice in science, but I don't think they describe all science.

But the scientific method is the process by which we get to that understanding, and that's where evidence comes in.

So the scientific method proceeds by having a hypothesis, an idea that you can use to make predictions about the world around you.

Using that prediction, you design an experiment that gives you data, and that data is your evidence that you confront against the hypothesis to see if it fits, or if it doesn't fit and decent science, if it doesn't fit, should then reject the hypothesis.

Both inputs are really important.

You need to have theory and hypotheses to give context to explain the data that you're seeing.

But you need to have the evidence to tell you which hypotheses describe reality.

You can't have one without the other.

So evidence is incredibly important in enabling us to understand the universe, but it's not the only ingredient? If we just had evidence, how would we make sense of it? That's the point I want to make.

I was going to give you an example of the scientific method, but being a particle physicist, I was just going to give you a particle physics example of the discovery of the Higgs boson, which is a really nice example.

We have a hypothesis dreamt up in the 1960s of this strange field, this energy field that permeates throughout the universe.

It sounds science fictionary, It's invisible.

It just yields 1 prediction, which is the existence of a particle you should be able to see and it took 50 years to be able to design the experimental equipment to actually obtain the data to then see if that was indeed the case.

Which brings me on to the second point I want to raise.

So we've talked about theories that don't seem to have experimental evidence, like multiverses, like string theory.

We've got to remember that the scientific method is a continual process.

Our ability to find out knowledge and advance science is a continual process and to do that, you have to advance your theories beyond your current understanding to try and understand more.

You have to push your experimental facilities beyond your current technology in order to be able to find out more and at any stage in that cycle, you will have theories that haven't yet progressed to the stage of yet being testable, either because they're not mature enough, like string theory, to yield predictions that are currently testable, or because they yield predictions which experiment hasn't caught up with to make predictions yet, so to test those predictions yet.

You're in a sort of limbo in the scientific process at that point.

So I would claim that the role of evidence coming in defines what we would say as science and scientific knowledge.

It's the testable part and then the scientific process, the scientific method of these examples that you've given, of theories coming in that don't have evidence at the moment, is part of our process for extending science.

That's my take.

Massimo: The first thing I want to make clear is, for myself at least, as both a philosopher of science and a scientist, there simply is no such thing as science without empirical evidence.

Now, we can discuss what is the relationship between empirical evidence and theory.

We can discuss whether, at one point, a theory becomes not particularly interesting as a research program because it's not yielding anything that can be tested.

All of those things can be negotiated, and they need to be negotiated by the properly competent scientific community.

You know, I'm A biologist.

I'm not going to tell the string theorists, well, you waited long enough, dudes, move on, right? They're going to be the ones to decide when that time has arrived.

But I think that it is simply non-negotiable that empirical evidence, there's no science without empirical evidence, and there's no science more particularly without a good match between the empirical evidence and the theory.

But that's one of the things that probably will have to flesh out.

Now, often we have this issue of scientists or some scientists at least are dogmatic.

Well, yes and no.

There's two ways of looking at the issue of dogmatism here.

On the one hand, there are certain things that have been so well established and so well understood that, yeah, I'm going to be dogmatic about it.

If somebody tells me, you know, Darwin was fundamentally wrong, natural selection is not a real process in nature, I'm just not even going to look at that person.

Because that is something that has been established over 150 years plus of experimental results, theory, and so on and so forth.

I'm simply not, I don't have the time to renegotiate it.

But if you're telling me, I don't think string theory is well established and sure, of course, yes, that's true and in fact, the relevant epistemic community, that is the fundamental theories themselves, are actually not in agreement on what's going on there.

So I'm going to wait until they figured it out.

So that's one sense in which scientists can be dogmatic.

The other sense is scientists can be dogmatic in the sense that they can be resistant to new ideas.

and sometimes improperly so.

Or maybe they can push their own agenda, their own ideas, in a way that it's inappropriate.

Well, welcome to the world.

I mean, scientists are human beings.

