The Truth About Geometric Unity

Jonathan Tooker[1]

[1] *Occupy Academia, Atlanta, Georgia, USA, 30338*

(Dated: August 15, 2013)

Abstract

In May of 2013 a pair of articles appeared on the Guardian newspaper website featuring a new candidate "theory of everything" called Geometric Unity. A cursory reading of each article gives the impression that Geometric Unity was developed by Eric Weinstein, but a closer reading reveals that Weinstein is not credited as such. The truth about Geometric Unity is that it was authored by this writer in several papers beginning in 2009. This article will describe the development and prominent features of the new theory.

Alok Jha's recent Guardian article, *Roll over Einstein: meet Weinstein*, featured a new candidate "theory of everything" called Geometric Unity. As in Marcus du Sautoy's similar piece, the article reports the efforts of a former academic now working in finance, Eric Weinstein, who is presented as the author of the theory. However, when the articles are read with care, they only report that Geometric Unity is in Weinstein's area of study and that he showed the theory to others.

The truth about Geometric Unity is that it was authored by this writer in several papers beginning in 2009. These papers are all available free of cost through the open-access academic publishing archive viXra. Originally designated the Modified Cosmological Model (MCM), it is not clear who coined the mellifluous term Geometric Unity. What is clear is that the non-existence of any Weinstein papers on Geometric Unity is explained with an author search for Jonathan Tooker at viXra. This article will describe the development and features of the new theory.

Nima Arkani-Hamed, a physicist at Princeton's Institute for Advanced Study and winner of the Fundamental Physics Prize, is a popular figure in the philosophy of science. In recent interviews he has commented on two philosophical avenues by which fundamental physics may be advanced. These are conservative radicalism and radical conservatism.

Conservative radicalism is the doctrine of assuming something radical and then applying known physics to the assumption and studying the results. As an example, one might assume the sky is a strange sort of duck or that three is actually seven (or any number of marginally less absurd, *conservatively* radical technical things.)

On the other hand, radical conservatism is the reasonable approach to fundamental physics. Principles which are known to be true are applied in situations where they might not have an intuitive application. Development of the MCM was an exercise in pure radical conservatism. The thesis of the MCM is that perhaps momentum is conserved at all times, everywhere: a conservative thesis on any metric.

Before getting into the substance of the new theory, a few words on its context. While doing PhD studies as a Presidential Fellow in the Center for Relativistic Astrophysics at Georgia Tech, this writer had the privilege to attend three excellent lectures on fundamental physics in cosmology. One by Abhay Ashtekar and two by Sir Roger Penrose. The MCM was formulated as a direct response to the cutting edge ideas presented there.

Ashtekar demonstrated new analytical methods in the field of loop gravity which is a cousin of the more popular string theory. He explained that the show-stopping singularities at the beginning and end of a universe are avoidable. In place of a big bang and a big crunch (which is just like a big bang but at the end), loop gravity allows a series of big bounces where each universal collapse immediately springs back into a universal rebirth. The prevailing idea has been that there can't be anything before or after the universe due to singularities but loop gravity bouncing changed that.

Sir Roger gave one lecture about some very dense twistor mathematics and another about a paradox in the entropy of the universe. (Entropy is a measure of disorder.) It is a widely respected principle that the entropy of the universe always increases. That's the second law of thermodynamics. As the universe expands from the big bang, the entropy increases. Later, as the universe begins to contract under gravity the entropy continues to increase. Eventually it collapses completely and is exactly the same as when it began. (A big bang singularity is indistinguishable from a big crunch singularity.)

Here is the paradox: this makes no sense because the entropy of the crunch is by definition much higher than that of the bang. How can two identical structures have different levels of disorder? This problem was encountered in the lab as the Gibbs paradox and subsequently solved but as of 2009, no solution for this cosmological paradox had been found.

Enter the Modified Cosmological Model. Without getting too technical, most readers will know spacetime is 4D. What may be new to some is that just as ordinary momentum is conserved in 3D space, 4-momentum should also be conserved in 4D spacetime. If the universe is bouncing, it must be bouncing against something or else momentum isn't conserved. Think of the bounce as a point in space. As the universe collapses, matter falls into that point from all directions so 3D momentum is automatically conserved. All the matter moving left bounces against the matter moving right, the upward matter bounces against the downward matter, etc... All three dimensions of space conserve momentum easily.

Here is the tricky bit. Since spacetime is collapsing and not just space, there also has to be something moving backward in time for our forward time universe to bounce against. For 4-momentum to be conserved there has to be another universe. In the MCM, two universes bounce against each other, one in forward time and one in backward time.

This immediately solves Sir Roger's entropy paradox. As one universe has entropy increasing in forward time, the other universe has entropy decreasing in backward time. When they come together at the bounce the increased entropy of one universe is exactly canceled out by the decreased entropy of the other. It's simple. Each bounce is identical and has the same level of disorder as every other bounce. Paradox averted.

A byproduct of the two universe situation is a solution to the foremost problem in modern physics: dark energy. When we look at distant objects in the sky, we see them accelerating away and the more distant an object, the greater its acceleration. The simple and unambiguous measurement of this phenomenon earned the 2011 Nobel Prize in physics for Adam Riess, Saul Perlmutter and Brian Schmidt.

A few words on how gravity works. Alice and Bob suddenly teleport out into space and appear near a large mass. Whoever is closer to the mass will begin to move toward it more quickly than the other person. Since there is nothing around for reference, Alice and Bob will simply see each other start to separate. Regardless of who is actually nearer to the mass, Alice will think she remains stationary as Bob drifts away and likewise Bob for Alice. This is a simple statement of the principle of relativity. It's difficult to differentiate a situation where Alice moves away from Bob and one where Bob moves away from Alice.

