Re: Epistemology 201: The Science of Science

Source: http://sci.tech−archive.net/Archive/sci.physics/2005−03/2181.html

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From: Lester Zick (*lesterDELzick_at_worldnet.att.net*)
Date: 03/03/05

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Date: Thu, 03 Mar 2005 23:36:02 GMT
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On 3 Mar 2005 12:35:46 −0800, stevendaryl3016@yahoo.com (Daryl
McCullough) in comp.ai.philosophy wrote:

>Lester Zick says...
>
>>I've read many over the years on SR and GR. None deal with the actual
>>mechanics. They're just descriptive.
>
>That's all that science *ever* is. Science consists of coming up
>with models (or descriptions) for the way the world works. The
>model is not the world any more than a map of a city is the city.
>But hopefully it is close enough that we can use it for guidance,
>for prediction.

This is pretty much what scientists say science is because they've
proven dismal failures at mechanical explanations for much of anything
from quantum effects to relativity.

>>I'm simply referring to our location is space relative to the origin
>>of BB or whatever temporal origin we imagine there is. If these are
>>concentric or radially opposed we have an isotropic isomorphic
>>relation between the two metrics, temporal and spatial.
>
>I don't know what you mean by "two metrics"? As I said, the word "metric"
>has a very specific meaning in special and general relativity, but that
>notion of metric is a *spacetime* metric.

There is a metric associated with the origin of time and a spatial
metric associated with us and if the two are not concentric and not
diametrically opposed there would be an anisotropic isomorphism for
time and space defined in terms of those metrics.

>>But this requires the special assumption of a privileged place for
>>us in the universe.
>
>I don't know why you think that. As I explained to Albert, one way
>to understand this is to look at a simpler model with only one spatial
>dimension and one temporal dimension. Think of the surface of the

>Earth as 2D spacetime. Longitude (East−West) represents spatial location,
>and lattitude (North−South) represents temporal location. The beginning
>of time (the Big Bang) is the South Pole, and the end of time (the Big
>Crunch) is at the North Pole. At the beginning of time (the South Pole)
>there is only one spatial point, and all the matter that exists at that
>time is in one point. Then at later times (that is, farther north), space
>expands till it reaches its maximum expansion at the equator. Then it
>starts contracting again, until all of space is contracted at a single
>point again at the North Pole.
>
>Asking where (spatially) the Big Bang took place is like asking what
>is the longitude of the South Pole. The South Pole doesn't have a longitude,
>or it has all possible values of longitude, because the South Pole is a
>single point.

I don't care where BB took place. I just care whether it had some origin and whether we are assumed to be concentric with that origin or diametrically opposed to it and if not what the implications would be.

>>Let me see if I can explain this anisotropic isomorphism by means of
>>an analogy another poster used. Let's suppose for the sake of argument
>>that BB occurs at (0,0) and we are located at (5,5) and we're looking
>>in the direction of (10,10) and see the same red shift as at (0,0).
>
>I'm not sure what those coordinates are supposed to mean.

They're just elementary 2D cartesian coordinates. There's nothing special about them.

> In terms
>of the simplified model of 1 space dimension and 1 time dimension,
>a point in a closed spacetime is characterized by a lattitude (from
>90 degrees South to 90 degrees North) and a longitude (from −180
>degrees to +180 degrees). Lattitude represents time and longitude
>represents spatial location. To say that space is
>homogeneous is to say that for any circle of constant lattitude
>(representing the universe at a specific time), all points are
>the same. Each point on a line of lattitude is as much "at the
>center" as any other point. To say that space is isotropic is
>to say that looking East, things look exactly the same as when
>looking West.
>
>To say that space is expanding is to say that the circumference
>at 60 degrees South lattitude is greater than the circumference
>at 59 degrees South lattitude.

Okay, Daryl. I offer my example to explain the geometric anomaly in omnidirectional cosmic red shifts and you reject it and insist on your own example to explain my thinking. You don't understand my example and I don't understand yours. It's another pitfall of reasoning by example so I guess we'll just have to leave the subject wherever it is.

>>Now we understand we are looking back in time as we look in the
>>direction of (10,10) but the difficulty is we are looking at (10,10)
>>and not (0,0) where time actually began, the temporal metric origin.
>
>You can't "look" in the direction of the past or the future. Any
>direction you can turn is pointing in a spatial direction.

And any direction you look you look into the past. That means if you look out far enough you're looking at the origin of time.

>>Okay. But there is one part of Euclidean geometry that is accurately
>>reflected in Cartesian coordinates and that is the idea that straight
>>lines are the shortest distance between points. Non Euclidean
>>geometries just ignore this problem by claiming things cannot or
>>simply don't travel in straight lines.
>
>That's not quite right. In non−Euclidean geometry, a "line"
>is *defined* to be the shortest path between two points,
>but the path must be *in* the space. So considering the
>surface of the Earth to be a non−Euclidean 2D geometry,
>the shortest distance between two points on the surface
>of the Earth is a "great circle" connecting those points.
>Great circles are the lines for the Earth.

And straight lines are still the shortest distance between points in Euclidean and non Euclidean geometries alike even if you can't traverse them.

>>But that doesn't alter the fact straight lines remain the shortest
>>distance between points whatever other assumptions are made.
>>Euclidean geometry thus remains the limiting notion implicit in
>>every non Eucidean geometry possible in this respect and must be
>>accounted for whatever special assumptions are employed in addition.
>
>That's pretty much right. Every non−Euclidean geometry can be
>built up out lots of little pieces, each of which is approximately
>Euclidean.

Not at all what I had in mind. Every non Euclidean geometry has to be built up on the properties of straight lines plus further assumptions.