Whatever makes anybody think that scientists are different, qualitatively, from the rest of humanity, I mean, that seems to be a mistaken idea.

Scientists are not more objective than other people.

They're not, certainly not more, somehow capable of deciding what the truth is about their own theories.

They have their own biases.

We all will do.

The way, however, science works, and it works reasonably well, at least we haven't figured out a better way of investigating nature so far, is that science is done by a community of people and these people have, the more varied their cultural background, gender, politics, and whatever it is, the better science comes out.

Just to give you a trivial example, until not that long ago, a lot of medical research was done only on middle-aged white men, because the people that were doing the research were middle-aged white men.

Then it turns out that certain aspects of human physiology are in fact significantly different for women, or significantly different for people of different ethnic backgrounds.

But that came to the fore and was corrected only once we started having enough women or enough ethnic minorities involved in the process of science, and people started looking at it and said, wait a minute, you're missing here half of the picture, you're missing 1/4 of the picture.

That's the way it works.

We haven't figured out a better way of doing it yet at the moment.

Is science the only path to knowledge? That depends on what you mean by knowledge.

I think it is the only path to serious understanding of the natural world.

We don't have any other way, we haven't figured out any other way of doing it.

You can try mystical insights, just sit in your room and think about the universe, and you won't come up with anything worth coming up with.

I am a philosopher.

I can do a lot of armchair philosophizing, but I will not be discovering new facts about the world that way.

However, if by knowledge you mean something broader, like understanding, because as it's just been pointed out, one thing is the facts, and the other thing is the understanding of those facts.

The theories are actually supposed to articulate an understanding of things.

So understanding is broader than just than just science.

So we can have other disciplines contributing to it.

In particular, in this case, I think philosophy of science, epistemology, even cognitive science, because cognitive scientists are the ones that actually point out the cognitive biases that scientists themselves suffer from as human beings and therefore can be addressed.

Finally, are there limits to science? Because sometimes you hear these old things about, oh, but science is a limited enterprise.

Yes, of course it is.

It's a human enterprise.

It's done by fallible human beings.

It's done by human beings that are smart, but up to a point.

We can understand, process information, and so on and so forth, only up to a point in a certain way and not only that, but we are clearly defined in the way in which we think by our particular cultural background and historical moment.

The reason both Darwin and Wallace came up with the metaphor of natural selection, because the theory is, as far as we can tell, correct, and it describes the way the world is.

But the metaphor of natural selection came out of the specific background of Victorian England.

Had it been done at another time in another culture, they would have come up with a different metaphor, a different way of looking at things.

That's true everywhere all the time.

If anybody, including any scientist, thinks that they can transcend their own cultural milieu, they're just fooling themselves.

Host: OK, now I want to start burrowing down a bit into the question of what it is that we're talking about, what it is that qualifies as evidence and Rupert, you pointed out some respects in which pressures, personal and institutional and political and social pressures can distort the scientific agenda and can distort the way that evidence is used.

But would you accept the general principle that evidence is looking at what the world tells you, if you like, comparing that against predictions that your theory makes and seeing how well they match?

Rupert: Oh, yes, very definitely.

I mean, I've spent most of my career as an experimental scientist.

I mean, I'm doing experiments I was doing one just a couple of days ago.

I mean, this is what I do and if I didn't believe in evidence, I wouldn't waste my time doing it.

So I'm totally in favour of that.

I mean, my gripes are really about not sufficient skepticism about assumptions, selective, dismissal of evidence, corruption of the scientific process.

Those are the points I'm making.

I'm not against evidence.

I think it's essential to science and as a biologist, which biology is a very empirical subject, it's very important.

The research I do in disputed areas of science, like research on telepathy, leads me into discussions where these become rather crucial issues, because I've had encoun-

ters with so-called skeptics who've told me I had a debate at the European Skeptics Congress with a leading European skeptic on telepathy.

Host: The European Skeptics Congress.

Rupert: Yes, in Brussels.

Massimo: And those are not people who want to leave Europe or anything like that.

