"The representation of matter by a tensor was only a fill-in to make it possible to do something temporarily, a wooden nose in a snowman."

Albert Einstein's Last Lecture, Relativity Seminar, Room 307, Palmer Physical Laboratory, Princeton University, April 14, 1954

"In the first place, we entirely shun the vague word "space," of which, we must honestly acknowledge, we cannot form the slightest conception."


"According to the general theory of relativity space is endowed with physical qualities; in this sense, therefore, there exists an ether. But this ether may not be thought of as endowed with the quality characteristic of ponderable media, as consisting of parts which may be tracked through time."

A. Einstein, *Äther und Relativitätstheorie*, May 5, 1920

Panta rei conditio sine qua non est

It is suggested that the spacetime manifold is a dynamical entity re-created at every step of a hypothetical spacetime arrow; the latter is due to the "expansion" of space by the dynamic dark energy (DDE). Two modes of spacetime are postulated in this Phoenix Universe: local mode, in which we have point-like events cast on a perfect continuum, with a "carpe diem" unit probability (cf. the measurement problem in QM here), and a global atemporal mode, in which a Machian-type negotiation of every next step is being processed. The effects from the global mode of spacetime, which literally build up '3-D space', begin from the macro-scale of classical physics in two "directions": quantum effects toward the Small, and dark matter & dark energy effects toward the Large. Briefly, we model the universe as a huge brain which 'thinks' with its global-mode state by following the rule 'think globally, act locally'. The implications for quantum gravity are explained by revealing the two modes of spacetime in Quantum Theory and General Relativity, and by suggesting conceptual solutions to the problems and paradoxes hindering the quantum gravity of He Who Does Not Play Dice.

We haven't the money, so we've got to think!
Lord Rutherford, 1962 Brunel Lecture, 14 February 1962

Overfunded research is like heroin: It makes one addicted, weakens the mind and furthers prostitution.
Johann A. Makowsky, The Jerusalem Post 19.4.85

Does a fish need a bicycle?

Latest update: November 26, 2009

Printable copy (current version) from
http://www.god-does-not-play-dice.net/front_page.pdf
Check out 'Quantum Mechanics 101' [here](#), my detailed reproach upon wasting taxpayers' money with LIGO [here](#), and my efforts toward quantum gravity [here](#).

Regarding **Quantum Mechanics** (QM), the aim is to avoid the incomprehensible paradoxes and **artifacts** in it (watch the double slit experiment [here](#)), which originate from its textbook interpretation (Niels Bohr's belief that quantum world can only be "seen" through classical "glasses"). We can indeed **understand** the quantum world (but not the current QM textbooks; cf. [Richard Feynman](#)), by changing the "glasses" through which we "see" and construe the quantum world: the universe modeled as a **brain**.

Regarding the artifacts in QM, we may be in a situation similar to an Eskimo trying very hard to comprehend the notion of "**trunk**". In our case, we encounter an incomprehensible **wave-particle complementarity**, which could be just an artifact from our wrong thinking, like the "nose-arm complementarity" in the case of the Eskimo observing **elephant's trunk**. Surely 'the quantum system' doesn't live in any **relativistic space**, so one should expect all sorts of headaches and **artifacts** (e.g., "diese verdammte Quantenspringerei", [Erwin Schrödinger](#)) from imposing wrong "glasses" onto the quantum world 'out there'. (A typical example is Franco Selleri's quest for detecting [de Broglie waves](#).)

The prerequisites for the interpretation of QM suggested [here](#) originate from Schrödinger. Back in 1935, [Erwin Schrödinger](#) stressed the following:

"The rejection of realism has logical consequences. In general, a variable has no definite value before I measure it; then measuring it does not mean ascertaining the value that it has."

And in a letter to Einstein dated 18 November 1950 (quoted after J. Bub, p. 115), he wrote (emphasis added):

"It seems to me that the concept of probability is terribly mishandled these days. Probability surely has as its substance a statement as to whether something is or is not the case — an uncertain statement, to be sure. But nevertheless it has meaning **only** if one is indeed convinced that the something in question quite definitely **is** or **is not** the case. A probabilistic assertion presupposes the **full reality** of its subject."

We are obviously dealing with a new form of reality: a **probabilistic** assertion, and the Hilbert space itself, **cannot** accommodate the Kochen-Specker case in which "the something in question" is **beyond** an unequivocal "**is** or **is not**" state (cf. "an unequivocal true-false value" in Isham and Butterfield, p. 3; emphasis added):
In quantum theory, on the other hand, the relation between values and results, and in particular assumptions (i) and (ii), are notoriously problematic. The state-space of a Hilbert space $\mathcal{H}$, a quantity $A$ is represented by a self-adjoint operator $\hat{A}$ (which, with no significant loss of generality, we can assume throughout to be bounded), and a statement about values "$A \in \Delta$" corresponds naturally to a linear subspace of $\mathcal{H}$ (or, equivalently, to a spectral projector, $\hat{P}[A \in \Delta]$, of $\hat{A}$).

Assumption (i) above (the existence of possessed values for all quantities) now fails by virtue of the famous Kochen-Specker theorem [4]; which says, roughly speaking, that provided $\dim(\mathcal{H}) > 2$, one cannot assign real numbers as values to all quantum-theory operators in such a way that for any operator $\hat{A}$ and any function of it $f(\hat{A})$ (a function from $\mathbb{R}$ to $\mathbb{R}$), the value of $f(\hat{A})$ is the corresponding function of the value of $\hat{A}$. (On the other hand, in classical physics, this constraint, called $\text{FUNC}$, is trivially satisfied by the valuations $V^*$.) In particular, it is no longer possible to assign an unequivocal true-false value to each proposition of the form "$A \in \Delta$".

Check out the implications of KS Theorem to the Precise Value Principle (PVP) and the statistical interpretation of QM from R.I.G. Hughes, p. 164.

Going back to Ernst Specker's tripod, if there are states of the tripod in which one of its legs has UNdecidable color, then not just this particular leg, but the whole tripod will be UNdecidable. It's a package.

The phrase "an incomplete Kochen-Specker colouring" (Helena Granström, p. 2) has no meaning whatsoever; it is the result from imposing wrong "glasses" onto the quantum world. And if you subscribe to the modern quantum mysticism -- "the quantum state is not a physical object, it is a representation of our state of knowledge, or belief" (Itamar Pitowsky, p. 28) -- your brain will wind up in a schizophrenic state of, say, 68% "knowledge" of the quantum state, and 32% of "[what da heck is that uncolored KS sphere?]".

No mental concepts, such as 'knowledge' or 'imagination', are admissible in the ontology of quantum reality. We must never mix apples with oranges ($\text{Res Extensa}$ and $\text{Res Cogitans}$).

Karl Svozil refers to this UNdecidable faculty of the quantum world as "ambiguity" (p. 4), and stressed: "This ambiguity gets worse as the number of particles increases." If you think about the quantum world with classical concepts, it will get from bad to worse, until you end up with the (old) cosmological "constant" problem (more on that from Alan Guth).

As Erwin Schrödinger might have said in 1935, the same "variable" that has had no definite value before you measured it will continue to keep its UNdecidable nature after you "measure" it as well. And you can't fit it in any Hilbert space, of course (what is the $\dim(\mathcal{H})$ for 32% "uncolored" and 68% colored KS sphere?).

Let's give it a name: potential reality. In the quantum realm, it (i) offers its context-dependent explications (a.k.a. "observables"), (ii) keeps the sameness ($\text{Genidentität}$, Kurt Lewin) of particles of the same type, which MTW regard as "a central mystery of physics" (p. 1215), and (iii) facilitates the ultimate quantum phenomenon: entanglement. It may be difficult to grasp, but is much simpler to the juggling with the possible implications from Bell's inequality and their loopholes (e.g., Ghim and Zhang).

As to quantum gravity (notice the opinion of an expert here), the 'potential reality' is introduced to revive the physical objectivity of spacetime "points", by
making the spacetime manifold itself an emergent phenomenon: "The requirement of general covariance takes away from space and time the last remnant of physical objectivity" (A. Einstein, Grundlage der allgemeinen Relativitätstheorie, Annalen der Physik 49 (1916) 769-822). The current formulation of GR can only determine "the mutual relations that exist between the gravitational field and the matter fields (i.e. the value the gravitational field takes where the matter field takes such and such value)", but not "the proper time between spacetime points" (Wiki; more from Butterfield and Isham), and the field equations "cannot even uniquely determine the topology of a manifold" (Alan Macdonald, Einstein's Hole Argument, p. 4).

How can we fix these problems? By introducing two connections, geometric (local mode) and torsion (global mode of spacetime). The torsion connection is completely vanished (Hehl and Obukhov) in the local mode, hence its effect are considered "dark" (see Alex Murphy).

Notice also that a hierarchy of 'potential reality' (never in plural), resembling the structure of cognitive concepts, is postulated (application here). In metaphysical terms, it supports the views of Aristotle and Spinoza: no "parts" of the infinite can exist, as the infinite Substance is indivisible. It's not like Russian dolls.

In the case of a human brain (not mind or consciousness), the UNSpeakable potential reality can be explicated with, for example, three (and many more) sayings, which produce "measurements" (if you prefer QM jargon) on it:

1. All are not hunters that blow the horn.
2. La robe ne fait pas le médecin.
3. Es ist nicht jeder ein Koch, der ein lang Messer trägt.

None of these "measurements" can "collapse" the potential reality (Platonic idea) explicitated with these sayings. And if our brain can work with 'potential reality', so can the universe modeled as a brain.

Regarding the brain above your neck: its 'potential reality' is to its human self what EM radiation is to your subjective experience of 'color' -- no direct action of the human self on its brain is allowed in science. Hence it may be conceivable that the potential reality entwined with the human brain could be bridged to that of the quantum vacuum (BCCP). All you may need is an arrow of spacetime. (Notice, however, the 'two rules of success' here.)

Notice also that 'potential reality' is an intrinsically holistic phenomenon, so it will be very misleading to call it "dark", just because it is not possible to be traced back from any of its physical explications in the r.h.s. of Einstein field equation.

Forget about "energy conservation in GR". It's an oxymoron (details from Denisov and Logunov). What kind of "time" is implied in the non-linear dynamical cancellation of the two "fluxes" (Merced Montesinos), such that the ether would not "come back"? Can your wristwatch read it?

The sole "explanation" of this ultimate puzzle of GR, offered by Chris Isham, was that, "after all, general relativity does seem to work well as a theory, and yet I can certainly read the time on my wrist watch!" But your wristwatch should not be able to read more than one instant from this (global) non-linear "time". Complex problems have simple, easy-to-understand wrong answers (Murphy's Law No. 15).
We need quantum gravity, to uncover "the proper time \( \tau \) along spacetime trajectories" (Carlo Rovelli; drawings here) and the genuine 'time variable' associated with the expansion of space due to DDE. Once we achieve this formidable task, we will (hopefully) find out what -- if anything -- might remain unchanged/conserved in this particular (global mode of) time. In the current 'GR without DDE', the dynamics is "entirely generated by constraints. The dynamical data do not explicitly include a time variable" (Karel Kuchar), and one can only hope that "the energy momentum tensor which is the source of gravity" might be conserved "due to the Bianchi identities" (E. Guendelman, p. 9). Such hopes are (i) utterly murky even in the textbook GR, because any observable of the gravitational field is "necessarily quasi-local" (Laszlo Szabados) and (ii) not applicable to the new dynamics of GR due to DDE. For example, Noether's Theorem holds only for flat spacetime, and the Bianchi identities are applicable only for 'GR without DDE'.

At this point, I got an emotional response from Eduardo Guendelman, saying that the Bianchi identity is a mathematical theorem, so there is no ambiguity involved here. Well, I'm just a psychologist, so let me quote Matt Visser, p. 3:

"... the Einstein equations of general relativity are local equations, relating some aspects (notice the poetry -- D.C.) of the spacetime curvature at a point to the presence of stress-energy at that point. Additionally, one also has local chronology protection, inherited from the fact (Sic! -- D.C.) that the spacetime is locally Minkowski (the Einstein Equivalence Principle), and so "in the small" (that's the sole application of those 'twice-contracted Bianchi identities', cf. George F R Ellis and Henk van Elst, Eq. 2 -- D.C.) general relativity respects all of the causality constraints of special relativity.

"What general relativity does not do is to provide any natural way of imposing global constraints on the spacetime — certainly the Einstein equations provide no such nonlocal constraint."

Which is precisely the missing element needed to address the 'global properties of spacetime' in the presence of DDE. As R. Rakhi and K. Indulekha acknowledged (p. 5): "Because this energy is a property of space itself, it would not be diluted as space expands. As more space comes into existence (the same phrase was used by Sean Carroll -- D.C.), more of this energy-of-space would appear. (...) So the mystery continues."

And so does the confusion about it -- click here.

The intrinsic dynamics of the phenomenon of 'more space comes into existence' could only be detected in a reference frame from which this phenomenon is excluded, like 'not acting there'. But because DDE acts on the whole 3-D space en bloc, without any irregularities, there is no place in the universe in which we could install a clock and say -- look, this clock does read the (global mode of) time pertaining to the omnipresent phenomenon of 'more space comes into existence'. It is the theory of relativity itself, which cannot "detect" it. Which is why some people call it "dark".

Although the mathematical meaning of the phrase "more space comes into existence" is not clear, I don't think Kurt Gödel would have called the ultimate source of spacetime points "dark". Once we move from physics to geometry, it's a whole new world there. Pity Mike Turner called it "dark"; that's so wrong!

One cannot insert the "dark" energy of \( X \) into its consequence -- accelerated expansion of space. The source \( X \) does not belong, and cannot be fitted into the same 3-D space (Cauchy hypersurface) which is being created by \( X \). You
can do this only in GR textbooks that deal with 'GR without DDE'. Capiche?

Notice also that Matt Visser (see above) considers the metaphysical assumption that the spacetime were "locally Minkowski (the Einstein Equivalence Principle)" to represent a fact. But we only have a mathematical fact that locally, "over" a point, one can indeed eliminate the gravitational "field" by hand (Hermann Weyl). But because nobody has so far explained the resulting quasi-local nature of the gravitational field's observables (see Laszlo Szabados above), nor the origin and the mechanism of inertial reaction "forces", I think we should be very cautious and open-minded in interpreting such mathematical facts and theorems, like the above-mentioned Bianchi identity.

If you are looking for a genuine quantum-gravitational measuring device, your wristwatch (as well as the one of Kip Thorne) fits the bill, because it reads an already-linearized (see the explanation of 'already' below) time variable obtained from the "the proper time [tau] along spacetime trajectories" (Carlo Rovelli) and the (global mode of) time associated with the expansion of space due to DDE.

This is to me the ultimate puzzle in present-day GR. The sole "explanation" of Chris Isham was that, "after all, general relativity does seem to work well as a theory, and yet I can certainly read the time on my wrist watch!"

I will desist to comment on C. Isham's observation, and will instead take the liberty of being (again) deadly boring, by explaining the difference between 'GR without DDE' vs 'GR with DDE'.

First, a simple example from STR, with a trajectory of a Frisbee, on the fixed background of Minkowski spacetime: we can calculate the instantaneous state of the Frisbee at each point from the trajectory, and attach to this dimensionless point a well-defined vector. My teenage daughter couldn't understanding how it is possible to attach a vector to a "point", and I explained the puzzle by saying that the information from a finite interval from the history of this infinitesimal "point" is encapsulated in it -- we instruct this interval to shrink asymptotically toward zero -- so the vector is indeed well-defined. All this is possible under the
premise of the fixed "grid" in STR. But once we move to 'GR without DDE', the "grid" is gone (Emilio Elizalde): at each and every "point" from the trajectory, the non-linear mutual determination of matter and space (John Wheeler) takes place. But in what time (see Chris Isham's wrist watch above)? There is no background grid or "ether" w.r.t. w. one can define the dynamics of 'GR without DDE'. Yet people don't ask such questions and prefer to just do calculations with the linearized approximation of 'GR without DDE'. As another expert explained to his undergraduates, "one begins by introducing the notion of a tangent vector to describe an infinitesimal displacement about a point \( p \) " (Bob Wald, p. 4). But again, in order to recover the true dynamics of 'GR without DDE', you need some "ether" or rather 'reference fluid' w.r.t. w. one can describe the fundamental phenomenon of transience (Abner Shimony): see the so-called Aristotelian Connection here.

At this point, the 'GR with DDE' comes to rescue the Hamiltonian formulation of 'GR without DDE': we have a brand new, global degree of freedom of spacetime en bloc, hence can recover the transience of spacetime, as driven by the source of DDE, along the arrow of spacetime -- see above.

To identify this same source in the quantum realm (called 'potential reality'), let's go back to the interpretation ofQM here.

In a nutshell, the so-called PR\(^2\) interpretation of QM offers a solution to the non-unitary "collapse" by replacing the alleged "U" and "R" processes with a new (at least to people like Ed Witten, Steven Weinberg and Gerardus 't Hooft) form of reality, known since Plato, called here 'potential reality'. Its quantum presentation is ubiquitous and has zero entropy; hence the familiar notion of time, which pertains to monotonic increase of entropy "in time", is not applicable to 'potential reality'. It may produce "shadows" in terms of 'quantum observables', yet these "shadows" cannot be traced back, to reveal any evidence of such events (or "quantum information") ever having emerged from 'potential reality'. It may act, yet not experience any backaction from its "shadows". Hence it is the ultimate "background" for QM and GR. It evolves along the arrow of spacetime (resembling the "memory" of the universe), by unfolding from 'the ideal monad without windows'. In the local mode of spacetime, every "point" is filled with an already explicated value of its 'potential reality', and as the latter evolves and becomes enriched, the "number" of its localized explications increases accordingly: more and more things come into existence in the universe. As John Wheeler put it, "Time is Nature's way to keep everything from happening all at once". Only with 'potential reality' there is no need nor place for any 'unitary dynamics' in the local mode of spacetime. This is the metaphysics of 'the universe modeled as a brain', viz. the interpretation of expansion of space along the arrow of spacetime.

From this perspective, if we follow the deflation time arrow in the local mode of spacetime, things will gradually fade away in a strictly non-unitary fashion, but will only approach asymptotically The Beginning, because it is logically impossible to reach It from/within the local mode of spacetime (cf. the paradox here). The solution is 'dual age cosmology'.

As M. Gell-Mann and J. B. Hartle have noticed, "quantum mechanics is best and most fundamentally understood in the framework of quantum cosmology" (quoted after Claus Kiefer, p. 1). And vice versa.

The current situation with inflationary cosmology was presented by Alan H. Guth, the winner of the 2009 Isaac Newton medal, on 13 October 2009. He speculated that our galaxy could be an amplified "quantum fluctuation" (Part 2, 3:30 - 6:16),
... and then confessed his "Nightmare of Dark Energy" (Part 2, 11:36), on which the "eureka" of inflationary cosmology is grounded.

Perhaps Alan Guth should have entitled his talk 'The Dark Energy Nightmares of Inflationary Cosmology', as encapsulated in the [?] area in V. Mukhanov's paper:

![Diagram](http://www.god-does-not-play-dice.net/#XXX)

With the so-called dual age cosmology, the "first" Plankian time "after" The Beginning is stretched toward infinity in the local mode of time. This is otherwise being explained as 'the universe started asymptotically from time
zero'. In this local mode of time (read by your wristwatch), the universe is effectively eternal and its age is indecisive, while in the global mode of time it has a finite age. Another nice feature of dual age cosmology is that The Beginning is an atemporal phenomenon, and is always present (global mode of time) in the instant 'now'.

Let's go back to QM. Think of a trajectory of a Frisbee: at each "point" from the trajectory (the latter could be a perfect continuum of such "points"), the state of the Frisbee is a perfectly well defined fact, with a 'carpe diem' unit probability. I use this simple idea to introduce a new kind of cancellation mechanism, pertinent to 'potential reality', for removing the non-unitary "R" process (historical account from October 2002 here); hence the motto of this web site, since July 1997: Dead matter makes quantum jumps; the living-and-quantum matter is smarter.

Notice that not only the "R" process is being removed (as did Hugh Everett III in his relative state interpretation of QM), but the alleged "U" process and Hilbert space as well.

The established theoretical physics community, particularly Niels Bohr, ridiculed Everett's interpretation to the extent to which Hugh Everett left physics (and became millionaire).

NB: Notice that if the PR2 interpretation of QM is correct, then all tentative solutions proposed for the measurement problem and the classical limit of QM, based on either probabilistic or "toposification" (Chris Isham), 'neo-realist' interpretation of QM (Cecilia Flori, p. 211), will necessarily be wrong.

The next step is to elaborate on the continuum of such explicated quantum states (local mode of spacetime), which emerges from the back bone of the whole physical world (global mode). Here we enter quantum gravity, particularly the emergence of time and space from "something else" (Isham and Butterfield): check out the arrow of spacetime here, and think of 'the whole universe' as a huge brain which self-determines its consecutive quantum-gravitational states in line with the Bootstrap Principle of Geoffrey Chew. Also, the alleged quantum "fluctuations" are interpreted as flexibility of 'the quantum state' to offer potential states, one of which to be chosen (one by one) by 'everything else in the universe'. Hence the speculation about some 'spacetime foam' and the insoluble problems from it (how do you tell apart spacelike from timelike at Planck scale?) are avoided from the outset. Possible practical implications are outlined here.

As in the case of Hugh Everett, many theoretical physicists jumped to play the role of Niels Bohr, chief among them was Britain's leading expert in quantum gravity, who declared seven years ago (Wed, 23 Oct 2002 19:24:15 +0100):

"You do not know enough theoretical physics to help with any research in that area."

To the best of my knowledge, nobody has so far offered some new cancellation mechanism as a joint solution to the measurement problem of QM and the cosmological "constant" problems. Such cancellation mechanism is built in the UNdecidable quantum state (quantum presentation of Platonic ideas) from the outset: instead of dealing with some |alive cat> & |dead cat> from the "U" process, we encounter an UNdecidable 'cat per se', so if we happen to observe an 'alive cat' as a fact, with unit probability, the 'dead cat' will happily live undisturbed in 'the UNdecidable quantum state'. No "collapse" nor dead cat doppelgänger à la Everett are needed.
The animated cat above is very deceptive, because its "evolution" prior to the "collapse" seems fully deterministic. If you think about the quantum "evolution" of such superposed states in terms of 'energy eigenstates', notice the imaginary unit in S. Carroll's essay, Eq. 4: "all of the time evolution is encoded in the phases [XXX]" (ibid., p. 6). But how do you encode 'time evolution' in complex phases (Chen Ning Yang)? Recall that, after you "collapse" the cat, the alleged "time parameter" in the Schrödinger equation turns into some non-relativistic [you-name-it], but the equation itself doesn't say anything whatsoever about the nature of this "time parameter" prior to the "collapse", as introduced by hand (along with the Born rule) in QM textbooks.

To understand the origin of this whole mess, read the second sentence from the excerpt below (R.I.G. Hughes, The structure and interpretation of quantum mechanics, p. 77):

2.7 The Evolution of States in Quantum Mechanics

Like classical mechanics, quantum theory tells us how the state of a system evolves with time. The key role in the equation governing this evolution is played by an operator rather than by the Hamiltonian function, in line with the general principle that, in quantum mechanics, operators represent physical quantities. As in the classical case, the quantity in question is the total energy of the system; it is represented in quantum theory by a Hermitian operator $H$ which we call the Hamiltonian operator for the system. The rate of change of the state $\psi$ of a system is given by

$$i\hbar \frac{\partial \psi}{\partial t} = H\psi$$

and this equation is known as Schrödinger's time-dependent equation, or sometimes simply as Schrödinger's equation.

This "general principle", however, does not cover the case of UNdecidable, hence not-yet-physical, KS quantum state, as explained by R.I.G. Hughes here. One can hardly overestimate the enormous confusion from this huge blank spot in current QM textbooks -- just recall the ongoing quest for "quantum computing" and the alleged "decoherent histories" (J. Halliwell; cf. Franck Laloë, Sec. 6.4 and footnote 47 on p. 81).
All these problems are resolved in the PR² interpretation of QM from the outset. Moreover, the new cancellation mechanism is introduced to explain the ongoing, as-we-speak mechanism of 'the flatness problem' (asymptotically flat spacetime conjecture), producing an extremely precise balance between the two tug-of-war effects, CDM & DDE, of the geometry of spacetime at cosmological scales.

Otherwise we have to inject up to 96% "dark stuff" (with all sorts of "ghosts") into the current theoretical physics, as calculated under the assumption that 'potential reality' doesn't exist. As Evalyn Gates put it (p. 196), the detection of DDE was "like finding an elephant on top of a table impeccably set with the finest china and silver (...). We stare in shock at the uninvited guest and demand to know where the elephant came from -- and how it got into (the) room."

Regarding the arrow of spacetime: notice that the Frisbee-like sequence of explicated facts (local mode of spacetime) is inherently background-free, because the background (the reference fluid of GR and the UNdecidable quantum state) is 'not there', being placed [between] the "points" of the continuum of the local mode of spacetime. In other words, the "dark gaps" of the global mode are not like the real gaps between the tiles in R. Penrose's bathroom: regardless of how small tiles you choose, if you decrease the size of the tiles in a Fibonacci sequence, you will never ever reach the "gaps" from/within the local mode of spacetime (more on Fibonacci here).

This proposal makes the local mode of spacetime a perfect 3-D continuum with dynamical topology of asymptotically flat spacetime. The "dark" gaps of the postulated global mode of spacetime are completely sealed off by the arrow of spacetime -- the mechanism by which the "dark" gaps of the global mode are made nonexistent in the local mode is the same that makes the "speed" of light a fundamental constant (and also hides the mirror tachyonic world). This renders the Schlaefli conjecture (L. Schlaefli, Ann. di Mat. 5 (1873) 170), as well as all "branes" and other multidimensional superstitions in GR and string hypotheses (Lisa Randall; see also A. Vilenkin below) redundant, to say the least.

In the context of GR, the global mode of spacetime is located "within" each and every point from spacelike hypersurfaces, as it "lives" exclusively on null hypersurfaces. (Unlike the geometry of spacelike hypersurfaces, the geometry of null hypersurfaces is not metric (D. C. Robinson), which leaves a challenging opportunity to introduce an additional, to the Christoffel connection, global torsion connection.) To be precise, the "duration" of the global mode, recorded with a physical clock (local mode), matches the "duration" of the atemporal "handshaking" transaction in Cramer's interpretation of QM: it has been already completed at each and every instant we "look" at it (see below).

Hence in the local mode of spacetime, the dimensionless GW amplitude is zero, nonexistent, zilch. (Another case of reining a dimensionless amplitude, the mythical "quantum computing", is examined here.)

Notice also that the hypothetical global mode of spacetime cannot be read by a physical clock (it will "stand still"). It is introduced to replace the "external time parameter" in H.-D. Zeh (p. 13) and the "auxiliary internal time" (cf. Macias and Quevedo, p. 8) by 'the reference fluid of GR'. The latter can "act" upon matter without being affected in turn by matter. In this unphysical "absolute" reference frame, an electromagnetic radiation field can indeed "stand still" (recall that EM radiation field cannot stand still with respect to any physical observer, Bahram Mashhoon, p. 14).
The next metaphysical idea is straightforward: 'time' does not originate from 'change in space' but from 'change of space'. Only if you have the latter (global mode), you may introduce the former, as 'time read by a clock' (local mode). Why? Because one cannot insert the "dark" energy of $X$ into its consequence: accelerated expansion of space. The dynamics of 'the change of space' is defined relative to the "omnipresent ether $X$ " (global mode of spacetime). The latter is located "within" each and every point from the local mode of spacetime, and is wrapping the local mode by two (in fact, one) 'numerically finite but physically unattainable Aristotelian boundaries'.

All we can physically observe is that the local mode of spacetime is being 'acting upon itself'. Such self-action will of course look "dark" to all local sub-systems (see Alex Murphy).

Hence we can bridge QM and GR, and understand the origin of quantum and gravitational "waves": EPR-like correlations (global mode) will inevitably induce wave-like holomovement of physical stuff along the arrow of spacetime. Such wave-generation effects can be found in our brains and in many living organisms. Perhaps it determines the inertial reaction "forces" as well (don't bother to ask Criss Angel, he knows nothing about it).


I hold in fact:
1. That small portions of space are in fact of a nature analogous to little hills on a surface which is on the average flat; namely, that the ordinary laws of geometry are not valid in them.
2. That this property of being curved or distorted is continually being passed from one portion of space to another after the manner of a wave.
3. That this variation of the curvature of space is what really happens in that phenomenon which we call the motion of matter, whether ponderable or ethereal.
4. That in the physical world nothing else takes place but this variation, subject (possibly) to the law of continuity.

I believe Clifford's idea in (2), about "the manner of a wave", is amended here with the proposed origin of quantum-and-gravitational "waves": the continuous passage of "curved or distorted" from one point (not "portion", as in (1) above) to the next one is what the arrow of spacetime does on the perfect continuum of the local mode of spacetime (the "dark" gaps of the passage are being completely sealed off by the arrow of spacetime).

But why 'arrow of spacetime'? Because our good old 3-D space is not like a huge static warehouse, in which we would notice some redshifted light from moving objects, receding from us in line with the Hubble Law (some balloon metaphors may be highly misleading). It is the other way around: distant galaxies are not "speeding up" with respect to us in some absolute static space, but the very metric of space is "expanding" (I firmly disapprove of this notion of "expansion", and have suggested the so-called 'scale relativity principle').

Hence the space itself is endowed with dynamics, but then we need some ether w.r.t.w. such 'global dynamics of 3-D space' can be formulated. Then the only
possibility -- trust me, there is no other option -- is to place the omnipresent ether, as 'the source' of the "dark" energy', in the global mode of spacetime. Otherwise you will have to define the dynamics of space w.r.t. itself, and will look like Baron Munchausen. That's why we need an arrow of spacetime, in my opinion (but notice the opinion of Chris Isham above).

**NB:** If this is the case chosen by Nature, then any approach to quantum gravity, based on the "splitting" of spacetime (Brett Bolen), will necessarily be wrong.

The speculations of Roger Penrose will necessarily be wrong as well: "The fuzzy idea of where and what is infinity was clarified and made more specific by the work of Penrose [45, 46] with the introduction of the conformal compactification (via the rescaling of the metric) of spacetime, whereby infinity was added as a boundary and brought into a finite spacetime region." (Ted Newman et al.)

Perhaps we may have to develop new mathematical theory of 'potential reality', such that the "state space" of Margenau's Onta (quantum presentation of Platonic ideas) would match the structure of cognitive concepts; notice that in the "cheating on 20 questions" the answer 'cloud' was explicated by a Bayesian learning rule (not the Born rule). For comparison, the categorification of Feynman diagrams requires "black boxes with many wires going in and many wires going out" (Baez and Lauda, p. 16), while in our case all wires are "instantaneously" (global mode of spacetime; see the Escher drawing below) keeping track of all virtual 'black boxes' as well (relational ontology), in order to dynamically adjust to the changing context of the game, until they jointly select the final, explicated 'black box': 'cloud' (see also the four dice here).

**NB:** In the local mode of spacetime, the "duration" of the total negotiation with 'everything else in the universe' (relational ontology) is zero. Hence a wave pattern is being created, without any source of these "waves" being present in the local mode, and a new form of retarded causality (biocausality; see below) can be postulated -- a revitalization of Leibnitz' harmonia praestabilita, Jung's Synchronicity, and Einstein's Uberkausalität.

We definitely need mathematical theory of 'potential reality'. The task is highly non-trivial, but once we unravel the correct mathematical theory, the astonishing effectiveness of mathematics (Eugene Wigner) may drive us closer to the true quantum gravity of He Who Does Not Play Dice -- the world is not deterministic but flexible, and the 'chooser' of one possibility (one at a time) amongst infinitely many is 'the whole universe' in its state of ONE.

All I've been getting so far is either dark silence or insults (some of them really harsh).

Perhaps the situation will improve in 2010, after the sixth consecutive failure of LIGO Scientific Collaboration (LSC) to detect GWs with the so-called "enhanced LIGO". GW energy transfer is fundamentally non-linear phenomenon (Hermann Bondi), but is wiped out with the "linearized approximation" adopted by LSC. Also, GW energy is intrinsically quasi-local, in the sense that GWs do not propagate exclusively *in one direction only* ("when the waves are all moving in the same direction", cf. P.A.M. Dirac, Ch. 33, p. 64), as they also have a holistic global component (atemporal "handshake"), which covers the whole 3-D space en bloc.

LIGO Scientific Collaboration (LSC) stubbornly refuse to acknowledge that there are no bans whatsoever on the dipole radiation, simply because conservation of gravitational mass-energy and momentum, in a world dominated by an evolving cosmological "constant", is a wishful thinking. They fear to even mention the
implications of DDE to their project, and have never tried to address the (old) cosmological "constant" problem, which *inevitably* occurs if you trust the unwarranted assumption that the "dark energy" from the quantum vacuum can only spring from Lorentz-invariant stuff with positive energy density.

Is it possible to detect some 'elementary shift' of the expanding metric -- the "intrinsic time interval associated to any timelike displacement", T. Jacobson, pp. 18-19 -- due to the omnipresent and perfectly smooth DDE? In what reference frame? Notice that you're dealing with some "fluid" that "has zero inertial mass! It can be accelerated with no cost, no effort" (B. Schutz, p. 255) and "provides an all-pervading energy density and negative pressure that are the same to all observers, at all places, and at all times in the history of any universe model, even the expanding ones." (p. 257)

Similar rhetoric questions apply to the dynamics of the metric, producing inflationary gravitational waves on the 3-D "balloon" hypersurface. It's a bundle.

Yet the same kind of waves, only much "weaker", are expected to be detected by LIGO (see below).

Forget it. There is no need for "precise calibration" of a dead turkey.

The insane efforts of LSC remind me of the old joke about a drunken man, who has lost his key somewhere in the dark, but is searching for it under the street lamp, simply because it is brighter there. Only LSC's "key" costs billions. Which is why I accused LSC members of aggressive professional negligence, and offered them to review my White Paper. They responded with dark silence, as usual.

 연결된 철학자로 Paul Ginsparg의 "모더레이터"를 체크해 보세요.

Since all this points to the unknown dynamics of GR, consider this: similar to the case of particle-wave duality, the splitting the spacetime into two "components" is allowed for educational purposes only. In fact, we are dealing
with **one object**, as stressed by Hermann Minkowski (recall again the elephant's trunk). Hence if you split the spacetime into two "components", and let one of them ('time read by a clock') to "evolve with respect to the other one (3-D space) -- as Paul Dirac and ADM did in the misfortunate Hamiltonian formulation of GR -- you will end up with a dead frozen snapshot of the arrow of spacetime, in which all GW effects (the positivity of mass and its inertial reaction "force") have already been completed by the "instantaneous" non-linear Machian-type negotiation (global mode of spacetime; see the Escher drawing below) with 'everything else in the universe' (the so-called biocausality).

To explain "already", let me quote from Thomas E. Phipps, Should Mach's Principle be taken seriously? *Speculations in Science and Technology*, 1(5) 499-508 (1978), p. 504:

"Gravity is a different beast from radiation of any kind. Being mediated by virtual particles, which may be considered to be kept permanently virtual by the physical non-existence of gravity shields or absorbers, gravity can act (nonlocally) with infinite speed -- in effect, with precognition. That is exactly what it does, if Mach's principle has any substance. The fixed stars "know" the subway is going to jerk, because they have sent their virtual spies forward in time to find out about it."

The crux of the idea of biocausality is well-known. Back in 1953, Wolfgang Pauli suggested that the concept of finality ("the end (telos), that for which a thing is done", Aristotle, *Physics* 194b33) should be considered as a complement to causality in deterministic and statistical laws. The stipulation here is that Aristotle's effective cause & final cause determinate jointly the next state of all material constituents of the universe relationally, in line with the bootstrap principle 'think globally, act locally' (global mode of spacetime; see the Escher drawing below), but in the local mode the resulting biocausality is retarded, along the arrow of spacetime.

From this perspective, detecting GW effects requires "online" access to the global mode of spacetime, in which the dynamical determination of spacelike and timelike directions (hence Lorentzian metric) is being produced -- one-at-a-time, along the arrow of spacetime. In simple words, this means that the
proper GW detectors must be endowed with the self-acting faculty of the human brain, to match the "interaction of spacetime with itself" (C. Kiefer, p. 2; cf. also J. G. Pereira et al., arXiv:0909.4408v1 [gr-qc], p. 10, Eq. 7.2).

As of today, nobody cares. Nobody.

I can take it. I'm psychologist, and don't need quantum gravity to practice PHI.

Why would a fish need a bicycle?

D. Chakalov
Thursday, 26 November 2009

Some history of the project outlined above. In January 1972, shortly after my demobilization from BG army (age 19, with the lowest possible rank), I decided to study psychology and "sort out" the physics of the human brain, to explain and eventually explore its amazing latent abilities. It took me sixteen years to realize that the task is unfeasible with the established Weltbild, and on 22 May 1988, at 23:45 local time, I decided to try the project 'the other way around', namely, to develop a model of the universe as a 'brain', such that there will be a natural explanation of the physics of the (small) brain from the outset. After many trials and errors, the first (relatively) encouraging evidence appeared in July 1998, but the project is still far from being completed. I am trying to find any weak points or inconsistencies in it, just as I would do with a brand new parachute, which I would have to put on ultimate test by jumping from a
helicopter. I do like the unfolding of the whole project, since it seems to me that all pieces of 'the bridge' snap to their places effortlessly. Yet there is no room for contention, and I never go into the mood of 'chi si contenta gode' (a contented mind is a perpetual feast; he who contents himself, enjoys).

Hopefully, if we join our efforts and knowledge (included at the level of our collective unconsciousness, cf. Jungian Kollektives Unbewusstes), some day we may succeed.

Meanwhile, please keep in mind the prediction of Robert Millikan, Nobel Prize in Physics (1923): "There is no likelihood man can ever tap the power of the atom."

This web site is my feedback to all people, who are helping me, one way or another, with improving the theory. Feel free to download it (app. 11.8MB) from http://www.god-does-not-play-dice.net/PHI_info.zip

By unzipping PHI_info.zip, a new folder, !Einstein_PHI, will be created on your hard drive. Find there START.html.lnk and open it (it is linked to this front page (index.html) in the website folder).

If, for some reason, you believe we don't need new approach to quantum gravity, try to understand Sean Carroll's speculations (448 pages, January 2010):

"... wavefunctions appear to collapse in one direction of time but not the other is not an explanation for the arrow of time, but in fact a consequence of it. The low-entropy early universe was in something close to a pure state, which enabled countless "branchings" as it evolved into the future." Yet he acknowledged: "we can't, once again, define a conserved total energy in any reasonable way." Consequently, the main speculation of S. Carroll about some "low-entropy early universe" is just as unclear as is its gravitational energy which would evolve "into the future". (Also, there may be a critical low geometric entropy state of the 'extremely early' universe, which may blur the timelike and spacelike directions themselves, and turn them into some primordial quantum dough from which nothing could possibly "decohere", ever.) As one of his senior colleagues summarized, "the entropy of the universe as a function of time is a very interesting problem for cosmology, but to suggest that a law of physics depends on it is sheer nonsense."

... Alex Vilenkin's arXiv:0908.0721v1 ($63,000 FQXi Grant):

The physical properties of all low-energy bubbles do not have to be the same. In fact, string theory, which is at present our best candidate for the fundamental theory, appears to have a multitude of solutions describing vacua with different values of the low-energy constants of nature. These solutions are characterized by different compactifications of extra dimensions, by branes wrapped around extra dimensions in different ways, by different values of the fluxes, etc. The number of possibilities is combinatorial and can be as high as $10^{100}$. Bubbles of all possible vacua will nucleate in the course of eternal inflation. The resulting multiverse, with bubbles within bubbles within bubbles, provides a natural arena for anthropic applications, such as the one I described for the cosmological constant.

... Laura Mersini-Houghton's arXiv:0909.2330v1 [gr-qc] ($50,000 FQXi Grant):

"... when treated in a multiverse framework, fundamental time is directionless and consequently physical laws inherit its time-reversal symmetry. Despite that
reversal symmetry is broken for the local time by the bubble nucleation, the bubble still inherits laws of physics at birth from the multiverse, without modification. Thus the emergent time’s arrow in the bubble does not affect the time-reversal symmetry imprinted onto the physical laws that the bubble inherits from birth in the multiverse. (...) An emerging time in the multiverse does not appear plausible since the emergence adds information on the multiverse that wasn’t there prior (...) but we face the same kind of emergent non-unitary phenomenon with DDE -- an evolving cosmological "constant" that springs from the quantum vacuum - D.C.)."

... and the obstinate belief of Andrei Linde ($164,179 FQXi Grant):

"During the last 25 years a new scientific paradigm gradually emerged. (...) My main goal is to learn how to make scientific predictions in this complicated framework."

Sure enough, Andrei Linde tried to answer the first off question of how many universes are in the "multiverse" (arXiv:0910.1589v2):

slow-roll inflation. This process may create

$$N \sim e^{180} \sim 10^{10^{77}}$$

(3)

universes with different geometrical properties. This number is incomparably greater than $10^{500}$. If the initial size of the universe is greater than $H^{-1}$, the total number of different universes is even much greater.

Coincidently or not, his calculation matches the number of angels (mostly blond) that can fit on the head of a pin, as suggested by A. Linde's medieval colleagues.

If these people were here in the 21st century, I suppose they would gladly join LIGO Scientific Collaboration (see above), and speculate that, shortly after the "big bang", the whole universe was still small enough to fit on the head of a pin, with strong ripples of the spacetime metric (see their picture above). They would love to feel again like an 'absolute observer' with an absolute clock paired with an absolute measuring rod, to tell the dimensions of the universe and its current cosmological age, as read by their absolute wristwatch. But instead of arguing about angels (either blond or not), they would certainly prefer to measure the "ripples of the metric" (albeit very weak), which again can only be seen from the same standpoint of 'absolute observer'. Needless to say, they will easily publish tons of articles on "GW astronomy", and will ignore any alternative viewpoint on what can be "seen" by such absolute observer: nothing but "gauge-dependent" stuff.

That's how 'potential reality' is being camouflaged in present-day GR, simply because if it were possible to detect the source of DDE as 'gauge invariant observable', the omnipresent and perfectly smooth ether (the source of DDE) will be exposed to direct physical observations, as 'spacetime acting upon itself'.

Back in April 1986, Yakov Zel'dovich wrote in a letter the following (private communication): "Long time ago, there was a period of time during which there was still no time at all." Of course he was joking.
Yet the 'global mode of time', pertaining to potential reality, cannot be read by any physical clock, because the poor inanimate clock will read it as 'stand still' or "no time at all", as Yakov Zel'dovich put it. Maybe The Beginning, which lives in "no time at all", is always with us (dual age cosmology).

Anyway. Perhaps in the next twenty-five years a new paradigm will emerge: the universe modeled as a brain. The driving force of its arrow of spacetime cannot spring entirely and exclusively from the "brain" itself, which brings us to Virgil's statement: Mens agitat molem (The Aeneid, Ch. 6, 727).

In German, it reads: Der Geist bewegt die Materie. Physically, Der Geist may look like 'the ideal monad without windows'. However, no scientific predictions can be made about it, or else we will conflate religion with science. Thank God, this is impossible.

D. Chakalov
October 31, 2009

Subject: "best of all possible worlds."
Date: Fri, 8 Oct 2010 21:09:20 +0300
From: Dimi Chakalov <dchakalov@gmail.com>
To: Robin G Jordan <jordanrg@fau.edu>

Dear Professor Jordan,

It was a great pleasure to read your essay on Newton vs. Leibniz,

http://courses.science.fau.edu/~rjordan/phy1931/NEWTON/newton.htm

"Leibniz thought the idea of God as an astronomical maintenance man as absurd. He believed that God had carefully chosen among an infinity of possible worlds, the one He felt the most suitable. So that although we may not have a perfect world, it was the

"best of all possible worlds."

I intend, Deo volente, to talk on a similar subject on 25 November 2015,

http://www.god-does-not-play-dice.net/#VGP

My web site isn't encrypted (like Newton's 6accdae13eff7i3l9n4o4qrr4s8t12ux), and if you have some spare time, I will highly appreciate your comments on my efforts.

Kindest regards,

Dimi Chakalov
Dear Joe,


May I use this opportunity to invite you and your colleagues to my talk on quantum gravity,

http://www.god-does-not-play-dice.net/#VGP

All the best,

Dimi

How do we know that Father Christmas has a beard?
We know it, because snow falls when he shakes his beard.

Old Tanzanian saying

====================================
Dear Mr. Gray,

I trust you are familiar with the anecdotal story about a 'spherical cow',


Suppose someone claims that *the real cows are indeed round*, because cows might be approximated as spherical objects, and then ask your government to allocate a significant portion from your taxes for detecting the unique pattern of 'real spherical cows'.

Likewise, you were told by a number of people that, after applying their spherical-cow approximation to Einstein's theory of general relativity, they might eventually detect gravitational waves (GWs): "we haven't been able to detect them yet because they are very weak" (Jim Hough).

However, their persistent optimism is rooted on artifacts due to their spherical-cow (=linearized) approximation of GR,

http://www.god-does-not-play-dice.net/Szabados.html#SBG

I fact, they ignore all problems due to their approximation. For example, Hermann Weyl proved in 1944 that such spherical-cow approximation implies the existence of a tensor that, except for the trivial case of being precisely zero, does not otherwise exist,

http://www.sjcrothers.plasmaresources.com/weyl-1.pdf

Regarding Ralph Cordey at Astrium UK and the so-called LISA Pathfinder: How much this spherical cow will cost to UK taxpayers, I wonder.

Yours sincerely,

Dimi Chakalov
35 Sutherland St
SW1V 4JU

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**Note:** The failures to detect GWs were "explained" by Jim Hough with a very misleading statement: "we haven't been able to detect them yet because they are very weak". In fact, GWs are immensely powerful phenomena, but nobody -- Jim Hough and Sheila Rowan included -- can offer a non-linear theory of GWs. All they can do is to imagine that, by the time GWs reach LIGO or LISA, they will be "very weak", such that their spherical-cow approximation to Einstein's GR would be correct. But again, they don't have any non-linear theory of strong GWs, from which some "weak limit" can be derived.

All they do is asking for more taxpayers' money for detecting spherical cows,
instead of doing their homework first on paper, to demonstrate such "weak
limit" to initially strong GWs. Pity nobody cares.

D.C.
May 12, 2010

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Subject: arXiv:1005.1614v1 [gr-qc]
Date: Tue, 11 May 2010 05:14:25 +0300
From: Dimi Chakalov <dchakalov@gmail.com>
To: Robert Geroch <geroch@uchicago.edu>
Cc: Alexander Vlasov <Alexander.Vlasov@pobox.spbu.ru>, qubeat@mail.ru

http://arxiv.org/abs/1005.1614

R. Geroch: "I am not sure that this is the right perspective — or even whether
"right" makes much sense in this context."

Bob, I think you can have your cake and eat it -- the key word is 'quasi-local',
http://www.god-does-not-play-dice.net/#topology

You and your Russian colleague are so good in math ...

D.
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Note: To explain quasi-local, and 'what is going on' in QM, check out Feynman
[Ref. 1, 12-1]:

"The first question we have to answer is: What are the base states for the
system? Now the question has been put incorrectly. There is no such thing as
"the" base states, because, of course, the set of base states you may choose is
not unique. New sets can always be made out of linear combinations of the old.
There are always many choices for the base states, and among them, any
choice is equally legitimate. So the question is not what is the base set, but
what could a base set be? We can choose any one we wish for our own
convenience. It is usually best to start with a base set which is physically the
clearest. It may not be the solution to any problem, or may not have any direct
importance, but it will generally make it easier to understand what is going on."

There is such thing as "the" base state (never in plural) -- the UNdecidable KS
state, as explained below.

For example, in the case of two spin-half particles, everything you insert in
brakets

\[ |1> = |++>, |2> = |+->, |3> = |-->, |4> = |--> \]

... are just possible physical manifestations of "the" base state, much like the
three sayings above, emanating from their UNspeakable potential-reality state
of your brain.

Thus, the system \{"the" base state & |whatever>\} evolves along the arrow of spacetime in a strictly quasi-local fashion: see Fig. 1 and Fig. 2 below.

Feynman also stressed [Ref. 1, 12-2]: "That’s the question: How do the amplitudes change with time in a particular (fixed) base?"

The amplitudes change along the global mode of time: see again Fig. 2 below. Don't be befuddled by the anti-relativistic "time parameter" in the Schrödinger equation, because you need "the" base state to eliminate the measurement "problem" in QM and reconcile QM with STR, as well as solve the puzzle of quantum vacuum and gravitation: “the” base state does not gravitate.

It would be nice if Robert Geroch writes up a sequel to his 30-year old book General Relativity from A to B, entitled "General Relativity from A to A+ds", to elucidate the concept of 'interval' in GR -- professionally. But he wouldn't. Trying to discover new math is a tough challenge.

The last time I heard from Robert Geroch was eight years ago, only to require his email to be removed from my web site. I will gladly do that, if only he writes a serious paper on GR, or at least reply professionally. Here are two questions:

Do you believe that the "points" from the underlying manifold can be connected only and exclusively only by their physical content that is invariant under "active" diffeomorphisms? If your answer is 'no', what could be “the” base state in GR (a.k.a. the reference fluid of GR), which binds the "points" by one single unique bare UNdecidable matrix?

If your answer to the first question is 'yes', you are ready to teach GR and enjoy its generic pathologies [Refs 2 and 3].

It is generally believed that (i) one can picture the spacetime in GR as a manifold that can be "locally modeled" on some fictitious flat Minkowski space, but (ii) this picture should break down at short distances of the order of the Planck length. Neither of these ideas are needed, however. There is no need for any limitation in the possible accuracy of localization of spacetime events either. Why is that? Because the so-called Planck length may possess an inner geometrical structure.

Ignore it at your peril.

D.C.
May 12, 2010
Last update: May 14, 2010


"The problem of the definition of the concept of singularity in General Relativity is very difficult indeed, as can be appreciated by reading on its historical development (Hawking and Ellis, 1973; Tipler, Clarke and Ellis, 1980). The
intuitive ideas are clear: if any physical or geometrical quantity blows up, this signals a singularity. However, there are problems of two kinds:

- the singular points, by definition, do not belong to the space-time which is only constituted by regular points. Therefore, one cannot say, in principle, “when” or “where” is the singularity.

- characterizing the singularities is also difficult, because the divergences (say) of the curvature tensor can depend on a bad choice of basis, and even if one uses only curvature invariants, independent of the bases, it can happen that all of them vanish and still there are singularities.

"The second point is a genuine property of Lorentzian geometry, that is, of the existence of one axis of time of a different nature to the space axes."

"All in all, it seems reasonable to diagnose the existence of singularities whenever there are particles (be them real or hypothetical) which go to, or respectively come from, them and disappear unexpectedly or, respectively, subito come to existence.

"And this is the basic definition of singularity (Geroch, 1968; Hawking and Ellis, 1973), the existence of incomplete and inextensible curves. That is to say, curves which cannot be extended in a regular manner within the space-time and do not take all possible values of their canonical parameter."

"Singularities in the above sense clearly reach, or come from, the edge of space-time. This is some kind of boundary, or margin, which is not part of the space-time but that, somehow, it is accessible from within it."

[Ref. 3] Lars Andersson, The global existence problem in general relativity, arXiv:gr-qc/9911032v4

Footnote 1: "All manifolds are assumed to be Hausdorff, second countable and $C^\infty$ (maximal differentiable atlas, cf. Michael Spivak, Vol. 1, Ch. 2 - D.C.), and all fields are assumed to be $C^\infty$ unless otherwise stated."

