

# Loop Quantum Gravity: BETTER than String Theory?

Smyčková kvantová gravitace: LEPŠÍ než teorie strun ?

7 087 zhlédnutí

Premiéra: 1. 7. 2021

my comment and opinions will be in red font

**(01)-** In the last days of his life albert einstein remained vexed by a problem he had devoted so much of his life to how to reconcile his theory of general relativity with the emerging field of quantum mechanics this problem still blows cosmologist's mind even to this day any sufficiently advanced technology is indistinguishable from magic general relativity tells us how the presence of matter curves and warps space-time changing the trajectories of massive objects like planets and altering the experience of time itself this theory our most successful in all of physics has given us the best descriptions of large-scale motion but as we shrink down to size scales below the size of atoms we start to see problems emerging some of the most vexing problems come from the infinite energies that emerge at the infinitesimal short ranges at subatomic scales some emerge from how general relativity changes the results of quantum mechanics with the bending of space-time to illustrate how this happens imagine space-time as a flat trampoline pulled taut with massive objects on it the objects viewed from above act in very predictable paths if we let the trampoline surface change we start to see the objects deflecting rolling in ways we wouldn't normally expect the surface itself is deformed and the actors the particles the massive planets themselves are affected the trampoline is still the same but its shape has changed we call this transformation in terms of the shape of space adiophiomorphism and we call the invariance of it diffumorphism and variance but the objects are not independent of the background they're on trying to do quantum mechanics in a dynamically changing spacetime is like trying to draw a picture on a piece of paper as it flutters in the wind in an esoteric sense quantum mechanical fields can become self-interacting when the background itself is changing general relativity describes space-time and how it deforms quantum mechanics tells the story of the objects acting upon it our understanding of each of them independently is great but putting them together reveals fundamental disagreements some of these disagreements are so violent it's impossible to make any prediction for many years theorists tried to work with background dependent models of the universe but what if the background itself could be redefined in a way such that it gave us our independence diffiomorphism and variants back ironically this modern question is actually quite ancient sometime around the 5th century bce greek and indian scholars proposed that matter was not continuous but gritty and indivisible at the smallest level the idea was championed by canada and the greek philosopher democritus today we have robust evidence and models of atoms and even subatomic particles from the proton and neutron down to the quark level it's natural to wonder if a parallel phenomenon exists for space and time and space time itself if so there could be a smallest interval a smallest length and a smallest time we call this process of chopping up space into tiny pieces quantization exactly as we do with matter itself by dividing up or pixelating space time depending on the dimension of the underlying space itself we see that space itself could be quantized whether in one dimension two dimensions three dimensions or any arbitrary number of dimensions you would choose the secrets of chemistry were explained with the quantization of matter in the same way perhaps the secrets of physics quantum mechanics the subatomic scale could be

explained by quantizing space-time if so it could remove the infinities and unpredictable behavior at the quantum scale that general relativity introduces as well as other issues in physics that have gone unresolved for almost a century establishing a fundamental minimum distance scale was the goal of early loop quantum gravity physicists the first step was to lay the groundwork of the theory choosing an advantageous variable set and finding new ways to describe the universe theoretical physicist lee smolin describes loop quantum gravity as a theory of quantum spacetime based only on experimentally well-conformed principles of general relativity

.....

**(01)**- In the last days of his life, Albert Einstein remained angry about the problem he had devoted so much of his life to, how to reconcile his theory of general relativity with the emerging field of quantum mechanics. I regret him. And I'm surprised he didn't entrust the task to mathematicians who can write "the transition from symmetry (which is an equation) [http://www.hypothesis-of-universe.com/docs/h/h\\_082.jpg](http://www.hypothesis-of-universe.com/docs/h/h_082.jpg) to the form of asymmetry" ... , or to those who can deal with how the linearity of the foam turns into the form of non-linearity, e.g. a parabola and that is gravity. They must have known that the "quantum world" is essentially a "boiling foaming chaotic space-time" in linear form, i.e. that the quantum world is a very-very curved grid of 3+3D space-time dimensions, e.g. [http://www.hypothesis-of-universe.com/docs/eng/eng\\_008.jpg](http://www.hypothesis-of-universe.com/docs/eng/eng_008.jpg) ; ...

