Introduction

Hi everyone! This is episode twelve of the Metaphysics of Physics podcast.

With this show, we are fighting for a more rational world, mostly by looking through the lens of the philosophy of science. We raise awareness of issues within the philosophy of science and present alternative and rational approaches.

You can find all the episodes, transcripts and subscription options on the website at metaphysicsofphysics.com.

I am Ashna, your host and guide through the hallowed halls of the philosophy of science. Thanks for tuning in!

Today we are going to answer some Quora questions relating to physics.

What are the signs that must exist in the universe so that we consider the string theory correct?

It is widely believed that one of the main problems with string theory is that nobody has a good idea of which practically observable facts would verify string theory. Or, to put it another way: We really have little idea of any practical way to test it.

There are of course people who believe that there are ways it can be verified. But, the problem is that they are not what we could currently call practical.

It is generally thought that we would need particle accelerators far more energetic than anything we know how to build with existing technology. It simply requires far too much energy.

In fact, so much energy that it is conceivable that no amount of technological advancement will ever make it practical.

There are a couple of indirect methods through gravity waves and the like that people think might be able to verify string theory. However, I think all of this rather misses the point. Let me explain.

Let us suppose that now or in a hundred years, someone comes up with an experiment that seems to suggest string theory is true. What would this imply?

Would it imply that all of the mathematics of string theory is true? Let us suppose this is the case.

Does this prove that reality has nine, ten, eleven or whatever number of dimensions? No. Because the entire concept of dimensions is an abstraction and no amount of evidence will validate “the universe having X dimensions”.

Dimensions are a mathematical concept. Dimensions have no physical existence and you cannot explain anything by saying “space” or “reality” has ten dimensions.

When we say that “space” has three dimensions, we simply mean that we can identify three abstract spatial relationships, height, length, depth or whatever terms you want to use for those three spatial relationships.

But, those relationships are purely mathematical, they are not physical. Space itself has no dimensions, we simply identify mathematical relationships to describe spatial relationships.

So, even if tomorrow I showed that all of the math of string theory works, you still have an issue. What does the math really mean? Does it mean that space has all those dimensions?

If not, what does it mean?

You see, you have to be aware that your theory requires a rational interpretation of observable reality. You cannot simply come up with a series of equations, show the math works and then interpret that math however you want. That is a huge failing of modern physics and why so much of it makes little or no sense.

You have to provide a rational interpretation of the math that is concordant with a rational metaphysics and which describes how reality actually works. Not how you think it works.

Which is the real issue here: What do you think string theory implies? Because many of the things that people think it implies cannot be proven to be true, as they violate rational metaphysics.

Hence, in a sense, much of string theory can never be proven to be true. If you hope to be able to prove any of it to be true, then you have to make sure it is rational as well.

As it stands right now, I see very little chance of that happening…

Why are there still opponents of the theory of relativity?

Some people oppose it because they do not like the physics or do not understand it. I would estimate that most "opponents" of relativity theory fall into this category. These people are either cranks or people that do not understand the theory. In both cases, they are generally not all that interesting.

But, then there is the second category. These people understand special relativity but disagree with many of the interpretations of reality offered by the theory.

Let me explain.

It is evident that the mathematics of relativity, both special and general relativity are beyond any serious doubt. They have been verified time and time again. But, what does the math imply?

Does it imply that time is a dimension? No, dimensionality is a purely mathematical concept. Not an aspect of physical reality.

Does it imply that time dilates? No. Time is not an aspect of reality or something that dilates. It is a purely abstract, relational concept used to measure motion or change.

Does it imply that space distorts? No. Space is also an abstract, relational concept, not a physical aspect of reality.

And so forth.

But, some of you will complain, we have proven that time dilates and space bends!

Have you though? You have shown that time-measuring devices act differently at high speeds. Which is very interesting indeed. But that does not show that time, which is an *abstract concept,* is affected by high speeds.

You say that you have shown that gravity seems to cause space to bend. Or, at least, that is how you interpret what you observe. But, if space is a relational concept, how can that be?

Perhaps what you observe does not mean what you think it means. Perhaps it implies very different things and we do not understand its implications as *well* as we think. And we are therefore ignorant of some very important facts…

Worth thinking about, no?

How can an absolute nothingness produce a something?

It cannot. This should be extremely obvious.

When we say “nothing” we simply mean that within a given area, there are no things, at least no things of interest, within that area.

In other words, it simply means that there are no entities there. At least not the kinds of entities we are interested in.