> Any manifold, Euclidean or non−Euclidean, looks Euclidean
>if you zoom in on a small enough piece. The surface of the Earth is
>a non−Euclidean 2D surface, so there are inevitable distortions if
>you try to draw a proportionally correct map of the Earth on a flat
>piece of paper. But if you aren't mapping the entire Earth, but just
>a single small town, then the non−Euclidean nature of the Earth
>becomes unimportant.
>

>>As long as lines in any form are used in any geometry of any order,
>>straight lines remain the shortest distance between points in geometry
>>claims to the contrary notwithstanding.
>
>Basically, what you are asserting is that space *must* be Euclidean.
>But why must it?

Correct because straight lines are the shortest distance between points and straight lines are all uniquely straight but all curves are not uniquely curved. So the definition of space requires straight lines if it contains points. There can be non Euclidean assumptions in addition but the definition of space is essential to all geometries.

>>>Sure, in the same way that saying that the northern border of the US
>>>is the same as the southern border of Canada doesn't make it so. Geometry
>>>is *descriptive* of the universe, and my point is that everything you
>>>need to know about the geometry of the universe is conveyed by a
>>>complete collection of maps for parts of the universe, together with
>>>a specification of which maps are overlapping. There is no need to
>>>postulate a higher dimension in order to describe a non−Euclidean
>>>universe.
>>
>>Unless a higher order space is required to accommodate objects
>>postulated to explain the effects described.
>
>Why is a higher order space required? It's true that if you want
>to embed the non−Euclidean geometry inside Euclidean geometry,
>you have to use a higher−dimensional Euclidean geometry to do
>the embedding. But why must it be embedded in Euclidean geometry?

Because space is common to all geometries and Euclidean assumptions regarding straight lines are common to all points in any space. This is the sense in which I meant Euclidean geometry represents the limit for non Euclidean geometries in general.

>>Your explanation for
>>contiguous shapes seems to require a higher dimension than the one
>>postulated for the shapes themselves.
>
>Only if you want to put together the object inside Euclidean
>space.

Which space do you prefer and continue to describe it in terms of dimensionality defined in Euclidean spatial terms. Otherwise there is no reason to use the term dimension at all.

>>>>A Kline bottle is a 3D object.
>>>
>>>I don't know why you would say that. Its intrinsic geometry is
>>>2D−−−it is a curved surface. A Kline bottle cannot
>>>be embedded in Euclidean 3D, so I don't know in what sense you

>>>would call it a 3D object.
>>
>>My bad. I thought it was a kind of ellipsoid with a hole through it.
>
>The hole is only necessary if you try to embed a Kline bottle in
>Euclidean 3D space. It's kind of like trying to draw a knotted rope
>on a 2D piece of paper. You can't actually draw it without cutting
>holes in the rope for it to pass through itself. But in Euclidean
>3D you can have a knotted rope that doesn't have any holes. In
>Euclidean 4D, you can have a Kline bottle that doesn't require any
>holes.

So my idea of a Kline bottle in 3D space is correct?

>>>Maybe you don't know what a Kline bottle. One way to describe it
>>>is to take two Mobius strips, and glue their edges together. It
>>>can't be done in Euclidean 3D.
>>
>>So it's 4D? The mobius strip is 3D I hope?
>
>The Kline bottle is 2D, but it requires 4D if you want to construct
>it in Euclidean space. Similarly, a Mobius strip is also 2D, but
>it requires 3D if you want to construct it in Euclidean space.

Well here you use a different definition of dimensionality than the
idea of embedding space.

>>>Euclidean geometry obeys Euclid's axioms for geometry. In particular:
>>>
>>> 1. Given two points, there is exactly one line connecting them.
>>> 2. Given a line, and a point not on that line, there is a second
>>> line that passes through that point that is parallel to the first.
>>> 3. The sum of the interior angles of a triangle is 180 degrees.
>>>
>>>These are not true of non−Euclidean geometry.
>>
>>Well, Daryl, I think as described above that non Euclidean geometries
>>have to honor the idea of a straight line as the shortest distance
>>between points as long as they use lines in any form or shapes defined
>>in terms of lines of any kind.
>
>A line being the shortest distance between two points is true by
>definition.

It's true by assumption and exhaustion of curved alternatives as
longer and not definable between points at all. You can never define a
circle or any other curve or non straight line between points. If so
you could square the circle.

> However, the idea that lines that are parallel at
>one point are always parallel is not true for non−Euclidean geometries.

>For example, on the surface of the Earth, the "lines" are the
>great circle routes, and any two intersect, so there are no parallel
>lines.

Never suggested the contrary.

>>>>As far as I am concerned Euclidean space is just the three dimensional
>>>>manifold,
>>>
>>>No, it's a three−dimensional manifold with specific connectivity
>>>and geometry. The surface of a sphere is a 2D surface, but it
>>>isn't a Euclidean 2D surface.
>>
>>Which makes the surface of a sphere a 3D object even though
>>traversible along two mutually orthogonal coordinates.
>
>No, it doesn't. The dimensionality of a space is the number
>of independent directions in the space. On the surface of a
>sphere, there are two independent directions: East−West, and
>North−South. So it's two dimensional. 3D comes into play only
>if you want to consider the sphere embedded in a higher−dimensionality
>Euclidean space.

Well I had this discussion at length a couple years back. Since the spatial dimensionality I'm interested in comprehending is defined in terms of mutually orthogonal straight lines, I expect we'll just have to disagree although I see no point to using the term dimension to refer to anything other than embedding space. Why use the term at all unless you're trying to conceal the implication that certain objects require more than three basic spatial dimensions to be contained?

>In other words, *if* you insist that everything is embedded in
>Euclidean space, *then* what you say follows.

Until someone shows me some non Euclidean space where straight lines aren't the shortest distance between points and curves are definable between points, I guess Euclidean space will just have to do.

Regards − Lester