Rupert: No, these are card-carrying members of skeptic organizations whose main purpose is to...

to sort of discredit, or at least it seems their main purpose is to discredit the research in parapsychology.

Anyway, here I was in a debate with the European Skeptic Congress.

I spent half an hour setting out evidence for telepathy gathered by myself and other people, telepathy in animals, telepathy in people.

My opponent gave a theoretical discussion for half an hour showing that the laws of thermodynamics and Gibbs free energy and so forth would not allow this to be possible and therefore, all my evidence was flawed.

So I asked him to point out what the flaws were and he said, oh, I can't do that.

I haven't read your papers.

Do you think I'd waste time on that? So I mean, here we have a kind of attitude that I've encountered myself only too often where I do research in disputed areas of science.

where there's a taboo against this.

I really believe strongly in evidence.

That's why I do the research.

But I've personally encountered this extraordinarily closed-minded attitude to it.

So I know, for me, this is a live issue.

Is evidence important or not? And I certainly know some people who call themselves scientists for whom it is not important if it doesn't fit with their worldview.

Massimo: So, but wait a minute, since I'm A card-carrying skeptic, I guess I should.

I'm curious, first of all, who was this person? Do you mind telling him?

Rupert: He was the Dutch Secretary of the Dutch Stichting Skeptics, whose name will come to me.

Massimo: Yeah, no, that's fine.

I know who he is.

Okay, so I'll write to him later.

So, okay, here's the thing with so-called card-carrying skeptics.

The skeptic community is not really the same as the scientific community.

There is a number of scientists, such as myself, who consider themselves skeptics in that sense.

But there are actually 2 distinct communities.

The skeptics, as a movement or as a set of organizations or whatever it is, they did come about largely over the last several decades as a way to confront what they perceive to be pseudoscience in the public eyes.

So these are actually people who are concerned about public understanding of science.

They don't usually do research on their own.

What they do occasionally do, very occasionally, but they don't do, they're not professional scientists.

They basically are, you can think of them as a sort of a grassroots version of public science.

They rely on what scientists do.

in order to inform themselves and some of them do it well.

Some of them, of course, they're human beings, so don't do it particularly well.

But I don't think one can fault them necessarily for, let's say, don't take it seriously research on telepathy or clairvoyance or whatever it is.

Because what they're doing is they're looking at the pertinent epistemic scientific community.

In that case, it could be psychologists or it could be biologists or whatever it is and they're saying, well, do you guys have done anything like this? Do you guys think there is any merit into that? And if the scientific community says, no, we don't, we don't think so, then the skeptics, I think, are in the proper domain of then essentially going to the public in general and say, look, scientists don't believe in this stuff, so you should be wary of these kinds of claims.

This morning I talked about, in one of the other appearances that I've done, I talked about this issue of trust, right? So most people in the general public simply do not have sufficient technical understanding of science to settle scientific debates in their own minds.

We don't.

I mean, even though I'm a scientist, I'm an evolutionary biologist, I cannot possibly settle debates even in other areas of science, be it quantum mechanics or experimental psychology.

This is not my competence.

I should be reading a lot of books and articles that I don't actually understand, right? So that's even worse for a member of the general public who does not have necessarily that technical background.

So it becomes an issue of trust and when you say, when it becomes an issue of trust, then you say, well, who is the expert? Or who is the expert community that I can go to? And for better or worse, because there certainly are flaws and there certainly are, there is going to be the occasional good idea that gets discarded, at least temporarily, The pertinent epistemic community is the one that the people should go to and say, well, if you guys don't believe this, or if you guys believe this, that's the opposite example is, let's say, climate change.

A lot of people in the general public, especially in the United States, are skeptical of climate change.

That to me is a form of denial.

It's not skepticism, because if 97% of climate scientists tell me, yeah, this thing is happening, and it is at least in part anthropogenically fueled, who the hell am I to say, no, you guys are all wrong and I understand it better.

Tara: But you're bringing up a really important point.