But, an absolute nothingness would mean that there would be no entities of any kind. Nothing would exist, at least within this area of alleged nothingness.

That means that there is no “it” to produce anything. To “produce something means that something exists so that it can take the actions required to produce this something. But, if there is no “it”, then there is nothing to produce anything.

So, what the question is actually asking is: “If there is nothing to act, how can the thing that does not exist, produce a something?”. Which makes no sense at all, it is an obvious contradiction.

The question supposes action devoid of entities, as though action can exist without entities to act! As though action can exist devoid of things that act. Which is again an obvious contradiction.

Actions are the *actions of entities.* Not of the absence of entities.

Is the universe eternal?

What do you mean by “the universe?”

If you mean, “all the things we observe” now, I do not think that all of them will exist forever.

If you mean “Everything that exists, at least within the area of space we can communicate with”, then I think the answer is basically the same.

But, properly speaking, the “universe” refers to everything that exists. This would include every “universe” in the sense physicists sometimes mean when they refer to “different” universes.

By “universe” they sometimes mean areas of space which can be observed or interacted with. Those parts of existence are separated out into different universes. Max Tegmark and other cosmologists like to do this.

But, in fact, all of those “universes” are in fact part of the same “everything that exists”. They are just different observable regions of the same universe.

This is my main objection to the concept of “multiverse”. You cannot have more than one of “everything that exists”. By definition everything is *everything*.

I think that whatever happens to the state of matter in our “universe”, whether the galaxies go away or all the stars burn out, there will always be *something* that exists.

What form that takes, I could not say. Perhaps if someone in billions of years was to look out into space, they would not see stars and planets as we know them, who knows. Perhaps no living entities will be there to do so.

But, that does not mean that there will be nothing that exists. Something will exist. There is no alternative to existence, to something existing in some form.

So, in that sense, the universe is eternal, as whatever exists, exists. So there is always some “totality of existence”.

[Are waves in water an example of particle-wave duality?]

No. But, perhaps this is a good chance to explain the issue of particle-wave duality.

When you say “there is a water” wave, what are you referring to? Which physically existent entities are you talking about?

For that matter, what are waves?

We will start by answering the latter question.

A wave is a *relational concept*. It refers to the cyclical motion of something or some other cyclical change in one of its other properties. In other words, it is simply an abstraction which identifies certain patterns in somethings behaviour.

But, does a wave physically exist? No. It is an abstraction, nothing more.

Ah, what about water waves, they exist, right? The water molecules certainly do. They are arranged in a certain pattern and we call that pattern a “wave”. But, the wave is an abstraction. What exists is the water.

It is similar if you look at things on a quantum scale. If you observe a wave, then you are observing something which is waving.

Ah, you say, but we observe that a photon (or an electron or what have you) actually is a wave. Just look at the double-slit experiment.

But, that is not the case. If you observe a wave, then you observe something waving. A wave is not a form of matter, nor do entities themselves physically exist in the form of waves. As waves are abstractions, not a form of existence.

Whenever you see a wave, you are seeing something waving. That is, something exhibiting some kind of wave behaviour.

What does this have to do with the question? Well, something. Nothing is an example of particle-wave duality. As nothing that physically exists is a wave, only something that waves, then *nothing* can be a particle and a wave at the same time.

How deep is Deepak Chopra's understanding of quantum physics?

I would say that it is virtually nonexistent. He does not really understand much of what quantum physics *actually* says.

He likes repeating phrases such as “quantum-leap” or “discontinuity” without having very much understanding of what such concepts mean in quantum physics.

Now, granted, those ideas can be very difficult for one to get their head around. So, if it was just that he did not use them very *precisely*, I think we could cut him some slack.

But, he uses them in a very sloppy, ignorant fashion that it is clear that he has made very little effort to understand what the ideas are supposed to mean.

This is complicated by the fact that he almost never corrects his mistakes, no matter how many times he is corrected.

But, what should we expect? Clearly, he is not an honest person. He has no interest in reality nor understanding ideas. He is more interested in using confusing terms in order to make himself seem smart so that he can fleece people out of money.

Why does he use so much quantum quackery? Because there is a lot of really difficult to grasp stuff in this part of physics.

But, more than that. There is a lot of nonsense. Such as particle-wave duality, the idea of things being in indeterminate states, quantum leaps and the like.

I know this is a very unpopular opinion in most circles: But any rational person should reject many of the *interpretations* offered in much of mainstream quantum physics.

