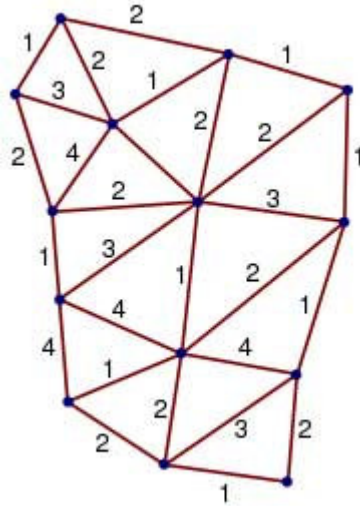


WHY THE SINGULARITY CANNOT EXIST and Why Loop Quantum Gravity is Wrong

by Miles Mathis



Some have still not understood my contention that mass cannot exist at a point, and that the point cannot exist in physics. Since this contention is at the heart of my critique of the calculus, General Relativity, QED, and string theory, I thought it best to give it a paper of its own.

In my paper on the calculus <http://milesmathis.com/are.html>, I exhaustively showed why the point cannot exist in any equations. Fundamentally this is because mathematical equations—in physics or out of it—consist of numbers, and the numbers we use operationally stand for lengths or intervals or differentials. Any number or variable or function stands for some extension, and therefore we cannot find solutions at points. I showed that it was a very basic definitional problem, and that it had existed since the time of Euclid.

Here I will show in more detail why we cannot have an object or a mass or an event or any material at a point. This should have been proved by my calculus paper, since if you cannot have any math at a point, you can hardly have any physics at a point. But I have further arguments against mass at a point, and it is possible these will be convincing to some readers where my calculus arguments were not.

A singularity is not just math at a point, it is mass at a point. It is believed by modern physicists that objects like black holes can disappear into singularities, and that the universe itself was once a singularity. Since the black hole and the universe are objects with mass, the claim must be that mass equations can have solutions at a point. They can't, simply because no possible mathematical equation can have a solution at a point: we would have to write our equations as the solution of

ordinal numbers, and that can't be done. But they can't for other very basic reasons, and those reasons are the ones we will look at here.

Mass is defined as density times volume. In other words, it is a density *in* a volume. So if your volume goes to zero, your mass must also go to zero. You cannot have mass in a zero volume, by definition of mass and volume. But a point must have zero volume, by definition. Therefore you cannot have mass at a point. And yet QED and GR both try to assign mass to points. The field equations of General Relativity were written by Einstein as the solution of the motions of mass points, and they are still in that general form (as I show below). Some mathematical variations have been applied to the field equations since Einstein, but none of these variations have jettisoned the point from GR. Tensors were, and still are, applied to points in space, even though this is and always has been strictly illogical. A tensor is basically a curved line or vector, and just as with a line, a tensor must logically be applied to an interval or differential. You cannot assign a line to a point, can you? That would be like assigning the color blue to the word “red”. A line is a line and a point is a point, and you cannot assign a line to a point. Likewise, you cannot assign a curved line to a point. A tensor, vector, or line must be applied to a length, or its mathematical equivalent. You cannot assign a length to a point, because a point has zero length.

We find the same problem in QED, where we see physicists applying tensors or events or changes or masses to points. For example, the photon is supposed to be a point particle, even though the two words contradict each other. A particle is a thing, while a point is a *nothing*. They will say it is OK, because the photon has no rest mass. But the photon does have energy, which by Einstein's equation is a mass equivalent. If you cannot have mass at a point, you cannot have energy at a point, either. This is basic logic. If you cannot have mass or energy or time or volume at a point, then you cannot have an event at a point. And yet modern physicists allow events at points all the time (see below). Gauge math is just like Einstein's math in this regard, since both base their fields or spaces on the same fundamental misconception of the point. Both misunderstand the point because both misunderstand the calculus. Modern physicists and mathematicians treat the point as a unit in their equations, which is like treating the zero as a mathematical unit. They are historically out-of-date in this by about 400 years, since the famous Flemish mathematician Simon Stevin showed in about 1600 that the point must be assigned to zero, not to the number one. The number one is the unit in all modern math, by definition. That is why we use the word “unit”: it comes from the Latin “unus, una, unum” which means “one.” Mathematicians accepted Stevin's analysis, and still do, but they don't appear to have let the idea sink in too far. Modern applied maths totally ignore Stevin's argument, which means we have regressed to the 16th century, before Newton, before Galileo—when they were still burning people for saying that the Earth moved around the Sun.

This is of utmost importance in modern physics because these modern mathematical spaces treat the point as the unit. In trying to create a field as the generator of the motions of mass points, Einstein was trying to assign zero to the unit in his math. His mass points are his units, you see. The numbers we find in solutions apply to them, so they are the units. But points as units is a pre-Stevin idea: it is a 16th century idea. Modern physicists and mathematicians are not more sophisticated than Galileo and Copernicus, they are less sophisticated.

The same can be said of QED, which does the same thing. As in GR, QED lets mass act as a unit. When QED finds mass at a point, it has assigned zero to its unit. This is why its equations have been rebelling from the beginning. This is why QED requires renormalization. When you assign zero to the unit in your math, your math will implode. It will start spitting out zeros and infinities,

and this is what causes the need for renormalization. Renormalization is the getting rid of these pesky zeros and infinities, by a sort of mathematical conjuring.