Sorry, I'm going to leap in here, which is the interpretation of data as well, the interpretation of evidence.

It's not straightforward to analyze data.

We've already mentioned that scientists are biased like anybody else, and you have to remove that bias to the best of your ability and make your data objective and then it has value in comparing to different hypotheses and reflecting reality.

It's very difficult for somebody not in your field to fully evaluate if you have understood your data appropriately.

I think that's now the case, because we've become so specialised.

So this idea of trust amongst scientists, or that scientists have done the right job, is tremendously important in believing that evidence is appropriate for the statements that are being made about it.

So that's something that we shouldn't forget as well.

Rupert: No, I completely agree.

You have to be able to interpret evidence in an appropriate way.

I think though that Massimo's point, you know, that you just go to the community and if they say we don't believe this, you trust them.

There are certain communities with, there are deep prejudices and taboos in all communities and this way would be just a reflection, a way of reflecting a predominant taboo.

Whenever I give talks on topics like telepathy to scientific audiences, I invariably have the experience of a fairly polite reception.

Sometimes there's a militant sceptic who tries to get me disinvited before I even speak, and they boycott the lecture.

That's quite common, actually and then the people who come usually listen politely.

They ask a few technical questions at the end about the statistics and so on and then in the tea break afterwards, what always happens is that people look right and left and they can't say, I'm so glad you talked about this.

I had this experience just last week.

I knew when my wife was calling and it was just, I'm sure it was telepathic and another one said, my dog knows when I'm coming home from the lab and they always say, I can't tell my colleagues because they're so straight and they'd be so disapproving and in one sub-department in Cambridge, all six members of staff came to me saying the same thing, that they were really interested, but they couldn't talk to their colleagues about it.

So I said to them, I said to you, I said to them, why don't you guys come out? You know, you'd have so much more fun.

So there are real taboos.

Host: Can I ask, do you think it's a valid activity to try to do experiments to see whether there is something that seems to be telepathic, some kind of telepathic communication?

Massimo: Sure and it has been done for more than a century.

Host: Right.

Massimo: And it hasn't convinced the relevant scientific community and therefore, at the moment, I'm going to say no.

further research is warranted.

I mean, look, the idea is that it's easy to paint, as I said, the scientific community as a bunch of rigid people who don't change their mind.

They have the truth.

They think that they have the truth.

and all that sort of stuff.

But that's just not the way the history of science shows things work.

I mean, if you just pick up any book on the history of science, you will see that there is always a high premium on discovering what everything else thinks is not true and convincing the rest of the community.

Do you think that Darwin got accepted overnight when he published this stuff? Do you think that Galileo got accepted overnight? I mean, the guy almost died as a result of his stuff.

There is a high premium and there is a high stake in sort of frontier scientific research.

But there is also a high likelihood of failure.

Whenever you're doing something that is at the frontier, whenever you're doing something that is at the borderlines between science and the unknown, more likely than not, you're going to fail.

That's just the way science works.

If it were really a safe enterprise, then we'd be rather boring and we would never go anywhere.

But the fact is, there is a high premium, a high price to be gotten if you actually do manage to convince the relevant scientific epistemic community and this has happened over and over and over.

I mean, the people that we justly recognized as geniuses of the scientific enterprise over the historical times have done precisely that.

So how would that happen ever if the scientific community were that entrenched in their own opinions and never changed their mind and so on and so forth? What is true, however, is that scientists tend to be conservative by nature and I don't mean politically conservative.

I mean that it takes a lot of evidence to convince them of something.

Now, Carl Sagan famously put it in these terms, which I'm sure nobody's familiar with, extraordinary claims require extraordinary evidence.

Sagan, who was a very smart astronomer, didn't actually come up with that, however.

He just came up with a specific turn of phrase.

The phrase goes back, or the concept goes back to David Hume in the 18th century and Hume basically said, in an inquiry on human understanding, and in particular on an essay on miracles, of all things, he said that a reasonable person proportions his beliefs to the evidence.

So what that means is that if I, let me give you an example.