Id., Notes on Differential Geometry, 1, p. 8:

"A differentiable manifold is a topological manifold $M$ together with a differentiable structure, i.e. a way of defining differentiable functions on $M$. The natural way of doing this (forget about this "natural way" - D.C.) is to use the charts $[X]$ to transfer the definition of differentiable functions from $\mathbb{R}^n$ to $M$."

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Subject: Positive-mass conjecture in the case of "more and more space appears" ?
Date: Wed, 2 Jun 2010 05:28:23 +0300
From: Dimi Chakalov <dchakalov@gmail.com>
To: Shing-Tung Yau <yau@math.harvard.edu>,
Richard M Schoen <schoen@math.stanford.edu>,
http://www.god-does-not-play-dice.net/#XXX
Dear colleagues,

As of April 2010, "over 2250 papers with the words 'dark energy' in the title have appeared on the archives since 1998, and nearly 1750 with the words 'cosmological constant' have appeared" (Shinji Tsujikawa, arXiv:1004.1493v1, p. 39).

I believe Michal Chodorowski explained, in arXiv:astro-ph/0610590v3, the meaning of "more and more space appears",

http://www.god-does-not-play-dice.net/#Blanchard4

It is totally unclear to me how one could define an isolated system in GR, in which "more and more space appears", to start thinking about some new positive-mass conjecture and the total energy in such "isolated system". Perhaps if one can demonstrate that _no_ asymptotically flat spacetime can be stable under the conditions of such (accelerated or not) "flux" of "more space", we will face a paradoxical situation similar to the ultraviolet catastrophe of late 19th century, after which some bright mathematician will sort out this whole mess.

Please advise.

With kindest regards and admiration,

Dimi Chakalov

Re: Positive-mass conjecture in the case of "more and more space appears"?

Date: Mon, 25 Oct 2010 15:11:29 +0300
From: Dimi Chakalov <dchakalov@gmail.com>
To: Shing-Tung Yau <yau@math.harvard.edu>, Shing-Tung Yau <yau@ims.cuhk.edu.hk>
Cc: Chiu-Chu Melissa Liu <ccliu@math.columbia.edu>, Mu-Tao Wang <rmtwang@math.columbia.edu>, Xiao Zhang <xzhang@amss.ac.cn>, Lau Loi So <s0242010@gmail.com>, Hsin Chen <hchen@ntnu.edu.tw>, Fei-Hung Hoa <93242010@cc.ncu.edu.tw>, Chih-Hung Wang <chwang@phy.ncu.edu.tw>, Hwei-Jang Yo <hjyo@phys.ncku.edu.tw>

Dear Professor Yau,

I hope my email from Wed, 2 Jun 2010 05:28:23 +0300 has been safely received.

I believe some young and hungry grad student might crack the puzzle of quasi-local mass,
If you and/or some of your colleagues know such person, please pass her/him the link above. The task is highly non-trivial and strictly mathematical, and also requires guidance from Shao Yong.

I also believe the future of new energy sources belongs to your country, but if you wish to extract energy from 3-D space, you should always follow the advice of Shao Yong. Since I haven't heard from you so far, it seems the latter turned out to be too difficult for you.

Yours sincerely,

Dimi Chakalov

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Examine the objects as they are and you will see their true nature; look at them from your own ego and you will see only your feelings; because nature is neutral, while your feelings are only prejudice and obscurity.

Shao Yong, 1011-1077

Fooling around with alternative current is just a waste of time.
Nobody will use it, ever.

Thomas Alva Edison, 1889

Subject: Finite Infinity
Date: Wed, 27 Oct 2010 05:18:05 +0300
From: Dimi Chakalov <dchakalov@gmail.com>
To: Robert Beig <robert.beig@univie.ac.at>,
Bernd G Schmidt <Bernd.Schmidt@aei.mpg.de>,
Sean Hayward <sean_a_hayward@yahoo.co.uk>,
Roger Penrose <penroad@herald.ox.ac.uk>,
Cc: George F R Ellis <george.ellis@uct.ac.za>

Dear Colleagues,

My efforts to redefine Ellis' Finite Infinity can be read at

http://www.god-does-not-play-dice.net/#Hehl_note

It seems to me that the conformal picture (e.g., S. A. Hayward, arXiv:gr-qc/0307028v2, "the new structure proposed for infinity is unprecedentedly rigid, allowing physical fields to have very simple behaviour at spatial infinity") is not applicable to the case of 'more space' emerging from some unknown stuff with "dark energy". It's a whole new ball game for Finite Infinity and positive mass conjectures in such dynamical space.

I will appreciate your professional comments.

Kindest regards,
Dimi Chakalov

Note: Stephen Leacock posed the dilemma of 'infinite space', as imagined in some "infinite" Euclidean space, in the following fashion:

"We cannot imagine that the stars go on forever. It’s unthinkable. But we equally cannot imagine that they come to a stop and that beyond them is nothing, and then more nothing. Unending nothing is as incomprehensible as unending something."

In order to resolve the conundrum of 'ending something', we should first realize that, in the local mode of spacetime (cf. Fig. 1 below), every 'step' toward the Finite Infinity provides the necessary and sufficient condition for the next step, much like in the Thompson's lamp paradox. If we go in the "direction" toward the infinitesimal, one can (with some luck) work out a cutoff and end-point. Hence if we wish to work out a Finite Infinity, the obvious choice is to introduce a cutoff and end-point conjugated with the infinitesimal. Namely, there should exist a maximal volume of 3-D space, at which we place the Finite Infinity, such that a finite volume of space (hence 'one meter' and 'one second') can be identified as a sub-volume from this maximal finite space volume.

Strictly speaking, the very notion of 'space' requires that all physical objects in it acquire finite size; it is our "intuition" that suggests that a table with length one meter would have some pre-existing and exact size of 'one meter'. We shouldn't trust our "intuition" based on the idealized world of classical physics -- both the length of a table and the diameter of the maximal volume of 3-D space are merely templates that are being filled with concrete physical content, which in turns provides their fleeting (AOS) intrinsic "length". In the case of an one-meter template, we observe a "fixed" table with length one meter. What we need for Finite Infinity is to define the template of 'the maximal volume of 3-D space'.

Unlike a table, the fleeting numerical value of 'the maximal volume of 3-D space' is not fixed by some "error margins", because space itself has become dynamical due to its "dark" energy. In other words, just as the minimal volume of 3-D space is bounded from below by the infinitesimal denoted with S, the maximal volume of 3-D space should be bounded by an UNdecidable "cutoff and end-point" L, such that LS = 1. Nothing can go "beyond" L (compared it to the conformal recipe), simply because nothing can go "below" the infinitesimal S.

Hence 'space' can be literally wrapped by itself (George Ellis would probably hate this), and we can think of Finite Infinity that is both null- and spatially "infinite". Only the math is unknown. Good luck.

D.C.
October 28, 2010
Last update: October 30, 2010
Don Marolf <marolf@physics.ucsb.edu>,
Malcolm MacCallum <m.a.h.maccallum@qmul.ac.uk>,
Alan Rendall <rendall@aei.mpg.de>,
Jose M M Senovilla <josemm.senovilla@ehu.es>,
Miguel Alcubierre <malcubi@nuclecu.unam.mx>,
Bernard Schutz <bernard.schutz@aei.mpg.de>

Gentlemen:

I mentioned your gathering at
http://www.god-does-not-play-dice.net/#Blanchard

Four years ago, I proposed to convert LIGO tunnels to wine cellars. If you have a better idea, please do write me back.

Sincerely,

Dimi Chakalov

Subject: GR19 - 2010
Date: Fri, 4 Jun 2010 01:49:18 +0300
From: Dimi Chakalov <dchakalov@gmail.com>
To: Gabriela González <gonzalez@lsu.edu>
Cc: Jorge Pullin <pullin@lsu.edu>,
r gambini@fisica.edu.uy,
r gambini@relativity.phys.lsu.edu

Dear Professor González,

Regarding my email from June 8, 2005: I noticed your name at

Perhaps it will be a good idea if you blow the whistle at GR19 and expose the insurmountable problems of “GW astronomy”,

http://www.god-does-not-play-dice.net/#Blanchard

The sooner, the better.

Should you have professional questions, please don't hesitate to write me back.

Yours sincerely,

Dimi Chakalov

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Subject: Re: LSC March 2005 and June 2005 Meetings
Date: Wed, 08 Jun 2005 20:08:12 +0300
From: Dimi Chakalov <dimi@chakalov.net>
To: Gabriela González <gonzalez@lsu.edu>
CC: Jorge Pullin <pullin@lsu.edu>,
Dear Professor González,

I watched your movie "Gravity: Making Waves", with Ray Weiss and Mike Zucker, and would like to share my concerns regarding the "direction" of detecting gravitational waves

[snip]

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**Note:** Look at the "direction" of GW scattering in the animation below: you might be able to "see" these GWs iff you're a meta-observer capable of monitoring the whole spacetime *en bloc*.

However, this same "direction" is assumed to exist inside the same 3-D space **as well**: check out the [Mock LISA Data Challenge Taskforce](http://www.god-does-not-play-dice.net/#XXX) and LIGO-Virgo Mock Data (custom made) Working Group, as explained eloquently in their [arXiv:gr-qc/0701026v1](http://www.god-does-not-play-dice.net/#XXX):

"The burst “repeater” source was placed at the center of the Galaxy and the performance modulation due to Earth’s rotation has been studied with 24 hours of simulated data."

So, the direction of GW scattering 'from the center of the Galaxy toward Earth' matches the direction of the same GW scattering seen by the meta-observer.

Do you smell a rat? If not, join LIGO Scientific Collaboration.

D.C.
June 4, 2010

===================================

Subject: 8th International LISA Symposium, Stanford University, June 28, 2010 - July 02, 2010
Date: Mon, 7 Jun 2010 06:13:31 +0300
Message-ID:
<AANLkTikjRKN3_IeSejei8qsM8MgY8tOAv0_Mv6ziQe_M@mail.gmail.com>
From: Dimi Chakalov <dchakalov@gmail.com>
To: Vivian Drew <vdrew@stanford.edu>
Cc: Joan M Centrella <Joan.Centrella@nasa.gov>,
Warren Johnson <johnson@ligo.phys.lsu.edu>,
Stephen Merkowitz <stephen.m.merkowitz@nasa.gov>,
Meredith Gibb <meredith.gibb@nasa.gov>,
Karen Smale <karen.m.smale@nasa.gov>,
iris.t.purcarey@nasa.gov, Catherine.m.Corlan@nasa.gov,
Shau-Yun.Tsai-1@nasa.gov, andreluiz.s.luz@nasa.gov,
notoya.r.russell@nasa.gov, mor.vimmer@nasa.gov,
simon.barke@aei.mpg.de, johanna.bogenstahl@aei.mpg.de,
marina.dehne@aei.mpg.de, Roland.Fledermann@aei.mpg.de,
antonio.garcia@aei.mpg.de, joachim.kullmann@aei.mpg.de,
benjamin.sheard@aei.mpg.de, gudrun.wanner@aei.mpg.de,
frank.steier@aei.mpg.de, Cliff <cmw@wuphys.wustl.edu>

Dear Dr. Drew,
The reason why LIGO, LISA, etc. will fail miserably is explained at

http://www.god-does-not-play-dice.net/#mantra

Hundreds of millions U.S. Dollars and Euro -- taxpayers' money -- have been wasted so far by LIGO Scientific Collaboration, and even more are scheduled to be wasted with the "enhanced" and "advanced" LIGO and LISA.

I seriously urge you and your colleagues to examine your problems professionally. Please feel free to pass this email to all participants of your 8th International LISA Symposium.

NB: Should you or any of your colleagues have *professional* questions, please do write me back. Notice I will not reply to insults nor to emotional statements.

Yours sincerely,

Dimi Chakalov

Subject: The Averaging Problem in GR
Date: Tue, 23 Mar 2010 13:48:51 +0200
Message-ID: <bed37361003230448y8c3d28fr19844c193638a2ab@mail.gmail.com>
From: Dimi Chakalov <dchakalov@gmail.com>
To: Robert van den Hoogen <rvandenh@stfx.ca>
Cc: Juliane Behrend <jbehrend@stfx.ca>, Masumi Kasai <kasai@phys.hirosaki-u.ac.jp>, Naoshi Sugiyama <naoshi@a.phys.nagoya-u.ac.jp>, Frank Steiner <frank.steiner@uni-ulm.de>, Claus Gerhardt <gerhardt@math.uni-heidelberg.de>, Eduardo Guendelman <guendel@bgu.ac.il>, Thomas Buchert <buchert@obs.univ-lyon1.fr>, Yi Zhang <zhangyia@cqupt.edu.cn>, Lau Loi So <s0242010@gmail.com>, Xiao Zhang <xzhang@amss.ac.cn>, Marco Spaans <spaans@astro.ruq.nl>, Sergio Doplicher <dopliche@mat.uniroma1.it>, Volker Runde <vrunde@ualberta.ca>, Robert M Wald <rmwa@midway.uchicago.edu>, Robert Geroch <geroch@midway.uchicago.edu>, Chris Isham <c.isham@imperial.ac.uk>

Dear Professor van den Hoogen,

Your recent paper [Ref. 1] is a joy to read, and also a tough challenge to study. I haven't yet completed the second part, but since you acknowledged that Problem C (determining the gravitational correlation) is unresolved, may I offer some thoughts on the subject matter.
It seems to me that many physicists are unaware of the fundamental puzzle in differential calculus, as shown with the Thompson Lamp paradox,

\[\text{http://en.wikipedia.org/wiki/Thomson's_lamp}\]

They write textbooks and teach GR like a bartender [Ref. 2]. Other "bartenders" suggest various ad hoc solutions to the "dark" constituents of the universe in the following fashion:

Q: What is green, lives underground, has one eye, and eats stones?  
A: The One-Eyed Green Underground Stone Eating Monster!

I believe both dark matter and dark energy are artefacts of our essentially incomplete presentation of 'the infinitesimal', which may in turn be resolved with some pre-geometric plenum "connecting" x' and x [Ref. 1] dynamically, along an 'arrow of spacetime',

\[\text{http://www.god-does-not-play-dice.net/#quiz}\]

\[\text{http://www.god-does-not-play-dice.net/#Bahn}\]

I also believe the Thompson Lamp paradox has a quantum version: the UNdecidable KS state,

\[\text{http://www.god-does-not-play-dice.net/#KS}\]

The latter may act as the pre-geometric plenum mentioned above.

Your critical comments and suggestions, as well as the feedback from your colleagues, will be greatly appreciated.

May The Force be with the inhomogeneous cosmologists [Ref. 3].

With all good wishes,

Dimi Chakalov

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p. 1: "Can there be an alternative description for these observational effects that does not assume the existence of these mysterious dark quantities?"

"One possibility is that both dark matter and dark energy are artefacts of some effective averaged theory of gravitation.

....

Problem A (How does one Average tensor fields on a manifold?)
Problem C (What is the nature of the gravitational Correlation , \(C_{ab}\))

....

p. 7: "3.2. Choice 1: Parallel Transport along Geodesic"

"To begin, we must first select a unique curve that connects the points x and x' and a connection: for our purposes, we choose the geodesic and the Levi-Cevita connection. The geodesic is a "natural" choice as there are no other "natural" curves that connect x' and x. In Riemannian space, the geodesic is the shortest and straightest path connecting points x' and x. A weakness in this approach is
the assumption that a unique geodesic exists connecting \( x' \) and \( x \).

p. 8: "We have illustrated a covariant averaging procedure for tensor fields addressing problem A. We have not averaged the Einstein Field Equation’s of General Relativity, and therefore have not addressed problem C of determining the gravitational correlation, so much more work to do."

[Ref. 2]
http://www.math.ualberta.ca/~runde/jokes.html

An **infinite** crowd of mathematicians enters a bar. The first one orders a pint, the second one a half pint, the third one a quarter pint... "I understand", says the bartender - and pours two pints.

[Ref. 3] Masumi Kasai (23 June 2009): "May the Force be with the inhomogeneous cosmologists. May the Force be with us."
IPMU International Conference dark energy: lighting up the darkness!

Subject: Request for opinion
Date: Wed, 31 Mar 2010 20:47:14 +0300
Message-ID: <w2jbed37361003311047sdef905d3w938a76121dcd3c8@mail.gmail.com>
From: Dimi Chakalov <dchakalov@gmail.com>
To: Helena Granström <granstrom.h@gmail.com>

Dear Dr. Granström,

I am respectfully requesting your professional opinion on the interpretation of KS Theorem at

http://www.god-does-not-play-dice.net/#KS

http://www.god-does-not-play-dice.net/#KS_details

Kindest regards,

Dimi Chakalov

Subject: arXiv:1005.3767v1 [quant-ph], Sec. 4
Date: Fri, 21 May 2010 05:06:16 +0300
Message-ID: <AANLkTInsis_3Uw6F0YjPNVRHwucvJyalu9j3O_6_3GJf@mail.gmail.com>
From: Dimi Chakalov <dchakalov@gmail.com>
To: Diederik Aerts <driaerts@vub.ac.be>

Dear Diederik,
I wonder if your work overlaps with mine:

http://www.god-does-not-play-dice.net/#KS

Best regards,

Dimi

Subject: arXiv:1006.1552v1 [gr-qc], dated: June 9, 2010
Date: Wed, 9 Jun 2010 04:06:55 +0300
From: Dimi Chakalov <dchakalov@gmail.com>
To: Naresh Dadhich <nkd@iucaa.ernet.in>

Hi Naresh,

Regarding your idea that \( \lambda \) "characterizes the matter free state": the "matter free state" has been discussed at

http://www.god-does-not-play-dice.net/#KS
http://www.god-does-not-play-dice.net/#Geroch_note
http://www.god-does-not-play-dice.net/#Blanchard

I very much look forward to reading your arXiv:1006.1552 v2 [gr-qc].

Regards,

Dimi

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Note: Check out N. Dadhich's arXiv:gr-qc/0405115v1, particularly the discussion of Eq. 4. He also posed the following question (arXiv:0802.3034v5 [gr-qc]):

"It is remarkable that even classical dynamics of gravity asks for dimension > 4. As two and three dimensions were not big enough for free propagation of gravity, similarly four dimension is not big enough to fully accommodate self interaction dynamics of gravity. Then the most pertinent question is where does this chain end?"

It ends at infinitely-dimensional spacetime -- see Fig. 2 below. Every infinitesimal "point" from the local mode is endowed with infinitely-many connections (global mode of spacetime) with 'the rest of points' in the local mode. And since the global mode is hidden by the so-called 'speed of light', the bootstrapped local mode is "self-acting" upon itself along the arrow of spacetime. Not surprisingly, the origin of this "self-force" is not traceable, and some people consider it "dark".

This offers a new interpretation of the old idea of "breathing" (inhaling/exhaling) universe (common knowledge in India), only the duration of the "breathing" cycle is exactly zero in the local mode of spacetime, rendering the latter a perfect continuum. That's the proposal for 'quantum principle for
spacetime dynamics', after Schrödinger and KS Theorem.

Perhaps Naresh Dadhich would some day accidentally discover it. All he has to do is to forget about "branes" and other multidimensional superstitious.

D.C.  
June 12, 2010

Subject: The raw potato, http://pirsa.org/09080013  
Date: Thu, 27 May 2010 15:57:16 +0300  
From: Dimi Chakalov <dchakalov@gmail.com>  
To: Bob Coecke <coecke@comlab.ox.ac.uk>  
Cc: John Baez <baez@math.ucr.edu>

Hi Bob,

I trust all my email messages sent in the past three years have been received.

You declared your intentions to make "new models and axiom systems for quantum reasoning", and expressed hopes for "important steps towards quantum gravity",

http://www.comlab.ox.ac.uk/projects/NewQuantumFormalism/index.html

If this just a hobby? For if you were collecting stamps, while I was suggesting to switch to collecting paper napkins, I could understand your attitude of neglecting the underlying "raw potato" -- the UNdecidable KS state,

http://www.god-does-not-play-dice.net/#KS

Try it with your brain at

http://www.god-does-not-play-dice.net/#context

NB: Category theory cannot -- not even in principle -- model the "raw potato". You and John are wasting your time and FQXi donations: $89,981 for your efforts, and $131,865 for John's "Categorifying Fundamental Physics".

Now, if you (John won't respond) are serious about your business, please reply professionally, and I will elaborate.

If you're doing it as a hobby -- don't bother. Have a beer instead.

Take care,
Dear Dr. Crane,

Regarding your talk at the 7th QPL workshop "Quantum Physics and Logic" and arXiv:gr-qc/0602120v2, and the $135,247 FQXi award, perhaps you may wish to see my recent email to Bob Coecke, http://www.god-does-not-play-dice.net/#Coecke

I think $135,247 is a lot of money to be spend for a hobby. What do you think?

Sincerely,

Dimi Chakalov

Dear Dr. Chang,

I read with great interest your arXiv:0705.2908v2, but couldn't understand the following:

"When the positive and negative matters with the same mass meet, they will become a real vacuum." And also: "The positive and negative matters under some exceeding conditions may be created from nothing at the same time. They will also be main tests of the existence of negative matter."

What could be the ultimate source of positive and negative matters (called "nothing"), such that it can "meet" them as "a real vacuum"?

Kindest regards,
Dear Graham,

You said (Thu, 23 Dec 2004) that the affine structure "is a further primitive (not definable from mere differential structure) structure which you can postulate using some representation or other of it" -- please see

http://www.god-does-not-play-dice.net/#Force

I will appreciate your critical comments.

All the best,

Dimi

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Subject: Re: The shape of space
Date: Thu, 23 Dec 2004 12:38:15 +1030
From: Graham Nerlich <graham.nerlich@adelaide.edu.au>
To: Dimi Chakalov <dchakalov@gmail.com>

I meant something pretty simple by what I wrote in Shape of Space. Consider a space which has the structure only of a differential manifold. Then, so far, no affine structure, no geodesics, no curvature, no Christoffel tensor. The transition from this to affine structure is not given by or extruded from Christoffel symbols or the 3-tensors which they represent. The affine structure is a further primitive (not definable from mere differential structure) structure which you can postulate using some representation or other of it. You can postulate it as a covariant derivative, a connection, or a tensor which can be represented in coordinates by a Christoffel symbol. But that representation makes sense only if the affine structure is already there, so to speak. True, in GR, the fundamental equation tells us (among other things) that the curvature and the "matter distribution" are co-determinate. That doesn't mean that the curvature is caused by the matter tensor. A simple analogy shows the catch in that way of thinking. The distance relations between London, New York and Sydney entail that the cities aren't on a flat surface. But the distances don't cause the shape of the surface. These places couldn't have those distances if the surface wasn't curved in the first place. The basic equation of GR places a mutual constraint on the tensors on each side of it.

I guess you know that the tensor as represented by a Christoffel symbol isn't straightforwardly like other tensors. If you don't, B. Schutz A First Course in General Relativity sec. 5.5 gives a clear account of it.

Best wishes
Graham Nerlich

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Subject: Dreaming about LISA, arXiv:1011.2062v1 [gr-qc]
Date: Wed, 10 Nov 2010 04:07:11 +0200
Message-ID:<AANLkTinqa4NF+vAwZm1m_Mb8vYRiGhKcDyW40Y7V+eGU@mail.gmail.com>
From: Dimi Chakalov <dchakalov@gmail.com>
To: Stanislav Babak <stba@aei.mpg.de>,
jgair@ast.cam.ac.uk, antoine.petiteau@apc.univ-paris7.fr, alberto.sesana@aei.mpg.de
Cc: Leonid.Grishchuk@astro.cf.ac.uk, Beverly Berger <bberger@nsf.gov>, Tom Carruthers <tcarruth@nsf.gov>, Denise S Henry <dshenry@nsf.gov>, Ramona Winkelbauer <rwinkelb@nsf.gov>, LSC Spokesperson <reitze@phys.ufl.edu>

Dear Mr. Babak,

You wrote (p. 2): "we will use the fact that LISA will observe about 30 events per year..."

But it isn't a *fact*. The fact of the matter is that people are not stupid, and are fully aware of the errors in your hypotheses:

http://www.god-does-not-play-dice.net/ExplanatoryNote.pdf

It is manifestly pointless to dream about LISA, because you won't get it.

Sincerely,

D. Chakalov

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Overfunded research is like heroin: It makes one addicted, weakens the mind and furthers prostitution.

Johann A. Makowsky, The Jerusalem Post, 19.4.1985

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Subject: Pornography at the NSF and GW parapsychology
Date: Thu, 1 Oct 2009 14:34:37 +0300
From: Dimi Chakalov <dchakalov@gmail.com>
To: Carlos <carlos@hotmail.com>
Cc: Beverly Berger <bberger@nsf.gov>, Tom Carruthers <tcarruth@nsf.gov>, Denise S Henry <dshenry@nsf.gov>, Ramona Winkelbauer <rwinkelb@nsf.gov>, Peggy Fischer <pfischer@nsf.gov>, OIG <oig@nsf.gov>
Dear Carlos,

I forgot about these funny news: 75% of the people who work at the National Science Foundation (NSF) have been found to be surfing at Porno in the web.


I've been trying to contact NSF since July last year, but the only response I got so far was from Mr Berger (email printed below).

The forthcoming scandal about LIGO will be enormous:
http://www.god-does-not-play-dice.net/Szabados.html#SBG

Nobody cares. NOBODY.

All the best,

Dimi
http://www.god-does-not-play-dice.net/#NB

==========

Re: LSC: Aggressive professional negligence
Date: Fri, 5 Sep 2008 12:51:16 -0400
Message-ID: <A74B5B2C42009044AD35C5490049DAE7011BA3A6@NSF-BE-01.ad.nsf.gov>
From: Berger, Beverly K. <bberger@nsf.gov>
To: Dimi Chakalov <dchakalov@gmail.com>

I will be on vacation until Sept. 8 and will have no email contact for most of that time. If you cannot wait until I return, please contact Denise Henry (dshenry@nsf.gov).
Note: At the age of 57, my hair is getting lily-white, and I may claim that it is sufficiently white to enjoy surfing at porno in the web, yet still sufficiently black to attract real blond girls. Likewise, LSC members deeply believe that GW strain, which might hit LIGO some day, would be sufficiently weak to be modeled with the linearized approximation of GR, yet sufficiently strong to be detected with the so-called Advanced LIGO (cf. J. G. Pereira et al., arXiv:0909.4408v1).

But LSC can't have their cake and eat it. As Hermann Weyl demonstrated in 1944 (Hermann Weyl, How Far Can One Get With a Linear Field Theory of Gravitation in Flat Space-Time? American Journal of Mathematics, Vol. 66, No. 4 (Oct., 1944), pp. 591-604), the linearized approximation of GR is "a shadow without power".

Notice that LSC cannot describe smooth bi-directional transitions from strong GWs to very weak GWs, as they approach asymptotically their sudden death at the stage of "a shadow without power". Joshua Goldberg is manifestly silent on this crucial problem, and Kip Thorne didn't even mention Hermann Weyl's article in his lecture "Gravitational waves in flat spacetime". Instead, he tried to defend the so-called "invariance angle" of LIGO's arms with an article by Eugene Winger, which he has read as a student "around 1960". Just look at the L-shaped tunnels of LIGO: isn't this "graviton parapsychology"?

The persistent "evolution" of the beliefs of LSC members is really amazing. Back in 1981 (cf. Daniel Kennefick, p. 1), Kip Thorne had no difficulty in "finding a taker for a wager that gravitational waves would be detected by the end of the last century. The wager was made with the astronomer Jeremiah Ostriker, one
of the better-known critics of the large detectors then being proposed. Thorne was one of the chief movers behind the largest of the new detector projects, the half-billion-dollar Laser Interferometer Gravitational Wave Observatory, or LIGO. He lost the bet, of course."

Now LSC members are effectively saying 'just gives us a couple of billion dollars more, and we gonna make it'. Exactly how much more? The Advanced LIGO Cost Estimating Plan (M990310-05.pdf, updated 05.27.2003) is here, but is hidden to 'mass society' taxpayers.

Notice that LSC have already prepared 'Plan B', in case they fail miserably again. In their latest "science white paper", submitted to the Astro2010 Decadal Survey (Bernard F. Schutz et al., arXiv:0903.0100v1 [gr-qc], p. 3), they wrote:

"It is worth reminding ourselves why and where GR might fail." (...) "Any such failure of GR should point the way to new physics."

Once the "Advanced LIGO" fails in 2015, they will celebrate the 100th anniversary of Einstein's GR with their "way to new physics", claiming that their total failure is actually of fundamental importance, like the negative result for the ether drift in the experiment of Michelson and Morley ... but with just a few billion dollars more for LISA and Einstein Telescope, everything will be just right.

Are NSF officials going to risk a devastating embarrassment from their blind support of GW parapsychology?

D. Chakalov
October 2, 2009
Last update: October 26, 2009

Subject: Re: The schizophrenic behavior of gravity (SBG)
Date: Sat, 13 Mar 2010 15:45:13 +0200
Message-ID:
From: Dimi Chakalov <dchakalov@gmail.com>
To: Nikolai Mitskievich <nmitskie@gmail.com>
Cc: Ludvig Faddeev <faddeev@pdmi.ras.ru>, Viktor Denisov <denisov@srz.sinp.msu.ru>, kip@tapir.caltech.edu, weinberg@physics.utexas.edu, LSC Spokesperson <reitze@phys.ufl.edu>, Beverly Berger <bberger@nsf.gov>, Tom Carruthers <tcarruth@nsf.gov>, Denise S Henry <dshenry@nsf.gov>, Ramona Winkelbauer <rwinkelb@nsf.gov>, GW_comp@oglecy.gsfc.nasa.gov, Laszlo Szabados <lbszab@rmki.kfki.hu>, Adam Helfer <adam@math.missouri.edu>, Bernard.Schutz@aei.mpg.de, danielk@uark.edu, c.isham@imperial.ac.uk, luca@phy.olemiss.edu, Roger Blandford <rd33@stanford.edu>, Lynne Hillenbrand <lah@astro.caltech.edu>, Donald C Shapero <dshapero@nas.edu>, Adam Riess <ariess@pha.jhu.edu>

Dear Dr. Mitskievich,
You wrote (arXiv:1002.1421v1): "I am regretful not to tell these considerations to Kip S. Thorne more than two decades ago, simply because of a kind of awkward modesty."

I think Kip Thorne should have been aware since mid-1980s that the whole idea of some "dimensionless GW amplitude" acting on physical objects is wishful thinking,

http://www.god-does-not-play-dice.net/#Jones

The rigorous proof was delivered by Denisov and Logunov in 1982; English translation in 1984,

http://www.springerlink.com/content/tr05r2853123/?p=2f6d7ad5e83047baab73de519b1007f4&pi=0

Sec. 6, pp. 1728-1734, http://www.springerlink.com/content/r4227857n075h92h/?p=6191681b74ad428f9ebf0f883311fbcf&pi=6

Please notice that the crucial *asymptotic* expression $r \to \infty$ at the link above is mathematically unclear, that is, pure poetry.

Physically, it is also totally unclear due to the so-called "dark" energy from empty space,

http://www.god-does-not-play-dice.net/#quiz

So, even if we assume that Kip Thorne has somehow missed the monograph by V. Denisov and A. Logunov, he is most certainly aware that the whole "GW astronomy" is in murky waters since the discovery of "dark" energy in 1997 by Adam Riess,

http://www.god-does-not-play-dice.net/#facts

How did he manage to drag so many people into this nonsense, I wonder.

Notice that LIGO Scientific Collaboration might have prepared 'Plan B', in case they fail miserably again. In their "science white paper", submitted to the Astro2010 Decadal Survey (Bernard F. Schutz et al., arXiv:0903.0100v1 [gr-qc], p. 3), they wrote:

"It is worth reminding ourselves why and where GR might fail." (...) "Any such failure of GR should point the way to new physics."

Once the "Advanced LIGO" fails in 2015, they will celebrate the 100th anniversary of Einstein's GR with their "way to new physics", claiming that their total failure is actually of fundamental importance, like the negative result for the ether drift in the experiment of Michelson and Morley ... but with just a few billion dollars more for LISA and Einstein Telescope, everything will be just right.

I am afraid NSF officials are indeed taking the risk of devastating embarrassment after their blind support of GW parapsychology. And they will get it:

http://www.god-does-not-play-dice.net/Szabados.html#SBG
Perhaps you can help your US colleagues. You know the work by Viktor Denisov, Anatol Logunov, and Ludvig Faddeev. I hope you have some spare time to write up a brief paper and post it on arxiv.org server, to prevent the abuse of Einstein's GR with the 'Plan B' above.

Nobody should blame GR for the forthcoming failures to detect GWs with some "enhanced" or "advanced" LIGO. Einstein’s errors regarding energy transport by GWs were identified even before Kip Thorne was born. I will be happy to provide you the references.

Looking forward to hearing from you,

Yours sincerely,

Dimi Chakalov

Note: The staggering problem of "GW astronomy", encoded in the asymptotic expression $r \rightarrow \infty$, can perhaps be explained by an ancient Greek in the following fashion. Suppose Achilles is throwing his famous spear in one direction along the radius of the universe, $r$, starting from its center at Athens. He isn't familiar with the wisdom of present-day cosmology, but is a staunch relativist and knows that the universe is like an unbroken ring with no circumference, for the circumference is nowhere, and the "center" is everywhere.

How can Achilles prove the 'no circumference' conjecture? Suppose that, at some advanced stage from his exercise, he finds out that cannot throw his spear anymore, because he has reached some (asymptotic) limit of being 'too far away from Athens'. Namely, the increasing distance ($r$) between Achilles and Athens somehow blocks his spear at $r \rightarrow \infty$, placing the circumference of the universe at some "effective infinity" from all "centers", Athens included. But because Achilles is smart relativist, he will be immediately puzzled by the privileged (if not absolute) location of Athens in the universe and its influence on his spear, such that he cannot replace Athens with some closer point from his path (say, just one point behind the last location of his spear) and throw his spear further, ad infinitum.

This is very unclear, isn't it? As Adam Helfer put it (arXiv:0903.3016v1 [gr-qc]), the asymptotic spacelike regime is "less well understood mathematically at present". English translation: it's pure poetry, as stated above.

The situation with the alleged null infinity isn't better either: "From a physical point of view, null infinity is very far away." (Bernard F. Schutz, Mathematical and Physical Perspectives on Gravitational Radiation, August 2, 2002)

To paraphrase Woody Allen, infinity is very long, especially towards the end. People tend to indulge themselves with some "rescaling metric" recipe (Ted Newman), but it is totally unclear how to "rescale" the metric during its accelerated expansion, as driven by the "dark" energy from empty space.

In this gloomy situation, may I offer some optimistic speculations. John Stachel mentioned a seminal paper by Niels Bohr and Leon Rosenfeld, Zur Frage der Messbarkeit der elektromagnetischen Feldgrssen, published in 1933: Because EM charges "occur with two signs that can neutralize each other, a charge-current distribution acting as a source of an electromagnetic field can be manipulated by matter that is electrically neutral and so not acting as a source
of a further electromagnetic field; and one can shield against the effects of a charge-current distribution." Then he added: "A glance at Bohr and Rosenfeld 1933 shows how important the possibility of neutralizing the charges on test bodies is for measurement of the (averaged) components of the electric field with arbitrary accuracy, for example. This difference may well have important implications for the measurement of gravitational field quantities."

So, we need some entity that is charge-neutral to the two signs of mass: potential reality. Also, because GWs are sheer coordinate effects, they might "propagate" with any velocity desired by the human imagination, included 'the speed of thought' (Arthur Eddington, The Propagation of Gravitational Waves, 1922). We have to stick to the full non-linear GR, because its linearized approximation is "a shadow without power" (Hermann Weyl; see above).

Yes, GWs exist, and can be detected. All we may need is a "device" that can also detect quantum waves without any "collapse" whatsoever: a human brain.

All this has been said many times at this web site; sorry for repeating it here. The only correction I need to make concerns my statement above: "Einstein's errors regarding energy transport by GWs were identified even before Kip Thorne was born." But I was wrong. Hermann Weyl's article was published in 1944, at the time when Kip Stephen Thorne was 4 year old. Sorry, I was wrong. Mea culpa.

D. Chakalov
March 14, 2010

Subject: STRANGE MISCONCEPTIONS OF GENERAL RELATIVITY, by G. 't Hooft
Date: Tue, 16 Mar 2010 15:50:10 +0200
Message-ID: <bed37361003160650s3e298c86r5b67c848fa6db72c@mail.gmail.com>
From: Dimi Chakalov <dchakalov@gmail.com>
To: CEOFOP <G.tHooft@uu.nl>,
"Szabados,L." <lbszab@rmki.kfki.hu>,
"Dupre, Maurice J" <mdupre@tulane.edu>,
Norbert Straumann <norbert.straumann@gmail.com>,
Domenico Giulini <domenico.giulini@itp.uni-hannover.de>,
Luca Bombelli <luca@phy.olemiss.edu>,
Adam Helfer <adam@math.missouri.edu>
Cc: Stephen Crothers <thenarmis@gmail.com>,
"C. Y. Lo" <c_y_lo@yahoo.com>,
Merced Montesinos Velásquez <merced@fis.cinvestav.mx>,
Angelo Loinger <angelo.loinger@mi.infn.it>

On Tue, 2 Mar 2010 19:22:24 +0200, Dimi Chakalov <dchakalov@gmail.com> wrote:
> CEOFOP: All you need to prove me wrong is at
> http://www.god-does-not-play-dice.net/#Jones
>
Dear Laszlo, Maurice, Norbert, Domenico, Luca, and Adam,

May I ask you to share your opinion on the following issues concerning GR.

Dr. G. 't Hooft, the Chief Editor of Foundations of Physics (CEOFOP), has posted a silver-tongued essay on what he calls "gravitating misconceptions":

http://www.phys.uu.nl/~thooft/

"**Gravitating misconceptions**: response on claims by a group of self proclaimed scientists concerning the validity of the theory of General Relativity."

These "gravitating misconceptions" are explained at

**STRANGE MISCONCEPTIONS OF GENERAL RELATIVITY**, http://www.phys.uu.nl/~thooft/gravitating_misconceptions.html

Please note CEOFOP's claim that "a true, real stress-energy-momentum tensor for gravity does also exist!", provided "all of the metric is handled as "dynamical" " [Ref. 1]. The result is that "the energy in gravity and that in matter always balances out to zero" (ibid).

This reminds me of Merced Montesinos' paper [Ref. 2] on 'the right answer to the wrong question' (MTW p. 467).

NB: I wonder how you would comment on CEOFOP's "true, real stress-energy-momentum tensor for gravity", given his statement that "Einstein's equations are non-linear, and this is why gravitational fields can be the source of additional amount of gravity, so that a gravitational field can support itself." [Ref. 1]

Surely we don't see "the ether" coming back to GR textbooks [Ref. 2], but would you please explain your viewpoint on the above-mentioned "true, real stress-energy-momentum tensor for gravity" ?

Please also check out CEOFOP's interpretation of the "radial coordinate r " used in the Schwarzschild (actually, it is Hilbert-Droste-Weyl) solution [Ref. 1], and compare it with the interpretation offered by Angelo Loinger [Ref. 3].

A penny for your thoughts!

All the best,

Dimi

References

[Ref. 1] Excerpts from "**STRANGE MISCONCEPTIONS OF GENERAL RELATIVITY**", by G. 't Hooft
http://www.phys.uu.nl/~thooft/gravitating_misconceptions.html
"What does L say about this? "I have proven that dynamical solutions do not exist, so your solution is wrong". What is wrong about it? First, he ignores the wave packets and focuses on the plane wave solutions. These have infinite extension in space and time and represent infinite energy. That, indeed, is problematic in gravity. If the energy in a given region with linear dimensions $R$ exceeds $R$ in natural units, a black hole is formed so that space-time undergoes a subtle change in topology. This might arguably be called unacceptable. The problem is manifest in our explicit solutions, and this is why it is important to use wave packets instead. The wave packages are identical to the ones in Maxwell theory, and since they represent only finite amounts of energy (per unit of length in the $z$ direction), these solutions are indeed legitimate. I showed L how to construct explicit, analytical examples of such wave packets."

"Actually, a true, real stress-energy-momentum tensor for gravity does also exist! If all of the metric is handled as "dynamical" one finds that the Einstein tensor $G_{\mu\nu}$ itself acts as the gravitational part of the energy-momentum. Adding this to the energy and momentum of matter one finds a quantity that is trivially conserved: the addition gives zero, according to Einstein's equations. Thus, the energy in gravity and that in matter always balances out to zero. In practice, this is not a very useful definition; it would imply that gravity carries a gigantic amount of energy, most of which is invisible, and no further physical information is obtained, but it is the matter of principle (Sic! - D.C.) that counts here. In practice, we may wish to ignore the large contribution from the background, and this is why a "pseudotensor" emerges. One can add to this that, by construction, the pseudotensor should only depend on first derivatives, whereas the "true tensor" $G_{\mu\nu}$ contains second derivatives, which makes it physically counter intuitive."

"Black holes do not exist; they are solutions of the equation for the Ricci tensor $R_{\mu\nu} = 0$, so they cannot carry any mass. And what is usually called a "horizon" is actually a physical singularity."

"Mr. C. adds more claims to this: In our modern notation, a radial coordinate $r$ is used to describe the Schwarzschild solution, the prototype of a black hole. "That's not a radial distance!", he shouts. "To get the radial distance you have to integrate the square root of the radial component $g_{rr}$ of the metric!!" Now that happens to be right, but a non-issue; in practice we use $r$ just because it is a more convenient coordinate, and every astrophysicist knows that an accurate calculation of the radial distance, if needed, would be obtained by doing exactly that integral. "$r$ is defined by the inverse of the Gaussian curvature", C continues, but this happens to be true only for the spherically symmetric case. For the Kerr and Kerr-Newman metric, this is no longer true. Moreover, the Gaussian curvature is not locally measurable so a bad definition indeed for a radial coordinate. And why should one need such a definition? We have invariance under coordinate transformations. If so desired, we can use any coordinate we like. The Kruskal-Szekeres coordinates are an example. The Finkelstein coordinates another. Look at the many different ways one can map the surface of the Earth on a flat surface. Is one mapping more fundamental than another?

"The horizon is a real singularity because at that spot the metric signature switches from $(+,−,−,−)$ to $(-,+,−,−)$", C continues. This is wrong. The switch takes place when the usual Schwarzschild coordinates are used, but does not imply
any singularity. The switch disappears in coordinates that are regular at the horizon, such as the Kruskal-Szekeres coordinates. That's why there is no physical singularity at the horizon.

"But where does the black hole mass come from? Where is the source of this mass? $R_{\mu\nu} = 0$ seems to imply that there is no matter at all, and yet the thing has mass! Here, both L and C suffer from the misconception that a gravitational field cannot have a mass of its own. But Einstein's equations are non-linear, and this is why gravitational fields can be the source of additional amount of gravity, so that a gravitational field can support itself. In particle theories (Sic! - D.C.), similar things can happen if fields obey non-linear equations, we call these solutions "solitons". A black hole looks like a soliton, but actually it is a bit more complicated than that.

"The truth is that gravitational energy plus material energy together obey the energy conservation law. And now there is a thing that L and C fail to grasp: a black hole can be seen to be formed when matter implodes. Start with a regular, spherically symmetric (or approximately spherically symmetric) configuration of matter, such as a heavy star or a star cluster. Assume that it obeys an equation of state. If, according to this equation of state, the pressure stays sufficiently low, one can calculate that this ball of matter will contract under its own weight. The calculation is not hard and has been carried out many times; indeed, it is a useful exercise for students. According to Einstein's equations, the contraction continues until the pressure is sufficiently high to stop any further contraction. If that pressure is not high enough, the contraction continues and the result is well-known: a black hole forms. Matter travels onwards to the singularity at $r = 0$, and becomes invisible to the outside observer. All this is elementary exercise, and not in doubt by any serious researcher."
background metric, the vanishing property of $\tau_{\mu\nu} = 0$ is not interpreted here as a 'problem' that must be corrected somehow but exactly the other way around. In our opinion, there is nothing wrong with that property because it just reflects the double role that the equations of motion associated with the dynamical background play."

http://arxiv.org/abs/physics/0403092

_Idem_, The Black Holes do not exist - "Also Sprach Karl Schwarzschild",
arXiv:physics/0402088v1 [physics.gen-ph],
http://arxiv.org/abs/physics/0402088

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Date: Tue, 2 Nov 2010 05:41:05 +0200
From: Dimi Chakalov <dchakalov@gmail.com>
To: CEOFOP <g.thooft@uu.nl>
Cc: Masato Nozawa <nozawa@gravity.phys.waseda.ac.jp>,
Stephen Crothers <thenarmis@gmail.com>,
Thibault Damour <damour@ihes.fr>

Gerardus,

After some tantalizing assumptions (p. 4), you boldly declared (p. 11): "Matter and dilaton then join smoothly together in a perfectly conformally invariant theory."

But then you acknowledged (p. 12): "The author believes that quantum mechanics itself will have to be carefully reformulated before we can really address this problem."

Welcome aboard,

http://www.god-does-not-play-dice.net/#KS

There is no need to invent the wheel: check out Schrodinger at the link.

As I said six and a half years ago ("energy-momentum flows from matter to grav. fields and back", see below), you can bring a horse to the water, but cannot make him drink.

Dimi

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On Thu, 11 Mar 2004 08:17:00 +0100, "Hooft 't G." wrote:
> Let me briefly explain. Following the conventional Einstein equations, the matter-energy-momentum tensor is COVARIANTLY conserved; it is not conserved if you replace covariant derivatives by ordinary derivatives. This is how energy-momentum flows from
Note: Gerard 't Hooft has been generously "casting pearls to the swine" (exact quote -- see CEOFOP_1.pdf in CEOFOP_1.zip) at

http://www.phys.uu.nl/~thooft/gravitating_misconceptions.html

Check out a snapshot (2.11.2010) from the page above, Gerardus_energy.jpg, and notice the splitting of "the metric $g_{\mu\nu}$ into a background part, $g^{0}_{\mu\nu}$, for which we could take flat space-time, and a dynamical part: substitute in the Einstein-Hilbert action: $g_{\mu\nu} = g^{0}_{\mu\nu} + g^{1}_{\mu\nu}$. (...) Just require that the background metric $g^{0}_{\mu\nu}$ obeys the gravitational equations itself; one can then remove from the Lagrangian all terms linear in $g^{1}_{\mu\nu}$. This way, one gets an action that starts out with terms quadratic in $g^{1}_{\mu\nu}$, while all its indices are connected through the background field $g^{0}_{\mu\nu}$." It is utter madness indeed. Notice that this person is Chief Editor of Foundations of Physics (CEOFOP), and maybe (hope not!) teaches GR. That's really scary.

As to the latest note by Gerard 't Hooft, entitled "The plane gravitational wave for beginners" (Addendum 18/8/2010), he failed to mention that, for a pp-wave, all curvature invariants vanish (Hans Stephani and John Stewart, General Relativity, Cambridge University Press, 1982; section 15.3). That's 'for beginners'; I've said much more in ExplanatoryNote.pdf. Just a hint: the proper calculation of 'the self force' is not "miniscule" but shows the input of "dark energy" and the mechanism by which GWs transport energy and momentum; as Hermann Bondi stressed many years ago, "the question of the "reality" of the waves essentially concerned whether they transported energy. Such transport is a fundamentally nonlinear phenomenon." LIGO is manifestly blind and deaf to this inherently nonlinear phenomenon, and cannot measure anything related to BMS group.

D.C.
November 3, 2010

Subject: Re: STRANGE MISCONCEPTIONS OF GENERAL RELATIVITY, by G. 't Hooft
Date: Sun, 21 Mar 2010 04:16:04 +0200
From: Dimi Chakalov <dchakalov@gmail.com>
To: [snip]
Cc: [snip]

P.S. Please try to reconcile CEOFOP's "true, real stress-energy-momentum tensor for gravity"

http://www.phys.uu.nl/~thooft/gravitating_misconceptions.html

If you succeed, please do write me back.

D.

2010/3/18 Dimi Chakalov <dchakalov@gmail.com>:
> Dear colleagues,
> If you wish to be removed from this thread, please say so.
> The whole issue about GR is very simple indeed; I managed to explain it even to my teenage daughter,
> http://www.god-does-not-play-dice.net/#Bahn
> All the best,
> Dimi
>

Subject: Re: STRANGE MISCONCEPTIONS OF GENERAL RELATIVITY, by G. 't Hooft
Date: Sun, 21 Mar 2010 13:01:24 +0200
From: Dimi Chakalov <dchakalov@gmail.com>
To: "C. Y. Lo" <c_y_lo@yahoo.com>
Cc: [snip]

Dear Lo,

If you read my paper of 1995, you will know that 't Hooft is wrong.

Sure, I've read the Appendix. You also wrote (p. 422): "Note that E is unchanged if the Landau-Lifshitz "pseudotensor" is used in equation (3c)."

I have some comments on your Eq. 12a, but that's a different thread.

All the best,

Dimi

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Subject: Re: STRANGE MISCONCEPTIONS OF GENERAL RELATIVITY, by G. 't Hooft
Date: Sun, 21 Mar 2010 20:39:34 +0200
From: Dimi Chakalov <dchakalov@gmail.com>
Dear Lo,

> Your comments would be appreciated. Thank you.

I opened this thread on March 16th, 
http://www.god-does-not-play-dice.net/#Gerardus

As I said below, my comments on your Eq. 12a will be a different thread, so I'd suggest to discuss it privately. If you find my opinion interesting, please reply to me only. Very briefly:

Firstly, you wrote (p.421): "It seemed that only a covariant theory could be valid in physics (see Appendix)." But notice that the 'absolute structures in GR', after Anderson,

http://www.god-does-not-play-dice.net/#Brown

can show up in GR *only* as some disguised "gauge-dependent" objects,

http://www.god-does-not-play-dice.net/Greenberg.html#addendum

Secondly, you grounded your paper on the assumption that Einstein's quadrupole radiation formula might be correct, and tried to modify the field equations instead (p. 425).

You wrote (p. 423): "In view of the fact that there is no existing gravity energy-stress tensor, it seems simple and natural to assume that the source tensor T_ab is zero in a vacuum."

Then you argued (ibid.) that "Einstein's radiation formula implies that his field equation must be modified so that the source tensor is nonzero in vacuum."

Why not have it both ways? Yes you can: T_ab (the energy momentum stress tensor of all matter and fields) can *completely* vanish/dissolve into the vacuum, and stay available there for any partial, full, or "over unity" recall, if and when needed. All you need is a new form of reality: see my note on the dynamics of GR at

http://www.god-does-not-play-dice.net/#Bahn

Again, all this will be a different thread, so please reply to me only.

All the best,

Dimi
To: Stephen Crothers <thenarmis@gmail.com>
Cc: CEOFOP <G.tHooft@uu.nl>, "Szabados,L." <lkszab@rmki.kfki.hu>, "Dupre, Maurice J" <mdupre@tulane.edu>, Norbert Straumann <norbert.straumann@gmail.com>, Domenico Giulini <domenico.giulini@itp.uni-hannover.de>, Luca Bombelli <luca@phy.olemiss.edu>, Adam Helfer <adam@math.missouri.edu>, "C. Y. Lo" <c_y_lo@yahoo.com>, Merced Montesinos Velásquez <merced@fis.cinvestav.mx>, Angelo Loinger <angelo.loinger@mi.infn.it>

Dear Stephen,

Thank you for your prompt reply from Wed, 17 Mar 2010 23:15:09 +1000.

[snip]

> Let's not forget that Einstein's pseudo-tensor is a meaningless concoction of mathematical symbols because it implies, by contraction, a linear invariant that depends solely upon the components of the metric tensor and their first derivatives. But G. Ricci-Curbastro and T. Levi-Civita proved in 1900 that such invariants do not exist. Mr. 't Hoof does not understand this.