[http://www.hypothesis-of-universe.com/docs/c/c\\_016.jpg](http://www.hypothesis-of-universe.com/docs/c/c_016.jpg) ; [http://www.hypothesis-of-universe.com/docs/c/c\\_029.jpg](http://www.hypothesis-of-universe.com/docs/c/c_029.jpg) ; [http://www.hypothesis-of-universe.com/docs/c/c\\_036.jpg](http://www.hypothesis-of-universe.com/docs/c/c_036.jpg) ;  
[https://i.gifer.com/origin/4f/4f57eac50c99d4b3f03c01de39ee5c5c\\_w200.gif](https://i.gifer.com/origin/4f/4f57eac50c99d4b3f03c01de39ee5c5c_w200.gif) ;  
[https://i.gifer.com/origin/d7/d77576aa54be8097d393e6eba9c8b3bd\\_w200.gif](https://i.gifer.com/origin/d7/d77576aa54be8097d393e6eba9c8b3bd_w200.gif) ;  
[https://i.gifer.com/origin/72/727483b79aaecd78dac06fc023847b24\\_w200.gif](https://i.gifer.com/origin/72/727483b79aaecd78dac06fc023847b24_w200.gif) ;  
[https://i.gifer.com/origin/93/93ce9fab270e75a130f7f1317bade76c\\_w200.gif](https://i.gifer.com/origin/93/93ce9fab270e75a130f7f1317bade76c_w200.gif) ;  
and gravitationally curved space-time (around bodies) that is actually already  
"unpacked=unpacking a boiling vacuum", an unpacked space-time. And this boiling vacuum of dimensions is unpacking from the moment of the Bang, that is, they are unpacking the curvature of dimensions up to the "parabolic" curvature of gravity. And the unfolding of the existence of the initiated linearity = boiling space-time happens at the same time according to the "hot potato" rule. [http://www.hypothesis-of-universe.com/docs/eng/eng\\_008.jpg](http://www.hypothesis-of-universe.com/docs/eng/eng_008.jpg)

Mathematicians could write that **transition from linear foam to quadratic nonlinearity?** right? At least that's my idea of "quantum mechanics". This problem still blows the cosmologist's mind to this day.. because physicists do not realize that in the Universe there is no equation, no balance exists there and if it does, then it immediately turns into an asymmetry, a violation of symmetry ... because for 20 years now my "hot potato principle" on the internet, but they don't read it, or they laugh at it !![http://www.hypothesis-of-universe.com/docs/h/h\\_082.jpg](http://www.hypothesis-of-universe.com/docs/h/h_082.jpg) advanced technology is indistinguishable from magic, general relativity tells us how the presence of matter and deformations of space-time curves change the trajectories of material objects, OTR is the (non-linear) equation of "expanded" space-time; 3+3D grids... such as the planets, and changes the experience of time itself, this theory, the most successful in all of physics, has given us the best descriptions of motion on a large scale, but as we scale down to size scales below the size of atoms, we begin to see problems, which appear as the "parabolically curved space-time" begins to curve more and more into that linear foam [http://www.hypothesis-of-universe.com/docs/c/c\\_036.jpg](http://www.hypothesis-of-universe.com/docs/c/c_036.jpg) some of the most vexing problems come from infinite energies appearing at infinitesimally small distances on subatomic scales, some come from how general relativity changes the results of quantum mechanics by bending spacetime, that's what I'm saying : the foam of quantum mechanics is expands and goes into slightly curved gravity OTR (I'm not a mathematician so I can't express it exactly)...OTR "bends" space-time on the macro level of scales and QM also "bends" dimensions 3+3D space-time on the micro level so that it is a "balance of curved dimensions" ..as my interaction equations of elementary particle behavior say, the standard model. <http://www.hypothesis-of-universe.com/index.php?nav=eb> → ♦ these are all