So if I told you that I came to the festival by taking a plane from Rome and then a car from London, I doubt that anybody would seriously question my statement, because that's a pretty run-of-the-mill kind of thing, and I'm not making any extraordinary claim.

I don't need to provide you with the receipt for the airplane and all that, so you're just going to believe me, because why the hell would I lie? But if I said I stepped into my office in Rome, into a teleporter, and then appeared right outside the door of the festival here, you'd be a fool not to ask for serious evidence of that sort of stuff.

If you just believe me on it, I have a large bridge in Brooklyn that I can sell you for really cheap.

Right? So that's the issue and there is no clear answer.

Those are, the example I just gave you is clear, I hope.

But then there is a bunch of other situations where you just have to negotiate it over time and it's very possible, I don't exclude that in a 50 years down the road or 100 years down the road, somebody would have made enough inroads on, let's say, telepathy, to convince the relevant scientific community and all of this will say, and people will point to these kinds of discussions, I see those fools that didn't believe it.

Rupert: But they're not fools.

Massimo: They're actually doing the right thing.

They're being conservative.

Rupert: They're not.

They're just being bigoted and prejudiced and you see, you say extraordinary claims demand extraordinary evidence.

To say there's billions of universes seems to me an extraordinary claim.

There's no evidence whatsoever.

I don't believe it and yet I read the Skechel Inquiry, apart from Martin Gardner, I don't see many people objecting to that.

The billions of universes, it's a standard in physics.

You can hold down a professorship, you can be president of the Royal Society, you can believe this with no evidence and yet when, say telephone telepathy, about 80% of the population claim to have had the experience of thinking of someone who then rings in a way that seems to them telepathic.

It's not extraordinary, it's ordinary.

So then the question is, are these people deluded? Is it just coincidence? Do they just forget all the times they're wrong and stuff? Then you do experiments to find out.

That's some of the experiments I do.

How I do them, just to fill it in, is have someone sitting in a room being filmed on camera with a landline phone, no caller ID.

They give us the names of four people that they know well, who they might be telepathic with.

We pick one of the callers at random, ask them to ring.

They have to guess who's ringing before they pick up the receiver.

I think it's John.

Hi, John.

They're right or wrong.

The chance level is 25%, one in four.

These experiments, filmed experiments published in peer-reviewed journals, have hit rates about 45%, massively significant, more significant than the Higgs boson, actually.

Tara: Oh, well, actually, I wanted to ask about significance.

No, this is a really important point, significance.

I'm glad we've brought it up because it's not sufficient to just make a measurement of something once.

I mean, that might not mean anything.

If you have backgrounds, if you have systematic biases that you have to account for in your measurement, you need to repeat something a lot of times before it becomes significant enough to actually claim as evidence and depending on which branch of science you're in, the statistical level can be different.

But the example that you've just given there, my first question as a physicist would be, your normal question from the audience, that you've run this experiment how many times? What's the statistics? What are the sources of systematic error there? Have you taken them into account? Can I see them tabulated so I can understand a bit?

Host: I'm getting to all the data.

Let's not peer.

Lots of trials.

Rupert: Sorry.

There's lots of trials.

It's been repeated in other labs.

There's a lot of evidence, when I meet psychologists from the community that Massimo is so influenced by, and I say to them about this evidence, they haven't read it.

They just say, there is no evidence for psychic phenomena, it's all been discredited.

I mean, I hear that mantra over and over again.

That's why I don't trust them in their judgment in the way that Massimo seems to.

Host: I want to look at these multiverses, of which there certainly is no evidence, but I think it's probably important also to recognize that it's not an idea that someone has plucked out of the air because it seemed a nice thing to suggest, that those kinds of ideas stem from extending the physics that we know at the moment into realms where it becomes very hard, perhaps, impossible to test and there's a clear history of doing this and Tara, you were saying, you know, this is something that needs to happen.

It was, in a sense, something that Einstein was doing with general relativity, that, you know, he didn't come, that idea didn't come out of no way.

It was well motivated.