The problem is that he is Chief Editor of Foundations of Physics, and also teaches GR. He can do a lot of damage, mostly to his students.

> Furthermore, 't Hooft concedes that the total energy of Einstein's gravitational field is always zero. This implies that the field equations violate the usual conservation of energy and momentum so well-established by experiment.


I will limit our discussion to its absolute minimum, hoping that your colleagues will also respond professionally.

> Mr. C

Nice done, Mr. C :-) I hope to receive a paper by "Mr. L" soon. Stay tuned.

All the best,

Dimi

> ____________________________________________
> > On 3/16/10, Dimi Chakalov <dchakalov@gmail.com> wrote:
> >>
> >>> On Tue, 2 Mar 2010 19:22:24 +0200, Dimi Chakalov <dchakalov@gmail.com>
> >>> wrote:
> >>>>
Dear Lo,

Thank you very much for your reply from Thu, 18 Mar 2010 16:43:12 -0700 (PDT).

> I read your email and the attachments
Thank you. My initial email is also posted at

http://www.god-does-not-play-dice.net/#Gerardus

> He needs help.
Definitely yes.

> please see my paper attached.

Thank you very much. I posted the abstract from your paper at


If you prefer, I can replace it with your full paper, in .pdf format.

With all good wishes,

Dimi

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Note: Dr. C. Y. Lo kindly agreed (Fri, 19 Mar 2010 12:12:39 -0700 (PDT)) to replace the abstract with the full version of his paper; check out also ref. [20] therein.

D.C.


Subject: Re: STRANGE MISCONCEPTIONS OF GENERAL RELATIVITY, by G. 't
Hooft
Date: Tue, 16 Mar 2010 16:39:50 +0200
From: Dimi Chakalov <dchakalov@gmail.com>
To: CEOFOP <G.tHooft@uu.nl>,
"Szabados, L." <lbszab@rmki.kfki.hu>,
"Dupre, Maurice J" <mdupre@tulane.edu>,
Norbert Straumann <norbert.straumann@gmail.com>,
Domenico Giulini <domenico.giulini@itp.uni-hannover.de>,
Luca Bombelli <luca@phy.olemiss.edu>,
Adam Helfer <adam@math.missouri.edu>
Cc: Stephen Crothers <thenarmis@gmail.com>,
"C. Y. Lo" <c_y_lo@yahoo.com>,
Merced Montesinos Velásquez <merced@fis.cinvestav.mx>,
Angelo Loinger <angelo.loinger@mi.infn.it>

P.S. CEOFOP also wrote at
http://www.phys.uu.nl/~thooft/gravitating_misconceptions.html

"A third player, DC, strongly supports L and C, and on the side asks me to
seriously consider his theories about the 9-11 events: the two planes crashing
into the Twin Towers have first been snatched by UFO's, their passengers were
abducted, and the planes, without passengers and filled with explosives of an
unknown type, were directed into the towers. All of this to explain why the
towers collapsed in spite of their impeccable design. I can only try to guess who
came up first with this theory, but I now use it to illustrate the level of my
discussions with DC."

To explain the level of my discussions with CEOFOP, I invite you to check out
the facts at my 9/11 web page,
http://www.god-does-not-play-dice.net/9_11.html#Ward
http://www.god-does-not-play-dice.net/9_11.html#Ritter

D.C.
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Note: The only truth in CEOFOP's statements above is that I have indeed asked
him (along with Prof. Brian Josephson) to seriously consider my theory about
the 9/11 events: see my email from Fri, 25 Dec 2009 printed below.

All the rest -- "two planes crashing into the Twin Towers have first been
snatched by UFO's, their passengers were abducted, and the planes, without
passengers and filled with explosives of an unknown type, were directed into
the towers" -- is untrue.

Why did CEOFOP (G. 't Hooft) write all this crap at his web site, I wonder. He is
fluent in English, so we have two alternatives. One explanation could be that he
has somehow lost his intellect, but very selectively, only regarding my 9/11 web
page. Another explanation would be that he had actually understood the simple
text at my web page, but decided to lie about it, for unknown (to me) reasons.

In simple terms: he is either a selective moron, or just a bold liar. But not both.

I will leave the decision to his students in GR. If they come up with a third
option, I will immediately post it here.

D. Chakalov  
March 17, 2010

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Subject: Merry Christmas  
Date: Fri, 25 Dec 2009 13:45:04 +0200  
Message-ID:  
<bed37360912250345i2673cd82y35e969b267568d43@mail.gmail.com>  
From: Dimi Chakalov <dchakalov@gmail.com>  
To: Brian <bdj10@cam.ac.uk>, Gerard <g.thooft@uu.nl>

Dear Brian and Gerard,

I wish you and your families a very merry Christmas and all the best for 2010 and beyond.

May I use this opportunity to invite you to save human lives by taking action on the 9/11 issue,

[http://tinyurl.com/steel-evaporation](http://tinyurl.com/steel-evaporation)

With God, everything is possible.

Cordially yours,

Dimi

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Subject: Re: STRANGE MISCONCEPTIONS OF GENERAL RELATIVITY, by G. 't Hooft  
Date: Fri, 19 Mar 2010 15:01:04 +0200  
From: Dimi Chakalov <dchakalov@gmail.com>  
To: Stephen Crothers <thenarmis@gmail.com>  
Cc: [snip]

Dear Stephen,

> Mr. 't Hooft uses the linearised form of the field equations. He is  
> evidently ignorant of the fact that Hermann Weyl proved, in 1944, that  
> linearisation is inadmissible because it implies the existence of a tensor  
> that, except for the trivial case of being precisely zero, does not  
> otherwise exist.

Yes, many people ignore Hermann Weyl's 1944 article,


I quoted from it at

[http://www.god-does-not-play-dice.net/Szabados.html#H6](http://www.god-does-not-play-dice.net/Szabados.html#H6)
http://www.god-does-not-play-dice.net/#SBG_new

Perhaps G. 't Hooft should refer to Hermann Weyl as "Mr. W".

All the best,

Dimi

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Subject: Re: STRANGE MISCONCEPTIONS OF GENERAL RELATIVITY, by G. 't Hooft
Date: Fri, 19 Mar 2010 08:00:32 -0500
Message-ID: <4BA37570.5040601@math.missouri.edu>
From: Adam Helfer <adam@math.missouri.edu>
Reply-To: helfera@missouri.edu
To: Dimi Chakalov <dchakalov@gmail.com>

Dear Dimi,

Please remove me from this thread.

Thanks,

Adam Helfer

Dimi Chakalov wrote:

Dear colleagues,

If you wish to be removed from this thread, please say so.

The whole issue about GR is very simple indeed; I managed to explain it even to my teenage daughter,

http://www.god-does-not-play-dice.net/#Bahn

All the best,

Dimi

--

Adam Helfer
Department of Mathematics
University of Missouri -- Columbia
Columbia, MO 65211

tel. (573) 882-7283
fax (573) 882-1869
Dear Stephen,

Concerning the quantity 'r' in the "Schwarzschild solution", Mr. 't Hooft, in his lecture notes, calls it the shortest distance to the centre. He also calls it the radial coordinate or coordinate radius. He even told me once that it is a gauge choice that defines what 'r' is. It has never been correctly identified by any proponent of the black hole nonsense. All these concepts are false because it is irrefutably the inverse square root of the Gaussian curvature of the spherically symmetric geodesic surface in the spatial section and is thereby not even a distance in the related manifold. Here is my detailed analysis of this:


http://www.ptep-online.com/index_files/2008/PP-12-11.PDF

Unfortunately, Adam Helfer quits:

http://www.god-does-not-play-dice.net/#Helfer

Please remove his email address from this thread.

All good wishes,

Dimi
Dear Colleagues,

Regarding the stress-energy-momentum tensor for gravity, introduced by G. 't Hooft:

http://www.phys.uu.nl/~thooft/gravitating_misconceptions.html

"One way to see how this works, is to split the metric g_mv into a background part, [X], for which we could take flat space-time, and a dynamical part: [XX].

... "The stress-energy-momentum tensor can then be obtained routinely by considering infinitesimal variations of the background part, just like one does for any other type of matter field; the infinitesimal change of the total action (the space-time integral of the Lagrange density) then yields the stress-energy-momentum tensor. Of course, one finds that the dynamical part of the metric indeed carries energy and momentum, just as one expects in a gravitational field. As hydro-electric plants and the daily tides show, there's lots of energy in gravity, and this agrees perfectly with Einstein's original equations."

Another quote from CEOFOP:

"Any doubts about these facts are removed once the existence and properties of the Green functions for the linearized theory have been established. These Green functions can then be used to study systematic expansions to obtain the solutions of the complete, non-linear theory, to any required accuracy. Good theoretical physicists completely control the proper use of Green functions. (…) I did construct them, and found that, provided due attention is paid to the gauge freedom in the use of coordinates, these functions are well-behaved."

It is "casting pearls to the swine", says CEOFOP (Chief Editor Of Foundations Of Physics).

This is not a joke: check out the link above. The PDF file from his web page is available, too.

Final quote: "A third player, DC, strongly supports L and C, but his claims are too opaque for me to even address."

My "opaque" claims can be read at

http://www.god-does-not-play-dice.net/#Alice

http://www.god-does-not-play-dice.net/ExplanatoryNote.pdf

You'll be the judge.
Yours sincerely,

D. Chakalov

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Note: URL of the web page at

http://www.phys.uu.nl/~thooft/gravitating_misconceptions.html

Download "Strange Misconceptions of General Relativity", by Gerard 't Hooft, version from January 4, 2010 (CEOFOp.zip) from

http://www.god-does-not-play-dice.net/CEOFOP.zip

And version from August 15th (CEOFOP_1.zip) from

http://www.god-does-not-play-dice.net/CEOFOP_1.zip

To get Gerard 't Hooft's "pearls" of wisdom, all you need is to split the metric $g_{\mu\nu}$ into a "background part" (to obtain "flat space-time"), and a dynamical part that "carries energy and momentum", as "hydro-electric plants and the daily tides show". Just don't forget to use "well-behaved" Green functions.

A colleague of mine offered only a brief comment: "It's madness, utter madness."

Notice another essay by CEOFOP, entitled: "Will the Higgs be found?",

http://www.god-does-not-play-dice.net/Gerardus_predictions.pdf

He claims (May 12, 2010) that "theories without any Higgs particle are possible but ugly and have been practically ruled out by observations", but failed to comment on Howard Georgi's unparticles and my prediction from January 9, 2003.

As Howard Georgi explained, “there could be a scale-invariant world separate from our own that is hidden from us”. My comment: we can "see" this scale-invariant world with our brains only, as we know since Plato.

LHC is deaf and blind to the scale-invariant world, hence will only "see" that the number of quarks is jumping to 8 and more, in a Fibonacci sequence.
Qui vivra, verra.

D.C.
August 16, 2010
Last update: August 22, 2010

Subject: STOP wasting taxpayers' money!
Date: Thu, 8 Oct 2009 18:20:21 +0100
From: Dimi Chakalov <dchakalov@gmail.com>
To: Roger Blandford <rdb3@stanford.edu>
Cc: Lynne Hillenbrand <lah@astro.caltech.edu>,
Donald C Shapero <dshapero@nas.edu>,
Caryn Knutsen <astro2010@nas.edu>,
bpa@nas.edu,
Tom Prince <prince@srl.caltech.edu>

Roger:

I do hope my preceding email messages have been safely received.

I wonder if you have discussed my objections to LIGO funding at your latest meeting

http://sites.nationalacademies.org/BPA/BPA_049810#statement

Keep in mind that the forthcoming scandal about LIGO will be enormous:

http://www.god-does-not-play-dice.net/Szabados.html#SBG
http://www.god-does-not-play-dice.net/#NSF

Just don't keep quiet, and don't ever say you knew nothing about it.
Sincerely,

D. Chakalov
35 Sutherland St
London SW1V 4JU, U.K.

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Subject: Astro2010 Survey Committee Meeting, January 25-27, 2010
Date: Thu, 22 Oct 2009 02:43:57 +0300
From: Dimi Chakalov <dchakalov@gmail.com>
To: Martha Haynes <haynes@astro.cornell.edu>,
Fiona Harrison <fiona@srl.caltech.edu>,
Marcia J Rieke <mriekje@as.arizona.edu>,
Lynne Hillenbrand <lah@astro.caltech.edu>,
Caryn Knutsen <astro2010@nas.edu>,
Lars Bildsten <bildsten@kitp.ucsb.edu>,
John Carlstrom <jc@ddjob.uchicago.edu>,
Timothy Heckman <heckman@pha.jhu.edu>,
Jonathan Lunine <lunine@physics.arizona.edu>,
Juri Toomre <jtoomre@jila.colorado.edu>,
Scott Tremaine <tremaine@ias.edu>,
John Huchra <huchra@cfa.harvard.edu>,
Donald C Shaper <dshapero@nas.edu>,
Roger Blandford <rdb3@stanford.edu>
Cc: Paulett C Liewer <Paulett.C.Liewer@jpl.nasa.gov>,
Bruce Goldstein <Bruce.Goldstein@jpl.nasa.gov>,
NASA Official Thomas A Prince <prince@srl.caltech.edu>,
8th International LISA Symposium <vdrew@stanford.edu>,
Curt Cutler <Curt.J.Cutler@jpl.nasa.gov>,
Michele Vallisneri <vallis@vallis.org>

Ladies and Gentlemen,

Please terminate the financial support for LIGO,

http://www.god-does-not-play-dice.net/Szabados.html#SBG
http://www.god-does-not-play-dice.net/#NSF

The sooner, the better.

Yours sincerely,

Dimi Chakalov
35 Sutherland St
London SW1V 4JU, U.K.

==========================

Subject: [Copy] Email sent to Living Reviews in Relativity
Date: Tue, 22 Sep 2009 04:08:26 +0200 (CEST)
From: contact.lrr@livingreviews.org
Hello Dimi Chakalov,

This is a copy of the email you sent to Living Reviews in Relativity. If appropriate to your message, you should receive a response quickly. You successfully sent the following information:

   Email: dchakalov@gmail.com
   Phone:
   Website: http://www.god-does-not-play-dice.net/#NB
   Subject: To make a comment

Message:

   Regarding GW parapsychology:

   http://www.god-does-not-play-dice.net/Szabados.html#SBG

Please confirm the receipt of this email.

Yours faithfully,

Dimi Chakalov

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Other Data and Information:
   Time Stamp: Tuesday, September 22nd, 2009 at 4:08 am

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Subject: Re: "yes, I do understand GR, but cannot discuss that now."
Date: Tue, 20 Oct 2009 23:46:37 +0300
From: Dimi Chakalov <dchakalov@gmail.com>
To: Stanley Deser <deser@brandeis.edu>
Cc: Joel Franklin <jfrankli@reed.edu>,
    Richard Woodard <woodard@phys.ufl.edu>,
    Andrew Waldron <wally@math.ucdavis.edu>,
    Steven Carlip <carlip@physics.ucdavis.edu>,
    John Baez <baez@math.ucr.edu>,
    John W Barrett <john.barrett@nottingham.ac.uk>

Stanley:

On 31 March 2006, you claimed that you "do understand GR, but cannot discuss that now."

If this is indeed the case, then you should be able to find at least one error in my proposal at

   http://www.god-does-not-play-dice.net/#NB

Please demonstrate that you understand GR.
I extend this request to your colleagues as well.

Regards,

Dimi

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Subject: "yes, I do understand GR, but cannot discuss that now."
Date: Fri, 31 Mar 2006 15:54:26 +0300
From: Dimi Chakalov <dimi@chakalov.net>
To: Deser <deser@brandeis.edu>

No rush, take your time, I'm all yours.

D.C.

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Subject: Re: "yes, I do understand GR, but cannot discuss that now."
Date: Wed, 21 Oct 2009 01:32:35 +0300
From: Dimi Chakalov <dchakalov@gmail.com>
To: Stanley Deser <deser@brandeis.edu>
Cc: Joel Franklin <jfrankli@reed.edu>,
    Richard Woodard <woodard@phys.ufl.edu>,
    Andrew Waldron <wally@math.ucdavis.edu>,
    Steven Carlip <carlip@physics.ucdavis.edu>,
    John Baez <baez@math.ucr.edu>,
    John W Barrett <john.barrett@nottingham.ac.uk>

On Wed, Oct 21, 2009 at 1:14 AM, Stanley Deser <deser@brandeis.edu>
wrote:
> 
> Dear Sir,
> I cannot spare the time for your proposals; why not submit to a journal &
> see what happens? sd

Gladly.

Would you, or any of your colleagues, endorse the submission of my manuscript

http://arxiv.org/help/endorsement

The basic arguments are at

http://www.god-does-not-play-dice.net/Szabados.html#SBG

I will be happy to send you, or any of your colleagues, my manuscript, entitled:
"A Taxpayer's Perspective On GW Astronomy".

Regards,

Dimi

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On Wed, Oct 21, 2009 at 1:47 AM, Stanley Deser <deser@brandeis.edu> wrote:

> Not I!
> http://arxiv.org/help/endorsement ?

But didn't you say that you "do understand GR"? You're the right person.

Would you, or any of your colleagues, like to help U.S. National Science Foundation?

http://www.god-does-not-play-dice.net/#NSF

Again, the simple arguments are at

http://www.god-does-not-play-dice.net/Szabados.html#SBG

I can write up a polite (not frank) paper and send it to you or any of your colleagues -- you all are experts in GR. I only need endorsement of my manuscript.

BILLIONS of U.S. dollars -- all taxpayers' money -- will be wasted by your LIGO "colleagues".

Looking forward to hearing from you at your earliest convenience,

Yours faithfully,

Dimi Chakalov

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Subject: Prince of darkness
Date: Fri, 16 Oct 2009 14:41:14 +0300
From: Dimi Chakalov <dchakalov@gmail.com>
To: Alex Murphy <a.s.murphy@ed.ac.uk>
Cc: rminchin@naic.edu, Jonathan.Davies@astro.cf.ac.uk, Mike.Disney@astro.cf.ac.uk, LangRH@cardiff.ac.uk, Sarah.Roberts@astro.cf.ac.uk, sabatini@mporzio.astro.it, BoyceP@cardiff.ac.uk, cai@jb.man.ac.uk, Wim.vanDriel@obspm.fr, benjamin.allanach@googlemail.com, s.sarkar@physics.ox.ac.uk, matthew.chalmers@iop.org, Plus@maths.cam.ac.uk, J.D.Barrow@damtp.cam.ac.uk, blanchet@iap.fr

Subject: Re: "yes, I do understand GR, but cannot discuss that now."
Date: Wed, 21 Oct 2009 02:20:01 +0300
From: Dimi Chakalov <dchakalov@gmail.com>
To: Stanley Deser <deser@brandeis.edu>
Cc: Joel Franklin <jfrankli@reed.edu>, Richard Woodard <woodard@phys.ufl.edu>, Andrew Waldron <wally@math.ucdavis.edu>, Steven Carlip <carlip@physics.ucdavis.edu>, John Baez <baez@math.ucr.edu>, John W Barrett <john.barrett@nottingham.ac.uk>

http://www.god-does-not-play-dice.net/#XXX
Dear Dr Murphy,

I read with great interest your interview at

http://physicsworld.com/cws/article/indepth/40654

I wonder if your WIMP hypothesis can tackle the discrepancy between the generic formation of cusps of CDM


and the rotation curves, which seem to favor a constant density profile in the core (Blanchet and Le Tiec, arXiv:0901.3114v2).

Also, may I ask you and your colleagues to comment on John Barrow's explanation of the apparent "repulsive force associated with the cosmological constant",

\[ \text{Gravitational Force} = -\frac{GMm}{r^2} + m\lambda r \]

http://plus.maths.org/issue51/features/lambda/index.html

It seems to me that his idea is a bona fide case of Murphy's Law No. 15. I suspect that CDM and DDE are due to spacetime acting upon itself, hence the "acting agent" cannot _in principle_ be traced back to any concrete physical stuff,

http://www.god-does-not-play-dice.net/#NB

BTW you said in your interview that have done a café scientifique in Moscow, "which was pretty scary". Did you meet

http://www.god-does-not-play-dice.net/russian.html?

Kindest regards,

Dimi Chakalov

Murphy's Law No. 15: Complex problems have simple, easy-to-understand wrong answers.

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Subject: The Arrow of Time
Date: Mon, 2 Nov 2009 05:55:52 +0200
From: Dimi Chakalov <dchakalov@gmail.com>
To: Claus Kiefer <kiefer@thp.uni-koeln.de>
Cc: Laura Mersini-Houghton <mersini@physics.unc.edu>,
Ruediger Vaas <ruediger.vaas@konradin.de>,
Pankaj S Joshi <psj@tifr.res.in>,
H D Zeh <zeh@uni-heidelberg.de>,
Alan H Guth <guth@ctp.mit.edu>,
Jean-Pierre Luminet <jean-pierre.luminet@obspm.fr>,
Adam Helfer <adam@math.missouri.edu>,
Richard Lieu <lieur@cspar.uah.edu>
Dear Claus,

It seems to me that you are trying to explain one 'unknown' with another 'unknown'.

As you stated in [Ref. 1, p. 2], the topic of your essay -- the origin of the arrow of time -- is based on the singularity theorems of GR. Take Hawking-Penrose theorem, published in 1970. It presupposes some specific energy conditions [Refs. 2 and 3], which cannot hold in a world dominated by "dark energy"; see Rakhi and Indulekha at

http://www.god-does-not-play-dice.net/#GR

On top of everything, the hypothetical gravitational "collapse" is highly controversial in the first place [Ref. 4].

Perhaps it will be a good idea if you first sort out the unsolved mysteries in the basis of your essay [Ref. 1], as neither S. Hawking nor R. Penrose were anticipating some "dark energy" in 1970s.

I will appreciate your professional reply, as well as the comments from your colleagues.

Kindest regards,

Dimi

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From the abstract: "Remarks are also made concerning (...) scenarios motivated by dark energy."

p. 2: "The question raised by the presence of all these arrows is whether a common master arrow of time is behind all of them.

... "As indicated by the singularity theorems of general relativity, a consistent description of the Big Bang may require a new framework such as quantum gravity. The question then arises whether the origin of the arrow of time can be understood there. This is the topic of my essay.

... p. 11: "Since our present Universe is dominated by dark energy, which for our purpose here can be approximated by a cosmological constant [lambda], ...

... p. 12: "In the case of a non-vanishing cosmological constant ... "


p. 2: "If you believe the recent observational data regarding the accelerating universe, then the **SEC is violated on cosmological scales right now!**"

See also: H. Epstein, V. Glaser and A. Jaffe, Nonpositivity of the energy density in quantized field theories, Nuovo Cim. 36(3) (1965) **1016-1022**


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Note: Let's try to find out what we **know** that we **don't know** regarding 'The Arrow of Time'.

1. **Claus Kiefer** speculated extensively about 'entropy' [Ref. 1], but we "do not have a rigorous definition of entropy for systems coupled to gravity" [Ref. 5; see also the discussion of Eq. 1 on p. 7 therein].

2. We are also conditioned to believe that, since the Einstein field equations are "local", it would be impossible that "the global topology of the spatial section of an FLRW universe could have an effect on that universe's dynamics" [Ref. 6]. But Einstein field equations themselves are totally inadequate for addressing the main puzzle of **non-unitary emergence** of 'energy from empty space' -- see above. This opens an opportunity to seek 'the arrow of time' in global topology **changes**, to at least gather some hints as to how the Einstein field equations should be modified to tackle the **source** of "dynamic dark energy".

3. If we look at the "expanding" FRW universe above, the first puzzle we should notice is that the cosmological time, as read by our wristwatch, should **not** be observable: while FRW equations describe the physical time evolution, the "observed" quantities are "not gauge invariant and therefore should **not** be observable in obvious contradiction to reality", cf. T. Thiemann [Ref. 7].

3.1. **Thomas Thiemann** has argued that a tentative solution may be offered with some of those "scalar fields" introduced **ad hoc** [Ref. 7], to bypass the direct approach to the "dark energy" from the quantum vacuum. Unfortunately, all those "scalar fields" are red herring, firstly because there is no symmetry mechanism preventing their **strong** coupling -- see Sec. 2.2 in [Ref. 8].

3.2. **Thomas Thiemann** offered an 'either - or' dilemma [Ref. 7], but the answer to the puzzle may be **both**: the new physics that we're missing does affect QED, and of course the **predictions for LHC**.

4. Notice that the "dark" effects from 'potential reality' *have to be camouflaged* in GR as "**gauge-dependent**". This should be expected, as present-day GR cannot handle '**absolute structures**' such as the **source** of 'energy from empty space'. Surely "absolute structures carry no observable content" [Ref. 9]. Perfect!

Pity **Claus Kiefer** ignored my posting from **Dec. 26, 2008 @ 17:01 GMT**: the Hilbert space problem (C. Kiefer, Quantum geometrodynamics: whence, whither?", [arXiv:0812.0295v1 [gr-qc]]) may be solved along with the 'problem of time' **en bloc**, as it should be done.
References


"Either the mathematical formalism, which has been tested experimentally so excellently in other gauge theories such as QED, is inappropriate or we are missing some new physics."


p. 4: "Transition functions relabel the points that constitute M, which for the time being we think of as recognizable entities, as mathematicians do. (For physicists these points are mere 'potential events' and do not have an obvious individuality beyond an actual, yet unknown, event that realizes this potentiality.)"

... p. 11: "An absolute structure is a coordinate which takes the same range of values in each Diff(M) orbit and therefore cannot separate any two of them. If we regard Diff(M) as a gauge group, i.e. that Diff(M)-related configurations are physically indistinguishable, then absolute structures carry no observable content."

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Subject: How to quantize spacetime without affecting relativity
Date: Fri, 30 Oct 2009 10:25:10 +0200
From: Dimi Chakalov <dchakalov@gmail.com>
To: Giovanni Amelino-Camelia <amelino@roma1.infn.it>
Cc: Richard Lieu <lieur@cspar.uah.edu>, Jonathan Granot <j.granot@herts.ac.uk>

Hi Giovanni,

Regarding (i) you speculation from August 1998,
http://www.nature.com/nature/journal/v398/n6724/abs/398216a0.html

(ii) my email messages sent in the past three years (no reply from you), and
(iii) the latest confirmation of Lieu & Hillman's direct evidence against Planck-scale fluctuations in spacetime by Jonathan Granot,


see
http://www.god-does-not-play-dice.net/#NB

Please don't ever say you knew nothing about it.

Dimi

=================

Subject: Re: How to quantize spacetime without affecting relativity
Date: Fri, 30 Oct 2009 12:13:16 +0200
From: Dimi Chakalov <dchakalov@gmail.com>
To: Giovanni.Amelino-Camelia@roma1.infn.it
Cc: Richard Lieu <lieur@cspar.uah.edu>, Jonathan Granot <j.granot@herts.ac.uk>,

Hi Giovanni,

> the first point is that you describe the recent
> Fermi-telescope result as a test of "Planck-scale
> fluctuations in spacetime"

Nope. The common issue is the end result from two very different approaches,
by Richard and Jonathan. That is what matters.

If you wish to say something, first read the story at

http://www.god-does-not-play-dice.net/#NB

> I repeat: I shall be happy to offer more help
> if the requests are respectful and reflect a serious
> investment in the relevant literature

Please go ahead. The refuter of your speculations is one click away.

Take care,

Dimi

============
Dear Richard,

> I am truly grateful to all of you who wish to vindicate our 2003 work,
> but note also that our paper was six years ago and times were
> different. The Fermi limit is indeed unique, as they tested
> systematic rather than random 1st order Planck scale effect. Giovanni
> > is right - the Fermi test was not about fluctuations, but real
> > dispersion.

Of course. What I did say in my preceding email was: "The common issue is the end result from two very different approaches, by Richard and Jonathan. That is what matters."

Maybe I should have added 'that is what matters to the question in the subject line'.

Regrettably, Giovanni can't see the forest for the trees. Details about 'the forest' at

http://www.god-does-not-play-dice.net/#NB

Kindest regards,

Dimi

Subject: "Specifically, because of the Kocken-Specher theorem, ..."

(arXiv:0911.2135v1 [gr-qc], p. 187)

Date: Thu, 12 Nov 2009 05:57:44 +0200

From: Dimi Chakalov <dchakalov@gmail.com>

To: Cecilia Flori

Cc: Jan Plefka <jan.plefka@physik.hu-berlin.de>,
Steven Vickers <S.J.Vickers@cs.bham.ac.uk>

Dear Dr. Flori,

I've been reading your Ph.D. Thesis in the past three hours, and am truly amazed by your professional approach and perfectionism. You are a treasure.

Regarding KS Theorem, I think one can argue that the truth value of the propositions should be YAIN (Chris Isham disagrees, for unknown to me reasons). In your spare time, please see an outline at

http://www.god-does-not-play-dice.net/#NB

I will appreciate your professional opinion, as well as the feedback from your distinguished colleagues.

With all good wishes,
Dimi Chakalov


Subject: Re: When are you going to respond professionally?
Date: Sat, 24 Oct 2009 10:47:42 +0300
From: Dimi Chakalov <dchakalov@gmail.com>
To: Christian Corda <cordac.galilei@gmail.com>
Cc: lsfinn@psu.edu, cornish@physics.montana.edu, vfaraoni@ubishops.ca

On Fri, 23 Oct 2009 20:24:45 +0200, Christian Corda <cordac.galilei@gmail.com> wrote:
[snip]

> YOU DO NOT NOT UNDERSTAND GRAVITATION.

Prove it. My SBG argument is at the link below.

Sincerely,
D. Chakalov

On Fri, 23 Oct 2009 12:49:14 +0300, Dimi Chakalov <dchakalov@gmail.com> wrote:
>}
>> Gentlemen:
>>}
>> I mentioned your names and recent papers at
>>}
>> http://www.god-does-not-play-dice.net/Szabados.html#SBG
[snip]

Subject: Taxpayer's perspective on GW astronomy
Date: Mon, 26 Oct 2009 12:44:06 +0200
From: Dimi Chakalov <dchakalov@gmail.com>
To: Laszlo Szabados <lbszab@rmki.kfki.hu>,
Robert M Wald <rmwa@midway.uchicago.edu>,
Joel Franklin <jfrankli@reed.edu>,
Richard Woodard <woodard@phys.ufl.edu>,
Andrew Waldron <wally@math.ucdavis.edu>,
Steven Carlip <carlip@physics.ucdavis.edu>,
John Baez <baez@math.ucr.edu>,


http://www.god-does-not-play-dice.net/#XXX
Dear colleagues,

I wonder if you would agree to endorse the submission of my manuscript to [gr-qc],

http://arxiv.org/help/endorsement

The basic arguments are at

http://www.god-does-not-play-dice.net/Szabados.html#SBG

I will be happy to send you my manuscript, entitled: "Taxpayer's perspective on GW astronomy". Will be brief and utterly polite (not frank, as at my web site).

Kindest regards,

Dimi Chakalov

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Note: Excerpts from http://arxiv.org/help/endorsement:

"The endorsement process is not peer review. You should know the person that you endorse or you should see the paper that the person intends to submit. We don't expect you to read the paper in detail, or verify that the work is correct, but you should check that the paper is appropriate for the subject area. You should not endorse the author if the author is unfamiliar with the basic facts of the field, or if the work is entirely disconnected with current work in the area."

Stanley Deser refused to even consider endorsing my manuscript. I do hope some of his colleagues will agree.

If you, my dear reader, have papers "that have been submitted between three months and five years ago" to [gr-qc] or [astro-ph] domains, and would agree to endorse the submission of my manuscript, please contact me by email as soon as possible, and I will send you my manuscript.

D. Chakalov
October 27, 2009

=====================================

Subject: Re: Taxpayer's perspective on GW astronomy
Date: Tue, 3 Nov 2009 23:24:06 +0200
From: Dimi Chakalov <dchakalov@gmail.com>
To: Jonathan Thornburg <jthorn@astro.indiana.edu>
Cc: Jim Isenberg <isenberg@uoregon.edu>

Hi Jonathan,

Thanks for your reply. I regret that you refused to endorse the submission of my manuscript to [gr-qc]. As you put it in Irr-2007-3,
"The event horizon is a global property of an entire spacetime and is defined nonlocally in time: The event horizon in a slice is defined in terms of (and cannot be computed without knowing) the full future development of that slice."

... provided we know the source of DDE,

http://www.god-does-not-play-dice.net/#GR

Take care,

Dimi

>> I wonder if you would agree to endorse the submission of my manuscript
>> to [gr-qc] or [astro-ph],
>>
>> http://arxiv.org/help/endorsement
>>
>> The basic arguments are at
>>
>> http://www.god-does-not-play-dice.net/Szabados.html#SBG

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Note: Forty years have passed since Roger Penrose suggested the so-called Cosmic Censorship Conjecture (CCC), and people continue to ground their efforts on it (cf. Jonathan Thornburg and Michael I. Cohen et al., p. 2) and offer bets and drawings of "quantum horizon geometry".

Notice that the methods for finding an accurate history of the so-called event horizon (you need the "event horizon" (EH) in order to speculate about "black holes" viz. "binary black hole mergers" as "one of the most astrophysically common sources of gravitational radiation for detectors such as LIGO", cf. Mike Cohen et al.) require complete knowledge of "the full future evolution of the spacetime before the EH can be determined exactly" (ibid.).

Which is why you need to address the global dynamics of spacetime: the increasing emergence of energy-of-empty-space due to DDE.

Just one "closed timelike curve" (CTC) or "time-like naked singularity" in the past 13.7B years would have destroyed everything, and since there are no strict
bans on such catastrophic events (they simply have never happened, just like the ultraviolet catastrophe), "prohibited" only by people's belief in the current "dynamics" of GR and CCC in particular, recall that those "famous" singularity theorems are from 1970s, when nobody was aware of the flux of DDE.

Two examples: Geroch's theorem regarding CTCs (Robert Geroch, Topology in general relativity, J. Math. Phys. 8, 782-786 (1967)) and Tipler's theorem, which stipulates that, given the (obvious) positiveness of the energy-momentum tensor, there can be no changes in the topology of spacetime, hence the causal structure of spacetime is secured (Frank J. Tipler, Singularities and causality violation, Ann. Phys. 108, 1-36 (1977)), are from the old days of GR without DDE.

As Alan Rendall stated (p. 14), "The study of these matters is still in a state of flux." Which is why I requested endorsement of my manuscript.

So far two physicists have replied (J. Thornburg and S. Deser), the rest (73) have not even confirmed the receipt of my email (sent between October 26th and October 28th). Same story in September 2008. I'm talking to a brick wall.

D. Chakalov
November 4, 2009
Last update: November 9, 2009

Subject: Re: GR17, Session D1
Date: Mon, 2 Nov 2009 19:08:46 +0200
From: Dimi Chakalov <dchakalov@gmail.com>
To: Thomas Thiemann <tthiemann@perimeterinstitute.ca>,
thomas.thiemann@aei.mpg.de
Cc: lsmolin@perimeterinstitute.ca,
Curt.Cutler@aei.mpg.de,
brien.nolan@dcu.ie

Thomas,

I quoted from your astro-ph/0607380 at

http://www.god-does-not-play-dice.net/#note

Five years ago, you decided to bury my report into an evening poster session, and granted Lee Smolin three oral presentations: on Monday, July 19th ("Background independent approach to M theory", D2), on Tuesday, July 20th ("The low energy behavior of loop quantum gravity", D1), and finally on Friday, July 23rd ("Inflation in loop quantum gravity", B2i).

What you did to me was bloody unfair. Typical for a DDR communist.

Dimi

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Subject: Re: GR17, Session D1
Dear Thomas,

Please inform me about possible upgrade of my poster presentation to talk. I'm encountering tremendous difficulties in transforming my GR17 paper to poster. Feel like having my mouth shut with duck tape.

Best - Dimi

Subject: A fourth road to quantum gravity
Date: Fri, 6 Nov 2009 16:10:45 +0200
From: Dimi Chakalov <dchakalov@gmail.com>
To: Mark Buchanan <buchanan.mark@gmail.com>
Cc: Didier Sornette <dsornette@ethz.ch>, Lee Smolin <lsmolin@perimeterinstitute.ca>, Chris Isham <c.isham@imperial.ac.uk>

Dear Dr. Buchanan,

I would like to make two comments on your online article "In search of the black swans" [Ref. 1].

I'm interested in proactive management of emerging risks, type "black swans". With the benefit of hindsight, it seems to me that the event of 9/11 could not have been predicted, for reasons entire different than Max Planck's discovery; please see

http://tinyurl.com/steel-evaporation

The second comment pertains to the subject of this email: I believe Lee Smolin [Refs. 2 and 3], and all of his colleagues, have completely missed a fourth road to quantum gravity, from Erwin Schrödinger,

http://www.god-does-not-play-dice.net/#NB

Please feel free to pass this email to 'whomever it may be concerned'. The direct link:

http://www.god-does-not-play-dice.net/#Buchanan

Kindest regards,

Dimi Chakalov
35 Sutherland St
London SW1V 4JU, U.K.

****
"In 1890 an electricity company enticed the German physicist Max Planck to help it in its efforts to make more efficient light bulbs. Planck, as a theorist, naturally started with the fundamentals and soon became enmeshed in the thorny problem of explaining the spectrum of black-body radiation, which he eventually did by introducing the idea — a "purely formal" assumption, as he then considered it — that electromagnetic energy can only be emitted or absorbed in discrete quanta. The rest is history. Electric light bulbs and mathematical necessity led Planck to discover quantum theory and to kick start the most significant scientific revolution of the 20th century.

"... it is not the normal events, the mundane and expected "white swans" that matter the most, but the outliers, the completely unexpected "black swans". In the context of history, think [11 September 2001](http://www.god-does-not-play-dice.net/#XXX) or the invention of the Web."

"Time in the Newtonian schema is a parameter used to label points on a trajectory describing the system evolving in configuration space. When the system is small and isolated, this time parameter refers to the reading of a clock on the wall of the observer’s laboratory, which is not a property of the system. When we try to apply this notion to the universe as a whole, the time parameter must disappear (see [John Baez](http://physicsworld.com/cws/article/indepth/22388) - D.C.). Some have attempted to argue that this means that time itself does not exist at a cosmological scale, but that is the wrong conclusion. What disappears is not time, but the clock outside of the system -- which would be an absurd object since the system is [the whole universe](http://physicsworld.com/cws/article/indepth/39306)."

"One of the biggest mysteries is that we live in a world in which it is possible to look around, and see as far as we like."

"God is nothing but the power of the universe as a whole to organize itself."

Note: Nothing from the text above is original. The legacy of Erwin Schrödinger and [Henry Margenau](http://physicsworld.com/cws/article/indepth/43586) is anything but some unpredictable "black swan". For comparison, if someone has been offering the guiding principles for [HTTP protocol](http://www.god-does-not-play-dice.net/#XXX) to the people at CERN, but they were refusing to develop it, the invention of the Web [Ref. 1](http://physicsworld.com/cws/article/indepth/38468) would have never happened.

One can only hope that the upcoming sixth consecutive failure of LSC to detect GWs with the "Enhanced LIGO" will shake up the established theoretical physics community. If not, we will have to wait for the seventh consecutive failure of LSC in 2015, with their "Advanced LIGO".

What a terrible waste of time. And money.

Does anyone care?
Subject: Re: Tue 24 Nov 13:30pm - 14:30pm  
Date: Tue, 24 Nov 2009 20:06:09 +0000  
From: Dimi Chakalov <dchakalov@gmail.com>  
To: Jonathan Halliwell <j.halliwell@ic.ac.uk>,  
    Roland Omnes <roomnes@wanadoo.fr>,  
    Amihay Hanany <a.hanany@imperial.ac.uk>,  
    Helen Fay Dowker <f.dowker@imperial.ac.uk>,  
    Chris Isham <c.isham@imperial.ac.uk>  

Dear Jonathan,

It was a pleasure to attend your talk.

I'm also glad you quoted Roland's monograph, "The Interpretation of Quantum Mechanics", in which he demonstrated that by introducing the decoherence functional you're automatically confined to Boolean logic -- a clear indication for Murphy's Law No. 15, "Complex problems have simple, easy-to-understand wrong answers."

Since you mentioned in your talk the case depicted on Fig 1 from your arXiv:0909.2597v1 [gr-qc], I wonder whether you would, in such kind of "space", be able to look around and see as far as you like (Lee Smolin, "Three Roads to Quantum Gravity", Phoenix, 2000, p. 205). The test of the pudding, you know.

Fay: I'm glad you chose (synchronicity?) to sit next to me. If some day you decide to talk about the topology of space (with or without its "dark energy"), please drop me a line. I'll be delighted to attend.

Lastly, may I use this opportunity to invite all of you to join the new research program outlined at

http://www.god-does-not-play-dice.net/#NB

I believe it strictly follows Chris Isham's program, Type IV (arXiv:gr-qc/9310031v1).

If you have questions, please do write me back.

Wishing you all the best,

Dimi
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Dimi Chakalov
35 Sutherland St
SW1V 4JU
Subject: Re: Tue 24 Nov 13:30pm - 14:30pm
Date: Thu, 26 Nov 2009 21:38:33 +0000
From: Dimi Chakalov <dchakalov@gmail.com>
To: J M Yearsley <james.yearsley03@imperial.ac.uk>
Cc: Roland Omnes <roombes@wanadoo.fr>,
Amihay Hanany <a.hanany@imperial.ac.uk>,
Helen Fay Dowker <f.dowker@imperial.ac.uk>,
Chris Isham <c.isham@imperial.ac.uk>,
Jonathan Halliwell <j.halliwell@ic.ac.uk>

Dear Dr. Yearsley,

I attended Jonathan's talk, and a few hours later emailed him a proposal to verify the Decoherent Histories (DH) hypothesis [Ref. 1]; please see 'the proof of the pudding' at

http://www.god-does-not-play-dice.net/#Halliwell

Suppose you have a clear night sky, and fix your eyes, for 1 min, on a star that is/was 4M light years away. The star looks the same during the whole time of 1 min, and is always at the place you see it.

Now, if the spacetime were governed by DH hypothesis [Ref. 1], what kind of irregularities MUST have been imposed on photon's pathway? I suppose you can perform the calculations and find it out for yourself.

Please feel free to join the research project outlined at

http://www.god-does-not-play-dice.net/#NB

Kindest regards,

Dimi Chakalov
35 Sutherland St
SW1V 4JU

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"Central to both the classical and quantum problems is the notion of an entire trajectory. At the classical level it appears to be the appropriate reparametrization-invariant notion for the construction of interesting probabilities. At the quantum level, the decoherent histories approach appears to handle the problem in a natural way, perhaps because it readily incorporates the notion of trajectory."

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"What about the semiclassical approximation and the recovery of an appropriate external time parameter in some limit? (...) The discussion is also connected to the question: Where does the imaginary unit i in the (functional) Schrödinger equation come from? The full Wheeler-DeWitt equation is real, and one would thus also expect real solutions for [PSI]."
M. Bojowald, Canonical Relativity and the Dimensionality of the World, 
http://arxiv.org/abs/0807.4874

"If the theory does not allow us, even in principle, to extend solutions arbitrarily far in one direction, it may be difficult to view this direction as a dimension of the world."

Subject: "Einstein gravity is an emergent phenomenon" (Harvey R. Brown, arXiv:0911.4440v1 [gr-qc], pp. 8-9)
Date: Mon, 30 Nov 2009 16:45:01 +0200
From: Dimi Chakalov <dchakalov@gmail.com>
To: Harvey R Brown <harvey.brown@philosophy.ox.ac.uk>
Cc: Norbert Straumann <norbert.straumann@gmail.com>, Domenico Giulini <domenico.giulini@itp.uni-hannover.de>, Oliver Pooley <oliver.pooley@philosophy.ox.ac.uk>, J Brian Pitts <jpitts@nd.edu>, Jose Natario <jnatar@math.ist.utl.pt>, Timothy Adamo <tim.adamo@gmail.com>, Stanley Deser <deser@brandeis.edu>, Jacob D Bekenstein <bekenste@vms.huji.ac.il>, Hans C Ohanian <chohanian@einsteinmistakes.com>, Igor Novikov <novikov@tac.dk>, Dmitri Novikov <d.novikov@imperial.ac.uk>, Tatjana Shestakova <shestakova@sedu.ru>, Natalia Kirushiacheva <nkirushi@uwo.ca>, S V Kuzmin <skuzmin@uwo.ca>, Kirill Krasnov <kirill.krasnov@nottingham.ac.uk>

Dear Dr. Brown,

I fully endorse your statement, for reasons explained at

http://www.god-does-not-play-dice.net/#GR

Please notice that the source of DDE (see ‘GR with DDE’ at the link above) is assumed to play the role of ‘reference fluid’ and Anderson’s ‘absolute structures’ (James L. Anderson, Principles of Relativity Physics, Academic Press, New York, 1967, p. 73). The latter (i) do not obey the ‘generalized principle of action and reaction’ (ibid., p. 339), and (ii) can be revealed in Quantum Theory as ‘potential reality’,

http://www.god-does-not-play-dice.net/#NB

It seems to me that all the pieces of the jigsaw puzzle of quantum gravity snap to their places -- effortlessly.

Should you or any of your colleagues disagree, please bark back. The "curious incident" with my web site is that nobody is willing to comment on these very simple (and certainly not original) ideas.

Kindest regards,
Subject: A New Scenario, by Sergio Doplicher
Date: Tue, 1 Dec 2009 14:23:42 +0200
From: Dimi Chakalov <dchakalov@gmail.com>
To: Sergio Doplicher <dopliche@mat.uniroma1.it>,
    Luciano Maiani <luciano.maiani@roma1.infn.it>,
    Ray Streater <raymond.streater@kcl.ac.uk>,
    Owen Maroney <o.maroney.physics@gmail.com>,
    Bogdan Damski <bogdan.damski@gmail.com>,
    Haitao Quan <quan@lanl.gov>,
    Wojciech Hubert Zurek <whzurek@gmail.com>

Dear Professor Doplicher,

I have deep respect and admiration for your perfectionism and scrupulous intellectual honesty.

Regarding your Scenario (arXiv:0911.5136v1 [math-ph], pp. 29-30; arXiv:hep-th/0608124v1, p. 7), and the puzzle identified by Lee Smolin,

http://www.god-does-not-play-dice.net/#Buchanan3

please notice my proposal at

http://www.god-does-not-play-dice.net/#Brown

I will appreciate your critical opinion, as well as the feedback from your colleagues.

May I ask a question. I noticed that you'll teach QM,

Would you discuss my interpretation of QM with your students?

I believe kids have the right to know everything we know. If you consider Nevill Mott's paper (arXiv:0911.5136v1 [math-ph], p. 18) and the alleged "time-dependent decoherence factor" (W.H. Zurek et al., arXiv:0911.5729v1 [quant-ph]), I believe your students will grasp the ultimate puzzle of our good old asymptotically flat spacetime, and will never waste their life with chasing ghosts.

Kindest regards,

Dimi Chakalov

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Note: Contrary to what you may hear from Jonathan Halliwell, it is impossible to explain the trace of a charged particle in a bubble chamber, after Nevill Mott (see S. Doplicher, p. 18), with the current QM and GR textbooks. The problems from QM (A. Teta, arXiv:0905.1467v1, "possible histories", pp. 12-14) are swept under the carpet. Moreover, the problems from 'GR without DDE' are overwhelming. One is that we can't explain 'the energy-momentum density of generic background quantum states' (see below): "points become fuzzy and locality looses any precise meaning" (S. Doplicher, p. 21). More puzzles from M. Consoli and E. Costanzo, arXiv:0709.4101, Sec. 3: Is the vacuum a preferred frame? Could be. But if we model the vacuum as 'potential reality', there is no way to observe motion with respect to it: the usual expression from 1930s -- "the only Lorentz-invariant tensor" (ibid., Eq 13); see also G. Marsh, arXiv:0711.0220v2, Eq 2 -- does not apply to 'potential reality'. The latter is needed to explain 'GR with DDE'.

In the textbook version of 'GR without DDE', the 'coordinate time' read by your wristwatch, and the very notion of 'energy conservation' during some interval from that 'coordinate time', cannot be rigorously defined. The tacit presumption is that 'space' itself does not "move" anywhere, simply because there is no "outer space" in which our 3-D space could "expand into". But only the second part from this tacit presumption is correct, since our 3-D space can indeed "move" or rather "emerge" (C. Isham, gr-qc/9310031, Option IV): the intrinsic dynamics of space -- here we enter 'GR with DDE' -- can only be defined with respect to a hypothetical global mode of spacetime, which is hidden between the "points" of the local mode of spacetime. The latter stands as a genuine perfect continuum (the "dark gaps" from the global mode are hidden by the so-called 'speed of light'), and has been studied in STR and in 'GR without DDE'.

If we wish to think as proper relativists, this is the only choice we may have: see my email to Harvey R Brown above. Many people hate it and spit insults on me; other just keep quiet, but nobody has so far offered any viable alternative.

But is there any alternative to 'the arrow of spacetime'?

Back in 1772, on the occasion of the fall of meteorites, the French Academy of Sciences adopted a resolution categorically rejecting such ridiculous phenomena. The obvious reason had been that rocks cannot fall from the sky, simply because there are no rocks there. Likewise, when you look at the sky, you will never think that the space itself could possibly "move", in any way whatsoever. But once the "dark energy" from 'empty space' was confirmed, the intrinsic dynamics of 3-D space, hence 'GR with DDE', are unavoidable. Your good old wristwatch does read the dynamics of "dark energy" along the arrow of spacetime.

E sarà mia colpa se così è? (Niccolò Machiavelli)

D.C.
December 1, 2009
Last update: December 7, 2009


p. 18: "The coherence between the different outcomes, in principle still accessible with the measurement of the nearly vanishing interference terms (vanishing exactly only in the limit N --> [inf]), will be totally unaccessible in
practice as soon as N is sufficiently large, as the number of molecules in a bubble from the trace of a charged particle in a bubble chamber."

... pp. 19-20: "The conventional picture of the measurement process in Quantum Mechanics, as an instantaneous jump from a pure state to a mixture, which affects the state all over space at a fixed time in a preferred Lorentz frame, appears, in the scenario we outlined, as the result of several limits:

"1. the time duration T of the interaction giving rise to the measurement (which, in an exact mathematical treatment, would involve the whole interval from minus infinity to plus infinity, as all scattering processes) is set equal to zero;

"2. the number of microconstituents of the amplifying part of the measurement apparatus is set equal to infinity, thus allowing exact decoherence;

"3. the volume involved by the measurement apparatus in its interaction with the system (thus occupied by the microscopic part of the apparatus) tends to the whole space, allowing the reduction of wave packets to take place everywhere;

"In the conventional picture, some form of nonlocality is unavoidable, albeit insufficient for transmission of perturbations (hence not contradicting local commutativity) or even of information [58]: for a given observer, a coherent superposition of two possibilities might be changed, instantaneously in some preferred Lorentz frame, to a state where only one possibility survives, by the measurement performed by another observer in a very far spacelike separated region.

... p. 21: "Thus points become fuzzy and locality looses any precise meaning. We believe it should be replaced at the Planck scale by an equally sharp and compelling principle, yet unknown, which reduces to locality at larger distances.

... p. 27: "But locality is lost. There is no meaning to "E1 and E2 are spacelike separated", unless we pick a point \textcircled{\text{o}} in E, and limit ourselves to a special wedge W associated to \textcircled{\text{o}} and its spacelike complement \textcircled{\text{W}}. In this special case locality survives for free fields, but is bound to be destroyed by interactions on QST.

