Re: THIS STATEMENT HAS NO PROOF IN ANY SYSTEM = true or false?

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From: Keith Ramsay (*kramsay_at_aol.com*)
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examachine@gmail.com wrote:
| Mitch Harris wrote:
| > That is probably so. The emotional reaction I do know I had was with
| > your statement "there can be no such thing as continuum in the
| > physical world", which sounded just too (baselessly) authoritarian to
| > pass up comment.
|
| I do not mean to be authoritative. That would be a Torkelism.

Well, he doesn't generally sling around this kind of loose claim the way you're doing. If you don't want to sound like you're presenting yourself as an authority, stop using such phrases as "just doesn't exist", "it _cannot_ exist", "there is no such thing" without giving some solid reason to believe that they're accurate. I think you're just being very glib.

| I think the evidence for a discrete world far outweighs the evidence
| for a continuous world, which is basically non−existent.

On the contrary, there's essentially no evidence that the world is discrete. Really, there's not much that could reasonably be called evidence in either direction.

If the world were discrete, one could hope to observe the fact by examining it at a small enough scale. In principle, then, one should be able to model it at that level. But none of our best actually working models of the world is entirely discrete.

The approach to quantum gravity known as "spin networks" comes close, but still the state of a system is a superposition of states, where the weights can vary continuously. John Baez has pointed out that it's also consistent to have both a model such as the spin network

model and a model in which the states are treated as having
continuous space. The model is discrete in some respects
and continuous in others.

There are problems that naturally arise for lots of ways
that you could attempt to produce a discrete model of
nature. Ones that treat space as a lattice, for example,
tend to predict the existence of "preferred" directions
in space, or a preferred state of rest, which we don't see.
Getting a discrete model to be relativistically invariant
is a bit of a challenge.

| If the world were continuous, then there might be a way to store a
real
| number as a physical property. However, all storage devices have to
| rely on fundamental properties in the atomic world which are _all_
| discrete, e.g. quantum physics.

Not unless you assume what you're setting out to prove. If
we record something on an analog device, there usually is no
reason to think that the value being stored is one of a
discrete set of possibilities. People read about how the
energy levels of a bound system are discrete and get the
idea that according to quantum mechanics all quantities are
discrete, but it's not so.

A lot of the arguments that are put forth in favor of nature
being discrete are really only arguments in favor of nature
being modelled by a separable space. In topology a space is
separable if it has a countable dense subset. By giving
enough discrete information one can (apparently) describe a
physical situation to any desired degree of accuracy. But
if so that merely means that the state is a point in some
separable space, not that there is some ultimate level of
precision on which there are discrete steps from one state
of the system to the next.

| There is also something called Heisenberg's uncertainty principle.
Why
| would I believe that something exists beneath the Planck scale, while
| our physics tells us that you cannot physically subdivide the Planck
| scale.

Where does it say that? The Planck length is simply a length
small enough that to model physics on that scale, quantum
gravity effects have to be taken into consideration.

| There is no such thing, as far as I can tell, as to measure time
| or space in fractions of the Planck scale. I would of course be
| interested to know if there is a work that shows the Planck scale is
| bogus!

It's not so much that it's bogus, as that you're interpreting
what it means in a simplistic way. The state of a small piece
of space may well be in a superposition, where the location or
identity of points is indeterminate in some way. It doesn't
follow that the way to think of them is as a finite or even as
a countable collection.

| The problem with that kind of a belief is its similarity to
theological
| "reasoning". There is something called "God" that is fundamentally
| unobservable, but some people believe in its existence. Substitute
God
| with continuum. (That is I object also on metaphilosophical grounds)

I don't think the analogy is a good one. The only obvious
common feature of the two ideas is that you don't like them.
You're treating belief that something (like space) is
continuous as if it were the positive belief in some exotic
entity.

But it's the idea that space is discrete that's the positive
claim, not yet observed or verified. If space is discrete,
we presumably will eventually have a theory that identifies
the individual bits of it and can tell us how large a gap
there is, experiments that exhibit the effects of there
being such granularity, and so on. This has not happened
yet. No, physics does not currently treat space as being
made up of little points sprinkled around at around a Planck
length apart; it just doesn't.

One common point of view of atheists is that the existence
of God is something that similarly might be experience (if
only it were actually true), but that so long as they have
no such experience, they will opt for the assumption that
there is none. Belief in the continuity of space is often
of the same form: show us a length scale on which space is
made up of discrete points and we'll agree it is, but until
then we won't assume that there is such a scale.

Of course it's actually worse than that, because it might be
that on some scale nature works to a *close approximation*
like a discrete model, but on even closer inspection the
discrete model also turns out to be inaccurate. So it's not
at all clear to me that there can be a final and convincing
answer to the question. (Actually, the same issue has been
pointed out in relation to theology; it's a little hard to
see how one would be entirely sure that any experience one
had had was actually of God.)

Continuous models are not necessarily any more complicated
than discrete ones, so Occam's razor and the like don't

guide us away from tentatively assuming space is continuous
either.

| The only "evidence" for a continuous world is classical and
| relativistic physics cast in the language of geometry which makes
use
| of real−valued numbers, that is they are no evidence. (How can a
| "theoretical assumption" be an evidence?) If we take particle physics
| seriously, which we should, we cannot say that they are equal ways of
| describing the world.
|
| Here, something interesting you might ask: but the wave function is
| continuous right? Right. Does the wave function exist? I don't think
| so. It is merely another theoretical instrument.

It's fine to be circumspect about how well your models
correspond to reality, but you can't be arbitrarily
selective about it. For the time being, the best models
we have (simplest and covering the most phenomena) have
some kind of continuous element to them. Maybe you think
you can see beyond the veil presented by our models of
nature, and see that nature itself is one way or the
other, but I don't see how. Meanwhile, the best guide we
have to how nature is is given by those theories.

I don't consider the continuous nature of theories of
physics to be very strong evidence that nature is actually
continuous, but I think it's strong enough to refute the
glib assertions you've been making here, that a continuum
in nature just can't exist.

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In some sense I would say all of this is fairly irrelevant
to the meaningfulness of the continuum hypothesis. One way
that physics supports the meaningfulness of mathematics is
by deducing physical consequences with the use of certain
mathematical facts. You would be on much more solid ground
if you claimed merely that the continuum hypothesis will not
be needed to deduce observable consequences of any physical
theory. I think that's probably true.

On one axis, there's a gulf between Platonism and several
other philosophies of mathematics. Appealing to physics here
might sway some people toward thinking that some mathematical
question is or is not directly meaningful, but the Platonist
has already bitten the bullet in deciding that the meaningfulness
of a question doesn't depend upon there being any way even in
principle for us to answer it, either by proof, calculation,
or experiment.

Keith Ramsay