But it took some, there was certainly no evidence for it when he proposed it and it seems that in physics in particular, there is this tradition of building on what we know, building into, regimes where it's not obvious how things should be tested.

Do you think that's a valid way for science to proceed? Can it run ahead of its ability to produce evidence?

Tara: I do think so, for the reasons I stated at the beginning.

So this idea of physics proceeding by standing on the shoulders of giants, as Newton would have it, is important, because it's how we make progress.

You don't throw everything out every generation and start from scratch, because you would never get anywhere.

We have an understanding that describes a lot of the universe.

We want to understand more of it, because we know that there's so much out there that we don't yet understand and that's what motivates people to think of alternative approaches, like multiverses, like string theory.

It's to overcome problems in our existing understanding of the universe.

It's to try and find a solution to push our knowledge out more.

Now, these things are at the frontier and the thing about physics is that it's a really simple worldview compared to what Rupert's studying, or to philosophy, which are very complex systems, potentially, because you have a lot of variables.

In physics, we try and slim things down.

identify underlying laws of behavior that we can then extend to find out more about everything.

It's the way that's worked for us that's been very successful.

So these examples that you've highlighted are examples of our science in progress.

I don't know if they're going to pan out or not, to be honest.

Host: Do you think that what nature tells us always has to be the ultimate arbiter of that question? The position you outlined at the beginning seemed to suggest that was the case, and I think it was probably Richard Feynman who said, you can't fool nature.

But when Einstein came up with general relativity, and it was put to the test by Arthur Eddington looking at a solar eclipse, when he was told that, okay, it seems to confirm your idea, he famously said, I knew that it would and if the evidence, and

people said, what if the evidence hadn't supported it? He would have said, I would have felt sorry for the Lord because the theory is correct.

So it seemed to imply that he felt there was something beyond the physical evidence you can get from the world that can at least give you confidence in sticking with an idea.

Do you think that's a valid thing to do?

Tara: Yeah, there are instances of that throughout the history of physics and I'm thinking of Paul Dirac, who combined special relativity and quantum mechanics to come up with an equation that described the motion of an electron at whatever speed it was going and his equation had two solutions, twice as many as it should have had and to him, this equation was so beautiful in a mathematical sense that it really had to be real.

It had to describe the universe and it's that big-headedness, thinking that you've hit upon a good solution that really reality should be fitting.

In that case, four years later, experimental evidence to explain what this other solution was, which turned out to be antimatter, came along, and then we saw, well, in that case, Dirac was right.

But, you know, That's not always the case.

Host: But it wasn't just pig-headedness in Dirac's case, was it? was a sense that there was a beauty, as he saw it, to his equations that gave it some sort of validity and Massimo, you've just been to a meeting where this has been discussed.

Are criteria like that? It's valid criteria to judge scientific ideas when the evidence can't be done.

Massimo: No, they aren't and here's what happens.

So what we've been talking about in the last few minutes, like Einstein making that kind of announcement, there's a number of other examples in the history, especially physics.

They tend to be physicists.

I rarely hear a biologist making that kind of claim.

That has to be true because my mathematics is like that.

We remember those because those actually turn out to be right and we forget that there will be another 90 examples at the same time of people saying something similar, and we forget about them because they turn out to be wrong.

In fact, a book by Lee Smalling that came out a few years ago, The Trouble with Physics, is a history, a sociological history of 20^{th} century physics and it lists one theory after another that at some point or another, people said, this must be true because it's so beautiful, so mathematically perfect, blah, blah, blah, blah, and then it turned out to be wrong.

So yes, of course we want our theories to be as elegant, as simple as possible.

This is a human criterion, however.

This is not a criterion imposed by nature.

There's nothing that says that nature has to be simple or understandable, for that matter.

right? It's that we like it that way because this is, we are aesthetic creatures as well and it works better for us that way because we can understand better, we can explain better things if it turned out to be mathematically simple and so on and so forth.

But that's no guarantee of anything and all we have here is a simple case of what the psychologists will call a selective bias.

