In Defense of Rigor, In Defense of Epistemology, In Defense of Science

A Reply to "On The Fallacy of 'Gravitational Waves'"

July 16, 2016 • Benjamin Deniston

After reading the short July 14 article, "On The Fallacy of 'Gravitational Waves'"[1] I was compelled to write a reply to the author, to the readers of his article, and to the people who asked him to look into the matter of the recent gravitational wave detections by LIGO. In short, the lack of rigor coupled with the declarative nature of the claimed conclusions is a bit concerning. I hope this critique serves as a pedagogy for epistemology and science.

To get right into the substance of my critique, the author states,

> The issue, here, is not whether Einstein was right or wrong in hypothesizing the curvature of light in physical-space-time, but whether the reality of the curvature of physical space-time already proven by Einstein by means of a solar eclipse can be observed in the manner proposed by the LIGO group. The answer to that latter question is no, because the experiment of LIGO is a fallacy of composition.

He goes on to support this claim by saying,

> This LIGO experiment poses an interesting problem of epistemology, which I have been asked to look into briefly, because it poses a very serious question to a critical mind: How can a scientific experiment be proven by sense perception evidence or by the lack of sense perception evidence?

The troubling irony here is that, on the one hand, the LIGO experiment itself is claimed to be a "fallacy of composition" because it is said to be based on sense perceptual evidence, while, on the other hand, the author says "the reality of the curvature of physical space-time [was] proven by Einstein by means of a solar eclipse." What is the fundamental, *epistemological* difference between the observation of a star's position deviating from its expected location as a consequence of it's apparent proximity to the Sun, and the observation of beams light taking different times to traverse a distance as a consequence of the propagating effects of other gravitating bodies changing positions?

There is a difference between measuring the observed position of light and the observed time of light, sure. There is a massive difference in sensitivity of the instrumentation required for the two different types of observations, absolutely. There is a major difference in the complexity of the analysis required to predict what the expected deviations should be, definitely. But these are not epistemological differences.

However both examples depend upon being able to predict specific, precise deviations in observation – deviations unexpected and unexplained by the flat space, uniform time sense perceptual interpretation of the universe; deviations conforming to the type of space-time curvature expected from Einstein's principle of general relativity. The epistemology in these two cases – the issue of how we treat the relation between observation and actual knowledge – *is the same.*

Yet, one case the author claims to be the proof of general relativity, the other he claims to be a fallacy of composition.

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1 Pierre Beaudry, http://www.amatterofmind.us/on-the-fallacy-of-gravitational-waves/

If the author were claiming that there is a fallacy in the reasoning behind determining what signals LIGO should expect as a consequence of various processes operating in the context of general relativity, then that argument should be made – however that is not an epistemological issue, and incorrectly throwing around the term epistemology would be damaging to the importance of true epistemological investigations.

Word Games with 'Mathematics'

The author provides further condemnation of the LIGO results by saying the interpretation of the signal "is a mathematical construct not a reality in the heavens."

Again, for pedagogical sake, return to the author's statement that "the reality of the curvature of physical space-time [was] proven by Einstein by means of a solar eclipse." In that proof mathematics played essentially the same role. Based on Einstein's conception of general relativity, it could be mathematically calculated how much the position of a star should deviate as a function of it's apparent proximity to the Sun. That is not to say Einstein's original discovery process was mathematical, but if we're discussing the determination of what physical conditions should be associated with an effect of that new principle, and trying to predict how that effect will be expressed, a physical mathematics plays this secondary role.

It did with the solar eclipse observation, as it does with the signal detected by LIGO.

The determination of exactly what type of signals are to be expected from the processes associated with the recent LIGO detection is certainly much more complex and involved than in the case of the solar eclipse, but it is a quantitative difference in complexity of analysis, not a qualitative difference in epistemology or principle.

Again, if the author believes there is an error in the argument for what the particular signal detected by LIGO represents, then the author needs to make that argument and back it up – we should not disservice the all important distinction between mathematics and creative discovery with sloppy and wrong assertions and declarations.

If we take the deeper subject, the issue of Einstein's original creative discovery process, then the subject of mathematics vs actual science becomes the critical issue – however the ability to recognize and respect this all-important distinction is greatly diluted when it is falsely asserted in lazy fashion.

What is Mathematical Thinking?