equations of interactions between "curved dimensions inside elem. particle" ; interaction between wave packets, between element. by particles to illustrate how this happens imag in spacetime like a flat trampoline stretched with massive objects, the objects when viewed from above act in very predictable paths, if we let the surface of the 3+3D trampoline change, we start to see objects deflecting in a way that we would normally they did not expect itself is deformed and the actors of the particle of the massive planet itself are affected the trampoline is still the same but its shape has changed we call this transformation in terms of the shape of space adifiomorphism and its invariant we call diffumorphism and dispersion but objects are not independent of the background, they try do quantum mechanics in a dynamically changing space-time, more curved 3+3D spatiotemporal states float in less curved 3+3D states np even the less curved one "floats" in a totally flat Euclidean grid-grid-yarn of spacetime. it's like trying to draw a picture on a piece of paper , how it shakes in the wind in an esoteric sense, quantum mechanical fields can become self-interacting when the background itself changes, general relativity describes space-time and how it distorts quantum mechanics, tells the story of objects that act n is our understanding of each independently of the other great, but putting them together reveals fundamental disagreements, some of these disagreements so violent that they are impossible to predict for many years when theorists tried to work with background-dependent models of the universe, but what if the background itself could be redefined in such a way , that ironically gave us back our independence and variants. This modern question is actually quite ancient sometime around the 5th century, as Greek and Indian scholars proposed that matter was not continuous but rough and indivisible at the smallest level. This idea was promoted by Canada and the Greek philosopher Democritus today we have solid evidence and models of atoms and even subatomic particles from the proton and neutron down to the quark level it is natural to wonder if there is a parallel phenomenon for space and time and spacetime itself if it could there is the smallest interval, the smallest length and the smallest time we call this process of slicing space into small pieces precisely quantizing or pixelating space-time depending on the dimension of space itself that we see, we see that space itself can be quantified, whether in one dimension two dimensions three dimension or any number of dimensions you choose the mysteries of chemistry were explained by the quantization of matter in the same way, perhaps the mysteries of subatomic scale quantum mechanics physics could be explained by the quantization of spacetime, that is, not only to cut-quantize matter into small pieces, but also to quantize space-time into small pieces (which is again close to my concept of "producing" elementary particles from the dimensions of np themselves by wrapping-entangling the dimensions into balls) if it could remove the infinities and unpredictable quantum-scale behavior introduced by general relativity, as well as other problems in physics that remain unsolved for nearly a century, and establishing a fundamental minimum distance scale was an early-cycle goal of quantum gravity physicists, i.e., as a first step to lay the foundations of a theory of favorable variable selection sets and finding new ways to describe the universe, theoretical physicist Lee Smolin describes loop quantum gravity as a theory of quantum spacetime based only on the experimentally well-suited principles of general relativity that is, not only to cut-quantize matter into small pieces, but also to quantize space-time into small pieces (which is again close to my concept of reality, "producing" elementary particles from space-time dimensions themselves by packing-entangling dimensions into balls)

---

(02)- and quantum mechanics he notes four observations that make up the backbone of the theory the first any theory using our understanding of general relativity must be background independent second our idea of the background and how it dynamically changes should be consistently true when we reach the very smallest world of quantum mechanics the last two observations are related to how we use the field theories themselves they're important for making sure there is no universal proper time coupled quantum fields that muddy the math or extra dimensions that we don't observe together these observations inform the quantized nature of space time the earliest breakthroughs of the theory involve special solutions of the