That is, we remember the hits and forget the misses and that's why we get this impression that, oh, a lot of scientists have actually been guided just by this almost mystical sense of being right.

But I want to go back, if you guys don't mind for a second, to the comparison between telepathy and string theory.

I don't actually believe in either one of them and I'm even feeling uncomfortable saying, using the word belief applied to those kinds of concepts.

I mean, do I think that there is evidence or do I don't think that there is evidence? In the case of string theory, the case, I'm sorry, the multiverse, the case, the answer is clear.

No, there is no evidence at the moment, period.

So if we're just talking about you should believe only things that are, for which you have evidence, you shouldn't believe in the multiverse, and that's why I don't.

Tara: Can I pick you up on your use of the word belief? I mean, you can believe what you want.

Massimo: I can, sure.

But as a scientist, as I said earlier, I'd rather proportion my belief to the evidence and if there is no evidence about something, I simply don't believe it.

But don't believe it, it's not the same as dismissing it, right? That's what I wanted to get, to get the difference.

So not believing something is simply, I can be simply agnostic about it.

In fact, that describes, that better describes my position about the multiverse as well.

There could be a multiverse and there is interesting reasons, mathematical reasons, to think there might be such a thing.

But there is no empirical evidence at the moment and until and if the empirical evidence comes in, I am going to suspend my judgment, right? The reason that situation is different from telepathy is twofold and it goes back to that unfortunate behavior of your skeptic opponent.

Rupert: Van Nienhuis, he's called.

Massimo: Oh, okay.

Rupert: Nienhuis.

Massimo: So here's, I think, however, where the difference between the two cases are.

There are two major differences.

First of all, the multiverse is compatible and predicted by certain interpretations of very well-established mathematical theories that are based on very well-established physics.

That doesn't mean it's true, but it does mean that there is very good reasons to think that it may be true.

On the other hand, as your skeptic pointed out, it is in fact the case that as far as we understand, something like a lot of paranormal phenomena would in fact actually undermine a lot of our current understanding of physics, chemistry, and biology.

Now, there's nothing wrong with that, because it is possible that we don't understand well, we dramatically misunderstand physics, chemistry, and biology, but now the bar is raised.

Okay? On the one hand, we have a situation which is theoretically well compatible with what we know.

We just don't have the empirical evidence to prove it and on the other hand, we have something that actually would undermine a lot of what we think we understand about the world, which means that now the bar is raised higher.

That's one reason for the difference.

The second reason for the difference, I'm sorry, but I'm going to disagree on a factual matter.

research in telepathy and other parapsychological phenomena has been conducted in university laboratories for decades.

Two in particular, one at Cornell University and one at Princeton.

Both of them now have closed for lack of results.

They've published a few papers here and there in peer-reviewed journals, but the majority of the scientific community look at these things and now, sorry, this can be interpreted in a number of other ways that can be explained in a number of other ways that don't need to invoke telepathy.

That is a reason reasonable understanding, a reasonable assessment of the evidence over decades of research.

So it's not the case that there is no empirical research out there.

is no empirical research on the multiverse.

There is empirical research on paranormal phenomena.

It has been going on for decades, actually close to a century, and it hasn't convinced the proper epistemic community.

That to me, it's a fairly big failure.

Now, could it turn out to be otherwise in another 50s years? Sure.

Host: To play devil's advocate, we have, dark matter, I believe, was first proposed in the 1930s, Vicky, and we still have no sign of what it might be.

So why is it valid to continue to believe that is an idea we're pursuing?

Massimo: Again, so dark matter, well, you're the physicist, so you should really be answering that.

I'm going to give a very short answer, and then if you don't mind, you fill the huge gaps that I'm going to leave.

So dark matter, as far as I understand, is essentially A placeholder, and so is dark energy.

It's a question of, look, we know that there is something missing here.

We know because we can measure We can make measurements, cosmological measurements, and we know that there's something that is not there, that should be there.

There's not enough to account.

