Does the Leech Lattice Constrain String Vibrations?

ABSTRACT

Is Milgrom the Kepler of contemporary cosmology? If X is to string theory as Kepler's laws are to Newtonian theory then what is X? What questions should string theorists ask? Are string vibrations confined to 3 copies of the Leech lattice? If string vibrations are confined to 3 copies of the Leech lattice, then what might be the implications for Einstein's field equations? Does inertial resistance to gravitational acceleration become infinite as energy density approaches some natural upper limit? Is nature infinite if and only if the equivalence principle is 100% empirically valid? Consider Fredkin's finite nature hypothesis: In any mathematical model related to physics, a complete infinity is either a mathematical convenience or a physical mistake. What might be the implications of the Fredkin hypothesis for gravitational theory? Does Wolfram's automaton create approximate symmetries that falsely appear as completely valid symmetries above the Planck scale? Do string vibrations cause an unexpected inertial resistance to gravitational acceleration? This brief communication discusses the idea: (Inert mass) * Acceleration = (Intensity of the gravitational field) * (Gravitation mass) * (Scale factor related to the Leech lattice).

FOUNDATIONAL QUESTIONS AND THE LEECH LATTICE

What is the physical meaning of Milgrom's acceleration law? Is Newton-Einstein gravitational theory 100% correct?

"If it disagrees with experiment, it's wrong. In that simple statement is the key to science." — Richard Feynman

https://www.youtube.com/watch?v=b240PGCMwV0 Feynman Chaser - The Key to Science – YouTube

"If every individual student follows the same current fashion in expressing and thinking about electrodynamics or field theory, then the variety of hypotheses being generated to understand strong interactions, say, is limited. Perhaps rightly so, for possibly the chance is high that the truth lies in the fashionable direction. But, on the off-chance that it is in another direction - a direction obvious from an unfashionable view of field theory - who will find it? Only someone who has sacrificed himself by teaching himself quantum electrodynamics from a peculiar and unusual point of view; one that he may have to invent for himself. I say sacrificed himself because he most likely will get nothing from it, because the truth may lie in another direction, perhaps even the fashionable one." — Richard Feynman

http://www.nobelprize.org/nobel_prizes/physics/laureates/1965/feynman-lecture.html Richard P. Feynman – Nobel Lecture: The Development of the Space–Time View of Quantum Electrodynamics

"As the universe expands and cools down, it may undergo one or more SSB phase transitions from states of higher symmetries to lower ones, which change the governing laws of physics." — Yoichiro Nambu

http://www.nobelprize.org/nobel_prizes/physics/laureates/2008/nambu-lecture.html Yoichiro Nambu – Nobel Lecture: Spontaneous Symmetry Breaking in Particle Physics: a Case of Cross Fertilization

“How does it come about then, that great scientists such as Einstein, Schrödinger, and De Broglie are nevertheless dissatisfied with the situation? Of course, all these objections are levelled not against the correctness of the formulae, but against their interpretation. Two closely knitted points of view are to be distinguished: the question of determinism and the question of reality.” — Max Born

http://www.nobelprize.org/nobel_prizes/physics/laureates/1954/born-lecture.pdf Max Born – Nobel Lecture: The Statistical Interpretation of Quantum Mechanics

“Classical physics represents that striving to learn about Nature in which essentially we seek to draw conclusions about objective processes from observations and so ignore the consideration of the influences which every observation has on the object to be observed; classical physics, therefore, has its limits at the point from which the influence of the observation on the event can no longer be ignored. Conversely, quantum mechanics makes possible the treatment of atomic processes by partially foregoing their spacetime description and objectification.” — Werner Heisenberg

http://www.nobelprize.org/nobel_prizes/physics/laureates/1932/heisenberg-lecture.html Werner Heisenberg – Nobel Lecture: The Development of Quantum Mechanics

What are the most important lessons to be learned from Feynman, Nambu, Born, Heisenberg, Bohr, and Einstein? Are quantum field theory and general relativity theory mathematically incompatible because general relativity is slightly wrong?

"I have now struggled with this basic problem of electricity for more than twenty years, and have become quite discouraged, though without being to let go of it. I am convinced that a completely new and enlightening inspiration is needed; I also believe, on the other hand, that the flight into statistics is to be regarded as a temporary expedient that by-passes the fundamentals." — Albert Einstein, letter to Cornelius Lanczos, 14 Feb. 1938

http://books.google.com/books/about/Albert_Einstein_The_Human_Side.html?id=2fswAAAAQBAJ&pg=PA68 "Albert Einstein, The Human Side" edited by Helen Dukas & Banesh Hoffmann

“While correlation is a measurement of the degree of association between two or more variables, it gives no indication of the kind of cause and effect relationship that may exist among the variables. A high degree of correlation in two variables, of course, implies that there must be a reason for such close association; but the cause and effect relationship can be revealed explicitly only by other knowledge of the factors involved being brought to bear on the situation." — Howard L. Balsley, p. 168 of "Introduction to Statistical Method", 1964, Littlefield, Adams & Co.