**wheeler-dewitt** field equation fitted with astrocarr variables i know that's a mouthful but this is where we get our loops they're the solutions of a field theory with these special variables solutions of the **wheeler** to what equations allow you to describe quantum phenomena with gravity present the solutions are parallel transported connections that describe curvature in space-time more abstractly properties of space-time can be depicted as functions on a space of loops this stitching work pattern can be the mathematical basis for the nature of space-time and quantum gravity springs from the interaction of the loops themselves from this point physicists like **Carlo Rovelli** spent several years trying to tighten up the mat in the mid 1990s constructs of loops were chained together creating something called a spin network the spin network describes the geometry of space the loops and nodes move to represent ticks of time and when energy or mass is present integration over the affected loops gives us the properties of quantum gravity that we're looking for there are several benefits of loop quantum gravity compared to other theories of quantum gravity we don't have to assume that physical objects like strings or extra dimensions exist we don't have to prove the symmetries or compactified dimensions that string theory or other theories introduce and we can still solve the most important problems such as describing the entropy as formulated by the beckenstein hawking formula without adding new assumptions to the math one last benefit is now there is a lower limit on the length of the universe which restricts the frequency of electromagnetic waves making infinitely high frequencies impossible so we're all done right loop quantum gravity has so much promise it must be the exact solution well it has a lot of promise but it has some glaring issues as well it doesn't answer some questions about what the masses of the elementary particles are it doesn't provide much insight on the discrepancies of quantum mechanics by itself for this reason it might only be the seed of a so-called theory of everything that has yet to fully sprout another concern many physicists have with loop quantum gravity is that it makes predictions about the velocity of photons being dependent on frequency and perhaps even on the polarization of photons light from a very distant object called a gamma-ray burst produces photons say two of which come towards the earth at the same moment by looking for slight variations between the arrival time from two different photons with two different frequencies we can test for the fundamental granularity of space-time inherent in loop quantum gravity nasa's fermi gamma-ray space telescope detected two photons from the same source nine tenths of a second apart in 2009 this experiment was a significant blow to theories of loop quantum gravity because over such a massive time scale the photons traveled to the same speed within one part in 100 million billion it's possible that another experiment one perhaps testing the polarization of light instead could reveal some evidence for loop quantum gravity for now many theorists find this frequency discrepancy's failure to be revealed as a blow against loop quantum gravity remember back when michio kaku author of the god equation and a huge proponent of string theory had this to say about loop quantum gravity well the problem is that gravity is based on smooth surfaces smooth elegant beautiful gorgeous manifolds well matter is based on chopped up particles that you grind up and spit out like a meat grinder it's all cut up and so loop quantum gravity which in which field does it fall into it falls into the gravity field but says nothing about electrons protons quarks mesons the hundreds of scientists the hundreds of particles that we have analyzed nothing about it it's a theory of pure gravity and therefore it is simply not a unified field theory which even the creators of the theory acknowledge they'd be the first ones to say that their theory is not a rival the string theory it's just an alternative an alternative for gravity but not for electrons protons quarks you and me basically finding a way to merge general relativity

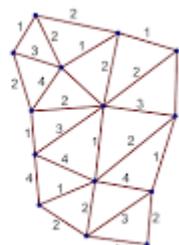
---

(02)- and quantum mechanics notes **four** observations that form the backbone of the theory, the **first** theory using our understanding of general relativity must be independent of the background, **And by background is meant what? .. ? It's a 3+3D spatio-temporal grid, isn't it true?!** **second** our idea of the background **how it should dynamically change**, but how else than that background, that spatio-temporal grid **if we consistently achieve that the smallest world of quantum mechanics.** **The last two, i.e. the third and fourth** observations are related to