There's not enough energy, not enough matter to account for the behavior of the universe as we actually observe it.

We're going to call it dark because we don't see it.

We don't know what the hell it is.

Some people have ideas, but we don't know what it is.

So it's not that one believes that somebody believes in dark matter.

Somebody simply believes the observation that tell us that there's something missing, and then we'll call that missing thing dark matter.

Am I completely off? I hope not.

Tara: No, this is it.

This is it.

So there are phenomena that are observed, which are interpreted as dark matter.

Now, nobody knows what dark matter is made of.

There are lots of different theories, and there are lots of eminent theoretical physicists who claim that absence of evidence is not necessarily absence of evidence, if I can get that right in the right way.

Massimo: It's not evidence of absence.

Tara: Thank you.

Because this stuff is invisible to us, it's hard to test and hard to pin down, which is why we know so little about what this phenomenon that we've observed actually is in terms of its nature.

But there are experimental observations of something there which have been interpreted as this.

Rupert: So I must respond to something Massimo said.

First of all, you said that if telepathy exists, it would overturn existing physics, chemistry and biology.

I don't think it would.

You know, when electromagnetic fields were introduced into science, it didn't overturn Newtonian physics.

It extended science and telepathy concerns the nature of minds.

It's not as if physics, chemistry, and biology have been very successful at explaining the nature of minds or consciousness.

It's not as if this is hard science, which we can rest everything on.

It's called the hard problem, precisely because you know so little about minds and consciousness.

Massimo: A philosopher calls it the hard problem, and he's wrong.

Rupert: But the thing is that it's not as if...

So first of all, you said we have to raise the bar because physics, chemistry and biology are...

The theory of mind is not solid.

It's very disputed and in consciousness studies, there's a wide range of theories about the nature of consciousness and how it works.

Some of them are field theories of minds, where minds have fields that aren't just confined to the brain, just like cell phones have fields that aren't confined to the phone.

Host: So would this idea need a new particle?

Rupert: No, it wouldn't necessarily need a new particle, but it would need connections at a distance of a kind that might involve an extension of the mind beyond the brain.

But the point is that it wouldn't necessarily imply overturn existing physics, chemistry and biology.

That was one of your points.

The bar must be much higher.

The second point is that all this evidence is so invalid people's departments get closed down.

In the US at the moment, there are currently, I think, 2 full-time parapsychologists.

There are about 100,000 subscribers to skeptic organizations who, if any parapsychology grant is made by any university, if any public funding body tried to make one, there'd be instant attacks.

So, and when universities get endowments for it, like the Koestler Chair at Edinburgh, the first person appointed was a parapsychologist.

When he died, the academic committee tried to appoint A sceptic and in fact, they have appointed A sceptic.

They've downgraded to a readership and kept the money for the psychology department.

This has happened over and over and over again within universities.

So using that as evidence for lack of prejudice, it seems to me rather distorting the fact.

No, It's just another example of a taboo and prejudice in action.

Massimo: Wait a minute.

I never said that there is lack of prejudice.

In fact, I started out my remarks by saying that scientists can be dogmatic and sometimes unnecessarily so.

Again, it just comes down to Has there been enough work to convince the proper community? That's really the bottom line and the answer so far, it's clearly no.

This is an empirical question.

The answer is clearly no, right? And so as an outsider, if I'm going to bet, I'm going to bet against you.

Rupert: Yeah, but what I can't get is, you know, I don't go around denouncing physical chemistry or denouncing astrophysics.

Why do people who know nothing about subjects feel so strongly they have to form organizations to denounce it and oppose it?

Host: I'm going to leave it there.

I think I'm very glad we found some disagreement.

I think what we have actually found also some agreement, because one of the questions we were meant to address is, can we have a science without evidence? And I think everyone up here has given the firm answer we can't.

Rupert Sheldrake, Tara Shears, Massimo Pigliucci & Philip Ball
Missing Evidence Debate
2016

The Institute of Art and Ideas. <www.youtube.com/watch?v=4hU2JJYXA_k>