"That remnant of locality has been exploited to construct deformations of local nets for which the two particle S matrix is nontrivial [70, 71], at the price of loosing locality in terms of fields localised in bounded regions. The various formulation of interaction between fields, all equivalent on ordinary Minkowski space, provide inequivalent approaches on QST; but all of them, sooner or later, meet problems with Lorentz covariance, apparently due to the nontrivial action of the Lorentz group on the centre of the algebra of Quantum Spacetime.

"On this point in our opinion a deeper understanding is needed.

... p. 29: "The common feature of all approaches is that, due to the quantum nature of spacetime at the Planck scale, locality is broken, even at the level of free fields, and more dramatically by interactions. Which, as far as our present knowledge go, lead to a breakdown of Lorentz invariance as well.

... "One might expect that a complete theory ought to be covariant under general
coordinate transformations as well. This principle, however, is grounded on the conceptual experiment of the falling lift, which, in the classical theory, can be thought of as occupying an *infinitesimal neighborhood* of a point. In a quantum theory the size of a "laboratory" must be large compared with the Planck length, and this might pose limitations on general covariance. One might argue that such limitations ought to be taken care of by the quantum nature of Spacetime at the Planck scale.

... "But the energy distribution in a generic quantum state will affect the Spacetime Uncertainty Relations, suggesting that the commutator between the coordinates ought to depend in turn on the metric field. This scenario could be related to the large scale thermal equilibrium of the cosmic microwave background, and to the non vanishing of the Cosmological Constant [79, 80].

p. 30: "This might well be the clue to restore Lorentz covariance in the interactions between fields on Quantum Spacetime."


p. 7: "A New Scenario. The Principle of Gravitational Stability ought to be fully used in the very derivation of Space Time Uncertainty Relations, which would then depend also on the energy-momentum density of generic background quantum states; this leads to commutation relations between Spacetime coordinates depending in principle on the metric tensor, and hence, through the gravitational coupling, on the interacting fields themselves. Thus the commutation relations between Spacetime coordinates would appear as part of the equations of motions along with Einstein and matter field Equations.

"In other words we may expect that, while Classical General Relativity taught us that Geometry *is* dynamics, Quantum Gravity might show that also Algebra *is* dynamics.

"This new scenario [12] appears extremely difficult to formalise and implement, but promises most interesting developments."

------------------------

Subject: The Hamiltonian formulation of GR is wrong.
Date: Tue, 26 Jan 2010 17:28:31 +0200
From: Dimi Chakalov <dchakalov@gmail.com>
To: Hanno Sahlmann <sahlmann@particle.uni-karlsruhe.de>,
Jacob D Bekenstein <bekenste@vms.huji.ac.il>,
Mordehai Milgrom <moti.milgrom@weizmann.ac.il>,
J M Pons <pons@ecm.ub.es>,
D C Salisbury <dcsalisbury@austincollege.edu>,
K A Sundermeyer <ksun@gmx.de>,
George F R Ellis <George.Ellis@uct.ac.za>

Dear colleagues,

If we accept the challenge of "dark energy" and "dark matter", I believe it will
be wrong to use the Hamiltonian formulation of GR. It is not possible to quantize Einstein gravity in four dimensions either (Hanno Sahlmann, arXiv:1001.4188v1 [gr-qc]).

The problem is that we need to unravel a new degree of freedom pertaining to the NEW dynamics of spacetime: see R. Rakhi & K. Indulekha and S. Carroll, "more space comes into existence",

http://www.god-does-not-play-dice.net/#GR

http://www.god-does-not-play-dice.net/#Brown

Only people like George F R Ellis would ignore these bold facts.

Should you have questions, please don't hesitate to write me back.

Yours sincerely,

Dimi Chakalov

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Note 1: I really cannot understand why people believe that the source of "dark energy" should necessarily have positive energy density ("Treated as a fluid, this component has negative pressure (assuming positive energy density), ..." T. Padmanabhan), and be "invariant under Lorentz transformations" (E. Santos).

In the model presented here, these two self-imposed presumptions are dropped, and the source of "dark energy" is non-existent in the local mode of spacetime. None. Zero. Zilch. You can safely set it to zero, just as you usually treat the vacuum energy density in QFT.

Yet the source of "dark energy" can take any value in the global mode, depending on the particular cosmological stage of the universe, because \( T \) (the energy momentum stress tensor of all matter and fields other than gravity, with positive energy density) can completely vanish/dissolve into the vacuum, and stay available there for any partial, full, or "over unity" recall, if needed.

How? Because it is potential reality. Only people like George Ellis cannot grasp it.

All we can physically observe is that 3-D space is acting upon itself. We cannot trace back this 'energy from empty space', which is why some people called it "dark". In the same vein, the human mind would be considered "dark", because all we can observe is that the brain is being acting 'upon itself', by thinking about the brain, with the brain.

Gerard 't Hooft had a brilliant guess about the negative energy states, but his Ph.D. student Stefan Nobbenhuis ruined it, upon his guidance, by assuming that "there is no coupling other than gravitational (emphasis added - D.C.) between the normal matter fields and their ghost counterparts, otherwise the Minkowski vacuum would not be stable" (arXiv:gr-qc/0411093v3, p. 10). But the quantum vacuum can be stable without any gravitational coupling whatsoever, because gravity applies only to the explicated/physical form of reality, while the absolute value of energy stored in the vacuum is potential reality.

The misleading adjective "dark" (Mike Turner) comes from treating the potential vacuum reality as 'physically real'. In the case of John Wheeler's 'cloud', only
this last explicated physical reality will be subject to gravitational interactions, like the explicated Casimir energy. The 'cloud' has been explicated by an emerging context, while in the case of the "dark" energy from the quantum vacuum we encounter an emerging boundary: the energy here is not "boundary sensitive". It is 'the whole universe as ONE' (global mode of spacetime) that fixes the "boundary terms", so that we can only see a "cloud" with strictly positive mass. Surely the explicated "cloud" changes along the cosmological time arrow, but its "dark" driving force cannot be unraveled from the fleeting "cloud" (denoted with a in [Ref. 1]), just as we cannot unravel the UNdecidable Kochen-Specker quantum state from its colorizable projections. This is the legacy of Schrödinger and Margenau (see below), which I was hoping to explain on November 27, 2002.

Notice that in GR you inevitably need to introduce some additional structure [Ref. 2] compensating for the absence of the global mode of spacetime. To understand the origin of these of additional structures, recall the prerequisites that necessitate 'time' regarded as 'change': we need two different and distinguishable states of a physical system, and some background w.r.t.w. the difference between the two states can be identified. In STR, the task looks quite easy: take two consecutive, instantaneous, point-like states of a Frisbee along its continuous trajectory, defined w.r.t. the fixed background of Minkowski space, and you're done. In 'GR without DDE', the background is the 3-D space itself, which is allowed to change its "curvature" only, following the bi-directional "talk" between matter and space: "Space acts on matter, telling it how to move. In turn, matter reacts back on space, telling it how to curve" (John Wheeler). But because of the Equivalence Principle adopted in GR, gravity must be able to vanish completely "inside" an infinitesimal "point", hence there is no localizable point-like gravitational energy density in such "point" and across its infinitesimally small neighborhood, to compute derivatives (Bjoern Schmekel). Hence the notion of 'time', conceived as 'change' from point-like state A to point-like state B (defined w.r.t. a background of 3-D space), becomes terribly complicated because of its dual, non-linear duties: "the metric is treated as a field which not only affects, but also is (at the same time - D.C.) affected by, the other fields" (John Baez). Notice the notion suggested by Viktor Denisov and Anatol Logunov: 'physicogeometric dualism'.

Under these circumstances, people need to introduce some additional structures to define some "boundaries" of the whole spacetime; for example, some "fall-off conditions of the curvature in appropriate coordinate systems at infinity" [Ref. 2], because, in the case of the Einstein equations alone, "there are no physically motivated boundary conditions" (Alan Rendall). But notice that the background of 3-D space is still always there, in the sense that in 'GR without DDE' the space itself doesn't "move" (Robert Geroch). But once we endow the space itself with an additional degree of freedom, as in 'GR with DDE', it acquires new dynamics (arrow of spacetime), and those 'additional structures' that were introduced by hand [Ref. 2] should be derived from the "dark" ("no observable content", Domenico Giulini) global mode of spacetime.

Don't try to bridge the two "mirror" worlds (introduced by symmetries or quasi-symmetries [Ref. 2]) with any physical stuff whatsoever. Don't try to explain the self-acting faculty of 3-D space with the physical, "colorizable projections" that can only show up with positive energy density. You will be baffled by the driving force of the cosmological time arrow [Ref. 1] and the cosmological "constant" problems forever (cf. Amedeo Balbi), or at least until you quietly retire.

D.C.
January 27, 2010
Last update: February 2, 2010


2 The phrase ‘cosmological arrow of time’ means different things to different people; I will use it in the sense that \( a(t) \) being a monotonic function of \( t \) with \( a > 0 \), gives a direction for \( t \) from the evolution of \( a \).


p. 6: "Once the non-local nature of the gravitational energy-momentum and angular momentum is realised, the conceptual challenge is translated into the manner of determining the appropriate physical parameters associated with the gravitational field in an extended region of spacetime. An unambiguous answer has been given in the case of the total mass of an isolated system. However, the situation is much less clear in the case of extended but finite spacetime domains.

"In a broad sense, existing attempts either enforce some additional structure that restricts the study to an appropriate subset of the solution space of General Relativity, or alternatively they look for a genuinely geometric characterisation aiming at fulfilling some expected physical requirements. In this article we present an overview of some of the relevant existing attempts and illustrate the kind of additional structures they involve.

... pp. 9-10: "The characterisation of an isolated system in General Relativity aims at capturing the idea that spacetime becomes flat when we move sufficiently far from the system, so that spacetime approaches that of Minkowski. However, the very notion of far away becomes problematic due to the absence of an a priori background spacetime. In addition, we must consider different kinds of infinities, since we can move away from the system in space-like and also in null directions. Different strategies exist in the literature for the formalization of this asymptotic flatness idea, and not all of them are mathematically equivalent. Traditional approaches attempt to specify the adequate fall-off conditions of the curvature in appropriate coordinate systems at infinity. (...) The whole picture is inspired in the structure of the conformal compactification of Minkowski spacetime.

... pp. 35-36: "But it must be acknowledged (...) that the status of the quasi-local mass studies is in a kind of post-modern situation in which the devoted intensive efforts have resulted in a plethora of proposals with no obvious definitive and entirely satisfying candidate.

..."The moral of the whole discussion in this article is that the formulation of meaningful global or quasi-local mass and angular momentum notions in General Relativity always needs the introduction of some additional structure in the form of symmetries, quasi-symmetries or some other background structure."
Note 2: Recently, J. M. Pons, D. Salisbury, and K. Sundermeyer (PSS) tried to solve the paradoxes of "frozen time" and "nothing happens" (arXiv:1001.2726v1 [gr-qc]), stressing the difference b/w the gauge generator and the Hamiltonian (p. 5):

"These gauge transformations define equivalence classes within S, which we call gauge orbits. A gauge orbit represents a unique physical state (footnote 5), and its different points correspond to different coordinatizations.

Footnote 5: "Note that this state is the whole spacetime."

"... in the space of on-shell field configurations the gauge generator moves from one point $p$ to another $p'$, whereas the Hamiltonian works within every point $p$, which already represents an entire spacetime (emphasis added - D.C.)."

In another paper (arXiv:0902.0401v1 [gr-qc], p. 4), PSS illustrated their ideas with a "spatially homogeneous isotropic cosmological model", and acknowledged that "this model possesses the curious property that the only physical variable that changes in time is time itself!" (emphasis added - D.C.).

Which makes this "time" unobservable, or rather 'observable only with respect to itself'. Pity PSS didn't ask Karel Kuchar to comment on their speculations, nor mentioned the new dynamics of 3-D space due to its "dark" energy acting on the whole spacetime en bloc.

When will the Hamiltonian formulation of GR address this task? When pigs fly.

D.C.
January 31, 2010

Subject: The schizophrenic behavior of gravity (SBG)
Date: Tue, 9 Feb 2010 05:16:20 +0200
From: Dimi Chakalov <dchakalov@gmail.com>
To: Nikolai Mitskievich <nmitskie@gmail.com>
Cc: kip@tapir.caltech.edu, weinberg@physics.utexas.edu, LSC_Spokesperson <reitze@phys.ufl.edu>, Beverly Berger <bberger@nsf.gov>, Tom Carruthers <tcarruth@nsf.gov>, Denise S Henry <dshenry@nsf.gov>, Ramona Winkelbauer <rwinkelb@nsf.gov>, GW_comp@olegacy.gsfc.nasa.gov

Dear Dr. Mitskievich,

I think you shouldn't regret that you missed the chance to educate Kip Thorne [Ref. 1] about the inevitable failure of his LIGO project and the whole "GW astronomy". Arguments similar to yours have been spelled out by Steven Weinberg seven years ago (25 Feb 2003), after which he added: "I often find that people who say silly things actually do correct calculations, but are careless in what they say about them."

Not just Kip Thorne, but the whole LIGO Scientific Collaboration (LSC) are saying silly things, but because they use the linearized approximation of GR, they do "correct calculations".
However, if you use the same linearized approximation of GR, you can prove "GW astronomy" wrong by *reductio ad absurdum*:

http://www.god-does-not-play-dice.net/Szabados.html#SBG

Either way, with GR or with its linearized approximation, LIGO is for the birds.

Trouble is, some people from NSF continue to dump hundreds of million U.S. dollars -- all taxpayers' money -- into this GW nonsense.

Typical for a socialist country.

Yours sincerely,

Dimi Chakalov

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"The gravitational deformation in general relativity does in fact belong to the kinematic effects, when it is described without the use of geodesic deviation equation. Thus, for example, the interferometric detection of gravitational waves cannot give a non-zero result, since the scales of all types of equally oriented lengths do change in gravitational fields in the same proportion, and the numbers of light wavelengths fitting along the alternative arms of interferometer cannot suffer changes in a passing gravitational wave.

"I am regretful not to tell these considerations to Kip S. Thorne more than two decades ago, simply because of a kind of awkward modesty."

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Note: See what happens if you don't tell your students everything you know.

Example: Jim Hartle. Recently, a young theoretical physicist, Gareth Jones, defended his *Ph.D. Thesis* on "Searching for gravitational waves...". He looked at Ch. 23 from Jim Hartle's textbook, "Gravity, an introduction to Einstein's General Relativity", to eventually understand the dimensionless GW amplitude (Eq. 1.64, p. 15) that would "cause a periodic strain (i.e., stretching and contraction) of the proper distance between points (Sic! - D.C.) in spacetime" (ibid., p. 182).

But you can't hide the *dimensionality* of GW amplitude in 3-D space: check out SBG here. In order to prove LSC (at least 679 people) *wrong*, all you need is to drive the "background" in the linearized approximation of GR to its absurdity, as with the SBG argument. Not sure?

Please explain the *dimensionality* of GW amplitude (h) in Kip's mantra:
Something with [meter] maybe? Or some "creative analogies" from EM radiation?

If you look at Wiki, GW amplitude "is not the quantity which would be analogous to what is usually called the amplitude of an electromagnetic wave (...)."

The alleged GW has frequency, wavelength, and speed -- all defined with proper dimensionality. Only the action of geometry on matter, embodied in the mantra above, is a dimensionless ghost that shows up only with \(2.3 \times 10^{-26}\), say.

How can Gareth Jones change his Ph.D. brain, to think as a physicist? Surely the entity that fixes a 'meter' cannot itself be defined with what it produces -- a 'meter'. Can he notice the intrinsic parapsychology of statements like "our best (lowest) upper limit on gravitational wave amplitude is \(2.3 \times 10^{-26}\)"?

I think Jim Hartle (along with Bernie Schutz) should be blamed for Gareth Jones' professional career. It may be wasted by chasing ghosts with real, taxpayers' money.

In my opinion, the "dimensionality" of GW amplitude is just like that of quantum waves. And just like the de Broglie waves (cf. Franco Selleri above), in present-day GR these GWs cannot show up either, simply because they cannot transport energy-momentum to any physical system in the spacetime of GR textbooks.

Neither quantum waves (recall the quantum vacuum) nor gravitational waves are "empty" by themselves. Pity nobody cares.

D.C.
February 10, 2010
Last update: March 17, 2010

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Subject: Re: The schizophrenic behavior of gravity (SBG)
Date: Tue, 2 Mar 2010 04:55:21 +0200
Message-ID: <bed37361003011855j1eb9c7f1rc9a10ef89ac6c1@mail.gmail.com>
From: Dimi Chakalov <dcchakalov@gmail.com>
To: kip@tapir.caltech.edu, weinberg@physics.utexas.edu, marx_j@ligo.caltech.edu, bberger@nsf.gov, tcarruth@nsf.gov, dshenry@nsf.gov, rwinklbg@nsf.gov, GW_comp@legacy.gsfc.nasa.gov, takahasi@th.nao.ac.jp, matthew@astro.gla.ac.uk, gareth.jones@astro.cf.ac.uk, Curt.J.Cutler@jpl.nasa.gov, vallis@vallis.org, sigq_d@ligo.caltech.edu, Holger.Pletsch@aei.mpg.de, Bruce.Allen@aei.mpg.de, bernard.schutz@aei.mpg.de, info@ligo.caltech.edu, LSC Spokesperson <reitze@phys.ufl.edu>, IGUS Jim <chartle@physics.ucsb.edu>

P.S. Update at
http://www.god-does-not-play-dice.net/#Jones

D.C.
Dear Mr. Hermens,

It is a real pleasure to read your Thesis.

Just a brief comment. You wrote (p. 46): "The claim of Meyer that the Kochen-Specker Theorem has been nullified leads to the question what it is exactly that the Kochen-Specker Theorem states. A common notion is that the theorem states that (at any given time) not all observables can be assigned definite values that are independent of the measuring context."

Long before John Bell, Schrödinger explained the crux of the matter (November 1950),

http://www.god-does-not-play-dice.net/#NB

I suppose none of your senior colleagues have mentioned to you anything about my numerous email messages, with links to my web site. And that is not fair.

If I'm wrong about them, please write me back.

Kindest regards,

Dimi Chakalov

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Note 1: All kids, Ronnie Hermens included, have the right to know everything we know. This doesn't mean that they should accept our opinions. But in order to make educated decision about their professional career, we should kindly offer them all our knowledge and opinions. Otherwise it's just not fair.

Ronnie, here's a story from Uncle Dimi. Suppose you're in a pitch dark room. You hold a torch in your hand, but want to "see" how the darkness itself looks like before you observe it with the torch. As you might have guessed, 'the darkness itself' stands for the 'UNdecidable quantum potential reality' that cannot be fitted into any Hilbert space whatsoever; more from Uncle John.

Obviously, your task is not feasible. With your torch, you can only "see" the classical presentations of 'the dark room', which have been "filtered" through the classical spacetime at the scale of tables and chairs. So, what do you do? You use some QM textbook recipes for calculating probabilities for observing the dark room with your torch. NOT the dark room itself. And if you "look" with Hilbert space with dimensions 2, you may never notice any problems with your torch observations, as you can always infer what sorts of objects should have been in the dark room, before you turned on the torch and brought them into the classical spacetime of tables and chairs (recall the "quantum computing" mess).
The real fun with QM starts when KS Theorem comes to play: your torch observations do not make sense. You cannot infer anymore what kinds of objects should have been in the dark room before you turned on the torch. (In the context of "quantum computing", quantum states both 'partly exist' as context-evoked latent observables and 'partly do not exist', being UNdecidable quantum state (never in plural) as well. It's an "eigentümlichen, klassisch nicht beschreibbaren" (W. Pauli), indivisible bundle of 'both ONE and many'. Capiche?)

The essential ONE-"part" from the objects in the dark room will always remain unaccounted for. You can say NOTHING about it. It is UNSpeakable. You just can't fit it into any Hilbert space on which you make your torch observations. It is the ultimate quantum reality 'out there', which I simply call 'potential reality'.

You can say nothing about it, because any statement of yours refers exclusively to what you can "see" with your torch. This is my answer to your question "what it is exactly that the Kochen-Specker Theorem states", as you put it.

Your mentor, Nicolaas Landsman, has tried some toposification of quantum theory, but notice that this is just another torch. Chris Isham also plays with that topos torch. Other people try another, 'non-commutative spacetime' torch.

The math jungle is staggering. Don't go there, it's endless. How do I know?

Because there is only one way to solve both the measurement problem of QM and the cosmological "constant" problem. Both problems, en bloc. Just recall the basic tenet of Copenhagen [Ref. 1], and compare it with the interpretation of QM discussed here and the arrow of spacetime: the instantaneous state of Die Bahn (trajectory) of all physical objects, at all length scales, is nothing but the local mode of spacetime, as it evolves from "point" A to "point" B, following the expansion of space due to the "dark" energy of the vacuum.

Locally, Die Bahn [Ref. 1] is like a single flash or "point" with infinitesimal duration. The whole 'local mode of spacetime' is comprised of such already-correlated "points" with infinitesimal duration, all of which are explicated with a carpe diem unit probability, in line with the PR interpretation of QM. If you can imagine an instantaneous cross-section of the arrow of spacetime, the local mode will be a frozen flat 3-D space with total gravitational energy precisely zero (see above): the potential reality itself (the infinite "shop", see below) does not gravitate (cf. "yes you can"). Any of these 3-D "snapshots" constitutes a legitimate 'universe' by itself, but as the arrow of spacetime "moves" forward, we are led to consider a chain of such snapshots, and then it looks like the universe is somehow 'acting upon itself', because the "dark gaps" from the global mode are precisely sealed off, making the local mode a perfect continuum (notice the emergence of "waves" below). Of course we cannot locate the source of this "dark energy", call it X, inside the very thing that is being produced by X: the 3-D space of the local mode of spacetime. Which is why some (otherwise serious) people called it "dark", while other speculate about some mysterious "dark flow" and "axis of evil", as pictured here.

A few days ago, I tried to explain Die Bahn [Ref. 1] to my teenage daughter (she is the 'test bed' for my DVD video tutorials) as follows. Picture the quantum vacuum as an infinitely "large" cash-and-carry shop, from which you can get everything and anything (that caught her attention, as expected). You buy some stuff for your diet, but you can shop (i) only if you're "off the train", and (ii) only for your one-day meal. This 'one-day meal' is just one point from a perfectly legitimate universe -- the local mode of spacetime at the global instant 'now'.
Such "horizontal" cross-section of the arrow of spacetime takes only one sliding point 'now' from the ("vertical") arrow of spacetime. But because you inevitably chain your 'daily points' along a perfectly continuous trajectory (the "dark gaps" of the global mode of spacetime are completely sealed off due to the speed of light), you get an emergent Bahn with 'potential future' and 'irreversible past', as it emerges due to the arrow of spacetime, while the infinite shop, with all its (latent) stuff that you did not buy, will always remain "dark".

Imagine also that every day you're buying more stuff: if some theoretical physicists compare only your daily meals during a week (they can't glance at the "dark gaps"), they will claim that you've been getting 'more stuff' throughout the whole week from some "dark source". (If they include the infinite shop in their calculations, they will inevitably face their cosmological "constant" paradox.)

Also, notice that all people in the universe are shopping from the same "dark shop": they shop for their 'one-day meal' to cook up their common 'local mode of spacetime', but have to do it relationally (there is no background whatsoever in the local mode of spacetime), and also in a pre-correlated (EPR-like) fashion, in line with the Bootstrap Rule 'think globally, act locally'. The result is a (quantum-gravitational) wave of pre-correlated 'one-day meals' that also emerges during Die Bahn. Nothing is "waving" to emit these waves. They just emerge. Capiche?

Okay, let me try it this way. Do you remember how we played Frisbee on the beach? That poor Frisbee was too large and heavy to take advantage of its potential UNdecidable KS states, and since it also managed to ignore the effects of gravity, we could imagine some fictitious "fixed grid" (Minkowski spacetime) on which we can draw its Bahn. Had the Frisbee been a quantum-gravitational object, it would have all its instantaneous one-point "meals" correlated (recall the two hands) with 'everything else in the universe' ("off the train", in the global mode of 'the Frisbee per se'). Then the real Frisbee would be flying like a fish from a correlated shoal of fish, only you can't see the rest of fish from the shoal, and therefore can't see its wave-like movement, like the waves of the correlated centipede's legs. Simple, no?

I didn't try to explain why LSC may only unravel the blueprints from relic GWs cast in the distant past, but cannot observe 'the emergent wave' online, as it evolves along the arrow of spacetime. That would have been too much for her.

Finally, notice that if you take the whole stack of "Photoshop layers" (all your 'one-day meals') and flatten them onto one (.JPG) image, you will end up with a timeless "trajectory" immersed in a dead frozen 4-D "block universe", in which "time" can evolve just as much as "space" can: "There is no dynamics within space-time itself: nothing ever moves therein; nothing happens; nothing changes" (R. Geroch). Our (mischievous) wristwatches do in fact read the global cosmological time of 'Die Bahn', but because you can only use a physical "torch", you are deceived by a flatten image of all 'one-day meals': in Fig. 1 below, there are three consecutive 'one-day meals' or "points" from Frisbee's trajectory, connected by the pre-geometric plenum, while Fig. 2 shows the stack of "Photoshop layers" consisting of three different, re-created 4-D universes in their local mode, as they evolve along Die Bahn (the red arrow of spacetime, w). The quantum-and-gravitational waves "travel" along w (Fig. 2), which is why they cannot be detected on the flatten image (Fig. 1): regarding GWs, the linearized approximation of GR is a "shadow without power" (Hermann Weyl).
Notice the misleading "dark" energy and "curvature" of spacetime

With the current GR and diff geometry textbooks, you can explore only one instant 'now' from the arrow of spacetime. Even if you try to introduce some "infinitesimal coordinates shift" [Ref. 2, Eq. 4.1], as in today's GR textbooks, you will nevertheless be dealing with a frozen one-instant "trajectory", and can
never solve the Cauchy problem for the Einstein equations: the "dark background" of 'the reference fluid' of GR is missing from GR textbooks. You can use such 'calculated-from-one-instant trajectories' only in classical physics and STR (e.g., the trajectory of a Frisbee, calculated from some of its instantaneous states).

To resolve the genuine dynamics of GR, we need to make the 3-D space dynamical: the global cosmological time originates from the dynamics of space. First of all, we have to replace the familiar expression 'with respect to the rest of the Universe' [ibid., p. 263] with a Machian "absolute" reference frame, which works as 'the reference fluid' of GR -- the global mode of spacetime. Recall also the idea of "breathing" (inhaling/exhaling) Universe, and imagine the elementary step/cycle of the arrow of spacetime (cf. Fig 2 above) as the "negotiation" of the two hands in Escher's drawing below: an inhaling ("offer") quantum-gravitational wave is being emitted in the global mode of spacetime from each and every "point" from the local mode, followed by an exhaling ("confirmation") quantum-gravitational wave converging on the next point from the next horizontal layer. What is the duration of this "breathing" cycle in the local mode of spacetime? ZERO. This is the meaning of the phrase 'Your Global Time is ZERO'. The local mode of spacetime is a perfect continuum. But that's too much for you, isn't it?

D.C.
February 10, 2010
Latest update: March 30, 2010


p. 263: "The principle of space travel while locally "at rest", is analogous to galaxies receding away from each other at extreme velocities due to the expansion (and contraction) of the Universe.

"Instead of moving a spaceship from a planet A to a planet B, we modify the space between them. The spaceship can be carried along by a local spacetime "singular region" and is thus "surfing" through space with a given velocity with respect to the rest of the Universe.

§1.2.1, 'The (3+1) Formalism: the Arnowitt-Deser-Misner (ADM) technique'

p. 265: "In 1960, Arnowitt, Deser, and Misner [5] suggested a technique based on decomposing the space-time into a family of space-like hypersurfaces and parametrized by the value of an arbitrarily chosen time coordinate x^4."
"This “foliation” displays a proper-time element $\text{d}t$ between two nearby (emphasis added - D.C.) hypersurfaces labelled $x^4 = \text{const}$ and $x^4 + \text{d}x^4 = \text{const}$. The proper-time element $\text{d}t$ must be proportional to $\text{d}x^4$.

p. 267: "The main advantage of the ADM formalism is that the time derivative is isolated (emphasis added - D.C.) and it can be used in further specific computations.

p. 275: "This horizon first appears for the occupants of the spaceship, who are unable to “see” beyond the distortion, and therefore cannot communicate with the outer universe.

p. 280: "Let us consider the infinitesimal coordinates shift

$$x^a = x^a + N^a, \quad (4.1)$$

Subject: The infinitesimal coordinates shift -- with respect to 'the rest of the Universe'
Date: Fri, 19 Mar 2010 14:31:11 +0200
From: Dimi Chakalov <dchakalov@gmail.com>
To: Patrick Marquet <patrick.marquet6@wanadoo.fr>
Cc: Larissa Borissova <borissova@ptep-online.com>,
    Tatyana Shestakova <shostakova@phys.rsu.ru>,
    Natalia Kiriushcheva <nkiriush@uwo.ca>,
    Dmitri Rabounski <rabounski@gmail.com>,
    Serge Krasnikov <gennady.krasnikov@pobox.spbu.ru>,
    Michael Kuntzman <MichaelKuntzman@hotmail.com>,
    Miguel Alcubierre <malcubi@nuclecu.unam.mx>,
    Michael Pfenning <mitchel@cosmos2.phy.tufts.edu>,
    Larry Ford <ford@cosmos.phy.tufts.edu>,
    Allen Everett <everett@cosmos2.phy.tufts.edu>,
    William A Hiscock <hiscock@physics.montana.edu>,
    Chris Van Den Broeck <vdbroeck@nikhef.nl>,
    Thomas A Roman <roman@ccsu.ctstateu.edu>,
    Robert M Wald <rmwa@midway.uchicago.edu>,
    Robert Geroch <geroch@midway.uchicago.edu>

Dear Professor Marquet,

I greatly admire your Extended formulation of GR (EGR), particularly the so-called “residual” (true) field tensor. Yet it seems to me that the infamous "infinitesimal coordinates shift" in ADM presentation, which you used in your latest article cited below, is seriously flawed, as hinted in the subject line.

As an alternative to ADM speculations, please see

http://www.god-does-not-play-dice.net/#Bahn

Details at

http://www.god-does-not-play-dice.net/#quiz
I will highly appreciate your professional comments, as well as the feedback from your colleagues.

Kindest regards,

Dimi Chakalov

------


Subject: Re: PTI, by Ruth Kastner
Date: Fri, 5 Mar 2010 04:54:05 +0200
From: Dimi Chakalov <dchakalov@gmail.com>
To: Ruth <rkastner@umd.edu>, John <jcramer@uw.edu>
Cc: Adrian Kent <a.p.a.kent@damtp.cam.ac.uk>,
Joseph Berkovitz <dwyer@umbc.edu>,
Tim Maudlin <maudlin@rci.rutgers.edu>,
Huw Price <huw@mail.usyd.edu.au>,
Jeremy <jb56@cam.ac.uk>,
Sergiu Klainerman <seri@math.princeton.edu>,
Sergio Doplicher <dopliche@mat.uniroma1.it>

Dear Ruth,

You said (Feb 16th) that "will take a look" at my note on KS Theorem, yet in your latest arXiv:1001.2867v3 [quant-ph], co-authored with John Cramer, there is not even a hint to it.

Regarding the UNabsorbed offer wave, you and John argued (footnote 9) that "it is the uncommitted (to a particular basis) nature of the offer wave which gives it its flexibility and thus its ability to explore “all possibilities at once.” 

How would you (and John) tackle these 'all possibilities at once' if they pertain to the UNdecidable KS state? How can you, or anyone else, derive the Born Rule in the case of KS state?

Can you possibly derive *anything* resembling 'probabilities' in the case of KS state?

http://www.god-does-not-play-dice.net/#KS

I will appreciate the opinion of your colleagues as well.

All the best,

Dimi

On Tue, Feb 16, 2010 at 9:04 PM, <rkastner@umd.edu> wrote:
> > Thanks Dimi! I will take a look.
> > Best
> Ruth
>
=====================  

Subject: Re: PTI, by Ruth Kastner  
Date: Fri, 5 Mar 2010 14:43:10 +0200  
From: Dimi Chakalov <dchakalov@gmail.com>  
To: Ruth <rkastner@umd.edu>  
Cc: John <jcramer@uw.edu>

On Fri, Mar 5, 2010 at 8:03 AM, <rkastner@umd.edu> wrote:
>
> OK, it's the Peres-Mermin version of KS.

Excuse me?

I wrote: "Nothing -- not even some "contextuality" -- can save Harry (or Dick, or Tom) from the case in which he (or Dick, or Tom) must not possess any hands."

And also: "NB: There is nothing "probabilistic" or "stochastic" in the quasi-local UNdecidable quantum state that neither 'is' nor 'is not'. Can't fit it in any Hilbert space."

> This is similar to the GHZ example, These are all "no hidden variables" proofs.

It isn't about "hidden variables" of any kind whatsoever. It is about how TI/PTI would address this KS state: please read my email from Fri, 5 Mar 2010 04:54:05 +0200.

> I certainly did read this when you first sent it to me, as I said that I did

Then please prove my interpretation wrong:

http://www.god-does-not-play-dice.net/#KS

John: Would you please help Ruth?

D.

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Tuesday, March 30th, 2010  
Your Local Time: 27 minutes past 7 P.M.  
Your Global Time is ZERO

Note: Nothing in the local mode of spacetime can (nor have to) wait "... until the conserved quantities are transferred and the potential quantum event becomes real", as John Cramer put it.

We see only the end result from already-completed atemporal "handshaking" transactions, and of course we cannot trace it "back" to the global mode of spacetime -- all the negotiations between the offer-and-confirmation wave is one single event in the local mode of spacetime. In the local mode of spacetime, its "duration" is zero -- just like the proper time of photon's flight "between" its emission-and-absorption; see Kevin Brown.
In the local mode of spacetime, all this "happens" over a "point". Which is why there is no "source" of the quantum-gravitational waves that is "waving", as stressed by Anthony Zee.

The second case of fixing the physical constituents at this same "point" concerns GR: we need to examine the "negotiations" of matter and geometry, which also "take place" in the global mode of spacetime: "Space acts on matter, telling it how to move. In turn, matter reacts back on space, telling it how to curve" (John Wheeler).

In GR, the offer-and-confirmation wave pertains to the "dipole radiation", and as it "converges" on the next point from Die Bahn above, it fixes the positivity of mass in the local mode of spacetime. According to SRP, we can imagine "two" such waves only in the global mode, as they "run" in two opposite "directions": from the macro-world of classical mechanics toward S and L, and vice versa.

In my (perhaps very biased) opinion, these "two" (offer and confirmation) waves should determine the instantaneous inertial reaction "forces" as well. Currently, GR says nothing about the origin and mechanism of (Machian) inertial "forces".

Nobody likes "miracles" in GR, so I very much hope we can find 'the right answer to the right question', to paraphrase MTW, p. 467, and understand the origin of inertia and the affine structure of space.

Regarding the geodesic hypothesis, Alan Rendall acknowledged: "In elementary textbooks on general relativity we read that the Einstein equations imply that small bodies move on geodesics of the spacetime metric. It is very hard to make this into a mathematically precise statement which refers to actual solutions of the Einstein equations (and not just to some formal approximations)." Notice that Alan Rendall didn't even mention those 96% of the stuff in the universe, which is "dark" and moves on some weirdly modified geodesics.
Yes, Sidney Harris is right: the re-creation of the local mode of spacetime, along the arrow of spacetime, does look like a "miracle", perhaps because we know nothing about the so-called 'speed of light' that is hiding the global mode from any direct view from the local mode. All we can observe is 'the world of facts' with unit probability, which has already, post-factum being cast in the past, as in the example with the Sun: we cannot observe the actual state of the Sun, but only its state that has been 'actual' some 8 min before we looked at the Sun.

The local mode of spacetime is a perfect continuum, because the "dark gaps" from the global mode are completely sealed off by the so-called 'speed of light'. We also have a pocket of propensity-states (KS states; see below) to choose from, which cannot be fully derived from our past only -- this is the lesson from the Free Will Theorem. Sorry for repeating this all over again.

D.C.
March 5, 2010
Last update: March 30, 2010

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Subject: Question 1 (existence): Does there exist any smoothness structure on *any* topological manifold?
Date: Tue, 30 Mar 2010 04:52:54 +0300
From: Dimi Chakalov <dchakalov@gmail.com>
To: Torsten Asselmeyer-Maluga <torsten.asselmeyer-maluga@dlr.de>
Cc: Carl H Brans <brans@loyno.edu>, Helge Rose <rose@first.fhg.de>

Dear Dr. Asselmeyer-Maluga,

Regarding your latest arXiv:1003.5506v1 [gr-qc] and the footnote on p. 3 from your book with Dr. Brans, may I offer you my views on the subject at

http://www.god-does-not-play-dice.net/#Bahn

Should you or your colleagues have questions, please don't hesitate.

Kindest regards,

Dimi Chakalov
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**Note:** Let me quote from Robert Wald's arXiv:gr-qc/0511073, "Teaching General Relativity", p. 5 (emphasis added): "First, one needs a mathematically precise notion of the "set of points" that constitute spacetime (or that constitute a surface in ordinary geometry). The appropriate notion is that of a manifold, which is a set that (...) but has no metrical or other structure. The points of an n-dimensional manifold can thereby be labeled locally by coordinates ... ."

This last sentence is a total Jabberwocky. How did we get these "points" that can be "labeled locally by coordinates", such that we can, and also have to, shuffle these coordinates to extract some GR observables?

Contemporary relativists begin by postulating a Hausdorff topological space that
has been somehow "connected", but usually mention this miracle in footnotes (e.g., Chris Isham, Modern Differential Geometry for Physicists, p. 61, footnote 1). They would denote this connected topological space with $M$, and introduce a second postulate: a differential structure on $M$, such that $M$ is promoted to a four-dimensional manifold. Then the third step is obvious: introduce a metric, and they are ready to teach GR (cf. Diego Meschini et al., Sec. 2.1) and muse over the exotic differentiable structures and the puzzle posed by Carl Brans:

$$\text{topological space } \rightarrow \text{ smooth manifold}$$

Perhaps one first needs a mathematically precise notion of the "set of points" that constitute a line (1-D Euclidean space), to elucidate how these "points" are connected in such way that the law of continuity, as defined in the standard calculus texts of the 1800's, is fully obeyed: the consecutive points of the same line should succeed each other without any interval or 'point in-between' them.

However, how should the topological space itself been "connected", in order to evolve into a perfectly smooth manifold? Specifically, does there exist any 'smoothness structure' on any topological manifold? I'm not aware of such beast in differential topology textbooks; hence my email above.

But here's the catch: on the one hand, the 'point-connecting agent' (called here pre-geometric plenum), which makes a Hausdorff topological space "connected", must not be anything that may, in any imaginable way, exist within the line made by "zero-dimensional" points. It can't be some "special middle point" or "special separating interval", because inside a line we have only points, and nothing but points. These points don't have any special hooks or handles that can determine the principle of locality and the so-called "speed" of light.

On the other hand, the pre-geometric plenum must somehow exist in order to "separate" the points and preserve their individual, albeit fleeting, physical content: "For example, $\phi$ is a scalar field on the manifold and $X$ represents the space-time coordinate of a particle, then although $\phi(x)$ has no physical meaning (if x is a point in the space-time manifold) nevertheless $\phi(X)$ does* have a meaning: ie you can talk in a Diff(M)-invariant way about the value of a field where a particle 'is', and similarly for a trajectory" (Chris Isham, private communication).

The only way out from this conundrum is to use the new (to contemporary relativists) form of reality, as explained in the case of the human brain and the quantum world. The potential reality does not exist in the local mode (cf. Fig. 1), hence the latter is a perfect continuum -- the "gaps" are completely sealed off by the so-called speed of light, because the "duration" of the transition from one "point" to the nearest "point" is zero: check out Kevin Brown above.

All this may sound like some metaphysical exercise devoid of any mathematical implications, but recall that in mathematics you have to follow the obvious and intuitively clear metaphysical ideas, or else will sink in a jungle with no way out.

Not to mention the infinite amount of energy packed in the quantum vacuum.

Now, people from the mathematical community disagree with the arrow of space and pre-geometric plenum. They postulate some "smooth" structure (66 times), and adhere to the "splitting" of spacetime, just like ADM [Ref. 1, pp. 479-486].
But how would you “quantize” a Riemannian manifold [Ref. 1, p. 425] and gravitational "field" represented by Riemannian metric? How would you specify a Poisson structure of the "dynamical system", as driven by [we-do-not-know-it]?

D. Chakalov
March 30, 2010
Last update: August 4, 2010


p. 31: "The basic idea of a manifold is to introduce a local object that will support differentiation process and then to patch these local objects together smoothly. ....

p. 37: "(W)e obtain a vector bundle by smoothly patching together local vector bundles. ....

p. 443: "This, or something like it, seems to be the final step in quantization. It is a crucial problem that has not yet found a satisfactory answer."

Subject: International Quantum Foundations Workshop
Date: Tue, 20 Apr 2010 14:23:06 +0100
Message-ID:
From: Dimi Chakalov <dchakalov@gmail.com>
To: Mike Towler <mdt26@cam.ac.uk>
Cc: Karl Svozil <svozil@tuwien.ac.at>,
F David Peat <dpeat@fdavidpeat.com>,
Guido Bacciagaluppi <g.bacciagaluppi@abdn.ac.uk>,
Herman Batelaan <hbatelaan2@unl.edu>,
Andrew Bennett <afbennett@peak.org>,
Jeffrey Bub <jgbub@umd.edu>,
Jeremy Butterfield <jbb56@cam.ac.uk>,
Samuel Colin <s.colin@griffith.edu.au>,
Murray Daw <daw@clemson.edu>,
Maaneli Derakhshani <maanelid@yahoo.com>,
Chris Dewdney <chris.dewdney@port.ac.uk>,
Maurice de Gosson <maurice.de.gosson@univie.ac.at>,
Jonathan Halliwell <j.halliwell@imperial.ac.uk>,
Lucien Hardy <lhardy@perimeterinstitute.ca>,
Basil Hiley <b.hiley@bbk.ac.uk>,
Adrian Kent <apak@cam.ac.uk>,
Martin Korth <martin.korth@gmail.com>,
Creon Levit <creon.levit@nasa.gov>,

http://www.god-does-not-play-dice.net/#XXX
RE: International Quantum Foundations Workshop
Saturday 28th August - Saturday 4th September 2010
The Apuan Alps Centre for Physics @ TTI, Vallico Sotto, Tuscany
www.vallico.net/tti/tti.html

Dear Dr. Towler,

Perhaps you and your colleagues may wish to check out an ontological interpretation of KS Theorem at

http://www.god-does-not-play-dice.net/#KS

Please notice that the UNdecidable KS state (called 'potential reality') has been interpreted as 'pre-quantum reality'.

For comparison, a similar task has been undertaken by Antony Valentini, at the expense of introducing some "signal nonlocality" [Ref. 1] and "hidden variables" [Ref. 2].

Unlike Valentini's theory, I trust every physicist can check out the interpretation of KS Theorem at the link above, and find out whether there is an error in it.

Should you or any of your colleagues find an error, please do write me back. If you cannot find such error, please be assured that I would be delighted to attend your Workshop and explain the so-called 'PR interpretation of QM'.
BTW please note that the human brain (not mind) can unmistakably handle such UNspeakable potential reality,

http://www.god-does-not-play-dice.net/#context

Perhaps all we may need is to model the whole universe as a 'brain'.

No need to introduce any hidden ghosts,

http://demonstrations.wolfram.com/CausalInterpretationOfTheDoubleSlitExperimentInQuantumTheory

The so-called 'potential reality' is known after Plato and Aristotle.

Looking forward to hearing from you and from your colleagues,

Yours sincerely,

Dimi Chakalov
35 Sutherland St
London SW1V 4JU
Phone [snip]

References


"Valentini has been working on an extension of David Bohm's "ontological interpretation" of quantum theory that would allow "signal nonlocality" that is forbidden in orthodox quantum theory. "Signal nonlocality" allows nonlocal quantum entanglement to be used as a stand-alone communication channel without the need of a classical light-speed limited retarded signal to unlock the entangled message from the sender to the receiver. This would be a major revolution in physics ... "

[Ref. 2] When Reality is Real: An Interview with Antony Valentini By Jill Neimark, Anthony Valentin

http://www.metanexus.net/magazine/tabid/68/id/7405/Default.aspx

"What is so unusual about Antony Valentini? Just this: he's resurrected a theory that undoes the central tenet of quantum mechanics, and gives relativity theory a good punt to left field as well. The theory follows quantum math, but at the same time allows for new possibilities beyond conventional quantum mechanics. It's a theory that says there is indeed an objective reality behind the things we observe -- that quantum uncertainty is not fundamental. And that somewhere, somehow, time is universal -- not relative. Goodbye, ghostly probabilities, with their strange propensity for collapsing into real things while apparently sort of holding back and remaining always a bit coy and ghostly... hello, hidden variables that are objective.

"And Antony's particular twist on the theory suggests a new explanation for the uniformity of the early universe -- where, he suggests, quantum law might not have applied, where stuff could interact faster than the speed of light -- and where those interactions were actually visible."
"There's no proof, of course -- at least not yet. But it's fun to think about.
 ......

"Q: How are you going to convince anybody of this?

"A: We need to find a violation of quantum mechanics in the early universe. We need to find a non-quantum distribution of particles. There may be particles floating around in space now which were left over from that very early time. People are looking for particles of dark matter left over from the early universe, and some of these may be good candidates. Another possibility is relic gravitons, particles associated with gravity that are believed to have stopped interacting with other particles at a very early time. Perhaps these relic gravitons from the early universe don't obey quantum mechanics.
 .......

"Q: How does the pilot wave theory view time and space?

"A: It goes against relativity theory, because it has faster-than-light processes, and in relativity nothing is supposed to go faster than light. So it seems to me that we may have to revise relativity theory and end up with a notion of universal time. In relativity, different observers at different speeds have their own time and there is no absolute time. But in this theory, distant observers can communicate instantaneously if they have control at this fundamental level of non-quantum particles. So they would be able to synchronize their clocks instantaneously even if they were millions of light years apart. Of course, some people don't like the idea, and that's a problem."

Note: I haven't yet received feedback from Mike Towler and from his colleagues regarding my email sent three days ago. Surely the KS Theorem poses very tough challenges regarding the crux of 'quantum reality'.

Luckily, Chris Isham has recently produced a clear explanation -- check out his arXiv:1004.3564v1, Sec. 5.1, 'The Kochen-Specker theorem and contextuality', p. 20:

"... the implication of the discussion above is that the value ascribed to B (resp. the result of measuring B) depends on whether it is considered together with A1, or together with A2. In other words the value of the physical quantity B is contextual. This is often considered one of the most important implications of the Kochen-Specker theorem."

The immediate question is this: What remains invariant in 'the quantity B' upon changing its "color" (see 'KS Theorem for teenage girls' below), to qualify as 'quantum reality of the quantity B'?

My proposal: pre-quantum reality. In the framework of Chris Isham's approach, the so-called pseudo-states (ibid., p. 16) are 'as close as we can get' to the UNSpeakable pre-quantum reality (called here 'potential reality'). In the case of the human brain, you can "measure" the latter with three (or more) sayings ("pseudo-states"), yet can never "collapse" the ultimate potential reality from which these "contextual" quantum states emerge.

Regardless of how you tackle such "pseudo-states" with some topos approach, the solution to the measurement problem in QM requires that you offer some 'peaceful coexistence' (Abner Shimony) of this pre-quantum reality and STR, as
explained at this web site. Recall its motto: Dead matter makes quantum jumps; the living-and-quantum matter is smarter. We could have sorted out this bundle of issues eight years ago, but I guess Chris Isham had a different agenda.

Anyway; here's an anecdotal story from 1970s (ibid., footnote 3, p. 6):

"I have a fond memory of being in the audience for a seminar by John Wheeler at a conference on quantum gravity in the early 1970s. John was getting well into the swing of his usual enthusiastic lecturing style and made some forceful remark about the importance of the quantum principle. At that point a hand was raised at the back of the lecture room, and a frail voice asked "What is the quantum principle?". John Wheeler paused, looked thoughtfully at his interlocutor, who was Paul Dirac, and answered "Well, to be honest, I don't know". He paused again, and then said "Do you?". "No" replied Dirac."

If you, my dear reader, cannot find an error in the interpretation of KS Theorem below, I will be happy to offer you my version of 'the quantum principle' and the origin of the quantum of action.

But if you aren't interested -- that's perfectly fine with me.

"just another crank" D.C.

April 23, 2010

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Subject: Re: International Quantum Foundations Workshop
Date: Sat, 24 Apr 2010 16:50:32 +0300
From: Dimi Chakalov <dchakalov@gmail.com>
To: Mike Towler <mdt26@cam.ac.uk>
Cc: [49 recipients]

Hello Mr Towler,

On Sat, 24 Apr 2010 13:56:55 +0100 (BST), you wrote:

> As I'm sure you are aware, sending unsolicited emails to large numbers of
> famous people asking what they think of your theory is not only widely
> considered to be appallingly rude but to be the hallmark of a crackpot.

It is not about my "theory", as you put it.

I'm afraid there is a large number of "famous people" who ignore the legacy of Schrödinger and Margenau, and cannot grasp the basic basics of KS Theorem and CK Free Will Theorem,

http://www.god-does-not-play-dice.net/#KS

If you and the rest of these "famous people" consider this "appallingly rude" and "the hallmark of a crackpot", I can only wish you a quiet a peaceful retirement.

Alternatively, if you and the rest of these "famous people" wish to get professional, please don't hesitate to write me back, with *specific arguments* refuting the interpretation of KS Theorem offered at the link above.
Just please reply professionally.

Thank you very much in advance.

Yours sincerely,

D. Chakalov

> On Fri, 23 Apr 2010, Dimi Chakalov wrote:
> >> P.S. An explanatory note, with excerpts from the latest paper by C. Isham, has been posted at
> >> http://www.god-does-not-play-dice.net/#Towler_note
> >> A penny for your thoughts!
> >> D.C.
>  
>  
> ================

Subject: Quasi-local Mass and Angular Momentum in General Relativity (November 1981)
Date: Mon, 26 Jul 2010 18:37:45 +0300
From: Dimi Chakalov <dchakalov@gmail.com>
To: Roger Penrose <penroad@herald.ox.ac.uk>
Cc: Peter van Nieuwenhuizen <vannieu@insti.physics.sunysb.edu>,
Glenn Starkman <glenn.starkman@case.edu>,
Alex Vikman <alexander.vikman@nyu.edu>,
David Jacobs <dmj15@case.edu>,
Chiang-Mei Chen <cmchen@phy.ncu.edu.tw>,
G Nester <nester@phy.ncu.edu.tw>,
Xiaoning Wu <wuxn@phy.ncu.edu.tw>,
Laszlo Szabados <lpszab@rmki.kfki.hu>,
Adam Helfer <adam@math.missouri.edu>,
Massimo Pauri <pauri@pr.infn.it>,
Luca Lusanna <lusanna@fi.infn.it>,
[snip]

Dear Roger,

Back in November 1981, you acknowledged that "several problems of interpretation remain to be solved". May I offer you some help with an 'arrow of space',

http://www.god-does-not-play-dice.net/#Zinkernagel_note

Are you still interested in GR?

Regards,
Hi Todd:

Pity you didn't take seriously my email from Thu, 19 Sep 2002 16:47:38 +0300 (cf. below).

The alleged "innocent cover state" [Ref. 1] and secret "quantum information" may be fused with 'the UNdecidable quantum state'.