Why? Because they are nonsense. And they help to undermine the credibility of science.

How is that? Well, if I am right and quantum physics has a lot of nonsense in it, then it is easy for people like Chopra to use it to try to make their own nonsense sound credible.

They are in effect saying:

“Look, science says my mystical mumbo-jumbo is true!”

And how can that be good for science? It clearly is not.

But, the bigger issue is that quantum physics is so mystical in the first place. The fact that Chopra is so prone to using it to try to bolster his nonsense is no coincidence.

Why do you think his kind almost never claim that the Laws of Motion back up their stuff? Or that the laws of electromagnetism back them up (although, some of them do try this)?

Because other parts of physics are not on the side of the mystics and do not seem so nonsensical.

It is just too easy to appeal to quantum physics. It seems so strange and mystical, yet it is supposed to be science!

What kind of attitude do you think that fosters about science?

Not a good one …

Can't there be a thought experiment for String Theory?

Of course, there *can* be. I see no reason why someone could not come up with thought experiments for string theory.

First, we should ask what a thought experiment is? Let us say that it is a mental exercise where you test a hypothesis in your mind and try to work out what that hypothesis implies.

One can probably do this with string theory. I would concede that given a lot of physicists do not know what string theory really means, it would be hard for them to figure out what it implies. But, I suppose it is at least conceivable that they might be able to do so.

But, the real question is, of what use is this? And what does it prove?

Well, I suppose it would be nice to know what string theory implies, whether or not that implication is useful, well one would hope so. Perhaps that implication suggests string theory is absurd or cannot be tested or perhaps it can be tested in this way.

But, what would the thought experiment prove? Nothing in itself. One still has to go out and test whatever they figure out with their thought experiment. While they might figure out some useful ideas, they are still doing science and they need to test those ideas.

So, a thought experiment is not a substitute for performing actual experiments. But, that is not to say that thought experiments cannot be useful. They can be, if you figure out the implications of your hypothesis that you can then verify one way or another.

Is it possible that the laws of physics are not constant throughout the universe?

Perhaps we should first ask “What are the laws of physics?”

They are not some magical rules written into the fabric of reality which makes things act the way we observe. No, that is a very Platonic kind of view.

What we are really talking about here is that things always act according to their nature and that they cannot act in any other way. Under normal conditions on Earth, a balloon will float upwards, a brick will fall if you drop it from a height and so forth.

When we talk about, say the “law” of gravity, we are not talking about some rule written into the universe which things somehow know to obey. It simply refers to the fact that things subject to gravity act in certain ways.

They act that way because that is their nature and they have to behave that way. To not do so would be a violation of their nature, which is not possible.

The term “law” simply describes (or approximates) what will happen with certain entities in a given context.

When we talk about the “laws of electromagnetism”, we are referring to the fact that given that the electromagnetic field exists, things subject to it must act in this way. They must, since it is in their nature to react to the electromagnetic field in this way.

So, given that the laws of nature are just things acting according to their nature, is it possible that in some part of the universe the laws of physics are not the same?

Well, we should remember that we are talking about things acting according to their nature. But, this is contextual. Meaning, that things will act as they should, but how they should depends on the context.

It depends on the nature of the entities involved, what the nature of other relevant entities are and how they interact.

If you take one entity, it might have a different nature and therefore act differently to a particular entity.

If you take entity A and it interacts with entity B, a different thing might happen than if A interacts with entity C.

The nature of what happens depends on the context.

But, in the same context, the same thing will always happen in every part of the universe.

Let's suppose you have entities A and B in location C and they take action D. If the same entities do the same thing in location E, then all else being the same, the same things will happen.

So, yes, in the sense the same “laws” will apply in every part of the universe.

But, the “laws” are contextual. In as far as they describe what will happen in a given context but may not apply to other contexts.

But, as where they do apply, they will always be the same. Since the “laws” merely describe things acting according to their nature, which they must always do.

Outro

That brings us to the end of this episode. I hope you enjoyed the answers to these Quora questions!

Some news, In April we will be launching our subscription content. This will be content which can be accessed for the very small monthly fee of $2. Although, you can donate more, if you want to help support the show or the creation of our articles.

Thanks for listening!

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Any amount contributed is received with appreciation and goes towards time and resources spent on producing and promoting the show!

As always, you are welcome to send in questions about any of the things talked about in this episode or about irrational stuff in physics or the philosophy of science in general. Send them to questions@metaphysicsofphysics.com.