how we use field theories themselves, and fields are always warped states of curved space-time dimensions which are important to ensure that there are no universally correct time-bound quantum fields to cloud the mathematics or extra dimensions that we do not observe these observations together inform the quantized nature of spacetime. The earliest breakthroughs in the theory include a special solution to the Wheeler-De Witt field equation equipped with astrocarr variables, I know it's a mouthful, but here we have our loops, they are field theory solutions. So far, I have not thoroughly understood exactly what physicists mean by the word loops in field theory". In my understanding of HDV, these are packets, wave packets, geons, cocoons, balls, quite clear...; in quantum gravity it's not entirely clear to me → what are their "loops" made of, and in real-physical what and in mathematical notation ??? with these special solutions of the Wheeler to whit equations make it possible to describe quantum phenomena of gravity. The solution is a parallel transported connection that describes curvature in spacetime. Abstractly, the properties of spacetime can be represented as functions in loop space, I still don't understand; it is said here: *the curvature of spacetime can be represented as a function of loops in space*. Maybe I should understand that the original continuous space-time, flat (!) is broken into discrete 3+1 locations in the "new" theory and these will be called loops ??, yes ? [http://www.hypothesis-of-universe.com/docs/c/c\\_411.jpg](http://www.hypothesis-of-universe.com/docs/c/c_411.jpg). But it is not the dismemberment of the "flatness of dimensions", but the "twisting - coiling - wrapping" of dimensions into discrete packages (you say "loop"). Spacetime appears granular, but "how do loops-cells-quanta-knots look topologically" is still not explained? This field is as trivial as the field of "zeros and ones", as the field of "space and non-space", i.e. the field of "something and nothing", as the field of "white and black dots"... There is nothing very special about it... but it would be if you accepted my invention that those loops = bundles of twisted dimensions present matter, they present those elementary particles of the Standard Model as described by my HDV. This working stitch pattern may be the \*mathematical basis\* for the nature of spacetime and quantum gravity springs from the interaction of the loops themselves. So space-time now has a new nature according to "the loops themselves"? Well, what is "nature"?...well, it's a presentation of matter, material elements = matter is built from the dimensions of space-time by "packaging". I've been presenting it to the world for 40 years and they're all blind

From this point, physicists like Carlo Rovelli spent several years trying to tighten the pad. ? In the mid-1990s loop constructions ( What do the loops look like "under the microscope", I couldn't find anywhere that the picture below is the "dots" "loops" ??...?? ) were joined together to form something called a spin network (WIKI says that a spin network is a "type of diagram"). Ah, so it has nothing to do with matter, it's just a poor diagram\*, i.e. that crooked gravitational space-time is parceled out \*\* into triangles\*\* while the essence of space-time, which is dimensional, disappeared !! Rovelli made it into "dash-connectors" and .. that's it - we have a diagram..., Rovelli crushed physical space-time into "grain-quanta" - god knows what - , he connected them with "dashes" and the world is a spin net. and and he said he worked on it for several years Ha-ha. Hooray.

Spin network  
(Spinová síť)



the spin network describes the geometry of loop space which are sort of parcels = triangles on curved spacetime to achieve linearity. This is more deception than wit. And it's nothing new.., already 35 years ago RNDr. V. Ullmann explained how it is linearized (\* the original correspondence is underlined below\*) e.g. a conic section of a parabola is taken, it is cut into infinitesimal pieces = line segments and they are assembled again into a straight line... and that's it. And I objected to him that this is a fraud on principle. So Carlo Rovelli did not invent

anything new and revolutionary. [http://www.hypothesis-of-universe.com/docs/g/g\\_039.pdf](http://www.hypothesis-of-universe.com/docs/g/g_039.pdf) It is a fraud on principle. They parceled out the granular "curved artifact" and then assembled it into a "non-curved state", a kind of polygon, and called it a spin network of "loops" and the nodes move to represent the ticks of time, yes : there are nodules on the time dimension of the 3+3D grid and they move, shift = roll along the dimension that "stands" [http://www.hypothesis-of-universe.com/docs/c/c\\_426.jpg](http://www.hypothesis-of-universe.com/docs/c/c_426.jpg) and when energy or matter is present, integration over the affected loops gives us the properties of quantum gravity, so you say "integration" "over the loops" gives you the "properties" of matter, mass elements ??!??! Although you say it in a way that's a bit of a pain in the ass, this is logically consistent with my HDV, where I believe that the "topological-geometric shape" of the package of dimensions = particles of matter re-presents the "properties" of matter-element of matter. That is, the shape of the packed dimensions and the number into a ball is presented to us as a PROPERTY, i.e. mass is also a property, spin is also a property, charge is also a property, etc. that we are looking for, there are several advantages of quantum gravity, loops compared to other theories of quantum gravity, we don't have to assume that there are physical objects like strings of stringers or extra dimensions, we don't have to prove symmetries or condensed wrapped dimensions, which string theory introduces ..And I thought that physics "looks for" facts), but it can be seen that it does not, that physics "introduces" the Universe as it should have facts according to physicists. So how is it? Physicists "quantize" space-time dimensions, or is space-time itself quantized-granular on the Planck scales?? My HDV considers that the Universe itself is realized from the Bang into a "field of curved dimensions" and on the Planck scales it is "granular" and that curvature so big, high, that the dimensions are packed-wrapped in packages which are then those mass elementary particles, or other theories, and we can still solve the most important problems, such as the description of entropy formulated by Beckenstein Hawking m formula without adding new assumptions to the mathematics. If I understood correctly, Rovelli et al. they only did their variant ( LQG ) in pale-pink to string theory , i.e. instead of "strings" floating in space-time, they invented "loops" on a network, on a curved network, a gravitationally curved space-time smooth grid, to linearize gravity, so the loops are (?) or are not (?) "inside" the 3+1D network. And loops are "of dimensions"... or not (?) ; whereas in string theory the "string-strings" are "floating" in a 3+1D or 11D network. What difference does that make? LQG = Rovelli linearized space-time with those loops and they only describe gravity in a linear form. (?) The stringers invented "string-strings" and placed them in the 11D multidimensional space so they could vibrate at all. (?)