In the case of your *brain*, you can grasp the latter by comparing the following two statements:

1. You can't hide a piece of broccoli in a glass of milk.
2. Don't wear polka dot underwear under white shorts.

The UNdecidable quantum state of your *brain* (not mind) is not about broccoli, underwear, milk, or shorts.

More from Schrödinger, Margenau, and KS Theorem at

http://www.god-does-not-play-dice.net/#KS

Should you and/or any of your colleagues cannot understand the arguments at the link above, please write me back.

Take care,

Dimi

"The day may come when quantum networks are ubiquitous. An advantage that steganography has over standard encryption schemes is that private information could be transmitted over a long time through a network, completely undetected and even unsuspected by other users. Steganographic techniques may also be useful as a way of authenticating quantum communications in distributed quantum information processing; such uses of classical steganography for authentication are often called "watermarking." Quantum steganography has far reaching consequences, and may provide a measure of security beyond what classical steganography can afford.

"Alice and Bob conceal their communication from Eve, hiding their message as errors in a codeword for an "innocent" cover state |\psi_c>, and using the resource of a shared secret random key. (Shared entanglement would work as well, or even better.)"

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Subject: Think globally, act locally
Date: Thu, 19 Sep 2002 16:47:38 +0300
From: Dimi Chakalov <dchakalov@surfeu.at>
To: Todd Brun <tbrun@ias.edu>
CC: adler@ias.edu,
[snip]

Dear Todd:

Reading your recent "Computers with closed timelike curves can solve hard problems", gr-qc/0209061 [Ref. 1], is a real pleasure.

=====

Note: Recall also the elusive Event Horizon -- a global property of an entire spacetime, which should be somehow "defined nonlocally in time" (J. Thornburg, lrr-2007-3). The mythical "black holes" cannot be defined rigorously in GR, so try the global, Heraclitean, and non-Archimedean time of the UNdecidable quantum state of 'the universe as a brain'. Or trust Chris Isham.

D.C.
July 8, 2010

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Subject: Weyl’s principle: Comoving reference frame & proper time
Date: Fri, 9 Jul 2010 20:07:23 +0300
From: Dimi Chakalov <dchakalov@gmail.com>
To: S E Rugh <rugh@symposion.dk>, H Zinkernagel <zink@ugr.es>

Dear colleagues,

Thank you for your clarification of Weyl’s principle [Ref. 1]. I believe it is obvious that the dynamics of space, as being "expanded" by itself (DDE of "empty space"), is missing in GR,

http://www.god-does-not-play-dice.net/#Blanchard
I think the human brain may possess such self-acting faculty, but if you try to pinpoint its mind, it will inevitably turn out to be "dark", just like the UNdecidable quantum state,

http://www.god-does-not-play-dice.net/#Brun

If you know how to model a universe that can act upon itself, please do write me back.

Kindest regards,

Dimi Chakalov

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p. 2: "Weyl's principle: The world lines of galaxies, or 'fundamental particles', form (on average) a spacetime-filling family of non-intersecting geodesics converging towards the past.

"The importance of Weyl's principle is that it provides a reference frame based on an expanding 'substratum' of 'fundamental particles'. In particular, if the geodesic world lines are required to be orthogonal to a series of space-like hypersurfaces, a comoving reference frame is defined in which constant spatial coordinates are "carried by" the fundamental particles. The time coordinate is a cosmic time which labels the series of hypersurfaces, and which may be taken as the proper time along any of the particle world lines."

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Note: Time does not originate from 'change in space' (coordinate time, Kodama time, etc.; see Julian Barbour), but from chance of space (cf. Fig. 2). Example with the Hubble Law here.

It is the arrow of space (AOS) that makes 'more and more space' to emerge (Isham and Butterfield) from [we-do-not-know-it], hence "the distances between all elements of the cosmic substratum (or, fluid) grow with time" (Michal Chodorowski), and we enjoy 'arrow of spacetime'. Were it possible to physically trace back the entity called [we-do-not-know-it], it won't be "dark" anymore, and the Aristotelian First Cause would be shifted one step further.

Notice that the arrow of space (AOS) leads directly to Machian quantum gravity, as the motion of any individual body is to be defined with respect to the entire universe (E. Mach, The Science of Mechanics (1883), Open Court, 1960, pp. 286-287). It has "infinite extent" (J. Barbour, arXiv:1007.3368v1 [gr-qc], p. 26), being in the state of ONE-ness (global mode of spacetime, cf. Fig. 2) that keeps "the last remnant of physical objectivity" (A. Einstein).

Physicists hate the Aristotelian metaphysics, however. They relentlessly try to picture [we-do-not-know-it] as some physical stuff with positive energy density, and end up with searching for an 'elephant in a china shop', only to find out that the elephant must be many orders of magnitudes larger than the store itself.
The AOS-driven dynamics of living and quantum/gravitational systems will inevitably produce a self-acting action, because the non-linear bi-directional negotiation between every "fish" and 'the rest of fish from the shoal' is "dark" in the local mode of spacetime. Sorry for repeating this again; I know it's boring.

If you disagree with the arrow of space (AOS), just try to define quasi-local quantities in asymptotically flat spacetime wrapped with (flexible?) "boundaries" at spatial infinity, yet keeping the splitting of spacetime (ADM) into two entities, one of which (called 'time') would refer to things that "evolve" with respect to something fixed, called 'space'. As R. Penrose acknowledged in November 1981 [Ref. 2], "several problems of interpretation remain to be solved".

Fuggedaboudit, Roger. Time can "evolve" just as much as space can; hence the arrow of space viz. arrow of spacetime endowing the conservation of quasi-local observables of Type I matter fields (Eq. 1 below), bootstrapped by gravity. Direct observation of "pure gravitational field" (cf. Dupre and Tipler below) is like direct observation of the human mind, while acting on its brain. Gravity makes all matter fields self-interacting, hence the proper GW detector should be endowed with the faculty of self-acting, that is, capable of acting on its own potential states along the arrow of spacetime.

We should drop the "no prior geometry" assumption in GR and derive the ether from Quantum Theory -- the vanishing of the covariant divergence of the stress-energy tensor (not "pseudotensor") is a quantum-gravitational phenomenon.

According to today's GR (Mario Goto et al., arXiv:1007.4846v1 [gr-qc]), "the Strong Equivalence Principle postulates that at every space-time point in an arbitrary gravitational field it is possible to choose a locally inertial coordinate system such that, within a sufficiently small (notice the poetry - D.C.) region of the point in question, the laws of the nature take the same form as in unaccelerated Cartesian coordinate systems in the absence of gravitation. On the other hand, the Weak Equivalence Principle is nothing but a restatement of the observed equality of gravitational and inertial mass."

**NB:** When and how does 'the finite small' shift to "sufficiently small", such that (operational definition) you "may erect a locally inertial coordinate system in which matter satisfies the laws of special relativity" (Steven Weinberg, pp. 62-68)? The laws of STR are applicable only if the so-called "sufficiently small" has already become a bona fide geometrical point from the global, Heraclitean, and non-Archimedean realm. On the other hand, the effects of gravity apply only to the Archimedean realm of finite things, such as 'one second' (see the drawing below) or 'one meter'. The bi-directional "talk" of matter and geometry ("space acts on matter, telling it how to move; in turn, matter reacts back on space, telling it how to curve", John Wheeler) is the ultimate "talk" of the Archimedean (local) and non-Archimedean (global) realms of spacetime. The cornerstone puzzle of GR is that your wristwatch does indeed read this "talk", and the covariant divergence of the stress-energy tensor does indeed disappear, or rather "dissolves" in the purely geometrical, non-Archimedean realm of "sufficiently small", staying available to re-emerge, as a quantum-gravitational phenomenon.

On September 21, 2008, I suggested 'necessary and sufficient conditions for spacetime': the former condition concerns physical substratum with positive energy density, while the latter condition refers to a global, Heraclitean, and non-Archimedean state of the whole universe as ONE -- a pre-geometric plenum "connecting" the geometrical "points". It is totally removed from the local mode of spacetime by the so-called 'speed of light', making the local mode a perfectly
smooth manifold. Einstein, and many other physicists, called this pre-geometric plenum *"ether".*

If you disagree with the pre-geometric plenum, try to 'connect the dots' in the drawing of *'one second'* by using only Archimedean geometry and physical stuff that is invariant under *active* diffeomorphisms. Or explain the vanishing of the covariant divergence of the stress-energy tensor. **Good luck.**

D.C.
July 10, 2010
Last update: August 20, 2010


It is perhaps ironic that energy conservation, a paradigmatic physical concept arising initially from Galileo’s (1638) studies of the motion of bodies under gravity, and which now has found expression in the (covariant) equation

\[ \nabla_a T^{ab} = 0 \tag{1} \]

—a cornerstone of Einstein’s (1915) general relativity — should nevertheless have found no universally applicable formulation, within Einstein’s theory, incorporating the energy of gravity itself. The energy tensor \( T^{ab} \), providing the right-hand side to the Einstein field equation, describes the complete local energy, this being the sum of the energy densities of all non-gravitational fields. Gravitational (field) energy, on the other hand, contributes non-locally to the total energy, its presence being manifested in the fact that \( (1) \) does not, by itself, give rise to an integral conservation law. To do so, \( (1) \) would have had to have had the form of a divergence of a vector — like the equation expressing conservation of electric charge:

\[ \nabla_a J^a = 0 \tag{2} \]

— rather than of a valence-2 tensor.


p. 458: "The contributions of gravity to energy-momentum conservation should somehow enter non-locally as corrections to the calculation of total energy-momentum. (...) From this perspective, gravitational contributions to energy-momentum, in a sense, 'slip in through the cracks' that separate the local equation \[ XXX \] = 0 from an integral conservation law of total energy momentum."

p. 777: "Thus, any non-constancy in [lambda] would have to be accompanied by a compensating non-conservation of the mass-energy of the matter."

Luca Lusanna et al., [arXiv:1007.4071v1 [gr-qc]]

"Almost a century after the birth of GR there is yet no universal consensus on how energy, momentum and other conserved quantities should be defined in it from a fundamental viewpoint. (...) The main reason to defend covariant conserved quantities in GR is that, according to the general covariance principle, if conserved quantities were intrinsically non-covariant they would be
irrelevant to the description of Nature.

"To be precise, the general covariance principle claims that the description of Physics can be done independently of any a priori coordinate fixing. It does not exclude that in particular situations one has a posteriori preferred coordinates, preferred splittings between space and time, or preferred observers; see [2], [3], [4], [5]. One very well-known example of such a situation is Cosmology: in Friedmann-Robertson-Walker solutions one has canonical clocks (e.g. the temperature of the cosmic background radiation) that not only break Lorentz invariance defining a cosmic (global) time but break the Galilei invariance defining observers which are at rest with respect to the cosmic background radiation."

Luca Lusanna and Massimo Pauri (6 March 2005), General Covariance and the Objectivity of Space-time Point-events, http://philsci-archive.pitt.edu/archive/00002224/

Chiang-Mei Chen and James M. Nester, Gravitation & Cosmology 6, 275 (2000); arXiv:gr-qc/0001088v1

"Via their energy-momentum density, material sources generate gravitational fields. Sources interact with the gravitational field locally, hence they should be able exchange energy-momentum with the gravitational field locally. From this physical conception we are led to expect the existence of a local density for gravitational energy-momentum."


"Most of the leading relativists in the early twentieth century, for examples Eddington [18] and even Einstein himself [19], claimed that general relativity was an æther theory, but they gave no mathematical demonstration of their claim.

"According to Einstein, in his Autobiography [12], the most natural choice for the tensor \( S_{\mu \nu} \) is the stress-energy tensor. Einstein was uncomfortable with adding the term [xxx] to the Ricci tensor, saying it was only introduced for 'technical reasons,' required by the vanishing of the covariant divergence of the stress-energy tensor.

"The vanishing of the divergence of the stress energy tensor is derived in Minkowski space using all the symmetries of Minkowski space. But leaving Minkowski space for a general spacetime means losing the symmetries that allowed the derivation of \( T_{\mu \nu} = 0 \) to start with!

"As MTW emphasize, the requirement that there is no “prior geometry”— that the metric is entirely determined by the field equations for gravity — actually fathered general relativity.

"A central point of Lorentz’s 1904 paper, in which he derived the Lorentz transformations, was that the Maxwell equations — for Lorentz, the equations of
the æther — do not allow an absolute time to be defined. This is of course now obvious since the speed of light in the vacuum is a constant, independent of a inertial observer.

"So the æther can be thought of as defining a time direction different from what we may have thought of as Newtonian absolute time.

"If space is not spatially flat, then the spatial Riemannian metric will define a metric connection, and we might thus have two connections, one from the spatial metric, and one in the time direction only.

"We suspect, but do not attempt to prove, that maintaining the distinction between two such connections would be very difficult.

"Essentially, the requirement that the connection arise entirely from the metric is nothing but the "no prior geometry" assumption, which, as we pointed out earlier, is the only assumption that will allow the geometry to be determined by the matter distribution and the boundary conditions. Once again, MTW have emphasized that the "no prior geometry" assumption is the basic assumption of general relativity. It is also an essential assumption of the curved ætherial Newtonian gravity theory we develop here.

"The question is, what should we select for the tensor $S_{\mu \nu}$? According to Einstein in his Autobiography: "On the right side [of the Einstein equations] we shall then have to place a tensor also in place of [the mass density] . Since we know from the special theory of relativity that the (inertial) mass equals energy, we shall have to put on the right side the tensor of energy-density— more precisely the entire energy-density, insofar as it does not belong to the pure gravitational field ([12], p. 75.)."

Subject: The vanishing of the covariant divergence of the stress-energy tensor
is a quantum-gravitational phenomenon
Date: Mon, 2 Aug 2010 20:05:20 +0300
Message-ID:
<AANLkTikaKMYEERCkKuyv7RXDdYXiYNqRWrx7gTuS0o6Z@mail.gmail.com>
From: Dimi Chakalov <dchakalov@gmail.com>
To: Angelo Loinger <angelo.loinger@mi.infn.it>,
Tiziana Marsico <martiz64@libero.it>,
John Stachel <john.stachel@gmail.com>,
Mihaela Dorina Iftime <miftime@gmail.com>,
Claus Kiefer <kiefer@thp.uni-koeln.de>,
Domenico Giulini <domenico.giulini@itp.uni-hannover.de>,
Norbert Straumann <norbert.straumann@gmail.com>,
Helmut Friedrich <hef@aei.mpg.de>,
Jeremy <jb56@cam.ac.uk>,
Laszlo Szabados <lbszab@rmki.kfki.hu>,
Shing-Tung Yau <yau@math.harvard.edu>,
Richard M Schoen <schoen@math.stanford.edu>,
Niall Ó Murchadha <niall@ucc.ie>,

http://www.god-does-not-play-dice.net/#XXX
Dear colleagues,

It had been suggested to Einstein by Levi-Civita, who had pointed out that, by virtue of Bianchi identities, the covariant divergence of the stress-energy tensor of matter and fields *has to* be equal to zero, in order to satisfy the dynamical laws of continuous media, as known in 1915:

http://arxiv.org/abs/physics/0702244

However, 'time' in dynamical laws does not come from 'change in space', but from 'change of space',

http://www.god-does-not-play-dice.net/#Zinkernagel_note

(Example with the Hubble Law at the link above.)

Hence we enjoy 'arrow of space', driven by some "dark" [we-do-not-know-it]. The (covariant divergence of the stress-energy tensor of) matter and fields can *completely* vanish/dissolve into the quantum vacuum, and stay available there for any partial, full, or "over unity" recall, if and when needed.

All this requires a new form of reality, after Schrödinger, Margenau, and KS Theorem:

http://www.god-does-not-play-dice.net/#KS

My next talk will be in Munich, on Wednesday, 25 November 2015. Meanwhile, check out the implications for LIGO, Virgo, GEO, LCGT, and LISA at

http://www.god-does-not-play-dice.net/ExplanatoryNote.pdf

Sincerely,

Dimi Chakalov

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Note: Since we represent matter by "a wooden nose in a snowman" (A. Einstein), what actually "vanishes" is completely outside present-day GR. Perhaps it is safe to say that the confusion about what becomes 'quasi-local' due to gravity, and exactly how, is enormous -- check out Carl Hoefer, Roger Penrose, Babak and Grishchuk [Ref. 1], and Einstein's Equivalence Principle (Okon and Callender; Hans Ohanian): the wegtransformierbar faculty of gravity (Hermann Weyl) over a "point", in the non-Archimedean realm of 'the grin of the cat without the cat', as observed by Alice.
Both the Riemannian space and Minkowski space can *only* accommodate facts. In the latter case, you have insurmountable problems with reconciling QM with STR. In the former case of Einstein's GR, the only event that can qualify as 'fact' is the already-completed bi-directional "talk of matter and geometry" over a "point". This is the origin of "the laws of an instant" (Karel Kuchar). But we may derive dynamical laws from 'an instant' only in Minkowski space; see what happens in GR here and here.

To be precise: I believe there exists a concealed, yet-to-be-identified object, which plays a dual role in GR, as it shows up as either "components of the metric tensor" or "gravitational field variables" [Ref. 1]. In plain words: "the metric is treated as a field which not only affects, but also is (at the very same instant - D.C.) affected by, the other fields" (John Baez). And from Laszlo Szabados: "the metric has a double role: it is a field variable and defines the geometry at the same time". Therefore, if you employ some classical space that can only accommodate facts, and try to apply the Equivalence Principle, you are destined to a blind alley: on the one hand, the "ether" must not "come back" (M. Montesinos), but on the other hand -- the gravitational (field) energy "contributes non-locally to the total energy" (R. Penrose), and you're back in murky waters, since November 1915. People are very reluctant to acknowledge that the gravitational "field" is not a classical field. Instead, they either keep quiet (Chris Isham) or offer their "pearls" of wisdom, like Gerard 't Hooft.

I think the introduction of some "flat space" in GR (CEOFOP, p. 25), as well as a "true, real stress-energy-momentum tensor for gravity" (see above), is not even wrong. Yet such ideas deserve publishing, because students should be made aware how vulnerable the mathematical formulation of GR is to ridiculous ideas -- see CEOFOP's "pearls" above.

Let me try to explain my viewpoint, in the framework of 'the universe modeled as a brain'. I take for granted that matter can interact with matter only. Corollary: any direct action of geometry on matter (e.g., Feynman's "sticky beads") is banned. It is like direct action of the human mind on its brain or other physical systems. In this context, the action of the alleged GW strain on physical bodies (LIGO's arms) should be considered 'GW psychokinesis'. To avoid such parapsychology, we should investigate how matter interacts with matter in a Machian universe, in which the non-linear negotiation and feedback from 'everything else' is encoded in the emergence of what has been called in GR 'geodesics'.

Regarding GWs: the omnipresent "direction" of GW propagation takes place in the global mode of spacetime; it correlates every "fish" with the whole school of fish, hence such AOS-driven dynamics will produce an emergent quasi-local geodesic of every "fish", and will induce geodesic waves, much like the waves of the legs of a centipede. Of course, we are confined in the local mode of spacetime, and cannot observe these emergent geodesics waves.

In the local mode, no fish could register any "deviation" from anything, just as in the example with four pre-correlated dice; details in 'the quantum principle'.

The "Gespensterfelder" (EPR-like) "action" from 'the whole school' on every quasi-local fish will show up as "dark", because it cannot be traced back from any quasi-local fish. LIGO is not endowed with the faculty of 'self-acting', and cannot detect such "dark energy from empty space".

Recall the game of '20 questions', courtesy from John Wheeler [Ref. 2]. The quasi-local object 'cloud' cannot be represented by a tensor, because it is not an
'objective reality out there'. It brings the quasi-local quantum-gravitational contributions -- just the contributions -- to matter and fields in the r.h.s. of Einstein equation. These contributions are being converted, in the global mode of spacetime, to bona fide type I matter fields; they just acquire an additional degree of freedom due to the bootstrapping faculty of gravity, resembling the geodesic hypothesis (A. Rendall) in today's GR (summary from K. Koehler, B. Mashhoon, and N. Dadhich).

To explain these quasi-local quantum-gravitational contributions, think of the object 'cloud' as a fish from the school of fish: at each and every instant from their collective quasi-local "geodesics", we have local conservation of energy and momentum to every closed (finite infinity, G.F.R. Ellis) system [matter & cloud], but this local conservation pertains only to one "horizontal" snapshot from the arrow of space -- cf. Figs 1 and 2 from 'Die Bahn'.

Thus, "the covariant divergence of the stress-energy tensor" (Wiki) does indeed vanish, because at each and every instant from the arrow of space (hence arrow of spacetime) the bi-directional talk of matter and geometry (cf. the double role of Einstein's equations, M. Montesinos) has been already completed, and in such already-correlated instantaneous snapshot all "nonlocal" and "dark" stuff has totally vanished.

Hence the "freely falling" bodies can indeed follow geodesics, as "the stress-energy has zero divergence" (Kenneth R. Koehler) at each and every instant 'now' from the local mode of spacetime (cf. Fig. 1). Picture these "horizontal" (local mode) sections of the arrow of spacetime as Photoshop layers stacked on the w arrow (cf. Fig. 2 above): the requirement 'stress-energy must have zero divergence' is indeed fulfilled, along with the Equivalence Principle, but only "during" an instant 'now' from the local mode.

However, because we inevitably flatten all "Photoshop layers" due to the so-called "speed of light", we see a perfect continuum of already-correlated facts, chained along a perfectly continual trajectory (e.g., the trajectory of a Frisbee on Minkowski space) or perfectly continual geodesic. In order to follow a geodesic (Alan Rendall), the Frisbee will have to obtain all quantum-gravitational contributions to its path from 'the rest of the universe', and then it will move like a fish from a school of fish. Most importantly, such quasi-local fish will always have strictly positive inertial mass.

(On March 27, 2007, Prof. Warren W. Johnson, LSU, wrote: "Ah ha, caught you lying! You do have a radically different "theory" to compete with Einstein's theories." But LIGO fellow Warren W. Johnson is wrong. I strictly follow Einstein's GR, and am trying to remove all "miracles" in GR (resembling the projection postulate in QM), which preclude us from understanding the geodesic hypothesis, as explained by Alan Rendall. If you agree with Warren Johnson, or trust Chris Isham, try to uncover some "total field of as yet unknown structure", and send your proposal to Alan Rendall. I hope he will then re-write his online article.)

Notice that the vanishing property of $\nabla \cdot T_{\mu\nu}$ (M. Montesinos) is manifestation of the so-called 'problem of time': nothing can possible "move" in such block universe; cf. G.F.R. Ellis below.
If you believe in the Riemannian space of 'facts' and use only Archimedean geometry, you will inevitably encounter insurmountable problems with the conservation of energy and momentum in present-day GR, as well as tug-of-war "dark" effects of gravity, dubbed CDM and DDE.

My suggestion is to zoom on the "infinitesimal variables" [Ref. 3] and reveal the interplay of matter and geometry -- their bi-directional "talk" on the interface of the Archimedean (material) and non-Archimedean (geometrical) realms. The end result is a perfect continuum in the local mode of spacetime.

**NB:** This can only happen if there is a physical mechanism producing such perfectly smooth spacetime manifold, based on the so-called speed of light: the "duration" of the bi-directional "talk", in the local mode of spacetime, is zero.

This is the meaning of the statement 'Your Global Time is ZERO'. More in my talk on Wednesday, 25 November 2015. My first talk didn't attract the attention of the theoretical physics community, but once the "enhanced" and "advanced" LIGO fail miserably by November 2015, I hope people will get serious about GR:

"The representation of matter by a tensor was only a fill-in to make it possible to do something temporarily, a wooden nose in a snowman." (Albert Einstein's Last Lecture, April 14, 1954)

D. Chakalov
August 6, 2010
Last update: September 6, 2010


..."In traditional field theories, one arrives, after some work, at the energy-momentum object which is: 1) derivable from the Lagrangian in a regular prescribed way, 2) a tensor under arbitrary coordinate transformations, 3) symmetric in its components, 4) conserved due to the equations of motion obtained from the same Lagrangian, 5) free of the second (highest) derivatives of the field variables, and 6) is unique up to trivial modifications not containing the field variables. There is nothing else, in addition to these 6 conditions, that we could demand from an acceptable energy-momentum object, both on physical and mathematical grounds.

..."In the geometrical formulation of the general relativity, the components $g_{\alpha\beta}(x^\alpha)$ play a dual role. From one side they are components of the metric tensor, from the other side they are considered gravitational field variables. If one insists on the proposition that "gravity is geometry" and "geometry is gravity", then, indeed, it is impossible to derive from the Hilbert-Einstein Lagrangian something reasonable, satisfying the 6 conditions listed above."


"There had been a plot not to agree on an object to be guessed, but that each person, when asked, must give a truthful answer concerning some real object that was in his mind, and which was consistent with all the answers that had gone before. With only one question left, John Wheeler guessed: "Is it a cloud?" The answer was "Yes!"

[Ref. 3] Eric Schechter (5 December 2009), Infinity: Introduction and History.

Comment: Eric Schechter wrote that "if you take a medium-sized number and divide it by an enormous number, you get a number very close to 0."

Since the notions of infinity and infinitesimal are, in some (yet to be explained) sense, reciprocal, the latter can be illustrated with the following expression (notice that this is just an illustration of the puzzle stressed by Lucretius):

$1/\infty \rightarrow 0$

We take a medium-sized number, 1, to represent a finite Archimedean thing (e.g., one meter or one second), and divide it by ... what kind of infinity? Potential infinity or completed/actual infinity? No matter what we choose, we
cannot recover the finite Archimedean thing by multiplying "zero" by "infinity". We are "bartenders" (recall Thompson's lamp paradox).

That's the puzzle of the finite Archimedean entities called 'space' and 'time' (local mode). Viewed from the local mode of spacetime, the infinitesimal -- the atom of geometry -- is the instantaneous state of Zeno's arrow. It is in 'absolute rest' with respect to all relativistic systems, hence we can define the elementary increment of physical variables (\(ds\) and \(dt\)) with respect to such "ether". I call it 'geometrical point', and stress that it is a non-Archimedean entity (global mode of spacetime), which builds up 'the grin of the can without the cat' (Alice), in line with the Continuum Hypothesis (CH). The latter is neither provable nor disprovable -- cf. Kurt Gödel. Why? Because the continuum emerges from the non-Archimedean realm of 'the universe as ONE', in which our mundane notions of "zero" and "infinity" do not hold anymore. They are simply not-applicable.

All we can say is that, depending on the "direction" we look at 'the universe as ONE', it looks like either infinitely small or infinitely large, as it wraps up the whole Archimedean 3-D space of present-day GR. Hence we can enjoy "self-contained" isolated systems, the asymptotic spacelike regime included (Adam Helfer).

The recipe is simple and unique. How else can you remove the jejune poetry in mathematical GR and differential geometry textbooks, encoded in expressions like "sufficiently small" and "smooth" (Piotr Chrusciel), and in stipulations that the Hausdorff topological space has somehow been made "connected" (Chris Isham)? There is no matter at the primordial level of 'pure geometry' to enable such "connection", which would show up as the affine connection (Graham Nerlich).

"It is extremely difficult to induce penguins to drink warm water", says John Coleman.

I hope these brief (and frank) comments can explain the idea about bi-directional "talk" of the Archimedean (material) and non-Archimedean (geometrical) realms. Forget about tensors.

More on Wednesday, 25 November 2015. GR "bartenders" are cordially invited.

D.C. August 9, 2010
Last update: August 11, 2010

Point set topology is a disease from which the human race will soon recover. Henri Poincaré

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Subject: Request for paper
Date: Wed, 29 Sep 2010 15:57:22 +0300
From: Dimi Chakalov <dchakalov@gmail.com>
To: Jochen Rau <jochen-rau@q-info.org>, Jochen Rau <jrau@th.physik.uni-frankfurt.de>, Jürgen Audretsch <juergen.audretsch@uni-konstanz.de>, Klaus Nagorni <nagorni@ev-akademie-baden.de>
Dear Dr. Rau,

If possible, please send me a copy from your paper/slides "How to infer a quantum state from imperfect data", November 19, 2010. I trust you'll mention KS Theorem,

http://www.god-does-not-play-dice.net/#KS

Regarding your 1993 article "On the metric structure of space-time", arXiv:1009.5523v1 [gr-qc], and Prof. Audretsch's article "Riemannian structure of space-time as a consequence of quantum mechanics" from 1983 ("quantum mechanics must contain classical particle mechanics as a limiting case", Jürgen Audretsch), please notice my efforts in quantum cosmology,

http://www.god-does-not-play-dice.net/#consciousness


Perhaps one can define God mathematically. It's all about 'Die Wirklichkeit des Möglichen in der Physik' (Jürgen Audretsch).

Kindest regards,

Dimi Chakalov

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Comments on 'primitive concepts' in spacetime structures, prompted by Jochen Rau's 1993 article [Ref. 1] and R = R(t) from Brian Dolan:

The key assumption, which Jochen Rau calls 'deformability', is that "the event manifold's physical structure is allowed to vary freely" [Ref. 1]. Precisely what is implied by "freely"?

In GR, there are no fixed paths in the "time" variable in R = R(t) from Brian Dolan -- paths are being made by "walking" (Antonio Machado) along the Heraclitean (non-Archimedean) time: "You cannot step into the same river twice, for fresh waters are ever flowing in upon you." In GR parlance, "more and more space ... appears."

Thus, the event manifold itself should be endowed from the outset with the flexibility to be modified at each and every next event from 'the world lines of galaxies' (Weyl's principle). Precisely what is implied by such flexibility?

Here Jochen Rau and I agree only on "it depends on the distribution of matter in the universe (and on boundary conditions)" [Ref. 1]. However, in a Machian-type universe the flexibility of the event manifold should not be constrained to Lorentzian metric. We may picture some emergent Lorentzian signature only within/during one fleeting instant from the Arrow of Space.

To cut the long story short, the 'no-prior-geometry' demand fathered GR (MTW, p. 431), but by doing so it also fathered a century of confusion. No aspect of the geometry of spacetime should be "fixed immutably", i.e., "cannot be changed by changing the distribution of gravitating sources" (MTW, p. 429). Any fixed background, such as the topology of space (not determined in current GR) and the fixed relations of 'inside' vs. 'outside' in 3-D space (local mode), must be made (i) dynamical and (ii) totally removable in the local mode of spacetime.
And that's why we need the *global mode* of spacetime: the "dark gaps" from the global mode are rendered/reduced to *zero* in the *local mode*, by the *Arrow of Space* and the so-called 'speed of light'. The physical/observable result is a *perfect* continuum, at *all* length scales. We don't have any other choice.

To resolve the century of confusion, I plan to suggest a *virtual geodesic path formulation* of GR on Wednesday, 25 November 2015 -- DeWitt's "many worlds" will be placed in our common 'potential reality', and the *selection of one* among infinitely many' worlds with *emergent Lorentzian signature* -- one-at-a-time -- will be made by 'the whole universe as ONE', in line with so-called *biocausality*.

As the old saying goes, you pays your money and you takes your choice; but assume well-defined concepts of (i) *energy density* in GR and (ii) trajectory of quantum particles (quantum *flexibility*, not "fluctuations"), your choices narrow greatly. Regarding (ii), all particles simultaneously explore all *potential* paths ("smells all the paths in the neighborhood", *The Feynman Lectures on Physics*, Vol. II, Ch. 19, The Principle of Least Action) *before* (=global mode) they jointly make the elementary (dt & ds) step along their trajectories; hence each and every step is unique and irreversible in the *Heraclitean* (non-Archimedean) *time*.

As to (i), the *energy density* is fixed *both* 'at a point' and 'viewed from infinity'. It's a package, and we can get it only with the *global mode* of spacetime in which the notions of 'geometrical point' and 'actual infinity' refer to ONE entity. Depending on the "direction" we look at 'the universe as ONE' from *within* the 3-D space (local mode), it looks either as 'infinitesimal geometrical "point" tending asymptotically toward zero', or as 'infinitely large and "expanding" volume of 3-D space'.

There is *no other choice* for quantum gravity. We first have to fix the long-standing problems of QM and GR, and then all pieces of the jigsaw puzzle will snap to their places -- effortlessly. Then the proper math will also show up -- effortlessly. I am sure professional mathematicians will understand what I mean.

If you agree with *Chris Isham*, you'll be playing with the drawing below forever.

Again, GR and QM "*bartenders*" are cordially invited.

Well, as *Blaise Pascal* says, I have made this note longer than usual because I lack the time to make it shorter. Sorry. Will try to do better in November 2015.

D. Chakalov  
September 30, 2010
"(W)hich physical assumptions are being tacitly made whenever one postulates the existence of a Lorentzian metric? Only after these assumptions are exhibited can one start to systematically relax them; thus, answers to the above question may be helpful for the study of more general space-time structures.

"Primitive concepts are taken to be events, counting of events, causal relationships and the ability to compare measurements; the corresponding mathematical structures are a differentiable manifold, volume element, causal vectors and affine connection(s), leading to the notion of an 'event manifold'.

"The key assumption, which I will call 'deformability', is that the event manifold's physical structure is allowed to vary freely.

"The proof of the Weyl-Cartan theorem is then reviewed to establish the result that any deformable event manifold must be Lorentzian.

2 Event Manifolds

"I assume that space-time is a connected n-dimensional differentiable manifold M. At x ∈ M, local measurements (e.g., evaluating vector fields) are performed using a basis of the tangent space T_xM. In order to have a means to compare local measurements at different points, I require the manifold to be endowed with an affine connection.

"The connection is assumed to be torsion-free.

3 Deformability

"So far my considerations have been very general, and the symmetry group G is by no means uniquely determined. Only now the key idea of General Relativity comes into play: rather than being fixed as in Newtonian theory, the local physical structure on the space-time manifold is itself a variable; it depends on the distribution of matter in the universe (and on boundary conditions)."
On Wednesday, 25 November 2015, I intend to suggest a virtual geodesic path formulation of GR:

http://www.god-does-not-play-dice.net/#Rau_comments

It will elaborate on the *emergence* [Ref. 1] of globally valid 3-D space, along an Arrow of Space,

http://www.god-does-not-play-dice.net/#Zinkernagel_note

Hence 'time' emerges locally, in terms of a 'future directed, time-like unit vector field' (cf. below).

Details in Sec. Summary, pp. 35-36, in

http://www.god-does-not-play-dice.net/ExplanatoryNote.pdf

Should you find these efforts interesting, please reply by September 25, 2015, and I will gladly send you details about the venue (probably Munich).

May I take this opportunity to thank you all for everything I learned from you, and will (hopefully) continue to learn in the years ahead.

Kindest regards,

Dimi Chakalov

[Ref. 1] C.J. Isham and J. Butterfield, On the Emergence of Time in Quantum Gravity, gr-qc/9901024
http://arxiv.org/abs/gr-qc/9901024

p. 25: "Space and time are such crucial categories for thinking about, and describing, the empirical world, that it is bound to be ferociously difficult to understand their emerging, or even some aspects of them emerging, from 'something else'.

.....
p. 46: "As we said in Section 1, we intend 'the emergence of time' to also cover the emergence of spacetime, and so space."

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Subject: A future directed, time-like unit vector field
Date: Tue, 31 Mar 2009 05:46:18 +0300
From: Dimi Chakalov <dchakalov@gmail.com>
To: Helmut Friedrich <chef@aei.mpg.de>
Cc: Hermann.Nicolai@aei.mpg.de, Curt.Cutler@aei.mpg.de

Dear Dr. Friedrich,

You acknowledged that a future directed, time-like unit vector field, for which no natural choice exists in general, is characterized indirectly and becomes explicitly available only after solving the equations (arXiv:0903.5160v1 [gr-qc], p. 17).

I've been trying to argue that this problem can only be solved by recovering the reference fluid in GR.

[snip]
Subject: The universe modeled as a 'brain'
Date: Sun, 3 Oct 2010 04:53:03 +0300
From: Dimi Chakalov <dchakalov@gmail.com>
To: Charles L Bennett <cbennett@jhu.edu>,
     Gary F Hinshaw <Gary.F.Hinshaw@nasa.gov>,
     David Spergel <dns@astro.princeton.edu>,
     Lyman Page <page@princeton.edu>,
     Ed Witten <witten@ias.edu>,
     Richard H Miller <rhm@oddjob.uchicago.edu>,
     Stephan S Meyer <meyer@oddjob.uchicago.edu>,
     Joshua A Frieman <frieman@fnal.gov>,
     Rocky Kolb <Rocky.Kolb@uchicago.edu>,
     Robert Rosner <r-rosner@uchicago.edu>,
     Carlos S Frenk <C.S.Frenk@durham.ac.uk>,
     Berkeley Center for Cosmological Physics <bccpcotb@lbl.gov>

Dear Colleagues,

I've been trying to suggest a model of the universe as a human brain -- please check out Sec. Summary at

http://www.god-does-not-play-dice.net/ExplanatoryNote.pdf

It seems to me -- please correct me if I got it wrong -- that Eqs 1 and 2, pp. 35-36 at the link above, may offer a solution to the 'most embarrassing observation in physics' (Ed Witten) and explanation of the apparent finite age of the universe:

"WMAP definitively determined the age of the universe to be 13.73 billion years old to within 1% (0.12 billion years) - as recognized in the Guinness Book of World Records!"

The model suggests a dual age of the universe, such that the evaluation of the statement from WMAP Team will be, in German, YAIN (both yes and no).

Your critical comments will be appreciated, and will be kept private and confidential.

Kindest regards,

Dimi Chakalov

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Subject: The Koch curve and Thompson's Lamp Paradox
Date: Mon, 20 Sep 2010 06:44:58 +0300
From: Dimi Chakalov <dchakalov@gmail.com>
To: Piero Nicolini <nicolini@th.physik.uni-frankfurt.de>,
     Benjamin Niedner <niedner@arcormail.de>
     Karl <svozil@tuwien.ac.at>, Jeremy <jb56@cam.ac.uk>

http://www.god-does-not-play-dice.net/#XXX
Dear Dr. Nicolini,

I read with great interest your latest arXiv:1009.3267v1 [gr-qc]. May I ask a question regarding the Koch curve in Fig. 1.

You and Dr. Niedner wrote: "It is an example of an everywhere continuous but nowhere differentiable curve. We can construct the Koch curve as a final product of an infinite sequence of steps. At each step, the middle third of each interval is replaced by the other two sides of an equilateral triangle."

Suppose we consider, as a Gedankenexperiment, an infinite sequence of steps, and assume "the presence of a minimal length" (p. 5), such that (operational definition) the initial 'interval' in Fig. 1 at this "minimal length" becomes _sufficiently small_ (the key expression from the Equivalence Principle in GR textbooks), hence can be considered as 'infinitesimal point' -- the very same infinitesimal point "inside" which the state of the Thompson's Lamp becomes _indecisive_. Namely, a superposition of |on> and |off> state(s), which can never be "collapsed" bzw. observed.

We would have an ultimate cutoff by such (Planckian?) 'sufficiently small minimal length', yet we won't be able to compute the actual length of the whole Koch curve (nor the Hausdorff dimension), because the _sufficiently small_ infinitesimal length will act as 'numerically finite but physically unattainable boundary/cutoff'.

Stated differently, the final curve won't be "infinitely long", as you put it, but _indecisive_.

I believe the implications for the notion of "delocalization of point like objects" (p. 3), as well as for those depicted in Fig. 4, are obvious, but let me first state my question:

Am I wrong?
More on the crucial issue of 'sufficiently small' at

http://www.god-does-not-play-dice.net/#when_how

Kindest regards,

Dimi Chakalov

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Subject: Re: The Koch curve and Thompson's Lamp Paradox
Date: Mon, 20 Sep 2010 07:43:13 +0300
From: Dimi Chakalov <dchakalov@gmail.com>
To: Piero Nicolini <nicolini@th.physik.uni-frankfurt.de>
Cc: [snip]

Dear Piero,

Thank you for your reply.

> as far as I understand, I would say that in some sense your comment is
> correct. the conventional computation of the Hausdorff length is modified
> as we showed in our paper.

With the Thompson's Lamp Paradox, I think the situation changes drastically.

> The introduction of a length scale breaks the self similarity property
> of the erratic path of a quantum particle.

Please see above.

> However some points don't seem to be correct in your comments. In
> particular the reference to the infinitely long case, which is the
> conventional case rather than that in the presence of a cut off as shown
> in Eq. 16.

Perhaps you didn't have time to consider my Gedankenexperiment vs. yours
(the alleged cutoff in Eq. 16).

Please check out the linked text at

http://www.god-does-not-play-dice.net/#Nicolini

I do hope to learn about your professional opinion.

All the best,

Dimi

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Note: The introduction of a *minimum* length scale as a 'numerically finite but
physically unattainable boundary/cutoff' follows from the *non-Archimedean*
nature of the geometric realm of 'the grin of the cat without the cat' (*Alice*): we
cannot reach the "hidden unmoved mover" (Karel Kuchar) and the Aristotelian
First Cause *from within* the *local mode* of spacetime. Corollary: speculations
about some dirty black hole thermodynamics, noncommutative gravity, non-commutative micro black holes, entropic "force" (the latter translates to 'information force'), etc., are unjustified.

D.C.
September 20, 2010

Subject: arXiv:1009.3559v1 [gr-qc]
Date: Tue, 21 Sep 2010 06:58:44 +0300
From: Dimi Chakalov <dchakalov@gmail.com>
To: Niall <niall@ucc.ie>, julian@platonia.com
Cc: david.klein@csun.edu, yang@euclid.math.temple.edu, lbszab@rmki.kfki.hu, Roger Penrose <penroad@herald.ox.ac.uk>

Dear Niall and Julian,

In your latest paper, you stated the following:

"The time at which wave-function collapse occurs is ill defined in relativity; however the simultaneity associated with the shape-dynamic CMC foliation could bring interpretational clarity. This is also true for the 'problem of time' [14], which arises from the ambiguity in the time evolution in superspace if foliation invariance (many-fingered time) is made inviolate."

May I request some interpretational clarity: please tell me how you plan to resolve the quasi-local mess in GR,

http://www.god-does-not-play-dice.net/#Zinkernagel2

If your colleagues have some insights, I will appreciate their feedback as well.

Regards,

Dimi

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Note: The only way I could think of "the time at which wave-function collapse occurs" is by speculating about Weyl's Principle being applied to some preferred foliation of spacetime into 3-D spacelike hypersurfaces, to fix the temporal order for spacelike separated "points" -- simultaneity-at-a-distance -- hence 'simultaneity surfaces' along which quasi-local effects propagate among the "school of fish", in which every "fish" follows pre-correlated quasi-local geodesics.

The present-day GR explicitly forbids such luxury, as well as some 'nondynamical time parameter' (Unruh & Wald).

Niall Murchadha and Julian Barbour claim that have found "the configuration space of general relativity" that "could bring interpretational clarity", and I
offered them 'the test of the pudding'. Are they implying some null surfaces backward in time to resolve the quasi-local mess in GR? Check out the 1982 paper by R. Penrose; the problem has been agonizingly clear since the inception of GR.

Apart from that, Niall Murchadha and Julian Barbour have brains, which could not have worked in any "timeless world" from GR, nor with some 'time variable' in STR, used to explain the energy conservation during that 'time variable', after Noether's Theorem.

The human brain needs an arrow of spacetime. Otherwise the human mind must act on its brain, which is sheer parapsychology. The latter has been explored by many people since the Roman Empire, with the same dead-end result.

If you seriously believe that the flow of spacetime is within the framework of the theory of relativity "an illusion", you have a choice: fix the quantum theory and theory of relativity by incorporating its "dark energy", or do parapsychology.

Or simply ignore this web site, and pretend that you've never learned anything from it, like Julian Barbour does.

D.C.
September 21, 2010

Subject: The Design and Validation of the Quantum Mechanics Conceptual Survey, arXiv:1007.2015v1
Date: Wed, 14 Jul 2010 15:37:59 +0300
From: Dimi Chakalov <dchakalov@gmail.com>
To: Sarah McKagan <sam.mckagan@gmail.com>
Cc: Sergio Doplicher <dopliche@mat.uniroma1.it>, Jeremy <jb56@cam.ac.uk>, David Schroeren <davidschroeren@cantab.net>, Ronnie Hermens <ronnie.hermens@gmail.com>, Landsman <landsman@math.ru.nl>, Laszlo Szabados <lbszab@rmki.kfki.hu>, Chris Isham <c.isham@imperial.ac.uk>, Adam Helfer <adam@math.missouri.edu>

Dear Dr. McKagan,

Students are kids, and I think nobody can blame them for being unable to grasp QM, given the fact that their tutors and professors are profoundly confused in the first place ("large variation in faculty views on many topics in QM", as you mildly put it).

Please see my efforts at

http://www.god-does-not-play-dice.net/#KS
(updated July 14, 2010)

More on QM and GR at
http://www.god-does-not-play-dice.net/#shoal

Your professional feedback will be appreciated.

All the best,

Dimi Chakalov

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Date: Thu, 11 Nov 2010 04:32:40 +0200
From: Dimi Chakalov <dchakalov@gmail.com>
To: Peter Evans <peter.evans@sydney.edu.au>
Cc: Huw Price <huw@mail.usyd.edu.au>,
John <cramer@phys.washington.edu>,
Tim Maudlin <maudlin@rci.rutgers.edu>,
Abner Shimony <abner.shimony@gmail.com>,
Philip Pearle <ppearle@hamilton.edu>

Dear Dr. Evans,

May I elaborate on John Cramer's idea (p. 4): "repeats until" ... at which point the transaction is completed, and the observer can finally witness the *already*-completed transaction (post factum). I deliberately use temporal notions to show that (i) we're dealing with two kinds of time, and (ii) this language doesn't work. Perhaps if we allow these two kinds of time to co-exist peacefully, the crux of QM can be resolved:

http://www.god-does-not-play-dice.net/#KS

I will appreciate your professional opinion, as well as the feedback from your colleagues. Please feel free to disagree, and explain why.

Kindest regards,

Dimi Chakalov

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Subject: Colloquium in Honour of Ernst Specker at his 90th Birthday, October 29-30, 2010
Date: Sat, 9 Oct 2010 06:02:21 +0300
From: Dimi Chakalov <dchakalov@gmail.com>
To: Jürg Fröhlich <juerg.froehlich@itp.phys.ethz.ch>,
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Jonathan Oppenheim <j oppenheim@damtp.cam.ac.uk>,
Stan Gudder <sgudder@math.du.edu>

Dear Colleagues,

In the late 1950's, Ernst Specker posed the question of whether the omniscience (total knowledge) of God extends to events which would have occurred if something had happened, which did not, in fact, happen (Ernst Specker, “Die Logik nicht gleichzeitig entscheidbarer Aussagen,” Dialectica 14, 239-246 (1960); p. 243).

Die Schwierigkeiten, die durch Aussagen entstehen, welche nicht zusammen entscheidbar sind, treten besonders deutlich hervor bei Aussagen über ein quantenmechanisches System. Im Anschluss an die dort übliche Terminologie wollen wir solche Gesamtheiten von Aussagen als nicht gleichzeitig entscheidbar bezeichnen; die Logik der Quantenmechanik ist zuerst von Birkhoff und von Neumann in [1] untersucht worden. Auf ihre Ergebnisse soll zurückgekommen werden. In einem gewissen Sinne gehören aber auch die scholastischen Spekulationen über die «Infuturabilien» hierher, das heisst die Frage, ob sich die göttliche Allwissenheit auch auf Ereignisse erstrecke, die eingetreten wären, falls etwas geschehen wäre, was nicht geschehen ist. (Vgl. hierzu etwa [3], Bd. 3, S. 363.)

This leads to the questions of 'the universal truth function', and "why does quantum theory not have this sort of complementarity" [Ref. 1].

My scattered thoughts on KS Theorem and truth evaluation in Quantum Theory can be read at

http://www.god-does-not-play-dice.net/#KS

Regrettably, I cannot attend the Colloquium in Honour of Ernst Specker, and can only wish him all the best upon his Birthday 'by distance', although I will be, in some sense, present as well, since we are all entangled.

May I take this opportunity to invite you at my talk on quantum gravity,

http://www.god-does-not-play-dice.net/#VGP

Kindest regards,

Dimi Chakalov

http://arxiv.org/abs/1010.1273v1

p. 3: "(O)ne must imagine that the outcome of a measurement (or equivalently, the property that is measured) is context-dependent — whether a gem is seen or not in the first box depends on whether that box was opened together with the second or together with the third."
"To get this kind of contextuality, it is necessary to find a situation wherein there are very specific sorts of limitations on joint measurability — there must exist a triple of measurements that can only be implemented jointly in pairs. For projective measurements in quantum theory, this sort of limitation on joint measurability does not occur.

pp. 27-28: "Specker's parable provides an interesting new kind of foil, because the kind of complementarity it exhibits — three measurements that can be implemented jointly pairwise but not triplewise – is something that is not found among projective measurements in quantum theory. This prompts the question: why does quantum theory not have this sort of complementarity?"

Note: Just a hint to the question above: suppose the \{1,0,1\} rule was not broken, and the full catalogue of expectation values for the spin-1 system were present (no "uncolored" section from KS sphere). Then people could develop a relativistic QM that could explain the "collapse" with some "hidden" stuff, and prove Schrödinger wrong, namely, 'a variable would have a definite value before I measure it; then measuring it simply means ascertaining the value that it has.'

D.C.
October 28, 2010

"Wenn es doch bei dieser verdammten Quantenspringerei bleiben soll, dann bedauere ich, mich mit der Quantentheorie überhaupt beschäftigt zu haben." (If we have to go on with these damned quantum jumps, then I'm sorry that I ever got involved.)

Erwin Schrödinger

"Let me say at the outset, that in this discourse, I am opposing not a few special statements of quantum mechanics held today (1950s), I am opposing as it were the whole of it, I am opposing its basic views that have been shaped 25 years ago, when Max Born put forward his probability interpretation, which was accepted by almost everybody.

"I don't like it, and I'm sorry I ever had anything to do with it."

Erwin Schrödinger, The Interpretation of Quantum Mechanics. Dublin Seminars (1949-1955) and Other Unpublished Essays, Ox Bow Press, Woodbridge, 1995

A brief note on the Kochen-Specker Theorem
(if you aren't familiar with the subject, read a note here)

Abstract: Any "quantum states" that can be put in Dirac brackets, such as
Whatever, as well as any combination of such "quantum states", cannot be mapped to (i) the UNdecidable Kochen-Specker (KS) state from the uncolored KS sphere and (ii) the general case of a pre-quantum or rather potential quantum reality. The latter cannot fit in any Hilbert space nor in the Riemannian manifold of GR (hypothetical manifold with postulated (i) differentiable structure, (ii) affine connection, (iii) tangent space at each infinitesimal "point", and (iv) metric that can only "expand" with respect to the reference fluid of GR).

July 23, 2010, 17:39 (GMT +3)

Suppose today is July 23, 1935. You are an Eskimo, and you have never seen, and will never see an elephant in your whole life. Yet you can nevertheless make observations on elephant's trunk by means of two "complementary" devices, 'nose' and 'arm'. You know that Heisenberg relations preclude you from observing simultaneously the "nose" and the "arm" of elephant's trunk (the position and momentum of an electron, say). Then you're struck by Schrödinger's 1935 paper: "In general, a variable has no definite value before I measure it; then measuring it does not mean ascertaining the value that it has. But then what does it mean?"

It means you cannot observe elephant's trunk with (inanimate) devices at the length scale of tables and chairs. It does not mean that the trunk doesn't exist. Fortunately, the Kochen-Specker Theorem can help you understand the true, UNdecidable quantum "trunk"; check it out with your own brain here. Richard Feynman claimed (12 August 1983): "We can do the arithmetic, but we cannot picture the car!" Yes we can. All we need is a brain.