I have not yet mentioned the subject which (from my reading of his article) appears to have what drove the author to make these unrigorous and sloppy arguments: the assessment that the signal detected by LIGO is the result of merging phenomena given the name black holes. It appears to me that the author's reasoning process revolves around his belief that there can be no phenomenon bearing any relation to what is presented under the name black hole, and his arguments are shaped to conform to that belief.

Ironically, it appears to be the author's adherence to his own axiomatic, pre-set belief system which has led (perhaps forced) him to make inconsistent and silly arguments, leading to the bold and careless assertion that the entire LIGO experiment is a "fallacy of composition" on epistemological grounds pertaining to mathematical thinking. Such examples of poor reasoning driven by adherence to an axiomatic belief system are, themselves, much better

pedagogical demonstrations of mathematical thinking.

Regarding the specific signal detected by LIGO, the author argues,

> How do you know that this is the effect of the collision of so-called 'binary black holes' and not some other noise? You don't really know. All you know is that a set of mathematical equations were constructed to give you the effect you were looking for.

First, regarding the author's question "[how do you know this isn't just some other noise?]" Without any proposed explanation for what the cause of this "other noise" would be, or why it would look just like what they were already looking for, this is a rather silly argument to rest upon. One could just as easily ask the same question about the deviation of a star's position near the Sun, "how do you know it isn't just something else?"

Second, it is not clear how "mathematical equations were constructed to give you the effect you were looking for." The specific character of a gravitational signal expected from such an event has been calculated and presented many years *before* such a signal was actually detected. Further, on epistemological grounds alone, this treatment of the signal LIGO detected isn't fundamentally different than the apparent displacement of the observed position of a star in close apparent proximity to the Sun. In both cases, the specific character of an expected deviation is calculated (either in an observed position of a star, or in the time it takes light to travel between two detectors), and observations are made to try and determine if that deviation is actually present or not – the relation between observation and knowledge in both cases is of the same character.

Again, if the author were claiming there is an error in the calculations pertaining to what this particular signal detected by LIGO actually represents, that would be a different argument, and would need to be presented and developed. Personally I am not presently qualified to determine if they did the calculations correctly, and I am also not qualified to assert they didn't – however holding up a vacuous and unsubstantiated claim of "epistemological" grounds as the basis for asserting the LIGO experiment is a fallacy is an insult to epistemology, and an insult to those who treat it seriously.

Open Questions, Not Closed Minds

What is presented by the LIGO team is the argument that for this particular space-time curvature signal to be generated two orbiting bodies would require certain masses and a certain orbital period, constraining the size of the orbit (by Kepler's harmonic law) and hence the size of the bodies and their density. When these relations are brought together the assessment is presented that the phenomena in question would require masses confined to volumes which meet the conditions of a general relativity space-time singularity – the conditions at which our present mathematical physics breakdown.

If this LIGO assessment is correct, it would be the best (but certainly not the only) evidence for the existence of such singularities.

What could actually be happening in such a physical process where our current mathematical physics breaks down in a singularity? What physical principles could govern such extreme regimes?

We don't know. And that should be an exciting prospect: new physical principles, yet undiscovered by man.

It is true we quickly confront extensive, highly speculative, mathematical-deductive "investigations" and proclamations about such phenomena.

Typical is the attempt to derive a mathematically consistent relation between general relativity and quantum mechanics in these regions, leading into the wacky world of string theory, for example. Such attempts to predefine the the undiscovered domain as mathematically-deductively consistent with, and derivable from the known are *actual* examples of the problem of mathematics having replaced science.

Perhaps the strong presence of these speculations is what has left a bad taste in the mouths of people about the whole subject, leading them to want to reject *anything* pertaining to the black hole-singularity discussion.

But don't throw the baby out with the bathwater!

Just because you have extensive bad mathematical speculation about this mysterious regime doesn't mean legitimate mysteries don't exist.

The true epistemological argument, to be made in the tradition of Plato, Cusa, Kepler, Leibniz, and LaRouche, is the expectation that new, higher-order physical principles will need to be discovered to understand this domain – principles which can not be deduced or derived, but only discovered by the power of human creativity, unique to the human mind.

My working hypothesis is to look at these singularities from the standpoint of the larger and more mysterious expression at the centers of galaxies as a critical clue to unlocking a higher understanding of the Universe as an anti-entropic, creative process.[2]

Don't fear the singularity – it is a shadow of creative discoveries yet to be made.

2 https://larouchepac.com/20160120/galaxy-project-vi-singularities-and-anti-entropy