The final advantage is now a lower limit on the length of the universe that limits the frequency of electromagnetic waves, which makes infinitely high frequencies impossible, so we're all done, we're done...right loop, quantum gravity has so much promise that it has to be best solution, has a lot of promise but has some glaring problems doesn't answer some questions about what are the masses of elementary particles, doesn't provide much information about the inconsistencies of quantum mechanics itself, for this reason it would could only be the seed of a so-called theory of everything that has yet to fully develop another concern that many physicists have with loop quantum gravity is that it predicts the rate of deportment of photons At the frequency and possibly the polarization of photons light from a very distant object called a gamma ray burst produces photons, two of which arrive at Earth at the same time by looking for minute differences between the arrival times of two different photons with two different frequencies . We can test the fundamental granularity of spacetime's own loop quantum gravity NASA's Cosmic Gamma-ray Space Telescope detected two photons from the same source nine-tenths of a second apart in 2009, and this experiment was a significant blow to theories of loop quantum gravity because on such a massive time scale photons traveled at the same speed within one section traveled at the same speed but along a different trajectory, the otherwise long journey of that warped space-time for 100 million billion, it is possible that another experiment that instead tests the polarization of light may now for some theorists uncover some evidence of loop quantum gravity find the failure of this frequency discrepancy as a blow against loop quantum gravity, remember when

**Michio Kaku** the author of god's equation and a big proponent of string theory said this about loop quantum gravity, **said**, the problem is that gravity is based on smooth surfaces, smooth, elegant, beautiful and manifold solutions, matter is based on chopped particles, well, **he said it nicely, like HDV : in a smooth global unrolling continuous warped space-time "floating" chopped-chopped grains-knots-packages-geons of tangled packed/packed dimensions**, which, however, conglomerated into formations, into stars and galaxies... which you crush and spit out like a meat grinder, it's all cut up and so the loop of quantum gravity, in which field it falls, falls into the gravitational field, but it doesn't say anything about electrons protons quarks mesons hundreds of scientists hundreds of particles we haven't analyzed anything about it this is the theory of pure gravity, (**OTR is about mass**). **It's not about "making packages = elem. particles" and their interactions** and therefore it is simply not a unified field theory, which even the creators of the theory admit that **they would be the first to say that their theory is not a rival to string theory, it is just an alternative and an alternative to gravity**, but not for electrons, protons, quarks, you and I basically find a way to unify general relativity. **Don't mix OTR and QM...but invent a mathematical transition from a linear chaotic foam of dimensions (3+3D) to a less curved and non-linear gravity-parabolic curvature (3+3D), eg by alternating symmetries with asymmetries.**

.....