Carsten Held stated that the KS theorem, "by its mathematical nature, is not empirically testable", and since Ronnie Hermens (and Wiki) seem to have some troubles with it, may I offer a brief, personal, and biased interpretation, ensuing from Ernst Specker's tripod.

Ernst Specker was eager to clarify the answer to a truly fundamental question: is it possible to distill all conceivable quantum states as 'observables in 3-D space', such that (i) there will be no counterfactuals (cf. Karl Svozil) and (ii) the unitarity principle will be upheld, that is, the probabilities for all conceivable quantum observables will sum up to unity. If that were possible, one could make a "reverse engineering" of a quantum system, by exposing all of its localizable observables, after which the cornerstone questions of Quantum Mechanics (QM), posed by Erwin Schrödinger in 1935 and in November 1950 (cf. below), would have acquired a dead simple answer: hidden variables. Then QM would be just a statistical theory based on the unitarity principle, and will also be marred with the intractable parapsychology of those "hidden variables" (maybe sub-quantum, or maybe noncontextual, but you never know, because all this parapsychological stuff is "hidden" from the outset). Thank God, the Kochen-Specker Theorem proved this whole mess wrong. But it also showed that the notion of 'complete set of observables pertaining to a quantum system' is far more subtle and rich than expected, due to the presence of an UNdecidable KS state that does not belong to this set.

Imagine three quantum guys, Tom, Dick, and Harry, and think of the "spectral decomposition" of their quantum states as being presented by their hands, with the following specifications: upon observation at particular instant, they all have
to simultaneously raise their hands (hermitian operators). Thus, each of them can, and have to, raise either his left hand (L), or right hand (R), or both (B). Recall that, unlike probabilities in classical statistical physics, probabilities in QM originate in Pythagoras' theorem in $n$ dimensions (C. Isham, Lectures on Quantum Theory, Sec. 2.1.2, get pp. 16-17 from here), so if one of the quantum guys cannot have orthogonal "states" for his hands, he will ruin the whole system.

The famous KS Theorem (download an explanation by R.I.G. Hughes from here) says that the (spin 1) system \{Tom_Dick_Harry\} will exhibit the following "paradoxical" (from the viewpoint of classical physics) situation: if Tom and Dick happen to possess context-dependent and well-defined ("an unequivocal true-false value", cf. Isham and Butterfield above) quantum states of their hands (either L, or R, or B), then in that same instant Harry will not have any hands at all. For if the poor guy had 'hands' in that same instant, he would have the opportunity to choose one of his context-dependant quantum states -- either L, or R, or B. He will instead be shifted to the "uncolored" section from KS sphere.

Next time you "measure" the system \{Tom_Dick_Harry\}, exactly the same thing can happen to Dick. Or to Tom. So, any time you observe some classical presentation of 'quantum state', be aware that nevertheless something essential is missing. It showed up in the case with Harry, yet it "covers" the whole system \{Tom_Dick_Harry\}, much like the "dark" energy from 'empty space'. Poetically speaking, the case with Harry was the "revenge" of the quantum Noumenon pertaining to \{Tom_Dick_Harry\} for our efforts to push it at the length scale of (unanimated) tables and chairs. Unlike the measuring devices examined in QM textbooks, the human brain can operate with its presentation of 'potential reality' elevated at the length scale of tables and chairs, as demonstrated with the example of three "measurements" (cf. the three sayings above). If our brains can operate with their UNSpeakable potential reality, so can 'the universe as a brain'.

Notice that if we constrain Tom, Dick, and Harry to raise only one hand (either L or R), people would entertain "quantum computing" and "topological quantum computation" (e.g., Michael H. Freedman), because the implications from KS Theorem will be obscured. But as the UNdecidable quantum state is still working in the quantum world, it cannot be harnessed with unanimated devices.

I employ the notion of 'potential reality' to signify the UNdecidable KS quantum state -- the genuine 'quantum reality out there'. Can't fit it in any Hilbert space whatsoever. If you prefer, think of it as Reichenbach's Common Cause Principle.

In summary, the Kochen-Specker Theorem demonstrates the UNdecidable KS quantum state. The latter is far more profound and important than the contextuality alone (Ref. 2) ("not all observables can be assigned definite values that are independent of the measuring context", cf. Ronnie Hermens).

Namely, the conclusion that "only contextual values can be ascribed" (Ref. 2) does not shed light on the implications from the fact that contextuality is invariant to the particular place of the observables in the 3x3 array. As I wrote above, the same thing that happened to Harry can happen to Dick, or to Tom.

Nothing -- not even some "contextuality" -- can save Harry (or Dick, or Tom) from the case in which he (or Dick, or Tom) must not possess any hands.

If at some instant of measurement Harry must not have any classical hands whatsoever, yet at some other instant he -- the same Harry -- can and will
obtain some contextual, well-defined, classical-able hands, then we are facing a phenomenon far more important than "contextual hands" alone. Namely, we can tell apart the contextualized classical-able hands, which can be filtered through the classical spacetime as 'classical hands', from those "intact" quantum states that can't. Which does not imply that the latter do not exist. In my view, only some quantum Noumenon can secure the ontological contextuality of quantum objects. The ontological contextuality may or may not provide 'the same Harry' with contextualized classical-able hands. It is also Undecidable and Unspeakable, and of course 'not empirically testable'. Thus, if you observe the "hands" of some quantum object, be aware that you're only observing its contextualized classical shadows on Plato's cave, emanating from the ultimate quantum potential reality.

Three years ago, I explained to my teenage daughter a similar puzzle in GR, regarding the Hole Argument. With slight modifications, the corresponding 'KS Theorem for teenage girls' would be as follows. Imagine you cannot see your finger nails "bare", without nail varnish. One way to think of such peculiar situation is that your 'bare finger nails' do in fact exist, but are somehow banned from showing up to you. Namely, your 'bare finger nails' can show up to you only after you cover them with your nail varnish, with different colors depending on your mood, but then they won't be 'bare' anymore. They will be "contextualized", with particular color. Well, KS Theorem (roughly) says that (i) if you use three different nail-varnish colors for each nail, and (ii) if you have to paint three (or more) of your nails, then one of the them would have to show to you its "bare" nature: the UNdecidable KS state. Which would, in turn, ruin your whole manicure. To avoid such disasters, you should use maximum two nail-varnish colors, and then all your "bare" finger nails will be safely covered with some particular "contextualized" color. The downside of such (seemingly perfect) manicure will be that you may never understand QM nor GR. Capiche?

NB: If the reader wishes to refute the "adult" interpretation of KS Theorem above, please start with converting the "uncolored" section from KS sphere to some Hilbert space (your choice), to match the case in which Harry would obtain some contextual, well-defined, classical hands, at the expense of either Dick or Tom being shifted to the same "uncolored" section from KS sphere. What is the time parameter pertaining to the dynamics of the reversible (KS sphere <--> Hilbert space) transitions, for all observables from \{Tom_Dick_Harry\}? Please don't hesitate!

In a drastic contrast to the "collapse" and the Eigenvalue-Eigenstate Link from the old Copenhagen School [Ref. 1], the PR interpretation of QM employs the phenomenon of 'emergence' (e.g., Isham and Butterfield): in the case with \{Tom_Dick_Harry\}, one could only observe, at particular instant of time, the emergence of only one of its latent observables, say, \{Tom, R\}, just like the end result from the correlation and "negotiation" (global mode of spacetime) that led finally to John Wheeler's 'cloud'. This one final result (one-at-a-time) is 'physical reality' (local mode of spacetime), while the rest of Tom's latent states, plus Dick's latent states, plus Harry's UNdecidable KS state constitute the 'potential reality' of the system \{Tom, Dick, and Harry\}, which is in turn rooted on the quantum Noumenon -- "The ideal monad has no windows" (Döring and Isham). This is entirely different from any 'modal' or 'contextual hidden variable' theory.

It goes without saying that a rigorous presentation of the ideas in the paragraph above is not available. These are just ideas presented with words. Back in 1935, Erwin Schrödinger also offered some very general ideas, presented with words:

"The rejection of realism has logical consequences. In general, a variable has no
definite value before I measure it; then measuring it does not mean ascertaining the value that it has."

The second part from the last sentence was totally forgotten by the mainstream theoretical physics community, and only Henry Margenau paid attention to it. Yet even today very few QM textbooks mention KS Theorem, which is rooted on this forgotten (or rather ignored) consideration spelled out by Schrödinger in 1935. As to the first part, "a variable has no definite value before I measure it", perhaps the intact quantum world 'out there' exists as the UNdecidable quantum state.

If this is the case chosen by Mother Nature, the mysterious transition from quantum to classical, which is essential to QM textbooks [Ref. 3], should be explained with the "back bone" of the quantum world -- potential reality.

Notice that the quantum truth functional in QM textbooks (e.g., Ref. 4, p. 314) is not applicable to 'potential reality' due to the presence of the generic "intact" (not limited to KS Theorem) UNdecidable quantum state.

For example, regarding the notion of spin ("klassisch nicht beschreibbaren Art von Zweideutigkeit", Wolfgang Pauli), Bob Griffiths rightly says (ibid., p. 196) that "there is no property (explicable at the length scale of tables and chairs - D.C.) corresponding to \( S_z = +1/2 \) AND \( S_x = +1/2 \) for a spin-half particle."

Of course not. The whole point is that there must exist something that keeps the "sameness" (Genidentität, Kurt Lewin) of thisspin-half particle, so that it can "pass through" it (the "intact" UNdecidable quantum state, or 'bare finger nails'), and be able to switch between its allowed states, in line with the conservation law known from QM textbooks.

Can we, with our Boolean logic, think of a quantum particle as possessing simultaneously perfectly well-defined position and momentum (ibid., p. 314)? Of course not. Does that mean that we can "impose bans" on such UNdecidable quantum state in the quantum world, just because we cannot think about it? Of course not. The "non-commutative" quantum state is simply not point-like. It may be perfectly well-defined as 'potential reality', yet not point-like. It has to be point-like only in classical mechanics, like the point-like states of a Frisbee along its classical trajectory. (The hypothetical abilities of the human brain to observe and act on the UNdecidable quantum vacuum state requires special considerations.)

Let's not mix apples with oranges, because the 'time' in the quantum world (no time operators in QM) is not like the one at the classical world, and the "intact" UNdecidable quantum state simply cannot get there. With unanimated measuring devices, we can "measure" only one frozen point from the anti-relativistic "time parameter" in the Schrödinger equation, and by imposing such wrong, albeit inevitable, classical filter on the quantum world we may develop distorted and misleading impression about some "time parameter in the Schrödinger equation". The experimental fact that even by detecting electrons one-at-a-time they nevertheless build an interference pattern [Ref. 5] demonstrates their quasi-local nature, yet the probability for detecting individual electrons on the screen, as point-like events, is blind and deaf to their quasi-local nature: the interference pattern can only be produced if the individual electron was able to "sense" the two slits simultaneously, while the probability for its detection on the screen refers to registered events that are inevitably point-like facts.

This should be the starting point for explaining "the central mystery of quantum
mechanics" (Richard Feynman): the nature of the quasi-local UNdecidable quantum state. It is not a 'fact', and cannot be presented with any probabilities, as was the case with Harry above. If you teach Quantum Mechanics, start with the double-slit experiments and finish with the KS Theorem, which is grounded on the statement made by Erwin Schrödinger in November 1950:

"It seems to me that the concept of probability is terribly mishandled these days. Probability surely has as its substance a statement as to whether something is or is not the case — an uncertain statement, to be sure. But nevertheless it has meaning only if one is indeed convinced that the something in question quite definitely is or is not the case. A probabilistic assertion presupposes the full reality of its subject."

NB: There is nothing "probabilistic" or "stochastic" in the quasi-local UNdecidable quantum state that neither 'is' nor 'is not'. Can't fit it in any Hilbert space.

There are three totally different cases in QM. With just one degree of freedom, we (not Mother Nature) calculate an observable with a single eigenvalue ("an eigenstate of \( k \) belonging to an eigenvalue \( k' \)," P.A.M. Dirac, p. 154); the second case is confined to 'contextual values' (we constrain Tom, Dick, and Harry to raise only one hand -- either L or R; see above); and the third case deals with the absence of any classical hands whatsoever, after KS Theorem and the Free Will Theorem.

Quantum Mechanics is about this third case. Can't fit it in any Hilbert space.

Tell your students about it, Prof. Doplicher. No kid should end up like A. Connes.

Surely the quasi-local/UNdecidable quantum state cannot be filtered through the spacetime of STR and the Boolean logic of propositions: the truth evaluator will be YAIN (both yes and no). Which is entirely different from the "toposification" of quantum theory suggested by Chris Isham -- neither true nor false, but "somewhere in between" [Ref. 6].

To quote Niels Bohr, "Mathematical clarity has in itself no virtue. A complete physical explanation should absolutely precede the mathematical formulation."
And the physical explanation has been spelled out by Schrödinger and Margenau. Only the math is unknown.

To move further (Machian quantum gravity), try to unravel the origin and mechanism of instantaneous inertial reaction "forces", starting solely from Albert Einstein's postulate that "the metrical character (curvature) of the four-dimensional spacetime continuum is determined at every point by the matter there, together with its state" (Kosmologische Betrachtungen zur allgemeinen Relativitätstheorie, 1917).

No way. Something inherently quasi-local is again missing (try an experiment with your brain here), as hinted by KS Theorem and CK Free Will Theorem. In the case of GR, the torsional degrees of freedom are excluded from the outset. But I'll stop here, because, as many people complain, the story will (again) become deadly boring.

I think Ronnie Hermens should ask his QM tutor (Nicolaas Landsman) lots of questions about KS Theorem. Perhaps he should also ask Chris Isham, after reading Ch. 9 from his famous textbook.
We shall use the Peres-Mermin version of KS paradox [23, 24]. The quantum observables and the KS conditions are depicted on Fig. 1."

FIG. 1: Peres-Mermin version of Kochen-Specker paradox. We have 9 observables \( x_i \) arranged into a 3 x 3 array. If one chooses the observables as in (b) - where we have two two-level systems and \( \sigma^{(i)} \)'s are Pauli matrices on \( i \)-th system - quantum mechanics allows for joint measurement only of observables in a chosen row or a chosen column. One can ask whether some better theory could reproduce quantum mechanical predictions but at the same time predict outcomes of all nine observables at the same time. This was the subject of the famous Einstein-Bohr controversy. The Kochen Specker paradox says that it is impossible. Namely, quantum mechanics predicts that along solid lines, the outcomes, if multiplied give with certainty 1, while on the dashed line they give -1. (In the paper, instead of values ±1 we shall use bit values 0, 1. Then quantum mechanics predicts that parity of outcomes is 0 for solid lines, and 1 for dashed line; we shall refer to it as KS conditions.) Thus, supposing that these nine observables have some preexisting values, which are merely revealed by measurement, we would obtain different value of the product of all nine of them, if multiply them in different order, which is a contradiction. So if one insists on ascribing some definite values to observables, the value of at least one of them would need to depend on whether the given observable is measured within row or within column, i.e. on the context. Thus only contextual values can be ascribed. Interestingly, the Kochen-Specker paradox, was thought not empirically testable, due to its mathematical nature. However recently, its operational version in terms of inequalities has been formulated [15] which paved the way to experimental verification of contextuality.
"Thus quantum mechanics occupies a very unusual place among physical theories: it contains classical mechanics as a limiting case, yet at the same time it requires this limiting case for its own formulation."

"... when constructing a quantum description of a physical system it is necessary to restrict oneself to a single framework, or at least not mix results from incompatible frameworks."

"One cannot use a single framework to answer all possible questions about a quantum system, because answering one question will require the use of a framework that is incompatible with another framework needed to address some other question."

"If two or more frameworks are compatible, there is nothing problematical in supposing that the corresponding conclusions apply simultaneously to the same physical system. (...) Consequently one can think of F1, F2, ... as representing alternative "views" or "perspectives" of the same physical system, much as one can view an object, such as a teacup, from various different angles. Certain details are visible from one perspective and others from a different perspective, but there is no problem in supposing that they all from part of a single correct description, or that they are all simultaneously true, for the object in question."

"Conceptual difficulties arise, however, when two or more frameworks are incompatible. (...) ... just as there is no property corresponding to $S_z = +1/2$ AND $S_x = +1/2$ for a spin-half particle. (...)"

"Incompatible frameworks do give rise to conceptual problems when one tries to apply them to the same system during the same time interval. (...) The difficulty comes about when one wants to think of the results obtained using incompatible frameworks as all referring simultaneously to the same physical system, or tries to combine the results of reasoning based upon incompatible frameworks. It is this which is forbidden by the single framework rule of quantum reasoning.

"Each of the nine observables in (22.14) commutes with four others: two in the same row, and two in the same column. However, it does not commute with the other four observables. Hence there is no reason to expect that a single value functional can assign sensible values to all nine, and indeed it cannot.

"The motivation for thinking that such a function might exist comes from the analogy provided by classical mechanics, as noted in Sec. 22.1. What the two-spin paradox shows is that at least in this respect there is a profound
difference between quantum and classical physics.

p. 263: "The nonexistence of universal quantum truth functionals is not very surprising. It is simply another manifestation of the fact that quantum incompatibility makes it impossible to extend certain ideas associated with the classical notion of truth into the quantum domain. Similar problems were discussed earlier in Sec. 4.6 in connection with incompatible properties, and in Sec. 16.4 in connection with incompatible frameworks.

p. 268: "Note that quantum truth functionals form a perfectly valid procedure for analyzing histories (and properties at a single time) as long as one restricts one's attention to a single framework, a single consistent family. With this restriction, quantum truth as it is embodied in a truth functional behaves in much the same way as classical truth. It is only when one tries to extend this concept of truth to something which applies simultaneously to different incompatible frameworks that problems arise.

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http://quantum.phys.cmu.edu/CQT/chaps/cqt27.pdf

p. 314: "For the purposes of the following discussion it is convenient to refer to the idea that there exists a unique exhaustive description as the principle of unicity, or simply unicity. This principle implies that every conceivable property of a particular physical system will be either true or false, since it either is or is not contained in, or implied by the unique exhaustive description. Thus unicity implies the existence of a universal truth functional as defined in Sec. 22.4.

"But as was pointed out in that section, there cannot be a universal truth functional for a quantum Hilbert space of dimension greater than two. This is one of several ways of seeing that quantum theory is inconsistent with the principle of unicity, so that unicity is not part of quantum reality."

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p. 375:

Ch. 22. Incompatibility paradoxes

The impossibility of simultaneously assigning values to all quantum variables was pointed out by Bell (1966) and by Kochen and Specker (1967). See the helpful discussion of these and other results in Mermin (1993). The two-spin paradox of Mermin (1990) was inspired by earlier work by Peres (1990). See Mermin (1993) for a very clear presentation of this and related paradoxes.

(Note: Bob Griffiths didn't comment on the Kochen-Specker diagram (see the 17 projections, p. 70, in S. Kochen and E.P. Specker, The problem of hidden variables in quantum mechanics, J. Math. Mech. 17 (1967) 59-87), but instead suggested "the helpful discussion of these and other results" offered by N. David Mermin. Recall that Kochen and Specker used a finite set of spin-1 observables (not spin-2, as in the case examined by Mermin). The essence of 'the Kochen-Specker Theorem' is the argument for nonexistence of truth functions on finite sets of projections -- nothing to do with Bell's 1966 paper (cf. p. 452, footnote 19). Bob Griffiths is to be taken with a grain of salt. The same, of course, applies to my interpretation. D.C.)
Bram Gaasbeek, Demystifying the Delayed Choice Experiments,

p. 4: "A remark on assumptions. In the previous section, we supposed the measured observables to be conserved. This is necessary to carelessly time-translate the projection operators. The translated observable here is the idler photon measurement. This determines the beam of photon (so its momentum) and is clearly conserved."

Philip Pearle, Wavefunction Collapse and Conservation Laws,

Philip Pearle: "... the collapse postulate of standard quantum theory can violate conservation of energy-momentum and there is no indication from where the energy-momentum comes or to where it goes."

Dharam Vir Singh Ahluwalia, Three Quantum Aspects of Gravity,
arXiv:gr-qc/9711075v1

p. 2: "The second observation that I wish to report here is that the collapse of a wave function is associated with the collapse of the energy-momentum tensor. Since it is the energy-momentum tensor that determines the spacetime metric, the position measurements alter the spacetime metric in a fundamental and unavoidable manner. Therefore, in the absence of external gravitating sources (which otherwise dominate the spacetime metric), it matters, in principle, in what order we make position measurements of particles [D.V. Ahluwalia, Quantum Measurement, Gravitation, and Locality, gr-qc/9308007]. Quantum mechanics and gravity intermingle in such a manner as to make position measurements non-commutative. This then brings to our attention another intrinsic element of gravity in the quantum realm, the element of non-locality."

Yuan K. Ha, Is There Unification in the 21st Century?
arXiv:1007.2873v1 [gr-qc]

pp. 8-9: "The result indicates that there is no evidence so far of any quantum nature of spacetime above the Planck length. Spacetime there (distance of 7.3 billion light years from Earth - D.C.) is smooth and continuous."
[Ref. 6] C J Isham, Is it true; or is it false; or somewhere in between? The logic of quantum theory, Contempory Phys., 46(3), 207-219 (2005)

Subject: Dark Energy
Date: Fri, 12 Feb 2010 15:11:03 +0200
From: Dimi Chakalov <dchakalov@gmail.com>
To: Fred J.G. <jgfredo@gml.com>
Cc: Jerzy Kowalski-Glikman <jurekk@ift.uni.wroc.pl>,
Yi Wang <wangyi@hep.physics.mcgill.ca>,
Miao Li <mli@itp.ac.cn>,
Erik Verlinde <e.p.verlinde@uva.nl>,
CEOFO <G.tHooft@uu.nl>,
Anthony Zee <zee@kitp.ucsb.edu>

Dear Fred,

Nice to hear from you.

> Did you read this submission from Erik Verlinde?

Yup. Do you know what advice Claude Shannon got from John von Neumann?
http://en.wikipedia.org/wiki/Entropy#Quotations

"You should call it entropy, for two reasons. (...) In the second place, and more important, nobody knows what entropy really is, so in a debate you will always have the advantage."

> Wiki on this fellow "Dutchman":
> http://en.wikipedia.org/wiki/Erik_Verlinde

Someone (Erik Verlinde?) wrote there that "Verlinde's approach to explaining gravity apparently leads naturally to the correct observed strength of dark energy." I respectfully disagree,

http://www.god-does-not-play-dice.net/#Zee

If some day Jerzy Kowalski-Glikman, or anyone else, explains the notion of "horizon", you will hear about it from CNN Breaking News :-)

All the best,

Dimi
--
http://tinyurl.com/steel-evaporation

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N. Gisin: "Finally, one should mention that a way out of our entire argumentation is to assume the existence of one preferred universal reference frame which determines unequivocally one and only one time ordering for all events."

Welcome aboard, Nicolas Gisin. You just discovered John Bell [Ref. 1] and the legacy of Schrödinger and Margenau,

http://www.god-does-not-play-dice.net/#NB

http://www.god-does-not-play-dice.net/Szabados.html#Hilbert

Have you ever received email from me in the past seven years?

Pity you can't respond ...

Sincerely,

D. Chakalov

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“The reason I want to go back to the idea of an aether here is because in these EPR experiments there is the suggestion that behind the scenes something is going faster than light. Now, if all Lorentz frames are equivalent, that also means that things can go backward in time. [This] introduces great problems, paradoxes of causality and so on. And so, it’s precisely to avoid these that I want to say there is a real causal sequence which is defined in the aether.”

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Date: Mon, 14 Dec 2009 04:15:30 +0200
From: Dimi Chakalov <dchakalov@gmail.com>
To: Steve Adler <adler@ias.edu>
Cc: bassi@ts.infn.it

Hi Steve:
Before wrestling with the CSL model, why don't you explore first the legacy of Schrödinger and Margenau?

http://www.god-does-not-play-dice.net/#NB

Notice that the latest reference at the link above, relevant to the modification of Quantum Theory, is from November 1950.

Latest update at http://www.god-does-not-play-dice.net/#Doplicher1

Regards,

Dimi

P.S. Notice also an update at http://tinyurl.com/steel-evaporation

D.

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Subject: A Biased and Personal Description of GR at Syracuse University, 1951-61, by E.T. Newman
Date: Thu, 4 Feb 2010 04:47:39 +0200
From: Dimi Chakalov <dchakalov@gmail.com>
To: Ted <newman@pitt.edu>
Cc: tim.adamo@gmail.com, goldberg@phy.syr.edu

Ted:

Perhaps that full-time base-scientist (Josh should know his name) who was trying to understand and develop anti-gravity devices at Wright-Patterson Air Force Base [Ref. 1] will be interested to check out

http://www.god-does-not-play-dice.net/#brick_wall

http://www.god-does-not-play-dice.net/Szabados.html#H3

Perhaps a Machian-type theory of gravity can explain the origin and mechanism of (instantaneous?) inertial reaction "forces" and their reversible cancellation, so that you can levitate your "anti-gravity device".

As to the McCarthy witch-hunt period [Ref. 1]: would you turn up your collar to read the facts about 9/11?

http://tinyurl.com/steel-evaporation

People are scared to even talk about 9/11. What a sad sad country.

I wish you and your colleagues could at least elaborate on the origin and mechanism of inertial reaction "forces", but I'm afraid you won't do it either. You didn't even respond to my email regarding your lrr-2009-6 and the mythical "future conformal null infinity".

Take care,
"I point out that Wright-Patterson Air Force Base provided financial support for the Syracuse and King's College groups (among several other relativity groups) from the mid 1950s to the early 1970s - during a most productive period. A question often asked is why did they do so. Though I was not privy to any internal Air Force information, once, when I spent a three month period working at the base, a full-time base-scientist remarked to me that they hoped to be able to understand and perhaps develop anti-gravity devices. It does seem likely that this idea played some role in their financial support.

.......

"... a few weeks after I arrived in Syracuse I saw that a well-known left-wing journalist, I.F. Stone was giving a public talk. I went to the talk but with considerable trepidation since I had come from a fairly left-wing family background and the time was at the peak of the Joe McCarthy witch-hunt period. In my mild state of paranoia I actually had my collar turned up so that I would not be recognized."

Subject: Gravity (not "gravitons") knows about everything
Date: Thu, 11 Feb 2010 16:25:10 +0200
From: Dimi Chakalov <dchakalov@gmail.com>
To: Anthony Zee <zee@kitp.ucsb.edu>
Cc: Iain A Brown <I.Brown@thphys.uni-heidelberg.de>,
    Lily Schrempp <L_Schrempp@thphys.uni-heidelberg.de>,
    Kishore Ananda <Kishore.Ananda@gmail.com>,
    Edward W Kolb <rocky.kolb@uchicago.edu>,
    Lawrence M Krauss <krauss@asu.edu>,
    Nima Arkani-Hamed <arkani@ias.edu>,
    Paul Federbush <pfed@umich.edu>,
    Ronnie Hermens <ronnie.hermens@gmail.com>


Dear Professor Zee,

I greatly enjoyed your essay. It is such a pleasure to get in touch with your sharp mind.

Regarding Secs I and VII, perhaps you may be interested to see

http://www.god-does-not-play-dice.net/#brick_wall

http://www.god-does-not-play-dice.net/#Brown
Since you offered the idea that the universe may be "secretly acausal but only the universe knows about it", please consider the possibility that the universe may not be "acausal" but pre-correlated (Leibnitz) and bootstrapped (Geoffrey Chew): think globally, act locally. Perhaps all we need is to model the universe as a brain,

http://www.god-does-not-play-dice.net/#history

You also wrote: "To move forward, physics had to abandon an apparently ironclad piece of commonsense that "where there is a wave something must be waving." I would not be at all surprised if it turns out that to move forward, we have to abandon an equally ironclad piece of commonsense. I leave it to the reader to identify that piece."

Have you seen a walking centipede? The legs exhibit a correlated wave pattern. Perhaps only the 'universe as ONE' (global mode of spacetime) can evoke quantum "waves" -- there is no source that is "waving", in QM textbooks.

As to GWs, "we have to abandon an equally ironclad piece of commonsense", as you put it. Please see the first link above.

I will highly appreciate your comments, as well as the professional feedback from your colleagues.

Kindest regards,

Dimi Chakalov

============================= Subject: An "improved" energy-momentum tensor, Eqs 41 and 42, arXiv:0911.1636v3 [gr-qc] Date: Mon, 26 Apr 2010 15:19:36 +0300 From: Dimi Chakalov <dchakalov@gmail.com> To: Brian P Dolan <bdolan@thphys.nuim.ie> Cc: Luca Fabbri <luca.fabbri@bo.infn.it>

Dear Dr. Dolan,

I read very carefully your papers on torsion degrees of freedom, but found it impossible to hear and follow your talk on June 10th last year, PIRSA:09060061. If you have a written version, please send me the link.

May I ask a question. Regarding your latest arXiv:0911.1636v3 [gr-qc] and your Lecture Notes MP476: Cosmology (dynamics of length scale R, p. 43), I wonder how you would pinpoint some dynamics of the so-called "dark energy".

I look at my wristwatch and claim that there is a "global" cosmological time, read by my wristwatch, such that, say, in the past 5 min the global 'length scale' R has been "increased". With respect to what? Can you introduce some Akasha-like "memory" of the whole universe, such that some (global) observer could verify that some "increase" of R has indeed happened w.r.t. some earlier value of R five min ago?

I cannot imagine how anything could be "conserved" in the cosmological time
driven by such dynamical "dark" energy of (whatever). Please advise.

My efforts can be read at
http://www.god-does-not-play-dice.net/#quiz

Kindest regards,

Dimi Chakalov

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Note: In one sentence: if something can be 'conserved in the time read by a
clock', then it will be 'observable', and won't be "dark", because its source could
be traced back and identified (cf. note 3). Again, the (global) time in which
something can be 'conserved' is not the (local) time read by our mischievous
clocks. It is the global mode of time produced by the dynamics of 3-D space
itself (cf. Fig. 2 above). Any approach based on the Hamiltonian formulation of
GR is inadequate from the outset, because the intrinsic dynamics of 3-D space,
produced by its "dark" energy, cannot be captured within the 3-D space itself.
You can never identify some isolated system in GR, and will always be haunted
by problems at "infinity" (Paul Tod, 01:19-02:05):

• The Big Question: which Cauchy data evolve
to give a smooth $\mathcal{D}$?

To clarify the problems mentioned above, I will quote from a well-known text by
S. Weinberg (emphasis added), in which the notion of 'torsion' has never been
mentioned, and will offer my biased, personal, and frank comments.

Steven Weinberg, *Gravitation and Cosmology: Principles and Applications of the

p. 68: "Although inertial forces do not exactly cancel gravitational forces for
freely falling systems in an inhomogeneous or time-dependent gravitational
field, we can still expect an approximate cancellation if we restrict our attention
to such a small region of space and time that the field changes very little over
the region. Therefore we formulate the equivalence principle as the statement
that at every space-time point in an arbitrary gravitational field it is possible to
choose a "locally inertial coordinate system" such that, within a sufficiently small
region of the point in question, the laws of nature take the same form as in
unaccelerated Cartesian coordinate systems in the absence of gravitation.

"There is a little vagueness here about what we mean by "the same form as in
unaccelerated Cartesian coordinate systems," so to avoid any possible ambiguity
we can specify that by this we mean the form given to the laws of nature by
special relativity, for example, such equations as (2.3.1), (2.7.6), (2.7.7),
(2.7.9), and (2.8.7).

"There is also a question of how small is sufficiently small." Roughly speaking,
we mean that the region must be small enough so that the gravitational field is
sensibly constant throughout it, but we cannot be more precise until we learn
how to represent the gravitational field mathematically. (See the end of Section
4.1.)"
p. 93 (the end of Section 4.1): "There are in general many generally covariant equations that reduce to a given special-relativistic equation in the absence of gravitation. However, because we only apply the Principle of General Covariance on a small scale compared with the scale of the gravitational field, we usually expect that it is only \( g_{\mu\nu} \) and its first derivatives that enter our generally covariant equations. With this understanding we shall see in this and the next chapter that the Principle of General Covariance makes an unambiguous statement about the effects of gravitational fields on any system, or part of a system, that is sufficiently small."

Comment (D.C.): This isn't any mathematical treatment of "sufficiently small". This is pure poetry, spiced with math.

......

p. 106: "Write the appropriate special-relativistic equations that hold in the absence of gravitation, replace \( n_{\mu\nu} \) with \( g_{\mu\nu} \) and replace all derivatives with covariant derivatives. The resulting equations will be generally covariant and true in the absence of gravitation, and therefore, according to the Principle of General Covariance, they will be true in the presence of gravitational fields, provided always that we work on a space-time scale sufficiently small compared with the scale of the gravitational field."

Comment (D.C.): Such kind of thinking is typical to people like CEOFOP.

..........  

p. 149: "Although a freely falling particle appears to be at rest in a coordinate frame falling with the particle, a pair of nearby freely falling particles will exhibit a relative motion (Sic! - D.C.) that can reveal the presence of a gravitational field to an observer that falls with them. This is of course not a violation of the Principle of Equivalence, because the effect of the right-hand side of (6.10.1) becomes negligible when the separation between particles is much less than the characteristic dimensions of the field."

Comment (D.C.): Pure poetry, again.

......

See pp. 146-147, The Bianchi Identities (6.8.4), and also 'The Cauchy Problem', p. 164:

"Thus we cannot learn anything about the time evolution of the gravitational field from the four equations \{XXX\} (7.5.1). Rather, these equations must be imposed as constraints on the initial data, ...."


......

p. 166, Eq. (7.6.7): "the total energy-momentum "tensor" of matter and gravitation" is "locally conserved."

Comment (D.C.): YAIN! It has to be "locally conserved", but only in the 'local mode of spacetime'; see Fig. 1 above.
p. 155: "The term $\lambda g_{mv}$ was originally introduced by Einstein for cosmological reasons (which have since disappeared); for this reason, $\lambda$ is called the cosmological constant. This term satisfies the requirements (A), (C), and (D), but does not satisfy (E), so $\lambda$ must be very small so as not to interfere with the successes of Newton's theory of gravitation. Except in Chapter 16 (cf. "the scale factor $R(t)$", p. 613 - D.C.), I am assuming throughout this book that $\lambda = 0$.

Comment (D.C.): After the discovery of the "dark" energy in the fall of 1997, Steven Weinberg didn't re-examine the source of the problem: you get "dark" energy because you presume that it comes from stuff with positive energy density, but if you focus on the puzzle of the physical existence of one "charge" only, you may discover the mechanism by which we see only positive energy densities, and not 'torsion connection' in GR. It should be "dark", of course.

Regarding the dynamics of "the scale factor $R(t)$", and the meaning of the variable $t$ therein, see my email and Fig. 2 above.

But as Chris Isham said eight years ago, ... (no comment).

D. Chakalov
April 27, 2010

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Subject: Curvature energy vs torsion energy, arXiv:1006.2154v1 [gr-qc], p. 4
Date: Mon, 14 Jun 2010 12:29:02 +0300
From: Dimi Chakalov <dchakalov@gmail.com>
To: Mamdouh Wanas <wanas@frcu.eun.eg>
Cc: [snip]

Dear Dr. Wanas,

May I ask two questions. You wrote, in your latest arXiv:1006.2154v1 [gr-qc], that torsion energy has "a pure geometric origin", and "follows a conservation law, similar to that of the curvature energy (for details see reference [7])".

I looked at ref. [7], Eq. 22 in your arXiv:0705.2255v1 [gr-qc], which deals with "the second Bianchi Identity", and hence cannot understand the *source* of the torsion energy.

Would you consider the other "charge" of mass, along the lines of Hermann Bondi (Negative Mass in General Relativity, Reviews of Modern Physics 29 (1957) 423)? Can you suggest a mechanism by which we can observe only positive mass, hence the physical source of torsion energy is not traceable in GR, and its origin looks like "a pure geometric origin"?

Kindest regards,

Dimi Chakalov

==========
Subject: If something walks like a duck and quacks like a duck, ...
Date: Tue, 28 Sep 2010 15:06:42 +0300
From: Dimi Chakalov <dchakalov@gmail.com>
To: Brian Dolan <bdolan@thphys.nuim.ie>
Cc: Sachiko Tsuruta <sachiko@physics.montana.edu>, Dana Backman <dbackman@sofia.usra.edu>, Alexander Potekhin <palex@astro.ioffe.ru>

Brian P. Dolan (September 21, 2010), Lecture Notes MP476: Cosmology, Sec. 3.1 Cosmological Constant, p. 45: "In General Relativity $R$ is not a radial co-ordinate, it is a length scale determining the physical size of lengths in 3-dimensional space. If $R = R(t)$ then when $\dot{R} > 0$ space is said to be expanding while when $\dot{R} < 0$ space is contracting. We can interpret $R$ as the physical distance between any two fixed galaxies, provided their separation is of the order of 100M Pc, or more."

http://www.thphys.may.ie/Notes/MP467/Cosmology-Lectures.pdf

Dear Brian,

Regarding the quote from your Lecture Notes, please recall that if something walks like a duck and quacks like a duck, it may not be necessarily a duck ("the physical distance between any two fixed galaxies"). Details in Sec. Summary, pp. 35-36, at

http://www.god-does-not-play-dice.net/ExplanatoryNote.pdf

I also mentioned your Lecture Notes and articles by your colleagues at

http://www.god-does-not-play-dice.net/Szabados.html#Sachiko

All the best,

Dimi

On Thu, Apr 29, 2010 at 2:06 PM, Brian Dolan <bdolan@thphys.nuim.ie> wrote:
> Dear Luca and Dimi,
> Thanks for your e-mails.
> [snip]

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Comments on Jean-Philippe Uzan


The crucial question: *à quelle distance?* The answer by Jean-Philippe Uzan:
2. Jean-Philippe Uzan, Dark energy, gravitation and the Copernican principle, arXiv:0912.5452v1 [gr-qc]

2.1. "The cosmological principle supposes that the Universe is spatially isotropic and homogeneous. In particular, this implies that there exists a privileged class of observers, called fundamental observers, who all see an isotropic universe around them. It implies the existence of a cosmic time and states that all the properties of the universe are the same everywhere at the same cosmic time. It is supposed to hold for the smooth-out structure of the Universe on large scales.

"We can distinguish it from the Copernican principle which merely states that we do not live in a special place (the center) of the Universe. As long as isotropy around the observer holds, the principle actually leads to the same conclusion than the cosmological principle."

2.1. Comment: Regarding 'fundamental observers', see Eq. 1 on p. 35 here. In the words of Paul Valery, "God made everything out of nothing, but the nothingness shows through."

As to the Copernican principle, recall the old wisdom that the universe looks like an unbroken ring with no circumference, for the circumference is nowhere, and the "center" is everywhere. The topology of such universe is unknown, of course.

2.2. Regarding Sec. 1.1.7, 'The equation of state of dark energy'

Jean-Philippe Uzan: "The equation of state of the dark energy is obtained from the expansion history, assuming the standard Friedmann equation."

2.2. Comment: Perhaps we could rely on the "expansion history" if only we knew the variable denoted by $t$ in $R = R(t)$ from Brian Dolan above. The problems are enormous.
2.3. Jean-Philippe Uzan, p. 41: "At the moment, none of these three possibilities is satisfactory, mainly because it forces us to speculate on scales much beyond those of the observable universe."

2.3. Comment: See the answer to the crucial question above. If you employ Archimedean geometry only, there is nothing at your disposal to define ds & dt and 'the grin of the cat without the cat' (Alice).


3.1. Regarding Sec. 7.2 (pp. 104-105), Jean-Philippe Uzan wrote (p. 103): "The numerical values of the fundamental constants are not determined by the laws of nature in which they appear."

3.1. Comment: In the same vein, the source of "dynamic dark energy" cannot be located inside the very thing it produces: 3-D space. I tried to explain the puzzle to my teenage daughter here; details and implications here.

Final comments: Previously, I tried to contact Jean-Philippe Uzan on Fri, 06 Jun 2003 15:19:29 +0300; Fri, 07 Nov 2003 21:39:48 +0200; and Thu, 18 May 2006 14:50:21 +0300. My last effort was made yesterday, regarding his review on varying "constants". We don't need any anthropic parapsychology: check out Pauli's solution from 1948 quoted here, and Eq. 2 on p. 36 here.

This is just business; nothing personal. I could be totally wrong, too.

D. Chakalov
September 30, 2010

Subject: Re: An “improved” energy-momentum tensor, Eqs 41 and 42, arXiv:0911.1636v3 [gr-qc]
Date: Thu, 29 Apr 2010 17:13:26 +0300
Message-ID: <l2sbed37361004290713r38b53e76m874be358e208959@mail.gmail.com>
From: Dimi Chakalov <dchakalov@gmail.com>
To: Brian Dolan <bdolan@thphys.nuim.ie>
Cc: Luca Fabbri <luca.fabbri@bo.infn.it>, Graham Nerlich <Graham.Nerlich@adelaide.edu.au>, Laszlo Szabados <lbszab@rmki.kfki.hu>

Dear Brian,

Thanks for your reply.

> Weinberg does not mention it for a very good reason ---
> there is no known source of matter that produces any
> appreciable torsion that could affect the Friedmann
> equation and influence gravitational dynamics, it is
> simply too weak. That is why it usually ignored.

I believe have discussed, at the link sent in my initial email, the problem with
the so-called "dark" energy. Its origin may not be confined exclusively to some (i) matter source with (ii) positive energy density (as usually done in the old cosmological problem by addressing the question of whether the quantum vacuum "gravitates", by Wolfgang Pauli in 1930s).

The "dark" energy may be of geometrical origin; hence my interest in the origin of torsion effects.

If we zoom on the affine structure (cf. Graham Nerlich below), I believe one can speculate about two "dark" components (global mode of spacetime), which I call 'torsion' and 'curvature' components of the affine connection. Please note that such two-component affine connection is postulated to explain how some Hausdorff topological space gets "connected" and can be endowed with differentiable structure.

In other words, all this is postulated prior to GR textbooks and review articles on torsion (e.g., how tangent spaces twist about a curve when they are "parallel transported"). It's all about the purely geometric connection "between" (=global mode of spacetime) points; please see Fig. 2 at

http://www.god-does-not-play-dice.net/#Bahn

The putative 'torsion component of the affine connection' may be envisaged by replacing the drawing from Wiki (cf. 'Torsion along a geodesic')

http://en.wikipedia.org/wiki/Torsion_tensor

with the *cycle* of Escher hands,

http://www.god-does-not-play-dice.net/#Escher

http://www.god-does-not-play-dice.net/#light

It's a whole new ball game "between" the points of the manifold: the curvature component of the affine connection pertains to the "bridge" between two adjacent points on a 'line', while the torsion component of the affine connection refers to this same "bridge" between two adjacent points, made by a 'cycle' (cf. above). It's the topology of the "bridge" that makes the difference between the two components of the affine connection.

In some ludicrously fictional "flat" (Minkowski) space, these two components of the affine connection should be "flattened", hence made indistinguishable, which would in turn obliterate the affine connection itself.

Going back to the mundane affairs of GR: people read at


"General relativity set the affine torsion to zero, because it did not appear necessary to provide a model of gravitation (with a consistent set of equations that led to a well-defined initial value problem)."

Do you believe that GR can eventually produce *any* 'well-defined initial value problem' ? If you do, please show me one example of solved Cauchy problem for the Einstein equations.

All the best,
Dimi
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**Note:** Let me quote from an alternative viewpoint [Ref. 1], in which the KS Theorem and Free Will Theorem haven't been mentioned. Notice that your brain has no choice but to follow its states, which are fixed in the "past, present and future all at once." All this explained with lots of advanced math. Enjoy!

D.C.
April 30, 2010


Footnote 1, p. 1: "S. Lloyd tells the amusing anecdote[?], "I recently went to the National Institute of Standards and Technology in Boulder. I said something like, ‘Your clocks measure time very accurately.’ They told me, ‘Our clocks do not measure time.’ I thought, Wow, that’s very humble of these guys. But they said, ‘No, time is defined to be what our clocks measure.’"

"Indeed, the standard second is *defined* as the duration of 9,192,631,770 oscillations of the radiation from the transition between the two hyperfine levels of the ground state of the cesium 133 atom.

......

p. 30: "In general relativity, for example, we have an initial value formulation, but can also find global solutions. In the initial value formulation, we can specify the configuration of the world at a given time, then integrate forward to predict how things will evolve. However, in the case of a global solution such as a cosmological model, we are presented a complete description of past, present and future **all at once**. In this view, the outcomes of measurements are already fixed.

"The best we can do is to think of consciousness as sequentially illuminating certain fixed events, then others, with all the events already right there in the solution."

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Subject: Re: torsion
Date: Sun, 2 May 2010 00:45:55 +0300
Delivered-To: dchakalov@gmail.com
From: Dimi Chakalov <dchakalov@gmail.com>
To: Brian Dolan <bdolan@thphys.nuim.ie>
Cc: Luca Fabbri <luca.fabbri@bo.infn.it>, Graham Nerlich <Graham.Nerlich@adelaide.edu.au>, Laszlo Szabados <lbszab@rmki.kfki.hu>

Hi Brian,

On Sat, 1 May 2010 14:00:41 +0100 (IST), you wrote:
> > On Thu, 29 Apr 2010, Dimi Chakalov wrote:
> >> >> The "dark" energy may be of geometrical origin; hence my interest in
> >> the origin of torsion effects.
> >
I guess this comes down to the old chicken and egg problem on Einstein's equations, which Einstein himself was not happy about. The geometry is determined by the matter distribution, but you need the geometry to specify the matter distribution. This is just as true in the Einstein-Cartan formulation as in the original Einstein formulation.

I think the chicken-and-egg problem and the so-called Buridan donkey paradox encapsulate the *paradox* of time in GR, as a relational/background-free theory: "the metric is treated as a field which not only affects, but also is (at the same time - D.) affected by, the other fields" (John Baez). This paradox is depicted by Escher hands,

Hence the dynamics of GR cannot be resolved with the unsolved puzzle of 'time in GR'. It is not surprising to me that people cannot define some 'gravitational energy' that would be conserved in such paradoxical time, and in the case of the Einstein equations alone, "there are no physically motivated boundary conditions" (Alan Rendall). Which brings me to the discussion with Laszlo regarding the precise meaning of his statement that any observable of the gravitational field is "necessarily quasi-local",

I believe the solution proposed at my web site is based on the only possible option for resolving this bundle of issues, because it seems to me that it solves other "quasi-local" paradoxes as well,

> I think you have a specific idea about the geometry in mind, involving torsion, that comes from a geometric principle.

It's actually a pre-geometric principle,

> If so that should translate into a statement about matter which, assuming it has observational consequences, could be tested. Historically I think people have worked the other way --- they look for types of matter that might give torsion and all the known candidates seem to give negligible torsion. If you have a geometrical principle in mind that makes torsion significant that would surely have observational consequences?

My "theory" is assembled on most general level. I cannot derive quantitative predictions, so it's far too early to say anything conclusive about the "dark" geometric effects of torsion.

Moreover, please bear in mind that everything I've written on my web site could be wrong. After all, I'm just a psychologist.
Best regards,

Dimi

Note: Regarding "a statement about matter which, assuming it has observational consequences, could be tested": use your brain to test 'potential reality' here, and check out the UNdecidable quantum state here. It's not about type I matter fields. It's all about quantum gravity.

Pity Brian Dolan didn't have time to check out the links. Your wristwatch does read the standard second defined as "the duration of 9,192,631,770 oscillations of the radiation from the transition between the two hyperfine levels of the ground state of the cesium 133 atom" (reference above). If you apply here GR, "points become fuzzy and locality looses any precise meaning", says Sergio Doplicher. Hence your wristwatch reads a finite time interval, called 'second', based on the miraculously precise timing of the cesium 133 atom. Moreover, the fact that "it is possible to look around, and see as far as we can" (Lee Smolin) is another mystery that GR cannot explain either.

The mystery of these finite intervals of time and space, comprised of infinitely many and infinitely small "points", is the subject of the so-called Scale Relativity Principle (SRP) outlined below. Central to SRP is the hypothetical pre-geometric plenum, which is supposed to act as a connecting-and-separating object that does not belong to this perfectly smooth set of "points". Hence we may describe an emergent and perfect continuum of "points", called 'local mode of spacetime': please see Fig. 1 above. That's 'law and order' at all length scales, from the Planck scale to the sliding cosmological "horizon". Pity nobody is interested.

"just another crank" D.C.

May 2, 2010
Last update: May 3, 2010

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Scale Relativity Principle: Equation of Space

Final version is expected on 25 November 2015, commemorating the 100th anniversary of GR (joint work by Levi-Civita, Einstein, and Hilbert)


Abstract

It is argued that the Hamiltonian formulation of GR cannot address the dynamics of space due to its "dark" energy from the quantum vacuum, hence new degrees of freedom should be introduced to the dynamics of space -- an arrow of space. The scope of 'scale relativity principle' (SRP), announced on 21 September 2008, is to introduce "boundaries" on spacetime, such that an isolated system endowed with 'finite infinity' can be constructed. The ontological assumptions in SRP are about 'necessary and sufficient conditions for spacetime': the former concerns physical substratum (positive energy density), while the latter condition refers to a global, Heraclitean, and non-Archimedean state of the whole universe as ONE.

[Excerpts from the 3rd draft version, 2 August 2010]

Let me start with a quiz: Look at the two pictures below and tell the essential difference.

![Diagram showing changes in the rate of expansion since the universe's birth 13 billion years ago. The more shallow the curve, the faster the rate of expansion. The curve changes noticeably about 7.5 billion years ago, when objects in the universe began flying apart at a faster rate. Astronomers believe that the faster expansion rate is due to a mysterious, dark force that is pushing galaxies away.](image-url)
Yes, you got it right: the first picture is a negative image from the original.

You may also say that, unlike Chuck Norris, those people at NASA, who offer a meta-observer view on the "expanding" 3-D space, use lots of math, but that doesn't really matter, because the essential similarity is that both images are jokes. Back in 1963, Roger Penrose offered a recipe for reaching infinity from any location in space, which was also a joke, although spiced with lots of math.

Here's the problem of "more space". Some prelims from GR textbooks: unlike STR, the spacetime in GR textbooks is considered "dynamical", such that, to follow a well-know metaphor, the "actors" (matter) and the "stage" (spacetime) engage in a non-linear negotiation (Escher's hands): "Space acts on matter, telling it how to move. In turn, matter reacts back on space, telling it how to curve" (John Wheeler). But notice that, unlike GR textbooks, the non-linear negotiation between the two sides of Einstein equation is interpreted here as "taking place" in the global mode of spacetime endowed with additional spatial degrees of freedom from the arrow of space.

We all agree that 'time' is no longer a fixed background parameter, but the global mode of time, in which the non-linear negotiation of geometry of spacetime vs. matter "takes place", cannot be read by any wristwatch from GR textbooks. This produces a plethora of "times" in GR textbooks, but "these definitions of time are in general unphysical, in that they provide no hint as to how their time might be measured or registered" (Butterfield and Isham). Here, all these "times" constitute the "eternally present" all time [tau] (Karel Kuchar).

To elucidate the second major difference in treating the 'tangent vectors', recall that in GR textbooks you are invited to take the same meta-observer, bird's-eye view on the whole spacetime as in the NASA picture above: to explain the alleged "curvature" of spacetime, "it is easy to see it in a 2-dimensional surface, like a sphere. The sphere fits nicely in 3-dimensional flat Euclidean space, so we
can visualize vectors on the sphere as 'tangent vectors'' (John Baez). Then you've been taught by Bob Wald "to work infinitesimally, using the idea that, on sufficiently small scales (this notion certainly needs clarification in the context of Thompson lamp - D.C.), a curved geometry looks very nearly flat (notice the poetry - D.C.). These departures from flatness can then be described via differential calculus. To do so, one begins by introducing the notion of a tangent vector to describe an infinitesimal displacement about a point $p$." The major differences to the interpretation offered here are in the following. Regarding John Baez, the local mode of spacetime is not embedded in any "higher-dimensional flat spacetime", but in an infinite-dimensional purely geometric manifold (called here 'global mode of spacetime'). Hence 'the infinitesimal' is indeed equipped with 'tangent vectors', but they all "point" to the global mode of spacetime -- not to the local mode.