As I have shown, GR has equations that rebel in the same way. The field equations often implode, giving zeros or infinities as solutions. This is precisely what is happening in the math applied to black holes or to the big bang. The math is imploding, just as in QED. But rather than renormalize the field equations, physicists prefer (for some reason) to accept the infinities and zeros, giving them mystical interpretations. In QED, they don't like the singularities and infinities, so they renormalize them away. But in GR, they have found a use for them. In GR, they have made a physical object out of the mathematical failure, selling the singularity as the nut of all massive objects. Singularities are now found all over the place, in many new theories. They are said to explain magnetic monopoles, cosmic strings, domain walls, and even “fuzzballs”. The singularity is even given various dimensions! A domain wall is a two-dimensional singularity, for example. That is somewhat like a three-dimensional line, a unicycle with three wheels, or a ten-armed octopus.

Loop quantum gravity, developed by Abhay Ashtekar, Carlo Rovelli, and Lee Smolin since 1986, is the attempt to show that singularities cannot exist. The attempt is praiseworthy, but the method is not. These physicists are correct to excise the singularity, but the way they go about it is very incorrect. Rather than correct the math at the foundation like I have done, they have done as all modern physicists do, piling more new bad math on top of old bad math. They basically renormalize the field equations of GR. Although they do not renormalize with the same tricks as QED, they do renormalize, since renormalization can be defined (broadly) as removing zeros and infinities from imploding field or space equations. One trick used in loop quantum gravity is the spin network (see diagram top of page). I mention it because I want to start by showing you why this trick cannot work. At Wikipedia we find this:

A spin network, as described by Penrose in 1971, is a kind of diagram in which each line segment represents the world line of a "unit" (either an elementary particle or a compound system of particles). Three line segments join at each vertex. A vertex may be interpreted as an event in which either a single unit splits into two or two units collide and join into a single unit.*

Notice the use of the word “unit” here. You see that my analysis of the unit above was not just metaphysics or semantics, or a pointless historical aside. As you see for yourself, Lee Smolin and the rest are using a math in which a “vertex is interpreted as an event.” What is a vertex? It is a point. We have an event taking place at a point here, and I have already shown that is impossible. An event cannot take place at a point, by definition.

Some will say that in a spin network, the point is just a point on a diagram. But that is false. A spin network is a mathematical space applied to the field in GR, so that vertex on the diagram represents a point in the physical space of GR. If the vertex is interpreted as an event in the math, it is being assigned physically to an event in the mathematical space or field, which means that Smolin and the rest are just repeating the mistake that caused the problem. They are trying to correct an error by doubling it. Clearly, that cannot work. Loop quantum gravity works only by employing further tricks.

The working trick of LQG is to get rid of the background of QED. Unlike GR, the math of QED is background dependent. To quantize gravity, LQG has to get rid of this background. This has two benefits, one of which is admitted and the other of which is hidden. The first benefit is obvious: in getting rid of the background it is possible to join the maths of GR and QED (with a lot of mathematical finessing, anyway). This is the benefit we are hit over the head with in all the promotion. The hidden benefit is that by getting rid of the background, QED becomes free-floating like GR. In other words, the field is defined by its own curvature, rather than by its curvature relative to a defining field. The field is hung from skyhooks. The math defines itself. There is no mechanics and no possible mechanics, since the math provides the curvature itself. The reason this provides Smolin with a “trick” is that once you have removed the background, both your field and your math can be pushed without anyone noticing. Curvature that is “background independent” is really just undefined curvature. Mathematical quantities that are undefined can be manipulated to suit any desire. To say it more broadly, any non-Euclidean math that is background independent can be used to prove anything, as I show in my paper <http://milesmathis.com/euclid.html> on that kind of math. Non-Euclidean math that is background independent is like a skater on very slick ice: her position can be adjusted with a small gust of air from a hidden vent or a gentle cough.

By switching to a background independent math, Smolin is able to renormalize in ways the masters of QED never dreamed of. He has both the gauge theories of QED and the tensor fields of GR to work with, and what is more, he has detached the gauge theories from their backgrounds. By “looping” back and forth between the two maths, he is able to find “a minimum distance beyond which the force of gravity no longer continues to increase.” But with this amount of sloppy and undefined math, he could just as easily prove the opposite. A good mathematician can prove anything with that amount of wiggle room, and Smolin's findings are really determined by nothing except his desire.

The only way to “renormalize” the equations of GR and QED without cheating is to bring them back to normalcy by jettisoning the point. If you remove the point from all the equations, the equations will not rebel, they will not spit out infinities and zeros at inopportune times, and you will not be forced to correct them later. I have just shown how to do that. You start by re-evaluating the calculus, and you maintain that rigor as you define your fields, your particles, and your events. If you do that, a large percentage of the modern problems just evaporate.

For this reason and others, the entire agenda of quantizing gravity is wrong-headed. Gravity is being quantized in order to unify the gravity field with the E/M field, but unification is achieved by a different method altogether. What allows for unification is not quantization, as I have shown <http://milesmathis.com/g.html>; it is the recognition that Newton's equations and Einstein's field *already* contain the E/M field; it is the recognition that QED already contains the gravity field. It is not necessary to “loop” together the gauge math and the tensor field, or to combine them in any other way. What is necessary is to pull apart Newton's equations <http://milesmathis.com/uft.html> (and thereby Einstein's), finding the E/M equations within. What is necessary is to pull apart Coulomb's equation <http://milesmathis.com/uft2.html>, finding gravity within.

As a closer, I would like to point out that the term “renormalization” is another misnomer. When current mathematicians “renormalize” equations, they are not really returning them to normalcy. They are just bashing them around, trying to force them into the shapes they want. Renormalization is sort of like plastic surgery. Plastic surgery is not returning a face to normal; it is making the face doubly abnormal, but attempting to match the double abnormality to the original normalcy. Renormality should really be called bi-abnormality. To be accurate, mathematicians should call their manipulations “bi-abnormalization” or, better, “multi-abnormalization.”