**(03)-** in quantum mechanics is still an urgent and pressing matter to this very day **loop** quantum gravity attempts to merge them both in a background independent way and is therefore very virtuous if loop quantum gravity can reconcile the various lacuna that theoretical physicists see in it and pass fundamental physical tests in observations of distant cosmological objects **perhaps someday it could be found to be not only a theory of quantum gravity but maybe even a theory of everything** i'm brian keating and this is into the impossible [Music] you

.....

**(03)-** v kvantové mechanice je dodnes naléhavou záležitostí **smyčky** kvantové gravitace se je pokouší spojit oběma způsoby nezávisle na pozadí, a je proto velmi ctnostné, pokud smyčková kvantová gravitace dokáže sladit různé mezery, které v ní vidí teoretičtí fyzici, a projít základní fyzikální testy v pozorováních vzdálených kosmologických objektů, možná někdy bude možné najít nejen teorii kvantové gravitace, ale **možná dokonce teorii všeho**, co by Brian bral, a to je do nemožného [Hudba] vy

.....

(\*) → in addition, a copy from the archive. It is on the net in the document  
[http://www.hypothesis-of-universe.com/docs/i/i\\_019.doc](http://www.hypothesis-of-universe.com/docs/i/i_019.doc) it is written at the end →

Mr. Professor, more than a month ago I sent you a letter with a question...and I didn't get an answer...so **a)** I don't know if you received the letter, **b)** or you don't want to answer, **c)** or you can't answer... and an answer so that I wouldn't bother you anymore, she would at least put an end to my question and put an end to something that I have fixed as an unfinished dialogue.

Thank you for ANY answer ( 10/27/2003 )

Finally Mr. Ullmann replied on 03.11.2003 this :

Dear Sir Colleague,

I'm sorry I haven't answered your question yet - you're not alone, I have a lot of pending correspondence. I've had a lot of work now, and besides, I'm not very orderly in dealing with various agendas, official materials, etc. - in short, your e-mail has reached the "lower geological layers". Regarding your question, this is a general method used in many fields. It's always nice when mathematical **formulas are simple**, and linear equations are like that.

However, this is rarely achieved in practice, so we basically help each other in two ways: 1. By a suitable **transformation**, which converts an originally non-linear relationship into a linear relationship (e.g. when interpolating an exponential function, we first perform the logarithm, then interpolate a simple **linear** function and inversely transform the whole thing and done).

2. If this is not possible, we **decompose the relevant quantity into a power series**, where the linear term has the greatest importance and validity, and higher power orders have the character of additional "corrections". If we are talking about small quantities (e.g. weak fields), their higher powers are so close to zero that we can neglect them in the limit - there is no "cheating" in this, but only a method to arrive at some relatively accurate values in complex cases results. And also a way to recognize some dependencies that we might miss in a complex non-linear model.

Sincerely Vojtěch Ullmann.

---

09/01/2001 he wrote

**\*\*Signpost: String Theory\*\***

(We especially thank Luboš Motl for his cooperation on this column) ( \***inserted comment will be from me - 19.01.2004\*** ) String theory is a contemporary attempt to bridge the gap between two major physics concepts: General Relativity, which applies on a galactic scale, and quantum physics, which investigates "microscale" phenomena. (The nonlinearity of gravity, apparently parabolic, >passes< into the linear interaction of the particles of the microworld. This is how physicists state it in various variations. Sure. But what is "passing" ??? It is similar to a sphere, a spherical surface of globally visible curvature it "transitions" in local places "in mini-scales" into a tangent plane and thus according to faulty logic it can be mathematically constructed as a linear equation. That's what physicists say and that's what they do, that's how Mr. V. Ullmann interprets it, that the equation of a spherical surface can be replace the equation of the tangent if the radius of the sphere is large and if the tangent is "local enough". The same in pale blue are those "renormalizations" of them I protest, it is a betrayal of principle ). It is believed that superstring theory could become the basis for a hypothetical "Theory of Everything" (TOE), which is considered a kind of Holy Grail of modern physics

---

JN, +kom 27.07.2021