Analogously, it's difficult to tell if the dark energy objects are accelerating away from Earth or if Earth is accelerating away from those objects. The common interpretation of the dark energy data has been that everything is moving away from the Earth in all three dimensions of space.

To interpret the data another way, replace Alice and Bob with Earth and the dark energy objects. Those objects are billions of light years from Earth so we are essentially looking at things billions of years in the past. This means that the Earth is billions of years closer to the crunch and gravity will act on it more strongly than on those other things in deep space. (The crunch is in the future so, in the sense of spacetime, the present is closer to it than the past.) Stronger gravity acting on the Earth causes the objects farther from the crunch to appear to recede as they accelerate more slowly.

In this situation, dark energy doesn't mean space is expanding. Instead time is expanding and the Earth is accelerating forward in time faster than distant objects. Both interpretations of the data are reasonable but unlike the common one, the MCM interpretation has a logical explanation.

Christoph Wetterich has proposed a third interpretation in *A Universe Without Expansion.* He has rigorously shown that if all masses constantly increase, the universe does not have to expand to account for dark energy. As an interpretation this is distinct, but mathematically it is equivalent to the MCM interpretation. In an equation, constant time with changing mass looks the same as constant mass with changing time. Since the mathematical formulation is essentially the same, Wetterich's result shows that the MCM interpretation is valid. Furthermore, the MCM interpretation remains the only one with a logical explanation.

By 2011 research on the MCM had reached a point that it no longer required a beginning and end to the universe to make sense. What the theory needed was an unknown ratio to push past a conceptual plateau. For obvious reasons, of the infinite possible ratios, the golden ratio was selected. This selection has been attacked as an absurd act of conservative radicalism but the scientific method does allow the assumption of precisely one extraneous thing in a course of research: the hypothesis. If the analysis resulting from the hypothesis makes sense, then the hypothesis is good. (If some useful insight is gained by assuming the sky is a strange duck then sky-as-strange-duck deserves some deep thought. *Quack*.)

Using the golden ratio as an input led directly to a connection between general relativity and the fine structure constant of quantum theory. (The MCM fine structure value is off by about 0.4% from what is measured in the lab but a consistent theoretical explanation for the deviation has been proffered. Future experiments will sort that out.) Bridging the gap between gravity and the quantum theory has been the primary goal of physics since those theories were first written down by Einstein and Heisenberg almost a century ago. This amazing positive result warranted further research into the MCM.

In early 2013 it was discovered that the MCM predicts all known elementary particles plus the existence of a new set of spin-1 particles called G and zeta. If the MCM is correct, the properties of these new particles should closely mirror the properties of the well known W and Z particles. Indeed the Higgs-like particle discovered at CERN in 2012 may turn out to be the G particle. Reporting in the non-academic press has stated that the new particle is confirmed as a Higgs but that's sloppy reporting. The new particle has not been identified. If it is a Higgs it must have spin-0 but the spin has not yet been determined. Until then it remains only Higgs-like.

In a 2013 paper available through CERN as CMS PAS HIG-13-016, the LHC's CMS group published evidence of another particle slightly heavier than last year's Higgs-like particle. This is more evidence in support of the MCM because the mass difference in the two new particles is the same as the mass difference in the W and Z. Furthermore, there is a slight anomaly in the decay of last year's lighter particle which may indicate the existence of a distinct anti-particle. The lighter of the W and Z – the W – also has a distinct anti-particle so this is another piece of evidence in favor of the MCM.

The purpose of the LHC is to test the predictions of theoretical physics and hopefully discover unexpected new things. With that in mind consider the following passage from the aforementioned CERN paper regarding the spin of the Higgs-like particle discovered in 2012.

> "The Landau-Yang theorem forbids the direct decay of a spin-1 particle into a pair of photons. Consequently the spin analysis compares the expectation of the spin-0 [standard model] Higgs, and the spin-2 graviton-like model"

The context of that passage is that the new particle has in fact been observed to decay to two photons. However, also consider this passage from a 2012 paper by John Ralston entitled *The Need to Fairly Confront Spin-1 for the New Higgs-like Particle.*

> "The Landau-Yang theorems are inadequate to eliminate spin-1. Theoretical prejudice to close the gaps is unreliable, and a fair consideration based on experiment is needed. [*sic*] The Higgs-like pattern of decay also cannot rule out spin-1 without more analysis."

This situation is odd. The LHC group has already taken the data needed to run the analysis for spin-1 but is choosing not to do so since there is a theoretical argument against it. The whole point of building the LHC was to generate data which can be used to test theories but for some reason the group is choosing to hold the Landau-Yang theorem on high and not even bother to do the analysis.

Arkani-Hamed gave a lecture in 2012 entitled *The Inevitability of Physical Laws: Why the Higgs Has to Exist*. He states that while spin-0 and spin-2 are the primary focus of the analysis, there is no reason that the new particle or particles can't have spin-1. He makes an analogy pointing out that spin-1 would imply a "Russian doll" model of bosons within bosons. Russian dolls are a simple example of fractal structure and with the inclusion of the golden ratio, the MCM becomes a fractal model. Evidence in support of the MCM is overwhelming.

It is worth repeating that the data needed for the full spin analysis has already been taken. Nothing more than a bit of number crunching remains. There is a theory out there, known to some as Geometric Unity and to others as the MCM, which predicts spin-1 in a logically cohesive, extensively supported way but for some reason the scientists who are able to run the analysis are choosing not to do so. What are they waiting for?