"In a theory in which parameters are added to quantum mechanics to determine the results of individual measurements, without changing the statistical predictions, there must be a mechanism whereby the setting of one measuring device can influence the reading of another instrument, however remote. Moreover, the signal involved must propagate instantaneously, so that such a theory could not be Lorentz invariant. Of course, the situation is different if the quantum mechanical predictions are of limited validity. Conceivably they might apply only to experiments in which the settings of the instruments are made sufficiently in advance to allow them to reach some mutual rapport by exchange of signals with velocity less than or equal to that of light. In that connection, experiments of the type proposed by Bohm and Aharonov, in which the settings are changed during the flight of the particles, are crucial." — John Stewart Bell

http://philoscience.unibe.ch/documents/TexteHS10/bell1964epr.pdf "On the Einstein Podolsky Rosen Paradox" by J. S. Bell, 1964

"Beneath Quantum Mechanics, there may be a deterministic theory with (local) information loss. This may lead to a sufficiently complex vacuum state, and to an apparent non-locality in the relation between the deterministic ("ontological") states and the quantum states, of the kind needed to explain away the Bell inequalities. …

… My primary concern is that Quantum Mechanics, in its present state, appears to be mysterious. It should always be the scientists' aim to take away the mystery of things. It is my suspicion that there should exist a quite logical explanation for the fact that we need to describe probabilities in this world quantum mechanically. This explanation presumably can be found in the fabric of the Laws of Physics at the Planck scale.

However, if our only problem with Quantum Mechanics were our desire to demystify it, then one could bring forward that, as it stands, Quantum Mechanics works impeccably. It predicts the outcome of any conceivable experiment, apart from some random ingredient. This randomness is perfect. There never has been any indication that there would be any way to predict where in its quantum probability curve an event will actually be detected. Why not be at peace with this situation?

One answer to this is Quantum Gravity. Attempts to reconcile General Relativity with Quantum Mechanics lead to a jungle of complexity that is difficult or impossible to interpret physically. In a combined theory, we no longer see "states" that evolve with "time", we do not know how to identify the vacuum state, and so on. What we need instead is a unique theory that not only accounts for Quantum Mechanics together with General Relativity, but also explains for us how matter behaves." — Gerard 't Hooft, 2002

http://arxiv.org/pdf/quant-ph/0212095v1.pdf "Determinism Beneath Quantum Mechanics" by Gerard 't Hooft, 2002

"Quantum mechanics as it stands would be perfect if we didn't have the quantum-gravity issue and a few other very deep fundamental problems. I want to understand what will happen to the Standard Model as we pursue higher energies, I want to understand what quantum mechanics is about, and I want to understand how gravity works. The suspicion is, probably, answers will come as a package. You can't just solve one problem without touching the others; they're probably related. Maybe you have to solve all the problems in one giant stroke. If that's the case, then you have a long fight ahead of us, because it's going to be very difficult." — Gerard 't Hooft

http://blogs.scientificamerican.com/critical-opalescence/2013/10/07/does-some-deeper-level-of-physics-underlie-quantum-mechanics-an-interview-with-nobelist-gerard-t-hooft/
"Does Some Deeper Level of Physics Underlie Quantum Mechanics? An Interview with Nobelist Gerard 't Hooft", Critical Opalescence, Scientific American Blog Network

"For a long time, it was presumed that the cosmological constant $\Lambda = 0$. Only very recently, strong indications were reported for a tiny, positive value of Λ. Whether or not the term exists, it is very mysterious why Λ should be so close to zero. In modern field theories it is difficult to understand why the energy and momentum density of the vacuum state (which just happens to be the state with lowest energy content) are tuned to zero. So we do not know why $\Lambda = 0$, exactly or approximately, with or without Einstein's regrets." — Gerard 't Hooft

http://www.staff.science.uu.nl/~hooft101/lectures/genrel_2010.pdf "Introduction to General Relativity" by Gerard 't Hooft