The new (to GR textbooks) "direction", resulting from the very "expansion" of space due to "dark" energy, is not the mythical foliation time orthogonal to the three Hamiltonian components that are somehow "tangential" to all hypersurfaces (cf. Kiefer and Sandhöfer below).
The new "direction" from the "dark" energy is non-existent in ADM presentation, since it pertains to the 'absolute time' of the 'absolute structures'. Small wonder Karel Kuchar couldn't dig it out from present-day GR: you have a plethora of unphysical "times" from the foliation recipe, and no reference fluid (global mode of spacetime), which makes you 'eternity blind' (John G. Bennett).

The crucial "direction" of the so-called "expansion" of space due to the "dark" energy from empty space (Lawrence Krauss) requires a brand new dynamics of GR. In GR textbooks, the flexibility of space is limited to its "curvature" only, and, if you manage to compute a linearized snapshot from Einstein's filed equation, you inevitably end up with a frozen "block" spacetime: "There is no dynamics within space-time itself: nothing ever moves therein; nothing happens; nothing changes" (Robert Geroch). Then the new dynamics of
spacetime, due to the "dark" energy, can only spring from something "outside" (the local mode of) spacetime. That is, from "outside" both sides in the Einstein equation -- the global mode of spacetime. It literally creates both "more space" (cf. R. Rakhi & K. Indulekha and S. Carroll above) and "more matter".

The proper dynamics of 'GR with DDE' cannot be unitary. Enter the puzzle of "points": the perpetually re-created world of facts (local mode of spacetime) and its ultimate source 'the ideal monad without windows' (Döring and Isham) contain uncountably infinite points ('the set of all sets', maybe). The cardinality of such "set" (if any) is not even aleph-0. Once created by The Beginning, the local mode of spacetime is wrapped by its special "boundaries" (see SRP below), such that the 3-D space of the local mode is de facto infinite (dual age cosmology).

NB: These so-called points are a special non-Archimedean entity. It was Lucretius who pointed out the unknown mechanism by which these "points" build up any finite domain of space. The task of revealing some pre-geometric plenum which "connects" these non-Archimedean "points" was missed by Felix Hausdorff and Roger Penrose, to name but a few.

On the other hand, the 3-D Flatlanders (local mode of spacetime) will only notice that the two 'ideal endpoints' or "edges" of the local mode of spacetime (denoted with S and L, see below) have acquired some 'numerically finite but physically unattainable values' (one of which is the Planck scale), and will recall the old idea that the universe looks like an unbroken ring with no circumference, for the circumference is nowhere, and the "center" is everywhere.

But they will also notice some puzzling "projection" from the dark energy, cast on the 3-D space, just as they can notice, and indeed measure, the "projection" of space curvature, cast on the 3-D space (see Larry Krauss, p. 12). While we don't know the nature of gravity, we are accustomed from GR textbooks to treat it as 'curvature of spacetime', although it shows up more like 'deviation of something from something else' that might be "flat" but you can't tell, because you have only one "flat" point.

The "projection" from "dark" energy, cast on 3-D space, is just as weird and misleading as the 'curvature of space', yet it bothers people much more than the puzzling nature of gravity (the latter has to disappear on "points", so you have only one "flat" point as a reference object for "curvature").

People from NASA may ask, what kind of stuff is "expanding", creating the illusion (see also the misleading picture below) about galaxies "running away" from each other, in line with the Hubble Law?

Wrong question. In the local mode of spacetime, nothing could possibly "expand" or be "curved". The actual illusion is that something is "expanding" (or "curved"). It is the illusion from NASA's meta-observer view.

NB: All such illusions, the absolute structure of space included, should be eliminated by proper relativistic presentations, such that the sole invariant object in space will be an infinitesimal "point". Its 3-D projection or "shadow" does look like a "point", but upon a closer view it unveils its infinite-dimensional nature.
The picture below (as well as the one from NASA above) can only be seen by some meta-observer, who can also see the whole universe, and of course count to infinity (like Chuck Norris). The 3-D Flatlanders can't.

Such kind of illusionary "expansion" (much like the "curvature" of space) may be caused by some 3-D "projection" from something, maybe some process or mechanism, which takes place in the global mode of spacetime. How about the old idea of the mutual penetration of the Large and the Small?

Perhaps Einstein would only look at my efforts and say ... well, he was a very polite person. But because he also was, on some occasions, driven solely by his personal taste and instinct, rather than sound physical principles [Note 1], let me try to follow his style.

On 21 September 2008, I suggested a scale relativity principle (SRP) aimed at explaining the nature of space (don't confuse it with Laurent Nottale's scale relativity). If we are to think as proper relativists, I believe we should abandon the absolute structure of 3-D space in today's GR [Note 2], and work out new symmetry presentations of The Large and The Small.

I also admit that SRP is direct prediction of my theory, hence if it turns out to wrong, so will be my whole project, as started in January 1972.

I believe physical objects can be considered "large" bzw. "small" only with respect to the macroscopic length scale of tables and chairs. If a volume of space changes its size toward 'the Large/Small', the metric of space in 'the Large/Small' will be altered accordingly, in such way that the "size" of objects in that sphere or volume will remain unchanged in the volume-determined reference frames of 'the Large/Small', yet will continue to look 'Large/Small' in the initial macroscopic scale frame of classical mechanics. The idea of SRP involves (i) an omnipresent observer (Claudia) endowed with 'the eternally present all time [tau]' (Karel Kuchar), (ii) space inversion producing CPT-invariant presentations of 'volume of space', and (iii) macroscopic observer located at the length scale of classical mechanics, from which the postulated mutual penetration of the Large and the Small starts to unfold.
We have three possible views on 'the length of objects' in 3-D space. First, the viewpoint of a macroscopic observer who can simultaneously see (i) 'the Large' as an expanding volume of space, and herself being located inside such expanding sphere, and (ii) 'the Small' as contracting volume of space, and herself being located outside such contracting sphere.

Consider a table with length two meters, located inside a sphere with diameter two meters, along with the macroscopic observer inside this sphere. If the table is stretching toward the size of a galaxy, it will look like 'getting larger' to the first observer, but its intrinsic length will always remain "two meters" to a co-moving observer in its scale-dependent reference frame evolving toward 'the Large'. The co-moving observer will never, in no circumstances, register any change of the length of the table, as her metric also expands with the same rate as the expanding table toward 'the Large'. Likewise for the journey toward 'the Small': take the first observer and the two-meter sphere at macro-scale, perform space inversion, and now the CPT mirror image (like turning a rubber glove inside-out) of the macro-observer will find out that she is now located outside a contracting sphere, as the table is now running toward the Planck scale, yet a co-moving observer will again see "her" table as keeping its intrinsic length of 'two meters' in her scale-dependent reference frame toward 'the Small'. This is the 'second view'.

And the third view is that of a fixed meta-observer (global mode of spacetime), who will see a table stretched to the size of a galaxy, a table at the initial macroscopic length scale, and a table squeezed to the size of an atom, all of which possessing 'the same UNdecidable (KS-like) length'.

Now, one can offer an operational definition of 'infinitesimal volume of 3-D space' in the local mode of spacetime (in ADM presentation, cf. B. Bolen, it is denoted with $ds$). Imagine an omnipresent observer being "spread" inside an 3-D Euclidean sphere -- except for the center. She looks at the point-like center of the sphere from infinitely many directions (radii) -- simultaneously. But the center of the sphere is not a bona fide mathematical point -- it is an infinitesimal, such that one can treat it as 'the smallest possible rubber glove' and perform CPT space inversion, by replacing (not 'reversing', as in Wu-Ki Tung's textbook, Ch. 11) all "points" inside 'the infinitesimal rubber glove' with all points outside it, that is, with all points of Claudia. Notice that we cannot use quantitative notions like 'more' and 'less' regarding any "number" of points -- neither those of Claudia nor those inside 'the smallest possible rubber glove'. Were the infinitesimal an abstract mathematical point, the operation 'space inversion/replacement' would be impossible, and then there would be two opposite and privileged views on 'the Small' and 'the Large', and the latter would be 'absolute qualities of space', just like in GR textbooks.

Thus, an operational definition of 'infinitesimal volume of 3-D space' is that which permits space inversion at (i) the minimal, hence infinitesimal, volume of space ($S$) and (ii) an arbitrarily large (inverse-proportional to $S$) volume of space ($L$).

Now an omnipresent observer can simultaneously "see" the very same center of the sphere (infinitesimal volume of 3-D space, $S$) in a space turned "inside out" as well; one could perhaps say that she is "residing" at two superposed inverted states of 3-D space, as she is able to see both $S$ from $L$ and $L$ from $S$ -- simultaneously. She is not restricted (as we are) to choose one of the 'views'. She is placed at $S = L$, and is wrapping the whole (seemingly "expanding", according to the first macroscopic observer above) 3-D space en bloc.
It doesn't matter whether this shrinking or expanding is (or is not) "accelerated": either way, the "number" of points is a non-Archimedean notion that cannot be subject to quantitative evaluations like 'more' vs. 'less'.

What matters is that the good old 3-D space has just been re-created, like a Phoenix Universe, along the arrow of space. The mechanism is the same as in The Beginning, but without the initial "inflationary stage" -- just an elementary step of the arrow of spacetime and an elementary increment of the memory of 'the universe as a brain', which leads to "more points" being emerged in its memory, available to choose from in the next elementary step: the universe only gets smarter, richer in terms of physical content, and more flexible, just like an evolving brain. If some day [John 1:1] decides to halt the arrow of spacetime, the UNdecidable nature of 'the infinitesimal' will be nullified, the Thompson's lamp paradox will suddenly become solvable, the number of "points" will become denumerable (e.g., there will be roughly $10^{99}$ "atoms of volume" in every cubic centimeter of space, as claimed by L. Smolin, p. 61), and the 3-D space will cease to exist. From our viewpoint, such development is logically impossible (the vacuum cleaner paradox).

The global mode of time runs simultaneously in opposite directions -- in all possible directions in 3-D space -- which will make her (and ours) unanimated wristwatch dead frozen, like the proper time of a photon "between" emission-and-absorption; see Kevin Brown. (This is the exact meaning of 'Your Global Time is ZERO', which was posted on this web site on March 14, 2004, to commemorate Einstein's 125th birthday; see the atemporal "handshaking" medium above.)

Such symmetry over 'space inversion' and the two "superposed" inverted views of Claudia (needed for derivation of three views on 'the length of objects' in 3-D space; see above) reveal the sole invariant object in 3-D space -- the infinitesimal volume of 3-D space, called "point".

After this shaky exercise with the sole invariant object in space, called "point", we need to explain the two 'scale factors' (for the lack of better terms), which create 3-D space: $S$ (from Small) and $L$ (from Large). $S$ refers to 'the infinitesimal point', and $L$ to 'the maximal yet finite volume of an ever-expanding 3-D space'.

We postulate: $LS = 1$. This is the recipe for a natural "boundary" (cf. G F R Ellis' Finite Infinity) imposed on $L$ due to the "extension" of the infinitesimal "point" $S$.

If we think of The Beginning as the case in which $L$ equals exactly $S$ ($L = S = 1$), we can understand the "inflationary stage" in which a tiny little difference between $L$ and $S$ is being introduced by [John 1:1], after which the two scale factors will run in opposite directions, to produce 3-D space tightly filled -- perfect continuum -- with infinitesimals $S$ and bounded by an "expanding diameter" $L$. Now Claudia will be placed in the global mode of spacetime -- both inside $S$ and outside $L$. She will be able to "see" the whole (infinitely-connected, by Claudia) local mode of spacetime en bloc, and her global mode of time will be just like that of our brains: an atemporal and infinite-dimensional "handshaking" medium by which each and every infinitesimal $S$ is simultaneously correlated -- the 'absolute now' of Claudia -- with 'the rest of the
universe', as depicted in the Escher drawing below. And since their EPR-like correlation is "spanned over" an infinitesimal "point", in the local mode we will see the blueprint from quantum waves and relic inflationary waves, yet their source will be inevitably "dark". (In order to detect quantum waves "online", one would have to perform a perfect non-demolition measurement avoiding any point-like collapse, by screening the quasi-local wave over extended 3-D domains.)

Notice that Escher's hands can be moved only by an arrow of space, not with the kinematics of L and S alone.

![Escher drawing](image)

Briefly, we can think of The Beginning as some "absolute vacuum polarization" (not necessarily irreversible), and suggest an equation of space:

\[
L = S = 1 \quad (\text{John } 1:1) \quad \Rightarrow \quad LS = 1
\]

The equation above contains reference to The Gospel, but I believe St. John wouldn't mind to be removed by those obsessed with different religions, such as anti-theism or "agnosticism" (those who deeply believe, for the lack of scientific proof, that there is nothing to believe in).

In summary, the elementary building block of geometry, presented with a geometrical "point" (explanation and drawings here), is supposed to be 'at the same time' a space-inverted image of 'the whole universe' at L, and vice versa. An omnipresent observer in the global mode of spacetime (the two "superposed copies" of Claudia) will be able to monitor all the "points" in the whole 3-D space en bloc, since it is ONE single object, L = S. Our "Claudia" is nothing but the postulated Aristotelian Connection, which binds all "points" by/via their space-inverted image at the level of ONE (the whole universe at L).

This is the pre-geometric plenum, which is still missing in differential geometry textbooks. Consider, for example, Chris Isham's Modern Differential Geometry for Physicists, 2nd ed., in which you are advised that the Hausdorff topological space has been somehow "connected" (p. 61, footnote 1; see also Sec. 1.2.1, p. 3, and pp. 59-60 and Fig. 2.1 therein). It is unclear what sort of pre-geometric plenum could do this job. Think of it as 'the universe as ONE', which is being multiplied as infinitely many (uncountably infinite) geometrical "points" ensuing
from 'the ideal monad without windows' (Döring and Isham), in such way that all "points" are connected and correlated by/via 'the universe as ONE' at \( L = S \).

This is a very old idea 'all is in all', which I am trying to cast in some (relatively) comprehensible scale relativity principle (SRP). There are no "genuine" nor "absolute" dimensions of physical bodies, according to SRP. The spatial relations of 3-D space -- inside/outside and left/right -- should originate from a four-segment "lily" spacetime diagram of the global mode of spacetime (notice the fav icon of this web site). Once such four-segment spacetime diagram is properly constructed (we also have to explain rotation symmetry), we should be able to calculate the cancellation of 'all but one' potential states of quantum-gravitational systems, hence show the correlated states that build up the local mode of spacetime, valid for only one frozen snapshot from Die Bahn.

The frozen snapshot from the "film reel" (the arrow of spacetime) will display an already-correlated set of point-like values of all physical variables, in line with the Bootstrap Principle 'think globally, act locally'. The atemporal (with regard to our unanimated wristwatches) correlation "takes place" in Claudia's global mode of spacetime. She is residing in \( L = S \), and her two "superposed copies", toward \( L \) and toward \( S \), contain uncountably infinite "number" of classical-able states from which one correlated and re-created physical universe is being explicated as 'local mode of spacetime': one-at-a-time, along the arrow of spacetime.

Notice, however, that the direction of the arrow of spacetime points only and exclusively only to the global mode of spacetime, but the latter is totally hidden in the local mode: the "dark gaps" are completely sealed off by 'the speed of light', rendering the local mode a perfect continuum.

Another important feature of SRP is the difference between \( L \) and \( S \) in their postulated relation \( LS = 1 \): while \( S \) is "bounded from below" by a geometric "point", the ever-expanding "horizon" of space is bounded by an entirely different geometric object, which is (sort of) 'inverse-proportional' to a geometric "point". Although the "number" of points needed for \( L \) and \( S \) to 'pass through' in order to reach the exact relation \( LS = 1 \) is indecisive in the local mode of spacetime, there is nevertheless a difference between the "run" toward \( S \) and the "run" toward \( L \), which determines the asymmetry of time. After all, in the global mode of spacetime the age of the universe is finite, such that any "run" towards it will have a fixed cut off at The Beginning, while the "end" of the cosmological time is indecisive, which in turn permits the evolution of 'the universe as a brain'.

**NB:** Notice the nature of the cut off toward \( S \) : it cannot be reached from within the local mode of spacetime due to the inherent teleological structure of 'the world of facts'. This truly fundamental cut off can only be "seen" from the global mode of 'the whole universe as ONE', hence it is considered to be the Aristotelian First Cause. Its action is called The Aristotelian Connection. It acts without being acted upon. Its job is to cast point-like values of physical quantities at the level of 'geometry' -- the grin of the cat without the cat, as Alice would have said regarding the left-hand side of Einstein equation.
And because The Aristotelian Connection produces not just one "point" (as in the Thompson Lamp paradox) but an infinite "number" (uncountably infinite) of such purely geometrical "points" -- simultaneously, with zero duration -- according to your wristwatch -- it connects these "points" of the local mode of spacetime as a pre-geometric plenum. It is also the ultimate "chooser" of particular physical content that would belong to particular geometrical "point": due to the correlation and negotiation (cf. Escher) in the global mode of spacetime of all potential physical content available to the local mode, the "chooser" of the particular physical content specifying any particular "point" is "everything else in the universe". The end result is the cancellation of all but one state from the spectrum of potential states available to the particular "point" to choose from, and we get the local mode of already-correlated facts -- one-at-a-time, along Die Bahn (the arrow of space).

Nobody and nothing "plays dice" here: God casts the die, not the dice. The inherent flexibility (not "uncertainty") of all spacetime points to get dressed with specific physical content is like the flexibility of the human arm to perform any movement. Surely there are constraints, boundary conditions, conservation laws, etc., yet the flexibility of all "points" to choose from their quantum-gravitational spectrum of potential states (God's "die" or rather 'matrix') can never be reduced to zero. For example, Heisenberg's relations can be interpreted as the flexibility of a quantum particle to choose from a spectrum of potential states: if its potential states regarding its next 'position' get shrunk, it will have a corresponding larger spectrum of potential states regarding its next 'momentum' to choose from. Of course, if you "filter" this quantum flexibility through the spacetime of STR, you may claim that it is impossible for a quantum particle to possess simultaneously point-like values of "complementary" observables. But again, these values need not be point-like. They can be perfectly well-defined yet quasi-local. The idea of wave-particle dualism may be correct for QM measurements, but nobody knows, for example, how would an electron look like in an intact quantum world: if it is not forced to behave like a point-like particle since it isn't being "observed" at the length scale of tables and chairs, how would its "wave" look like? Perhaps the quantum "wave" of an intact electron pertains to its quantum flexibility.

Going back to the pre-geometric plenum: perhaps the asymmetry of time is determined by the asymmetry of space, namely, by the difference between the two "runs" toward L and S, bounded by their relation LS = 1. All efforts to derive the fundamental asymmetry of time from some physical stuff or 'entropy' are doomed to fail, because such fundamental feature of spacetime can only be determined by 'the grin of the cat without the cat'.

Also, our wristwatches [Note 3] are perfect examples for quantum-gravitational measuring devices, as they can in fact read one 'dynamical instant' from Claudia's absolute time since The Beginning, but because we can "look" at this dynamical instant only with a physical "torch", we inevitably see a dead frozen snapshot, as explained eloquently by Robert Geroch.

Everything said here pertains only to the kinematics of spacetime; to obtain its dynamics (the arrow of spacetime) we need to include the Aristotelian First Cause "by hand", because nothing in this purely kinematical structure can or should point directly to God.

In modern parlance, SRP is expected to "suffer" from Gödel's incompleteness theorem, but because of the fundamental nature of SRP, the additional elements in it, which belong to some 'meta theory', will inevitably come from 'outside science'. To be specific, the introduction of Aristotelian First Cause "by hand" means endowing the universe with the faculty of self-acting: just like
the human brain (we think about our brain, with our brain), the universe modeled as a 'brain' should have the faculty of acting on itself, but no physical path toward 'the acting mind of God' (such path may show up with math only) should show up in quantum gravity. Perhaps some of those "agnostic" people may prefer to call Him "dark" -- I don't mind; we all enjoy His gift called free will.

More in my talk in November 2015. Just a hint: look at Fig. 2 in the note about Die Bahn above. The direction of \( \mathbf{w} \) is "dark" to the local mode, and the gravitational effects (global mode) should have 3-D presentations (e.g., the so-called "curvature") in the local mode (Fig. 1). If some day we find out that the origin and the mechanism of inertial reaction "forces" are indeed produced by the gravitational potential reality, perhaps we will explain the most difficult puzzle: the asymptotically flat space of the local mode of spacetime, produced by the two tug-of-war components of gravity at cosmological scale: CDM and DDE.

Perhaps at the largest length scale, \( L \), the "dark" geometrical effect from the global mode makes the 3-D space of the local mode 'asymptotically flat'. However, given the basis relation \( LS = 1 \), an absolute flat and absolute infinite 3-D space would require some mathematically unclear state \( \{ S = 0, L = [\text{inf}] \} \) -- the two symmetry axes of the infinitely-inflated sphere and torus will coincide, along with their centers (check out a story about a screen saver in Windows 98 here). I intend to argue, in November 2015, that the topology of the local mode of spacetime is being dynamically fixed as 'asymptotically flat' at each and every step of re-creation of the local mode (cf. Die Bahn above), by "passing" through such mathematically unclear state that is neither sphere nor torus anymore. Stated differently, I suppose there exist two asymptotical "boundaries" on what looks like an 'asymptotically flat 3-D space': a 3-D sphere and a 3-D torus with the largest possible radii, \( L \), "between" which a mathematically unclear (and purely theological) state is quietly residing. All this will be a sequence to my previous talk in September 2008.

As to the "expansion" of space depicted in the drawing from NASA, perhaps the projection of the metric in 'the Large' onto the macroscopic scale produces the illusion to the 'first observer' (cf. above) of some "expanding universe". Again, according to SRP, the "expansion" is not caused by any physical stuff. It is an illusion of some "expanding" metric, which can be seen only by the 'first observer'.

As suggested above, the cosmological horizon is 'ever expanding' along the arrow of spacetime, while the Planck scale is fixed. That is, the 'infinitesimal' is fixed (bounded from below) by some 'numerically finite but physically unattainable' values that do not change (e.g., the Planck length), while the 'maximal volume of space for gravity' \( L \) increases with the age of the universe, like an expanding horizon "bounded" by an ever-sliding \( L \): Panta rei conditio sine qua non est.

By the way, have you seen an UFO with your very eyes? If these guys can switch off the inertial reaction "forces", perhaps they can fly effortlessly, much like we move our thoughts. And if they can modulate the metric of space, perhaps they can make their pathway in the whole Milky Way just "two meters". From their perspective, they will indeed fly 'two meters', while the space will be "running towards them". Perhaps in such altered-metric space they fly literally 'from point to point', and with a very low speed of, say, just 2 m/s, as recorded by their wristwatch.
Wilbur B. Smith: "... to produce the gravity differential, the time field differentials which were necessary to operate the ship."

I wish I knew what is 'space' [Note 4]. There is so much latent energy packed in the quantum vacuum. Perhaps all we may need is access to the global mode of spacetime. The whole SPR may sound unclear and farfetched, but recall Christopher Columbus: If we don't leave for India, how can we discover America?

D. Chakalov
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Note 1. In a letter to Paul Ehrenfest from 4 February 1917, Einstein wrote about his 'cosmological constant':

"I have again perpetrated something relating to the theory of gravitation that might endanger me of being committed to a madhouse." (Ich habe wieder etwas verbrochen in der Gravitationstheorie, was mich ein wenig in Gefahr bringt, in ein Tollhaus interniert zu werden; English translation by N. Straumann).

Note 2. Recall Einstein's opinion of his theory:

"The right side (the matter part) is a formal condensation of all things whose comprehension in the sense of a field theory is still problematic. Not for a moment, of course, did I doubt that this formulation was merely a makeshift in order to give the general principle of relativity a preliminary closed expression. For it was essentially not anything more than a theory of the gravitational field, which was somewhat artificially isolated from a total field of as yet unknown
structure."

Note 3. The problems with 'time in GR', the paradox of time in canonical quantum gravity (Karel Kuchar), and the puzzle of so-called "dark" energy from empty space stem from the absence of the arrow of spacetime in present-day GR. On the one hand, our mischievous wristwatches do in fact read the arrow of spacetime as a "chain of points", as they "filter" only one of the infinitely many dynamical points" from the global mode of time, and read these filtered points "one-at-a-time" along the "vertical skewer" of the arrow of spacetime (global mode of time), on which all "horizontal snapshots" are stacked. On the other hand, in order to "look" at this arrow with physical (unanimated) devices, we can only use a "torch", which kills the arrow, and shows only one frozen point" fixed by the calculated values of physical quantities at this dead frozen point". And here people like Robert Geroch say -- let's try to solve the Einstein field equations, starting from this well-calculated frozen point", and then move the (canonical) data only on this "horizontal" set of such "points", and end up with the insurmountable Cauchy problem for the Einstein equations. Why? Because the genuine dynamics of GR ain't there (Stanley Deser will undoubtedly disagree).

Note 4. "In the first place, we entirely shun the vague word "space," of which, we must honestly acknowledge, we cannot form the slightest conception."

Albert Einstein, Relativity: The Special and General Theory, 1920

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P.S. Nobody has so far asked, what is the meaning of the phrase 'Your Global Time is ZERO'. The sole question from the readers of this web site has been, 'why don't you publish all this in a book, to explain your ideas' (or something similar).

The criticism is fully justified: reading my web site is anything but fun. I am considering writing a book, but it will be intended to kids age 15+, and will have to be complemented by a DVD with video lectures, to explain the crux of the idea about 'the universe modeled as a brain'.

Why kids? Because the future belongs to them (I will soon hit 58, Deo volente). My work on quantum gravity concerns very few people, all of whom have this utterly negative attitude of 'the worst of criticism is neglect'. Just a few examples: the last time I heard from Claus Kiefer was in 2003, only to tell me that he can't open the CD ROM I sent him by surface mail, because all computers at the University of Cologne run on Unix. The last time I heard from Karel Kuchar was on 8 Jan 2003, and from John Baez on 14 Jan 2002. The case with Chris Isham was even worse. And look what happened with my talk in 2008.

Thinking about the future, I can imagine only two developments regarding SRP. One possible case will be that it is just crap and delusion, so obviously wrong that none of the renowned experts made the slightest effort to show my stupid dilettante errors. Will see. Planck's Law of Thermal Radiation was met with very nasty attitude by the established scientific community [Note 5], as it literally blew away their comfortable world. If SRP turns out to be correct, it will cause far more "damage" to many established scholars studying canonical quantum gravity and "gravitational wave astronomy" (at least 679; see also [Note 6]).
But could SRP be correct, really? Well, as I mentioned previously, the two rules for success are:

Rule #1: Never tell them everything you know.

And nobody is curious anyway. (For those who are: I believe SRP embedded in an arrow of spacetime offer the only possible solution to the mind-brain problem -- the mind has to be both detached from matter, to preserve its ontologically different nature, and linked to it, in order to communicate with its brain via the bi-directional "talk" depicted in the Escher drawing above.)

Therefore, there is no need to use paper -- everything I need to say is, and always will be posted at this web site, available to anyone interested. If some day it turns out that SRP in 'the arrow of spacetime' had hit the right track toward quantum gravity, I suppose people will be interested to explore it (see the download link above).

Besides, we don't live in 18th century:

"When this lowly chap informed the Lucasian Professor of Mathematics that he had formulated the inverse square law of gravitation years before the publication of Principia, Newton is said to have flown into a rage. The two had already sparred over their optical theories, and when Newton took over as president of the Royal Society in 1703 (the year of Hooke's death), he began erasing all traces of Hooke. Famously, he tossed the only contemporary portrait of Hooke onto a fire."

D. Chakalov
February 26, 2010
Last update: March 2, 2010

Note 5. Max Planck, Philosophy of Physics, W.W. Norton and Company, New York, 1936, p. 97:

"An important scientific innovation rarely makes its way by gradually winning over and converting its opponents: it rarely happens that Saul becomes Paul. What does happen is that its opponents gradually die out and that the growing generation is familiarized with the idea from the beginning: another instance of the fact that the future lies with youth."

p. 1: "Equivalence principle implies no local definition possible in any situation: must attempt "regional" definition in regions at least as large as a wave-length.

p. 9: From a physical point of view, null infinity is very far away. A measure of how far one has to get from a source to be "near" infinity is to consider the divergence of the true curved-space light-cones from their flat-space approximations, which wind up at spatial infinity. Martin Walker first pointed out the enormous distance required to separate these cones by just one wavelength or period of the gravitational wave, a reasonable length scale for a radiation problem. The separation is something like $2M \ln(r/M)$. Setting this equal to $\lambda$ for the Hulse-Taylor pulsar, we solve for $r$ and find that it is a bit more than $10^{19}$ km! This is unimaginably bigger than the observable Universe, whose radius is a mere $10^{23}$ km.

p. 10: "A more elegant and potentially powerful scheme is to incorporate conformal techniques to bring null infinity to a finite point on the grid (emphasis added - D.C.), then can incorporate infinity into the computational domain (Friedrich, Husa, Lechner, Frauendiener all attending this meeting)."

Comment: I highly recommend B. Schutz' video lecture and manuscript to all Jehovah's Witnesses of Gravitational Astronomy. Compare it to B. Schutz' article "Gravitational Radiation", gr-qc/0003069 v1. More here.

D.C.
March 3, 2010
Dear Dr. Freedman,

I wonder if you could help me understand the topological nature of Kochen-Specker state,

http://www.god-does-not-play-dice.net/#KS

It seems to me that this UNdecidable state is protected from "decoherence",
simply because it cannot reside in any Hilbert space. It isn't "observable", nor is
computable in the sense of Turing (Topological Quantum Computation, 80.pdf).
You can grasp it with your brain only.

May I take this opportunity to invite you and your colleagues to join our efforts
toward a new relativity principle, outlined at

http://www.god-does-not-play-dice.net/#quiz

Kindest regards,

Dimi Chakalov

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Note: Michael Freedman posted today (November 4, 2010) the 16th version of
"Quantum Gravity via Manifold Positivity", arXiv:1008.1045v2 [quant-ph], in
which he tried to obtain the dimensionality of space from the notion of 'empty
set', and suggested a fleeting "pre-time" (ibid., p. 8). The latter emerges here
from AOS.

Notice that the UNdecidable Kochen-Specker state at the first link above is a
bona fide empty set from the viewpoint of its observed/actualized "projections"
(if you like non-linear modifications of QM, try to attach this particular "empty
set" to the manifold of states in geometrical formulation of QM).

To cut the long story short, "quantum computing" is impossible, even if it is
"topological" and supported by Microsoft. Look again at the "general principle" in
R.I.G. Hughes, The structure and interpretation of quantum mechanics, p. 77:
2.7 The Evolution of States in Quantum Mechanics

Like classical mechanics, quantum theory tells us how the state of a system evolves with time. The key role in the equation governing this evolution is played by an operator rather than by the Hamiltonian function, in line with the general principle that, in quantum mechanics, operators represent physical quantities. As in the classical case, the quantity in question is the total energy of the system; it is represented in quantum theory by a Hermitian operator \( \mathbf{H} \) which we call the Hamiltonian operator for the system. The rate of change of the state \( \mathbf{v} \) of a system is given by

\[
\frac{i\hbar}{\partial t} \frac{\partial \mathbf{v}}{\partial t} = \mathbf{H} \mathbf{v}
\]

and this equation is known as Schrödinger's time-dependent equation, or sometimes simply as Schrödinger's equation.

Firstly, this "general principle" does not apply to the case of UNdecidable, not-yet-physical, KS state, as explained by R.I.G. Hughes here. Secondly, because in QM we're dealing with operators, we cannot even imagine that some dynamical variable labeled with the anti-relativistic and "ideal Schrödinger time" (Jorge Pullin et al.) could possess some pre-existing values, like those we attach to each point of phase space in classical mechanics. Hence it is manifestly pointless to hope that we could control any of those quasi-local dynamical variables from the length scale of tables and chairs -- especially the Kochen-Specker state.

Now, if we look at GR, we have a similar puzzle with the equally incomprehensible "proper time \( \tau \)" (Carlo Rovelli), in the sense that our wristwatch does read a continual line (1-D Euclidean space) of already linearized snapshots from the initial "proper time \( \tau \)". Looks like something is doing a linearized and flattening "collapse" of the "proper time \( \tau \)" at each and every "sufficiently small" (Einstein) region of the points from our 'time read by a clock'. Hence the confusion in GR.

Not surprisingly, Mike Freedman didn't respond to my email (nor mentioned my efforts at the second link above). Due to the lack of interest, I will only reiterate the startling characteristic feature of 3-D space: finite things. If you wish to explain an elephant, all you need is to "obtain" its unique trunk; likewise finite things for 3-D space.

Details in my note on quantum gravity below. No other choice for self-wrapping of space and self-connecting of spacetime "points" seems possible. But first, one needs to identify an "instant", such that it can be (i) "multiplied" and (ii) "ordered in time", with "duration" equal to the infinitesimal separation of these instant(s), or rather one-multiplied-instant. More in Sec. Summary, pp. 35-36 from ExplanatoryNote.pdf.

All this is a tentative answer to Michael Teller's question (The Sunday Times, March 13, 2008): So long as the Universe had a beginning, we can suppose it had a creator. But if the Universe is really completely self-contained, having no boundary or edge, it would have neither beginning nor end: it would simply be. What place, then, for a creator?

Well, in The Universe does work like a brain, perhaps we may wish to consider
an entity resembling our mind and consciousness. Say, [John 1:1].

Is the all-mighty Microsoft interested, I wonder. 😊

D.C.
November 4, 2010
Last update: November 5, 2010

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Subject: Quantum gravity
Date: Sat, 20 Feb 2010 06:35:23 +0200
From: Dimi Chakalov <dchakalov@gmail.com>
To: Chris Isham <c.isham@imperial.ac.uk>
Cc: Jeremy <jb56@cam.ac.uk>

Hi Chris,

Over seven years ago, on Wed, 23 Oct 2002 19:24:15 +0100, you boldly declared the following:

"You do not know enough theoretical physics to help with any research in that area."

You haven't so far produced any evidence in support of your claim.

My latest proposal can be read at
http://www.god-does-not-play-dice.net/#quiz

Prelims from KS Theorem at
http://www.god-does-not-play-dice.net/#KS


As ever,

Dimi

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Subject: RE: Update?
Date: Fri, 12 Oct 2007 15:14:09 +0100
Message-ID: <18BC110D9A023542A41960EE3D066CD402D89B0C@icex3.ic.ac.uk>
From: "Isham, Christopher J" <c.isham@imperial.ac.uk>
To: Dimi Chakalov <dimi@chakalov.net>

[snip]
> unfortunately, your current mode of writing suggests to everyone that
> you are just another crank.
[snip]
Comments on Chris Isham’s opinions

Look at the following statement, from Stephen Hawking's "Grand Design" (to be published on September 9, 2010):

"Because there is a law such as gravity, the Universe can and will create itself from nothing. Spontaneous creation is the reason there is something rather than nothing, why the Universe exists, why we exist. (...) If there are trillions of universes as M-theory proposes, that luck and probability are enough to make our existence feasible, so no God was needed."

Ignore the second and third sentences (spontaneous creation of an infinite multiverse doesn't make sense at all, or implies a very dumb and sloppy god).

How many factual and logical errors can you identify in the first sentence?

I think our understanding (S. Hawking, C. Isham, and myself included) of gravitation and the origin of inertia resembles my wife's knowledge in electricity, as she can comprehend Ohm's Law only by some analogy of water running in a flexible hose. As to Hawking's conjecture about "singularity", it was formulated as a theorem many years ago, and only after very specific and crucial presumptions, which do not hold in a world dominated by [we-do-not-know-it].

Yet Chris Isham will always praise his colleague, Stephen Hawking, and will never expose the factual and logical errors (non sequitur) in the first sentence above. Moreover, if the so-called Arrow of Space is correct, both his theory and Stephen Hawking's "Grand Design" will be wrong.

But let's see the main ideas in the toposification of Quantum Theory, proposed by Chris Isham.

According to Gerard 't Hooft, “Isham believes another mathematical language may help, but I don’t think so. It sounds a bit as if describing the world in German is better than in Chinese.” Well, at least the "German" approach emphasizes on KS Theorem, which is usually obscured in the mainstream "Chinese version of QM."
Chris Isham: "The interesting question really is, what do you mean by time?"

Isham believes that "every physical system, from atomic particles to the universe as a whole, can be viewed through different topoi" (source here), and suggests the notion of 'pseudo-state' (Würst); see Slide 28, from his January 2008 lecture "Topos theory in the formulation of theories of physics",

http://www.comlab.ox.ac.uk/conferences/categorieslogicphysics/clap1/clap1-chrisisham.pdf

From Heidegger's perspective, there is 'no way things are' in QM (Slide 13). My objection is not against Chris Isham's opinion but to its implementation: all topoi he can possibly design cannot exhaust/fully describe the "quantum trunk" rooted on 'the ideal monad without windows', because we are dealing with a new form of reality (dubbed 'potential reality'), which resembles Leibniz' monads and our cognitive structures, in line with 'the universe modeled as a brain'.

One important implication is that, on the one hand, the truth value associated with 'potential reality' is definitely YAIN -- not 'somewhere in between true or false' -- but on the other hand, Heidegger's "things" are being explicated (as 'shadows on Plato's cave') in the quantum realm as reality 'out there' with unit probability, and their lifetime in the instant 'now' from the Arrow of Space is infinitesimal -- just a "point" from the continuum along the w axis (cf. Fig. 2).

Thus, we need two modes of spacetime, a global mode for 'potential reality' and a local mode for its fleeting explications along the Arrow of Space. Chris Isham is trying to place everything in one pot, while I separate them from the outset, and claim that their apparent fusion is due to the so-called speed of light, because the duration of their separation, in the local mode of spacetime, is zero.

We have a perfect continuum of such explicated things -- one-at-a-time, along the Arrow of Space -- in the local mode of spacetime, at all length
This is an absolute instant 'now' (cf. Isham's question above) from the Arrow of Space. It isn't physical, but looks like a transcendental tachyon, which is absolutely everywhere at 'no time' and at all length scales. It builds up the cosmological time and should not be 'GR observable', yet your wristwatch does indeed read it -- check out Luca Lusanna and the bewildered Tom Thiemann here.

The paradoxical situation is that I am strictly following Chris Isham's path to quantum gravity, announced in 1993. In my opinion, I am more 'Chris Isham' than he currently is. All differences boil down to the way he and I understand the continuum hypothesis and the quantum of action: dead matter makes quantum jumps; the living-and-quantum matter is smarter.

This is the motto of my web site, since July 1998. Let me try to explain it, by offering my version of 'the quantum principle'. Then I will try to answer the question about time posed above.

In simple words, the quantum principle is based on the Bootstrap Principle and the rule 'think globally, act locally'. It postulates the rules of the infinitesimal displacement of physical stuff in space and time, along the continuum of events produced by the Arrow of Space (bzw. arrow of spacetime): no "uncertainties" nor "quantum jumps" (verdammt Quantenspringerei, Erwin Schrödinger) exist in the quantum realm. We have continual trajectories of individual quantum particles, as well as emergent geodesics. The stochastic "quantum jumps" are artifacts from the measuring devices at the scale of tables and chairs.

If you examine the Gedankenexperiment with four dice, you will see that the transition from any n-state of the dice to the next n-state is perfectly continual in the local mode of spacetime: the duration of the EPR-like correlation "in the air" is zero in the local mode comprised from such n-states. The same holds for the emergent geodesics: the duration of the matter-geometry talk "takes place" in the global mode, at the interface of the non-Archimedean (geometrical) and Archimedean (physical) worlds, hence its physical duration in 3-D space (local mode) is zero. QM and GR are unified from the outset. Simple, no?

NB: If this quantum principle is correct, all other approaches to quantum gravity (Steven Carlip and Claus Kiefer included) must necessarily be wrong.

As to the question by Chris Isham above: 'time' is provided by the absolute clock of the Arrow of Space, which is external to all physical systems, yet is also "inside" each and every physical system, as it operates in the non-Archimedean realm of 'potential reality'. This absolute clock reads an infinite-dimensional time, which coincides with 'the time read by your wristwatch' (the dualist conception of time) only in the instant 'now' in which the global mode is being "flattened" to the local mode.

Of course, there is no way to find out if someone has found 'the right track', but at least I can think of QM & STR and the cosmological "constant", regardless of Chris Isham's opinion on my intellectual abilities and knowledge in theoretical physics.

As I'm still learning, since January 1972, perhaps some day I could say more on "the bridge"; check out the current version of my note on GWs at

http://www.god-does-not-play-dice.net/ExplanatoryNote.pdf
What looks really impossible, I'm afraid, is some day Chris Isham to defend his insulting claim from 23 October 2002.

No way. He will keep quiet, and will praise Stephen Hawking.

Apart from that, I must acknowledge that Chris Isham is a very nice person. We met on November 13, 1998, and had many discussions in his Office. At our last meeting on March 9, 2006, he offered me a cup of tea, which was delicious.

"just another crank" D.C.
September 3, 2010
Last update: September 7, 2010

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Subject: Andreas Döring (23 August 2008), Tutorial on Conceptual Issues of Quantum Theory, 1:32:40 - 1:33:00
Date: Sat, 13 Nov 2010 04:55:35 +0200
From: Dimi Chakalov <dchakalov@gmail.com>
To: Andreas <andreas.doering@comlab.ox.ac.uk>
Cc: Jeremy <j1b56@cam.ac.uk>,
    Chris Isham <c.isham@imperial.ac.uk>

Andreas Döring (23 August 2008), Tutorial on Conceptual Issues of Quantum Theory
http://www.comlab.ox.ac.uk/quantum/content/0808001/

Slide 40, "A contextual theory would allow the value assigned to some operator Â to depend on the context considered."

Andreas Döring, 1:32:40 - 1:33:00: "I must really admit it is not clear to me how much sense this could make."
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Hi Andreas,

On Friday, 13 November 1998, I met Chris in his Office and suggested to explore the correct _context_, as used by the human brain,

http://www.god-does-not-play-dice.net/#Reznikoff

http://www.god-does-not-play-dice.net/#Specker1

Twelve years later (13 November 2010), he still has not used his brain to check up my proposal, but is trying to place everything in one pot (Eintopf gemacht), as I wrote at

http://www.god-does-not-play-dice.net/#time

I trust you can do better -- no topos nor tensors,

http://www.god-does-not-play-dice.net/#XXX

If you're interested, feel free to write me back.
Dear Manfred,

I hope you can recall my email from Tue, 02 Sep 2003 15:51:53 +0300, regarding your arXiv:gr-qc/0308089v1 (cf. the subject line). Seven years later, I still don't know your viewpoint on the measurement (macro-objectification) problem and the clash of QM with STR (Abner has written a lot on this issue).

In your latest arXiv:1009.1220v1, you offered an alternative to the decoherence/einselection mess from Zurek, but the crux of the task has not been addressed: how do you reconcile QM with STR (Special Theory of Relativity)?

STR (Minkowski spacetime) requires 'objective reality out there', while QM explicitly denies it:

"In general, a variable has no definite value before I measure it; then measuring it does not mean ascertaining the value that it has."

This is the famous quote from Schrödinger at http://www.god-does-not-play-dice.net/#KS

In the case of STR, consider an example with the Sun:

1. If you look at it, you will see/observe a state of the Sun, which has been *real* 8 min prior to the instant of your observation.

2. At the *very same instant* of your observation, the Sun does possess a real state 'out there', which will be available to you for observation/recording after 8 min.
This is the meaning of 'objective reality out there'.

In order to reconcile QM with STR, we need 'reality out there', as suggested at the link above. Just drop "objective" and replace it with "potential".

As a bonus, I get your "translocal connections beneath the smooth surface of classical spacetime" (although not from your approach, of course), without any spukhafte Fernwirkungen or Gespensterfelder, plus much more,

http://www.god-does-not-play-dice.net/#Levi_Civita

Please tell me if you can do better.

I extend this request to all your colleagues.

Kindest regards,

Dimi

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Note: The so-called PR\textsuperscript{2} interpretation of QM stands for (potential reality) & (proper relativistic) interpretation\textsuperscript{1}. It explains smooth bi-directional transitions between the classical and quantum realms, does not treat the former as some "limiting case", resolves the temporal solipsism of QM and recovers Bells' aether, and explains the actualization of potentialities as a relativistic process, in line with 'the quantum principle'. As a bonus, you get the physics of the human brain and all living creatures, without any "psi-fields" or other parapsychology: click on the smiling cat above.

Or don't. It's your free will choice, in line with the PR\textsuperscript{2} interpretation of QM.

I'm just a psychologist, don't need quantum gravity. Even if someone explains the origin of inertia and sorts out the quantum vacuum energy with exact equations, all this will be redundant information, just as I don't need to know the exact biochemistry of food processing in order to enjoy a beef steak, say.

Does a fish need a bicycle?

D.C.

September 8, 2010

Last update: September 30, 2010

J. S. Bell, Quantum mechanics for cosmologists, in: *Speakable and unspeakable in quantum mechanics*, 2nd ed., Cambridge University Press, 2004

Ch. 15, p.136: "(W)e have no access to the past. We have only our 'memories' and 'records'. But these memories and records are in fact present phenomena. (…) The theory should account for the present correlations between these present phenomena.

"The question of making a Lorentz invariant theory on these lines raises intriguing questions. For reality has been identified only at a single time."

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\textsuperscript{1} The 'proper relativistic' interpretation of QM resolves the following problem, from Dah-Wei Chiu:
"The seemingly puzzle is analogous to the Einstein-Podolsky-Rosen (EPR) paradox, in which a pair of entangled particles are measured separately by Alice and Bob. In the context of special relativity, if the two measurements are conducted at two spacetime events which are spacelike separated, the time-ordering of the two events can flip under a Lorentz boost and thus has no physical significance. Alice and Bob can both claim that the entangled state is collapsed by her/his measurement and thus have different knowledge about what the physical state should be (should have been - D.C.), yet the predictions by Alice and Bob are consistent to each other."

The UNdecidable state of the entangled/superposed "particle" (never in plural) exist as 'potential reality out there', and can always be traced back to the past light cone of both Alice and Bob -- retrospectively, after their "observations". Neither the "time-ordering" nor the "different knowledge" about what 'the physical state' should has been have any significance whatsoever to 'the base state', since the latter is omnipresent and can never be "collapsed". It is the 'back bone' along which Nature (not QM textbooks) has worked out smooth bi-directional transitions between the classical and quantum realms. Simple, no?

Well, Manfred Requardt doesn't like it, for reason he never explained. Anyway.

How wonderful that we have met with a paradox.
Now we have some hope of making progress.
Niels Bohr

Note: Please read Ernst Specker's 1960 article and notice [Ref. 1] above. To explain the seemingly mundane notion of 'counterfactual definiteness' from QM textbooks, and then compare it with the brand new situation introduced with KS Theorem (usually not covered in QM textbooks), consider an entangled quantum coin, which is being flipped "in the air". Upon landing on the floor (Hilbert space), there are "two" (in fact, one) observer(s) waiting patiently in the Hilbert space, Alice and Bob, such that Alice can record the entangled quantum coin by viewing it 'from the bottom up', while Bob can see it only 'from above'. In such highly contrived Gedankenexperiment, Alice will know that if she observes 'heads', in the very same instant Bob should have seen 'tails' -- after all, it's one coin. Alice will also suppose that, by virtue of 'counterfactual definiteness', it is meaningful to ask: what would I had seen had Bob actually saw 'heads'?

I will spare the reader the usual excursion to Bell's theorem, EPR argument and its inevitable pitfalls (e.g., "quantum correlations happen without any time-ordering", and "nonlocal quantum correlations seem to emerge, somehow, from outside space-time", Nicolas Gisin), and will only stress that Alice&Bob are confined in the Hilbert space, hence can never "see" the quantum coin "in the air". UNdecidable KS state shows up only in KS Theorem.

Look carefully at R.I.G. Hughes, p. 164, and notice the difference between the geometrical presentation -- in the 3-D space of the macro-world of tables and
chairs -- of spin-1 vs. spin-1/2 systems. In the latter case, the component of the spin \textit{per se} (a bare finger nail, cf. 'KS Theorem for teenage girls' above) can choose from two alternative observable values, either +1/2 or -1/2, both of which can be accommodated along one axis from 3-D space -- all they need is to choose a "diametrically opposed direction" (ibid.) along that same axis in 3-D space. Therefore, in the case of spin-1/2 systems, the UNdecidable KS state need not, and hence does not show up -- the 3-D space does not force it to reveal all of its contextualized classical-able states.

Not so in the case of spin-1 system: the square $S^2$ of any component of spin can take three values -- 1, 0, -1 -- which in turn requires all three axes of 3-D space. In other words, even one square $S^2$ will invade/require all available geometrical degrees of freedom provided by 3-D space -- the classical "filter" for contextualized classical-able states.

Now, Kochen and Specker have shown that, if you consider any triple of such squares $S^2$, each of which requiring the three mutually perpendicular directions in 3-D space (cf. Eq. 2.8 on p. 17 from C. Isham's textbook here), the statistical interpretation of QM would imply that you will always find out that "two receive value 1 and the third 0" (ibid.), similarly to the case of 'counterfactual definiteness' from QM textbooks. But the statistical interpretation of QM turn out to be wrong, as anticipated by Erwin Schrödinger in November 1950.

You can't have all the contextualized classical-able states in such \{1,0,1\} pattern, as proven by KS Theorem. Some of them will always and inevitably fail to comply with your (biased) expectation for "an unequivocal true-false value", as explained eloquently by Isham and Butterfield, p. 3 (see the excerpt above), and will have to be shifted into the UNcolored section from KS sphere (Helena Granström, p. 2). Hence my interpretation of the UNdecidable KS state above.

There is no backward causation nor retrocausality, because 'potential reality' does not live on the local mode of spacetime (cf. Fig. 1 above), hence can act as Reichenbach's Common Cause Principle and Leibnitz' harmonia praestabilita along the arrow of spacetime (cf. the proposal for biocausality).

Notice also the logic of propositions regarding the "content" of potential reality, encapsulated with a single YAIN, and compare it to the topos approach by Chris Isham above.

I firmly disagree with the opinion in Wiki that KS Theorem (details in Mladen Pavicic et al., cf. p. 8 and p. 17) were some "complement to Bell's theorem". The latter theorem is based on counterfactual "reasoning", which might eventually be made clear and conclusive only in classical physics.

Regarding Bell's Theorem, Tim Palmer rightly noticed that (p. 7) "in order to establish Bell's theorem, we need to consider correlations between pairs of measurements when the magnets have different orientations, let's say $n$ for the left-hand magnets and $n'$ for the right-hand magnets. It is also necessary to assume that it is meaningful to ask: what would the spin of a left-hand particle have been had we actually measured it with magnets oriented in the $n'$ direction (or, conversely, what would the spin of the right-hand particle have been had we actually measured it with magnets oriented in the $n$ direction)?" Counterfactual "reasoning" is a recipe for parapsychology. More from Charles Tresser, Sec. 5.

There is no counterfactual "reasoning" in KS Theorem, ladies and gentlemen. Quite the opposite. Check out Ernst Specker above.
In summary, all quantum, as well as all gravitational "states" are contextualized quasi-local explications from their potential-reality state (never in plural): check out Fig. 2 above.