Is the following scenario empirically valid? The multiverse is finite and digital. There are a huge, but finite, number of alternate universes. The multiverse has 2 basic parts: (1) a boundary that contains all the measurable physics and all the measurable alternate universes, and (2) an interior that consists of non-measurable physics. Photons and gluons cannot escape from the particular universe in which they are located. Gravitons travel at the speed of light on average. A statistically significant few gravitons travel slower than the speed of light. These slow gravitons cause the Fernández-Rañada-Milgrom effect. A statistically few gravitons travel faster than the speed of light and escape from the boundary of the multiverse into the interior of the multiverse. These fast gravitons cause the nonzero cosmological constant and the inflaton field. Electromagnetic radiation from the inflaton field shows up as the space roar. If the fast gravitons never escaped from the universe in which they are located, then the slow gravitons and the fast gravitons would average out, yielding Einstein's field equations with cosmological constant = zero and dark-matter-compensation-constant = zero.

http://vixra.org/abs/1401.0226 "What Is Measurement? Why Does Measurement Exist?"

"We prove that the Leech lattice is the unique densest lattice in R^24." — Henry Cohn & Abhinav Kumar
http://arxiv.org/abs/math/0403263 "Optimality and uniquess of the Leech lattice among lattices"

Does the Leech lattice have some profound physical significance that string theorists do not yet understand?

"Strings could split and rejoin several times, in a process that would be analogous to a multi-loop Feynman diagram in Quantum Field Theory. The associated string world sheets

then take the form of a torus or sheets with more complicated topology: there could be *g* splittings and rejoinings, and the associated world sheet is found to be a closed surface of *genus g* ." — Gerard 't Hooft
http://www.staff.science.uu.nl/~hooft101/lectures/stringnotes.pdf "Introduction to String Theory", version 14-05-04, by Gerard 't Hooft

Is the Leech lattice the best hope for overcoming severe topological ambiguities that occur in string theory when string theory rejects Fredkin's finite nature hypothesis? If a worldsheet can have an arbitrarily large genus and if string vibrations are unconstrained by any lattice structure, then how could string theorists derive a computational method for string theory?

TWO VIEWPOINTS

VIEWPOINT 1: Classical reality is an approximation to quantum reality. Measurement modifies quantum reality.

VIEWPOINT 2: Classical reality is an approximation to quantum reality, and quantum reality is an approximation generated by Wolfram's automaton. Measurement is a natural process that creates quantum reality using 3 copies of the Leech lattice and Fredkin-Wolfram information below the Planck scale.

EQUIVALENCE PRINCIPLE

According to Einstein ("The Meaning of Relativity", 5th edition, 1956, p. 57), "A little reflection will show that the law of the equality of the inert and gravitational mass is equivalent to the assertion that the acceleration imparted to a body by a gravitational field is independent of the nature of the body. For Newton's equation of a gravitational field, written out in full, is

(Inert mass) . Acceleration = (Intensity of the gravitational field) . (Gravitational mass).

It is only when there is numerical equality between the inert and gravitational mass that the acceleration is independent of the nature of the body."

What did Einstein mean by the phrase "independent of the nature of the body"? If "independent of the nature of the body" means independent of the energy-density within and surrounding the body, then we should agree, at least in terms of energy-density, with Einstein's statement that "It is only when there is numerical equality between the inert and gravitational mass that the acceleration is independent of the nature of the body."

Is the correct physical interpretation of string theory completely consistent with Einstein's equivalence principle? Do the Leech lattice, the monster group, and the 6 pariah groups enable M-theory to have a computational method?

If strings vibrations are somehow controlled at the Planck scale by the Leech lattice, then there might be extreme inertial resistance to gravitational compression provided that the energy-density is large enough. In other words, the Leech lattice might cause large deviations from Einstein's field equation when and if nature encounters a conflict between lattice compression and gravitation intensity. Consider the hypothetical equation:

(Inert mass) * Acceleration = (Intensity of the gravitational field) * (Gravitational mass) * (Scale factor related to the Leech lattice).

How might the preceding equation be given a precise mathematical formulation?

POSSIBLE MODIFICATION OF THE FIELD EQUATIONS

Consider Einstein's field equations:

$$R_{\mu\nu} - \frac{1}{2} g_{\mu\nu} R + g_{\mu\nu} \Lambda = \frac{8\pi G}{c^4} T_{\mu\nu} .$$

I have suggested that the -1/2 should be replaced by -1/2 + dark-matter-compensation-constant. Now consider replacing T(mu,nu) by T(mu,nu) * (scale factor depending upon energy-density). The simplest idea might be to use T(mu,nu)/(1 – (T(mu,nu)/T(max))^2)^1/2 as the replacement. Would this simple replacement prevent the mathematical formation of black hole singularities? What does currently existing empirical evidence imply for estimates of T(max)?