Any comments? Please don't hesitate, like Chris Isham and his PI colleagues.

D.C.
April 23, 2010
Last update: October 11, 2010

Subject: How to falsify "decoherence" (if any)
Date: Mon, 11 Oct 2010 20:35:51 +0300
Message-ID: <AANLkTim+NxSPh6L0BKMYaDoD=p8p8vbuAKYFqmo7aWJk@mail.gmail.com>
From: Dimi Chakalov <dchakalov@gmail.com>
To: Zeh <zeh@uni-heidelberg.de>,
Claus Kiefer <kiefer@thp.uni-koeln.de>,
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Jorge Pullin <j.pullin@phys.lsu.edu>

Dear Colleagues,

May I offer you an exercise to falsify "decoherence", as I notice that some of you are still haunted by it:

H. D. Zeh, How decoherence can solve the measurement problem
http://www.rzuser.uni-heidelberg.de/~as3/SolveMeas.html

The Chinese Nebulae (located at the newly build National Supercomputing Centre in Shenzhen) achieved 1.271 PFlop/s running the Linpack benchmark, and can deliver a theoretical peak performance at 2.98 petaflops per second (FLOPS means floating point operations per second).

Suppose its Intel X5650 processors are "decoherent" quantum systems, such that all quantum fuzziness in the *timing* of their operations is "quite strongly peaked (notice the poetry - D.C.) about one path" (Jonathan Halliwell, arXiv:quant-ph/0501119v1).
Please calculate (roughly) how long your Chinese colleagues may run their Nebulae before it breaks down.

Please don't hesitate to publish your calculations.

I bet 100 EUR (sorry, no US dollars) that *none* of the above will happen, for reasons explained at

http://www.god-does-not-play-dice.net/#KS

Do you accept the bet?

Kindest regards,

Dimi Chakalov

Note: $10^{15}$ perfectly classical FLOPS, totally protected from the damping of the "tails" (Max Schlosshauer, arXiv:quant-ph/0312059v4, p. 30) -- indefinitely?

Prove it.

The task is interesting to me because my brain has roughly $10^{14}$ synapses, which do not make errors (I do; not my brain). Also, I cannot explain the generation of observable paths in Wilson cloud chambers, after Sir Nevill Mott (cf. Alessandro Teta, arXiv:0905.1467v1 [math-ph], pp. 9-10), with "decoherence". If people believe the latter is better than the Born Rule, they should explain (i) things we can observe, such as the generation of paths in Wilson cloud chambers, and (ii) things we cannot observe, such as 'global and absolute time' (A. Macias and H. Quevedo, gr-qc/0610057v1) along which space "expands". More on 25.11.2015.

D.C.
October 11, 2010
Last update: October 13, 2010

Subject: Bishop George Berkeley: "In rebus mathematicis errores quan minimi non sunt contemnendi."
Date: Tue, 7 Sep 2010 14:24:12 +0300
Message-ID:
<AANLkTikf4PyjrFkw2-P5Xou=dHR_Gtm=yVNfbbsY95A@mail.gmail.com>
From: Dimi Chakalov <dchakalov@gmail.com>
To: Steven Carlip <carlip@physics.ucdavis.edu>, Amanda Weltman <amanda.weltman@uct.ac.za>, Jeff Murugan <jeff@nassp.uct.ac.za>, George Ellis <george.ellis@uct.ac.za>, Yuan K Ha <yuanha@temple.edu>, Roy Maartens <roy.maartens@port.ac.uk>, Igor Barashenkov <igor@maths.uct.ac.za>, Thomas Thiemann <thiemann@theorie3.physik.uni-erlangen.de>, Arkadiusz Jadczyk <arkadiusz.jadczyk@cict.fr>, Dorje Brody <d.brody@imperial.ac.uk>,
Hi Steve:

I trust my email from Fri, 10 Sep 2004 11:47:18 +0100, prompted by your notes [Ref. 1], has been safely received.

Regarding your latest essay, I think the notion of 'small enough' [Ref. 2, p. 6] involves an unacceptable degree of poetry in the adjective "enough" -- see NB at

http://www.god-does-not-play-dice.net/#Zinkernagel_note

Details at

http://www.god-does-not-play-dice.net/#Alice

http://www.god-does-not-play-dice.net/#quantum_principle

I'm glad you offered a tentative verification of your general idea, that "even small violations at that scale can be magnified and lead to observable effects at large scales" [Ref. 2, p. 10] -- please see [Ref. 3].

Notice that any viable theory of quantum gravity must pass the reality check of 3-D space: "it is possible to look around, and see as far as we like" (Lee Smolin),

http://www.god-does-not-play-dice.net/#Buchanan3

In summary, I believe the whole issue (cf. NB at the first link above) is strictly mathematical, which is why I quoted Bishop George Berkeley.

I will appreciate your professional comments, as well as the input from your colleagues.

Regards,

Dimi

------

[Ref. 1] Steven Carlip, Conceptual problems in quantum gravity
http://www.physics.ucdavis.edu/Text/Carlip.html#problems

"According to general relativity, gravity is a characteristic of the structure of spacetime, so quantum gravity means quantizing spacetime itself. In a very basic sense, we have no idea what this means.

…..

"(For a nice review paper by Chris Isham on some of the conceptual issues in quantum gravity, go here.)"
http://xxx.lanl.gov/abs/gr-qc/9310031

[Ref. 2] Idem, The Small Scale Structure of Spacetime; to appear in

p. 2: "Over the past several years, evidence for another basic feature of small-scale spacetime has been accumulating: it is becoming increasingly plausible that spacetime near the Planck scale is effectively two-dimensional. No single piece of evidence for this behavior is in itself very convincing, and most of the results are fairly new and tentative.

.....

p. 6: "For a small enough region of spacetime, one might guess that the causal structure is generic, coming from a random causal ordering.

.....

"We then face a rather bewildering question: which two dimension? How can a four-dimensional theory with no background structure or preferred direction pick out two “special” dimensions at short distances?

.....

p. 10: "There is a danger here, of course: the process I have described breaks Lorentz invariance at the Planck scale, and even small violations at that scale can be magnified and lead to observable effects at large scales [2]."


pp. 8-9: "The result indicates that there is no evidence so far of any quantum nature of spacetime above the Planck length. Spacetime there (distance of 7.3 billion light years from Earth - D.C.) is smooth and continuous."

Subject: Ask Stephen Hawking
Date: Mon, 6 Sep 2010 02:13:43 +0300
Message-ID: <AANLkTi=eKqSxhYR2LiY+fhHQygJHMYT+x8v64NqSs3gM@mail.gmail.com>
From: Dimi Chakalov <dchakalov@gmail.com>
To: eureka@thetimes.co.uk
Cc: Jim Al-Khalili <j.al-khalili@surrey.ac.uk>

Dear Sir or Madam,

Regarding the public lecture at the Royal Albert Hall in London on October 20, chaired by Professor Jim Al-Khalili: may I ask you to deliver a question to Professor Stephen Hawking,

http://www.thetimes.co.uk/tto/science/eureka/article2711970.ece

To quote from the link above: “Because there is a law such as gravity, the Universe can and will create itself from nothing. Spontaneous creation is the reason there is something rather than nothing, why the Universe exists, why we exist. (...) If there are trillions of universes as M-theory proposes, that luck and probability are enough to make our existence feasible, so no God was
needed.”

I have no questions to Professor Hawking regarding the second and third sentences, as spontaneous creation of an infinite multiverse doesn't make sense at all. It rather implies an utterly dumb and sloppy god (hence no capitals), which of course has nothing to do with [John 1:1].

The first sentence, however, clearly suggests that Professor Hawking holds strong opinions on the nature of gravity, quantum cosmology, and quantum gravity. Hence my question:

Q: With all due respect, do you realize that (i) you are a deeply religious person, obsessed by anti-theistic beliefs, and (ii) your book delivers many biased and unprofessional statements?

Should you disagree, please explain (i) the origin of inertia and (ii) your opinion on whether the quantum vacuum energy "gravitates".

Thank you.

Yours sincerely,

Dimi Chakalov
http://chakalov.net
-----
35 Sutherland St
SW1V 4JU


Date: Wed, 18 Aug 2010 16:56:59 +0300
From: Dimi Chakalov <dchakalov@gmail.com>
To: Petr Hajicek ITP <hajicek@itp.unibe.ch>

On Wed, Aug 18, 2010 at 4:51 PM, Petr Hajicek ITP <hajicek@itp.unibe.ch> wrote:
> > Dear Dimi,
> > I cannot understand your comment

Do you have Internet?

> what is missing in my discussion of KS
> (which is standard, see Bub's book)

I have quoted from it: see the letter by Schrödinger from November 1950 at the first link from my initial email.

> Please do not send me to any further texts by you, which are similarly vague.

If you don't want to read and learn more, there is nothing I can do for you.

I wish you a pleasant and peaceful retirement.
Regards,

Dimi

> On Tue, Aug 17, 2010 at 9:13 PM, Dimi Chakalov <dchakalov@gmail.com>
> wrote:
> >>
> >> Dear Petr,
> >>
> >> Apart from the "wellcome" typo in your abstract, the treatment of KS
> >> Theorem (p. 64) is incomplete, which drives your efforts to a blind
> >> alley: I cannot see how you could possibly reconcile your ideas with
> >> STR.
> >>
> >> Q: What is the "back bone" of your quantum state, such that you can
> >> make smooth, bi-directional transitions b/w the word of facts,
> >> governed by STR, and the quantum realm?
> >>
> >> My efforts, which you've been persistently ignoring, are at
> >>
> >> http://www.god-does-not-play-dice.net/#KS
> >>
> >> http://www.god-does-not-play-dice.net/#Levi_Civita
> >>
> >> If you cannot answer my question, check out the links above.
> >>
> >> I will appreciate the professional opinion of your colleagues as well.
> >>
> >> Regards,
> >>
> >> Dimi
> >>

================================================================================================

Subject: Re: ... approaching the planned level of sensitivity?
Date: Fri, 20 Aug 2010 18:24:55 +0300
From: Dimi Chakalov <dchakalov@gmail.com>
To: Leonid Grishchuk <Leonid.Grishchuk@astro.cf.ac.uk>
Cc: Stanislav.Babak@aei.mpg.de,
mukhanov@theorie.physik.uni-muenchen.de

Hi Leonid,

Regarding my email from Wed, 14 May 2003 14:11:49 +0300: I quoted from your gr-qc/9907027 at

http://www.god-does-not-play-dice.net/#Levi_Civita

You and your colleagues are hard-core Russians, and probably will not respond, as you never did so far. Even since August 1981, after my first effort to contact a Russian physicist (David Abramovich Kirzhnitz), I noticed this terribly rigid, Soviet-style thinking.
I also noticed that you are still unable to uncover the blueprints from relic GWs (p. 4 and ref. [4] in gr-qc/9907027). If you're interested in a fresh look at the task, feel free to reply to this email, after reading the text at the link above.

Take care,

Dimi

-----

Note: Recall the correlation puzzle with relic GWs (Scott Dodelson et al., arXiv:0902.3796v1):

"This discovery of the last decade sharpens the classic horizon problem: why does radiation arriving from opposite ends of the Universe share the same temperature? The problem is now even more profound: how were the initial perturbations, with their puzzling synchronization, produced? What physical mechanism could have possibly planted these primordial seeds?"

If you use the 'spherical cow' (linearized) approximation of GR, the "puzzling synchronization" mediated by relic GWs will have to propagate in space, 'from one point in space to another', just like the z-direction toward the L-shaped tunnels of LIGO (e.g., arXiv:1007.3973v1, p. 11, Fig. 5). In the case of relic GWs, with "speed" faster than light.

If you drop the 'spherical cow' (linearized) approximation of GR, you will have to use pseudo-tensors to derive the magic L-shape of LIGO's arms. Try this:


If you succeed, we all will hear about it on CNN Breaking News.

D.C.
October 8, 2010

Subject: “A spoken thought is a lie”
Date: Wed, 27 Oct 2010 07:04:57 +0300
From: Dimi Chakalov <dchakalov@gmail.com>
To: Lev Okun <okun@itep.ru>
Cc: Iegor Reznikoff <dominiqueleconte@yahoo.fr>,
    Serge Krasnikov <gennady.krasnikov@pobox.spbu.ru>,
    Dmitry Slavnov <slavnov@goa.bog.msu.ru>,
    Andrei NB <novikov.borodin@gmail.com>,
    Leonid.Grishchuk@astro.cf.ac.uk,
    Stanislav.Babak@aei.mpg.de,
    mukhanov@theorie.physik.uni-muenchen.de

Dear Dr. Okun,

I'm glad you mentioned Фёдора Ивановича in your latest arXiv:1010.5400v1: the origin of mass may be UNSpeakable,
In the context of the famous saying in the subject line, \( E = mc^2 \) is a "verbalized" lie.

"Никто не обнимет необъятного" (Козьма Прутков), because it is rooted on 'the ideal monad without windows' (Kant's Noumenon). Hence my predictions about that huge Barbie called LHC.

Details at

I will appreciate your critical comments, as well as the professional opinion of your colleagues.

Kindest regards,

Dimi Chakalov
Note: I read today the fifth version of a very intriguing paper by Den Yerokhin 
et al., Dynamics of Universe in Problems, arXiv:0904.0382v5 [astro-ph.CO]; 764 problems. My favorite one is about the "dark energy", p. 56, Task 9:

"Show that assigning energy to vacuum we do not revive the notion of "ether", i.e. we do not violate the relativity principle or in other words we do not introduce notion of absolute rest and motion relative to vacuum."

I emailed Dr. Yerokhin and said that the task seems impossible (I don't know how to define the stress-energy tensor of the vacuum in the first place, and then make sure that it is "proportional to the metric", J. Baez and E. Bunn), and added: "If you know how to solve it, please drop me a line with some hints and references."

The reply by Dr. Den Yerokhin (answer.pdf), along with his permission to post it on this web site, can be downloaded from Yerokhin.zip. You be the judge.

I am still unable to understand how to "assign" energy to the vacuum, as its contribution must be zero (cf. M. Montesinos); additional puzzled from Luca Lussanna and Thomas Thiemann.

D. Chakalov
November 1, 2010

Subject: Dual speed of gravity in GR
Date: Fri, 10 Sep 2010 18:00:52 +0300
From: Dimi Chakalov <dchakalov@gmail.com>
To: Serguei Krasnikov <gennady.krasnikov@pobox.spbu.ru>
Cc: erast@hotmail.com

Serguei,

Regarding your latest essay: I know that you don't care about anything I suggest, as you never did in the past six years.

But since our brains are entangled, I do care about what I say or do *not* say to you. In the latter case, it would be bad if I don't tell you what I think about your latest arXiv:1009.1761v1 [gr-qc], although you will undoubtedly ignore it, since you're Russian.

There are two kinds of distances in the case of deons (Erast Gliner, arXiv:gr-qc/0006072v1): one is in the Riemannian spacetime of GR (examined in your arXiv:1009.1761v1 [gr-qc]), and the other is in the so-called global mode of spacetime,

http://www.god-does-not-play-dice.net/#Bahn

The first distance is always finite, and the speed of gravity does not exceed the "speed" of light, while the latter distance is exactly zero, hence the speed of gravity there seems to be infinite, like a transcendental tachyon. With such dual speed of gravity, you get correlations *resembling* a school of fish:
Subject: Re: Dual speed of gravity in GR
Date: Sat, 25 Sep 2010 04:55:57 +0300
Message-ID: <AANLkTimSDwyxQryOUOe2hqE=p6fHa206=HxFzf7O+qTi@mail.gmail.com>
From: Dimi Chakalov <dchakalov@gmail.com>
To: Jose Geraldo Pereira <jpereira@ift.unesp.br>
Cc: Serge Krasnikov <gennady.krasnikov@pobox.spbu.ru>,
Laszlo Szabados <lbszab@rmki.kfki.hu>,
Jeremy <jb56@cam.ac.uk>,
Chris Isham <c.isham@imperial.ac.uk>,
Adam Helfer <adam@math.missouri.edu>,
John Baez <baez@math.ucr.edu>,
Anthony Zee <zee@kitp.ucsb.edu>,
Sergio Doplicher <dopliche@mat.uniroma1.it>,
Sergiu Klainerman <seri@math.princeton.edu>

Dear Jose,

You and your co-authors stressed that "the electromagnetic wave is unable to transport its own source, that is, electric charge" (arXiv:0809.2911v2 [gr-qc]; cf. p. 4 at the link below).

If I am on the right rack, the true gravitational waves (forget about quadrupole radiation) should be unable to transport their own source either, that is, the entity in the l.h.s. of Eq. 1, p. 35, at the link below.

All the best,

Dimi

On Fri, Sep 24, 2010 at 4:46 PM, Dimi Chakalov <dchakalov@gmail.com> wrote:
> Hi Serguei,
> > Regarding my email from Fri, 10 Sep 2010 18:00:52 +0300: you replied
> > by saying that cannot understand the so-called global mode of
> > spacetime.
> > Check out my comment on J. G. Pereira et al., p. 4 from
If you and your colleagues are still unable to understand the crux of the matter, it will be entirely my fault, so please do write me back with your questions.

Regards,

Dimi

**Note:** In addition to the comments on J. G. Pereira *et al.*, arXiv:0809.2911v2, on p. 4 from [ExplanatoryNote.pdf](http://www.god-does-not-play-dice.net/ExplanatoryNote.pdf), see also Sec. Summary, pp. 35-37 therein, and another paper by J. G. Pereira *et al.*, Does a tensorial energy-momentum density for gravitation exist? arXiv:0812.0034v1. Jose Pereira and his co-authors concluded that "at each point of the world-line, inertia compensates gravitation yielding a vanishing (bit not exactly zero - D.C.) spin connection" (p. 6), and elaborated as follows:

"This means that inertial and gravitational effects are both embodied in the spin connection [XXX] and cannot be separated because of the equivalence principle (notice that inertial and gravitational effects can indeed be separated inside each "point" of the emergent geodesic - D.C.)

"As a consequence of this inseparability, the energy-momentum current in general relativity will always include, in addition to the purely gravitational density, also the energy-momentum density of inertia. Since the latter is a pseudotensor, the whole current will also be a pseudotensor. In general relativity, therefore, it is not possible to define a tensorial expression for the gravitational energy-momentum density. This is in agreement with the strong equivalence principle which precludes the existence of such definition [3]."

If we define the energy-momentum current with the mass-energy conservation equation on p. 35 from [ExplanatoryNote.pdf](http://www.god-does-not-play-dice.net/ExplanatoryNote.pdf), we may recover the source of gravitational waves, placed in the l.h.s. of Eq. 1, p. 35 therein. It yields a time-conserved "charge" with only one "sign", and allows the cosmological "constant" to show up with different values along the non-unitary evolution of The Universe.

More in my talk on Wednesday, 25 November 2015, about what looks in current GR like "torsion". Forget about tensors.

Let's start from scratch [Ref. 1]. I mentioned above that inertial and gravitational effects can be separated inside each "point" of the emergent geodesic, that is, in the postulated global mode of spacetime (not in present-day GR nor in the kind of teleparallel gravity studied by Jose Pereira -- read Janusz Garecki). The "point" in question is the one at which (or rather "inside" which) the two fluxes (Merced Montesinos) cancel each other completely, hence we may imagine some "locally inertial coordinate system in which matter satisfies the laws of special relativity" (S. Weinberg). To be precise, let me quote again Kevin Brown: "Einstein chose for his field equations a gravitational tensor whose covariant derivative vanishes identically, to ensure local conservation of energy-momentum, and this requirement is essentially equivalent to the geodesic hypothesis."

Now, what is the "size" of this "point" in GR? Infinitesimal (check out Ohanian's error here). We just have to zoom on the infinitesimal, which is considered
to be "of small spatial extension" [Ref. 2]. More here.

D. Chakalov
September 26, 2010
Latest update: October 14, 2010

[Ref. 1] Kevin Brown, General Relativity and the Principle of Inertia
http://www.mathpages.com/home/kmath588/kmath588.htm

"However, it's somewhat misleading to say that the equations of motion emerge from the field equations without having been imposed as a separate assumption. They follow as a direct consequence of the fact that particles follow "straight and uniform" inertial paths in each infinitesimal region of spacetime, and this in turn is a direct consequence of the local conservation of energy-momentum. It’s true that the field equations of general relativity imply this conservation, as can be seen by the vanishing of the covariant divergence of the Einstein tensor

\[ \mathcal{G}_{\mu\nu} = R_{\mu\nu} - \frac{1}{2} g_{\mu\nu} R \]

"The field equations simply equate this to the energy-momentum tensor \( T_{\mu\nu} \), so the covariant divergence of the latter must also vanish, hence energy-momentum is locally conserved, hence particles follow geodesics.

"But the local conservation of mass-energy didn't arise automatically, it was specifically designed into the field equations by the inclusion of the "trace" term (the term with coefficient 1/2) in the Einstein tensor. In fact, one of the early attempts of Einstein and Grossmann to formulate generally relativistic field equations led to the result \( R_{\mu\nu} = T_{\mu\nu} \), but not surprisingly this is unsatisfactory, precisely because the covariant divergence does not vanish. After a great deal of searching (and with the crucial help from Levi-Civita - D.C.), Einstein finally realized that the natural conservation laws – and hence the law of inertia – is recovered if we include the trace term. David Hilbert arrived at this same conclusion almost simultaneously (in November 1915), although his route was much more direct, since he proceeded from a Lagrangian, which automatically leads to conservation laws.

"In view of this, it’s surely disingenuous to claim that the field equations of general relativity allow us to dispense with the independent assumption of equations of motion; the equations of motion essentially were imposed as a separate assumption, corresponding to the assumed conservation of energy-momentum that was intentionally built into the equations by the inclusion of the trace term.

......

"It’s possible for the inertial mass of an electrically charged particle to be accelerated in a variety of ways while still conserving electric charge and current. In contrast, the conservation of energy-momentum fully constrains the motion of a massive particle (in the absence of non-gravitational forces), because the inertial mass is identical to the conserved gravitational "charge". The principle of inertia is really just another name for the conservation of energy and momentum.

......
"So, despite Einstein’s hopes, general relativity does not in any way explain or obviate the principle of inertia. Granted, if the field equations didn’t include the trace term (so that the covariant divergence didn’t vanish), the resulting theory would have many problems and be subject to many objections, but this goes without saying. No one disputes that the principle of inertia is extremely well-founded in observation. It is an extremely well-justified postulate – but it is still a postulate. General relativity does not explain inertia, nor does it dispense with the need to organize our spatio-temporal theories on the topology and morphology implicit in the principle of inertia and the associated distinguished coordinate systems."

[Ref. 2] A. Einstein, Autobiographical Notes: "In a gravitational field (of small spatial extension) things behave as they do in a space free of gravitation, if one introduces into it, in place of an "inertial system", a reference system that is accelerated relative to an inertial system."

.....

A. Einstein, 4 April 1955: "(T)he essential achievement of general relativity, namely to overcome 'rigid' space (ie the inertial frame), is only indirectly connected with the introduction of a Riemannian metric. The directly relevant conceptual element is the 'displacement field' (XXX), which expresses the infinitesimal displacement of vectors. It is this which replaces the parallelism of spatially arbitrarily separated vectors fixed by the inertial frame (ie the equality of corresponding components) by an infinitesimal operation. This makes it possible to construct tensors by differentiation and hence to dispense with the introduction of 'rigid' space (the inertial frame)."

(quoted after Friedrich Hehl and Yuri Obukhov, arXiv:0711.1535v1 [gr-qc])

Dear Friedrich,

I noticed your name at http://ctp.bue.edu.eg/workshops/newwebsite/speakers.html

I wonder if you plan to elaborate on the postulate of locality, from

"Postulate of locality: An accelerated observer (measuring device) along its worldline is at each instant physically equivalent to a hypothetical inertial observer (measuring device) that is otherwise identical and instantaneously comoving with the accelerated observer (measuring device)."

Bahram (arXiv:1006.4150v1 [gr-qc]) believes that "an accelerated observer may be replaced in effect (Sic! - D.) by an infinite sequence of hypothetical momentarily comoving inertial observers; mathematically, the world line of the accelerated observer is the envelope of the straight (presumably - D.) world lines of the corresponding hypothetical inertial observers."

I don't believe in teleparallel gravity, and would rather "insert" in that 'envelope of the straight world lines' a special mechanism, which could perhaps make GR *quasi-local*, as well as produce quasi-local positive mass in an asymptotically flat spacetime: please see my email to Dr. Mamdouh Wanas (printed below), and pp. 35-36 from Sec. Summary in http://www.god-does-not-play-dice.net/ExplanatoryNote.pdf

More on what looks like "torsion" in present-day GR at http://www.god-does-not-play-dice.net/#VGP

I wonder if you and/or some of your colleagues would be interested in discussing these ideas.

Best regards,

Dimi

[snip]

Subject: Re: CTP International Conference on Gravity and Cosmology
Date: Mon, 11 Oct 2010 00:35:03 +0300
From: Dimi Chakalov <dchakalov@gmail.com>
To: Friedrich_Wilhelm Hehl <hehl@thp.uni-koeln.de>
Cc: Mamdouh Wanas <wanas@frcu.eun.eg>, Bahram Mashhoon <mashhoonb@missouri.edu>, Jose Geraldo Pereira <jpereira@ift.unesp.br>, Adam Helfer <adam@math.missouri.edu>, Alan Rendall <rendall@aei.mpg.de>, Claus Kiefer <kiefer@thp.uni-koeln.de>, Laszlo Szabados <lbszab@rmki.kfki.hu>

On Sun, Oct 10, 2010 at 11:14 PM, Friedrich_Wilhelm Hehl <hehl@thp.uni-koeln.de> wrote:
> 
> Dear Dimi Chakalov,
> 
> 


Thank you for your email. Of course, I am always open for discussions. However, your ideas are so far from my actual field of interest that I cannot see an overlap with your ideas.

I believe they overlap at the postulate of locality:

-----

>> I wonder if you plan to elaborate on the postulate of locality, from
>> Friedrich W. Hehl and Bahram Mashhoon, Nonlocal Gravity Simulates Dark
>> Matter, Slide 3 at
>> http://www.thp.uni-koeln.de/gravitation/mitarbeiter/nlGrav2010DPG1.pdf
>> "Postulate of locality: An accelerated observer (measuring device)
>> along its worldline is at each instant physically equivalent to a
>> hypothetical inertial observer (measuring device) that is otherwise
>> identical and instantaneously comoving with the accelerated observer
>> (measuring device)."
-----

There is too much poetry in this postulate. If we add gravity to matter, the latter will have to be *quasi-local*. Clarifying the exact meaning of *quasi-local* is the scope of my efforts. We just have to zoom on the infinitesimal, which is (poetically) considered to be "of small spatial extension":

A. Einstein: "In a gravitational field (of small spatial extension) things behave as they do in a space free of gravitation, if one introduces into it, in place of an "inertial system", a reference system that is accelerated relative to an inertial system."

Stated differently, I think you've taken a wrong path marred with too much poetry.

I will appreciate the professional opinion of your colleagues as well.

All the best,

Dimi

Subject: Re: CTP International Conference on Gravity and Cosmology
Date: Mon, 11 Oct 2010 02:12:22 +0300
Message-ID: <AANLkTikdHBbovq_uxyTQ65nwJ7SNZt5f5q=rm5iyW7zbF@mail.gmail.com>
From: Dimi Chakalov <dchakalov@gmail.com>
To: Friedrich_Wilhelm Hehl <hehl@thp.uni-koeln.de>
Cc: [snip]

Dear Fred,

> We know that the clock hypothesis (a special case of the principle of
> locality) is very well obeyed by actual "clocks", like a decaying muon.

For fundamental research, I'm afraid "very well" is also poetry.
Moreover, you're thinking in terms of Archimedean geometry,
http://www.god-does-not-play-dice.net/#Huble_Archimedean

> In other words, here is a result of this "poetry" that can be confirmed experimentally.

But GR cannot *explain* the occurrence/emergence of *finite* attributes of space and time, such as 'one second' and 'one meter',
http://www.god-does-not-play-dice.net/#Levi_Civita2

Surely we enjoy actual "clocks", but in present-day GR they are miracles. And I don't like miracles.

> This is enough for me. If you want opinions of other colleagues, just approach them.

That's what I'm doing. The task is strictly mathematical. If they don't care, some day some young and hungry Chinese grad student might crack the puzzle.

Thank you for your time, and good night.

Dimi
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Note: Friedrich-Wilhelm Hehl was born on August 26, 1937, in Ludwigsburg, Germany. I consider him one of the leading experts on GR:


As Asher Peres used to say, "these things were well known to those who know things well", and Friedrich-Wilhelm Hehl is definitely one of the people who 'knows things well'. Regarding his 1985 article cited above, there are plenty of physical reasons (e.g., Salvatore Capozziello et al., arXiv:gr-qc/0101038) to believe that the spacetime continuum, viewed microscopically, should carry a torsion, but the dynamics of torsion, which F.W. Hehl "left for a forthcoming article" (October 1984), is still missing. Meanwhile the so-called DDE showed up, and the dynamics of torsion became a highly non-trivial task: the spin density of matter is not the source of torsion.

We should dig deeper than R. Penrose. Very briefly: the 720-degree rotational invariance of spinors may be interpreted as two "circles" resembling 8, which pertain to the atemporal "handshaking" of two waves in the postulated global mode of spacetime; the end result "happens" on null-surfaces (Kevin Brown) "at p" [Ref. 1], and has zero duration ("small spatial extension"), as recorded with your wristwatch. The key ideas are that physical events (local mode) emerge on null-surface, and are inherently quasi-local, with vanishing (present continuous) torsion; details on November 25, 2015. Notice the linked text in [Ref. 1] and the notion of 'self force' in Machian gravity [Ref. 2], and check out Eq. 1 on p. 35 from ExplanatoryNote.pdf regarding the axiom of 'dominant
energy condition'.

The null-energy conditions needed for singularity "theorems" and Tipler's theorem are wishful thinking in GR (references above). Because the "dark" energy from the quantum vacuum acts as an additional, all-permeating and perfectly smooth field, we encounter a blatant violation of Newton’s third law; check out an explanation with a car here: "The size of the force on the road equals the size of the force on the wheels (or car); the direction of the force on the road (backwards) is opposite the direction of the force on the wheels (forwards). For every action, there is an equal (in size) and opposite (in direction) reaction."

Compared it with the ultimate free lunch from DDE (August 2006): "Suppose you accelerate a car, but the gauge fuel shows that you're actually gaining more fuel by accelerating the car. That's the ultimate 'free lunch' provided by DDE, only physicists cannot explain it." It doesn't get diluted as space expands. On the contrary, it's getting more and more. From the perspective of contemporary physics, it is far more shocking than perpetuum mobile, simply because it exists.

We cannot apply Newton’s third law (Hans Ohanian) to the source of DDE - some perfectly smooth stuff that "has zero inertial mass" and "can be accelerated with no cost, no effort" (B. Schutz). From the viewpoint of classical physics, this perfectly smooth [we-do-not-know-it] had its highest value at the instant of "inflation" (like the amount of fuel in a tank car), and then should have depleted rapidly, or in accelerated fashion during our current cosmological stage. Quite to the contrary: it springs out from "thin air" and does not, in any way, resemble the Casimir effect, say. It is a genuine non-unitary phenomenon, in the sense of John Wheeler's dictum 'Time is Nature's way to keep everything from happening all at once'. More in the papers above.

The alleged Newtonian limit is totally unclear as well -- notice the self-force from DDE in Machian gravity [Ref. 2] in the text below. Once we accept that space itself has become dynamical, it's a whole new ball game for the current GR.

Perhaps the reader may wish to consider a fiber over a point \( p \in M \) as collection of spinors (cf. p. 4 from Geroch; general info here and here), and see if one can make the "fish" \( p \) more flexible: \( p \) should be endowed with Lorentzian metric only at some (still unclear) quasi-local positive-mass limit at \( p \). The aim is to replace (i) the misfortunate splitting of spacetime in GR with an emergent spacetime along an arrow of space (compare it with R. M. Wald), and (ii) the misleading notion of "curvature" [Ref. 3], usually depicted with some "curved" 2-D surface immersed into 3-dimensional flat Euclidean space (John Baez), with atemporal correlations in the global mode of spacetime.

Have you seen a school of fish? I will take off my Euclidean spectacles [Ref. 3] and try some reverse-engineering. An incomplete list of tasks is outlined below.

Look at the fiber bundle hairbrush at Wiki, and compare it with the "spinning" (along two "circles" resembling \( \mathbb{8} \); see above) quantum hedgehog, which is supposed to show up upon zooming on the infinitesimal point \( p \) at Planck scale.
Q: Can you suggest a new nontrivial bundle (two Möbius strips maybe?) for the quantum hedgehog, which could facilitate the non-linear negotiation between an arbitrary quasi-local "fish", at some infinitesimal point \( p \), and 'the whole school of fish', in Machian perspective? The symmetry operations related to 'dominant energy condition' (cf. above) should be defined over four sectors (notice the fav icon of this web site), in a very remote analogy with Kruskal-Szekeres diagram.

Clarifications: the quantum hedgehog has infinitely many "bristles", which should also facilitate the global view on 3-D space (Wiki): one would see "all points in 3-dimensional space simultaneously, including the inner structure of solid objects and things obscured from our three-dimensional viewpoint" (see below).

Notice that every "fish" should be enabled to choose its quasi-local "geodesic" relationally, upon updating and refreshing its "Einstein field equation" at every next point from its quasi-local "geodesic", in line with Weyl's Principle. Notice that 'relationally' refers to the Heraclitean (non-Archimedean) time (called here 'global mode of spacetime').

Also, the quantum hedgehog should somehow (sorry, I'm totally speechless here) resolve the main puzzles of (i) finite things in space and (ii) the "boundaries" of 3-D space with a new version of Finite Infinity. The assumptions here are that, depending on the "direction" we look at the global mode of spacetime, it will show up as either 'tending asymptotically toward zero' or 'tending asymptotically toward infinity', while a global (omnipresent) observer would "see" the whole 3-D space (local mode) simultaneously, en bloc. Namely, the duration of the glancing at 'the whole school of fish' (the whole 3-D space) will be zero, as recorded with our wristwatch, because the luxon-like dynamics of the two "waves" (cf. above) does not feel any physical time. It's atemporal.

Locally, our global time is zero, and the re-created (AOS) local mode of spacetime is a perfect continuum. Hence all effects from the global mode are inevitably holistic ("dark", after M. Turner).

Last but not least, the ultimate puzzle of the kinematics of space concerns the origin of the so-called "speed" of light: in the local mode of space, the "points" (quantum hedgehogs) of the underlying manifold are chained in such a way that (i) there is nothing between them, (ii) there is an upper limit on the speed of passing physical stuff 'from one point to the neighboring one', and (iii) there is a whole mirror world (Yakov Terletskii) on 'the other side' of this "speed" limit.

That's all for now. I have five years to clarify my hedgehog Ansatz (and "bridge"), to the extent it would become fully comprehensible. It is not an easy task to eliminate the self-referentiality (Kevin Brown) of the metric "field" and expose the genuine dynamics of GR. The textbook rule 'partial derivatives go to covariant derivatives' (Wiki) looks to me like the Born Rule. People believe that the Christoffel connection can somehow "disappear", yet the higher-order derivatives never actually "disappear" [Ref. 4]. Pseudo-tensors work fine FAPP,
although they shouldn't, because nobody knows 'the right answer to the right question' (MTW, p. 467). The metaphysical speculations about what happens in the "sufficiently small" (e.g., Weinberg) are incredibly confusing. Something went wrong in 1915. Just look at the "quantum horizons" from Ashtekar and Krishnan.

Perhaps the inherent nonlinearity in the geodesic equation (Wiki) points to a new, relational dynamics of GR: the additional input from 'the whole school of fish' (Newton's third law is necessarily violated) is being smuggled via the non-linear mechanism of "more gravity" [Ref. 5]. Such "global" input will be inevitably "dark", because we cannot trace back its holistic source by zooming on any quasi-local "fish" at \( p \).

This "smuggling" can be explained by recalling that neither the coordinate time \( t \) nor the proper time \( \tau \) (Wiki) along spacetime trajectories can be used as an independent variable, as \( \tau \) is a "complicated non-local function of the gravitational field itself. Therefore, properly speaking, GR does not admit a description as a system evolving in terms of an observable time variable. (...) In the quantum context a single solution of the dynamical equation is like a single "trajectory" of a quantum particle" (C. Rovelli). Luckily, given 'the quantum principle' and the so-called PR\(^2\) interpretation of QM, one can design such 'single quasi-local trajectory of a single quasi-local quantum particle', in which the holistic input from 'the school of fish' is smuggled into the infinitesimal point \( p \) from the quasi-local trajectory of the quantum-gravitational "fish".

To be precise, at point \( p_n \) the holistic input from 'the school of fish' is wiped out completely, by "cancellation of energy and energy flux of the real gravitational field with the energy and energy flux of the inertial forces field" (Janusz Garecki); hence the "ether" (global mode of spacetime) cannot show up (M. Montesinos). In the fleeting linearized "snapshot" at \( p_n \) (local mode), the total energy of the gravitational field is always zero, the Einstein tensor and the energy-momentum tensor vanish identically, and all "dark" stuff has been linearized and physicalized. The same re-cancellation occurs at the next point \( p_{n+1} \) along the Arrow of Space, but because these seemingly "neighboring" points belong to two different universes from the "flattened" local mode of spacetime (cf. Fig. 1 above), their fleeting physical content is different, while the holistic origin of this difference is "dark". Hence no "fish" can register any "deviation" (with respect to what?) during its re-created quasi-local geodesic: its "geodesic equation" has been updated dynamically, at each and every next point \( p_{n+1} \) -- a genuine Phoenix Universe (Georges Lemaître, 1933). In the terminology of Karel Kuchar, this infinitesimal shift is mediated by the Perennial, which governs the dynamics "from outside as an unmoved mover". Notice that "all time \( \tau \) is eternally present" (K. Kuchar), as it should be.

In general, if we agree that gravitational energy should be defined over finite volumes of space (e.g., B. Schutz), the first off mathematical task is to resolve the main puzzles of finite things in space wrapped by its own "boundaries" at Finite Infinity (details above). This is what produces 3-D space per se, such that (operational definition) we can discriminate between 'inside vs. outside' and 'left vs. right'. These fundamental qualities of space are being wrongly treated as rigid background since 1915. If we introduce an Arrow of Space, perhaps we can recover the dynamics of GR: global time can only emerge from dynamical space.

Hence the idea about a null-surface formulation of 'emergent spacetime' along the Arrow of Space, in line with the so-called biocausality. The latter is defined with respect to the reference fluid in GR [Ref. 6, pp. 31-33]: it is the 'absolute
structure' (James Anderson) of 'the universe as ONE' (global mode of spacetime), which bootstraps all quasi-local quantum-gravitational "fish" into a school of fish. Notice that the "chooser" (P. Pearle) of every next state of a given "fish", along its quasi-local geodesic, is the bootstrapping mechanism of 'the whole shoal'.

As I said above, I don't like miracles, like "decoherence" and "ideal Schrödinger time" [Ref. 7]. The calculations in QM and QFT explicitly presuppose a perfect clock endowing the whole universe with some "global and absolute time" (A. Macias and H. Quevedo), but no physical stuff can reproduce it. It is an acute miracle, especially in GR. Physicists love to ponder on some Cauchy surface [Ref. 8], but it is a smooth differentiable miracle that cannot be assembled exclusively by physical stuff either (cf. Paul Tod's video lecture). Mathematicians used pure math and intuition to "assemble" these smooth differentiable miracles, then the founding fathers of GR (Levi-Civita, Einstein, and Hilbert) agreed upon introducing Lorentzian signature by hand, and banned these 'absolute structures' and Perennials.

That's what went wrong in 1915. We need new ideas about the origin of space. If you look carefully at the Finite Infinity and the pre-geometric plenum, you will realize that these are the only possible solutions for 3-D space to be wrapped by itself, and to produce a perfect continuum (see above): in the latter case, 'the universe as ONE' is being multiplied as infinitely many (uncountably infinite) infinitesimal 'points' chained in the local (physical) mode of spacetime by 'the whole universe as ONE' ... which is in turn non-existent there!

This is the pre-geometric plenum made by the so-called Aristotelian Connection; all geometrical "points" from 'the grin of the cat without the cat' (Alice) are connected by themselves (local mode) -- one-connection-at-a-time along AOS. No other option for self-wrapping of space and self-connecting of points seems possible.

To explain the claim in the preceding sentence, let me elaborate a bit more on the self-wrapping of 3-D space with the drawing below, bearing in mind the equation $LS = 1$ here. The meaning of finite things (elephant's trunk for 'space') is denoted with the unique number 1, which can be seen above as well. Notice the interplay of Archimedean and non-Archimedean geometry, which is missing in diff geometry textbooks (e.g., Chris Isham's one here) and in present-day GR.

Once the size of the infinitesimal (S) reaches the non-Archimedean realm of geometry, it becomes a geometrical point $p$ (from Planck scale), with "size" running asymptotically toward 0, while the "size" of $L$ is running asymptotically toward infinity, along the vertical axis. The global mode of spacetime refers to 'the whole universe as ONE' (Lucretius). The latter is totally missing in the local mode due to the "speed" of light, hence the physical space of 'finite things' becomes a perfect continuum: all points $p$ are entangled and self-connected by their 'common cause' of ONE (global mode), and by virtue of $LS = 1$.

No other option seems possible.

The drawing above can also explain the idea of dual cosmological age: finite in the global mode, and infinite/indecisive in the local mode, as the deflation time.
can never actually reach The Beginning at 0; details in pp. 35-36. As to the postulated **Equation of Space**, picture yourself riding the infinitesimal toward 0: from the viewpoint of the **global** mode, one could imagine an "accelerated" shrinking stage by approaching "zero" size/The Beginning, but in the local mode such "accelerated" stage is an **illusion**. Likewise in the case of time-and-space-reversed "direction"; see the original full drawing [here](http://www.god-does-not-play-dice.net/#XXX): people believe that space is *expanding*, but it actually *isn't*, because it would take an infinite cosmological time (local mode) to actually reach *the maximum large space*, denoted with \( L \).

There is no "accelerated" stage (Emil Mottola) in "shrinking" or "expanding" the volume of space by approaching asymptotically \( S \) or \( L \). The confusion with the old (since 1930s) cosmological "constant" problem is due to the **shape of space near** the two "boundaries" defined with *Finite Infinity*, and on the unwarranted assumption that the "dark energy" is due to some [we-do-not-know-it] with **positive** mass density (an *'elephant in a china shop'*), so it enters the current equations in GR: "a negative pressure can **overcome** a positive energy density" ([ibid.](http://www.god-does-not-play-dice.net/#XXX)). Alternatively, check out Eqs 1 and 2 in *ExplanatoryNote.pdf*, pp. 35-36.

(The very **cracks**, through which the **physicalized** (=converted into positive, cf. Eq. 1, p. 35) vacuum energy **gets smuggled** into the local mode of spacetime, vary in a wide interval, from producing "6 \times 10^{-10} \text{joules per cubic meter}" ([John Baez](http://www.god-does-not-play-dice.net/#XXX)) to an equivalent in energy to 5 (five) solar masses emitted in under 60 seconds in the form of **X-rays and gamma rays**; all this "dark energy" comes from the "ether", ranging from an *almost* vanished flux to "10^{54} \text{ergs/pulse}" in **GRBs**.)

The 'physical size of lengths in 3-D space' (the **scale factor**) would have to actually **expand** if we were limited to **Archimedean geometry** only. Were that the case, one could eventually picture some conformal recipe for reaching infinity by "rescaling the metric", as envisaged by [R. Penrose](http://www.god-does-not-play-dice.net/#XXX).

Regarding the "size" of *the maximum large space*, \( L \), in the proposed version of *Finite Infinity*: look at the slope in the **current** "accelerated" stage from [NASA](http://www.god-does-not-play-dice.net/#XXX), and map it to a reversed/inverted drawing (cf. the full original drawing [here](http://www.god-does-not-play-dice.net/#XXX)): can you extend the curve (not shown above) to reach an "accelerated" stage of approaching asymptotically infinite space? This will be the ultimate "cosmological horizon" for gravity. Because gravity cannot operate in infinite space, \( L \) should possess a numerically finite but **physically unattainable** value, perhaps in a manner resembling the "speed" of light for **bradyons**.

Finally, notice the **Gedankenexperiment** with an observer witnessing a "shrinking" bzw. "expanding" table with length two meters, starting from the macro-world. However, "It is very hard to imagine what new physics would introduce a cutoff on a scale of the order of 0.01cm" ([L.H. Ford](http://www.god-does-not-play-dice.net/#XXX), gr-qc/0504096v2, p. 6). I am only suggesting that the dual notions of 'small running toward \( S \)' and 'large running toward \( L \)' are **relative** to the length scale of tables and chairs. Namely, a **companion observer** watching the "changing size" of physical objects will not notice any difference whatsoever: her table stretched to the size of a galaxy, and her table shrunk to the size of an atom, will always keep its "size" of 'two meters' (or '0.01cm', L.H. Ford). This is an effort to revive the old idea of 'mutual penetration of the Large and the Small', but it will take a lot of work to identify the new symmetry operations for 3-D space, starting from the macro-world, along some reversible time-and-space "direction" toward \( S \) and \( L \).

I intend to elaborate on the time-and-space reversed "direction" (inverted space
with its CPT symmetries, like inverting a rubber glove inside out) and the VGP formulation of GR on 25.11.2015. The full original drawing here offers some hints for interpreting the possible forms of 'mass' (Yakov Terletskii) and the adiabatic separation of positive and negative mass [Ref. 9], but much more work is needed to clarify the whole bundle of issues and the interpretation of "torsion effects".

As it happens very often, I'll probably admit in November 2015 that what I wrote today, 15.11.2010, was very confusing. Sorry, I'm just a psychologist and my efforts are stereotyped as "just another crank". Well, you be the judge.

Maybe there are indeed wrong ideas at my web site, but recall Christopher Columbus: If we don't leave for India, how can we discover America?

D.C.
October 11, 2010
Last update: November 15, 2010


"To each point on a Riemannian manifold, it assigns a single real number determined by the intrinsic geometry of the manifold near that point."

http://en.wikipedia.org/wiki/Sectional_curvature

"In Riemannian geometry, the sectional curvature is one of the ways to describe the curvature of Riemannian manifolds. The sectional curvature \( K(\sigma_p) \) depends on a two-dimensional plane \( \sigma_p \) in the tangent space at \( p \)."

Notice the infinitesimal instant \( P \) from Leibniz, which allows us "to construct tensors by differentiation" (A. Einstein):

![Figure 16: The blue (dotted) line is the tangent at \( P \). Leibniz called the triangle \( PRT \) the characteristic triangle. He determined the ratio \( RT/PR \). He put \( PR = \Delta x \) and \( RT = \Delta y \) so he found \( dy/dx \)."

"These are the laws of an instant in canonical gravity. (...) In general relativity (notice Einstein's opinion here - D.C.), dynamics is entirely generated by constraints. The dynamical data do not explicitly include a time variable," says Karel Kuchar. Which is why the global time from the "expansion of space" is "dark" in current GR. In the forthcoming VGP formulation of GR, the "constraints" are
produced by 'the shoal of fish' and are similar to the [10, 20] condition for emergent quasi-local geodesics (cf. below). Thus, the corrected QM and GR are united at the 'base manifold' of emergent continuum.

http://en.wikipedia.org/wiki/Positive_mass_theorem

"In general relativity, the positive energy theorem (more commonly known as the positive mass theorem in differential geometry) states that, assuming the dominant energy condition, the mass of an asymptotically flat spacetime is non-negative; furthermore, the mass is zero only for Minkowski spacetime.'


Footnote 5, pp. 5-6: "Locality, for which the metric tensor $g_{mn}$ reduces to the Minkowski metric and the first derivatives of the metric tensor are zero, is limited by the non-vanishing of the Riemann curvature tensor, as in general certain combinations of the second derivatives of $g_{mn}$ cannot be removed. Pragmatically, it may be concluded that violating effects on the EP may be negligible in a sufficiently small spacetime region, close to a given event.  
...
"the Apollo 15 display of the simultaneous fall of a feather and a hammer [4].  
......

Footnote 24, p. 21: "It is sometimes stated that the interaction of the particle with its own gravitational field gives rise to the self-force. It should be added, though, that such interaction is due to an external factor (...). In other words, a single and unique mass in an otherwise empty universe cannot experience any self-force. Conceptually, the self-force is thus a manifestation of non-locality in the sense of Mach's inertia [135]."


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In the light of the geometric vision acquired by all our previous discussion, we can indulge in some instructive reflection. As repeatedly stated, there is no "curvature of space". Curvature is a property of a connection, and a great many connections may be defined on the same space. Take an electron on a Riemannian spacetime. It responds to the action of the Levi-Civita connection given by the Riemannian metric. Now add an electromagnetic field. The electron will now answer to the appeal of two connections, the previous one and the electromagnetic potential. Add further a neutrino: it will feel (probably) the Levi-Civita connection, but not the electromagnetic potential. As long as it stays far from the electron, there will be no manifestation of the weak-force connection. Thus, different particles feel different connections, different curvatures, and will consequently show distinctly curved trajectories to our euclidean eyes.


p. 14: "In general relativity the problem of gravitational field energy is notoriously more subtle and complex. This is due to the nonlinearity of the field equations, which in turn is related to the fact that gravity carries energy and is thus a source of more gravity (emphasis mine - D.C.). In this sense gravity differs fundamentally from the electric field, which does not carry charge and thus is not the source of more electric field.

....

p. 17: "At present it is certainly not clear what might replace our present concept of spacetime at the Planck scale."

http://www.phys.lsu.edu/faculty/pullin/kvk.pdf


p. 2: "Here we denote by t the ideal classical time that appears in the ordinary Schrödinger equation. (...) If one make some judicious assumptions, namely, that the clock does not interact with the system, that the clock is in a highly classical state (a coherent state where the “hand” of the clock is sharply peaked in space and moves in a monotonous way), ....

....

p. 3: "If one assumes one has a *clock* that follows the ideal Schrödinger time perfectly, ...

....

p. 6: "The problem of macro-objectification of properties may be described according with Ghirardi [11] as follows: "how, when, and under what conditions do *definite macroscopic properties emerge* (in accordance with our daily experience) for systems that, when all is said and done, we have no good reasons for thinking they are fundamentally different from the micro-systems of which they are composed?"

Subject: Request for opinion
Date: Fri, 5 Nov 2010 22:27:24 +0200
From: Dimi Chakalov <dchakalov@gmail.com>
To: Stephen Crothers <thenarmis@gmail.com>
Cc: Thomas.Mueller@vis.uni-stuttgart.de, Frank.Grave@vis.uni-stuttgart.de, Hans C Ohanian <chohanian@einsteinmistakes.com>

Dear Steve,

May I ask for your comment on the apparent discrepancy in treating "the conservation equation" (cf. conservation.jpg attached) in

and in

Hans C. Ohanian, arXiv:1010.5557v1 [gr-qc],
http://arxiv.org/abs/1010.5557

Please see non_conservation.jpg attached, from p. 3.

Q: How would you design a "geodesic" if the conditions for "conservation law" (non_conservation.jpg) are not fulfilled? I am referring here to the so-called "dark energy", which could spring from the l.h.s. of Einstein field equation.

Thank you for your time and consideration.

I will appreciate the professional opinion of your colleagues as well.

All the best,

Dimi

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Note: In order to pinpoint the "cracks" from 'the self-force' (A. Spallicci), through which the holistic ("dark") energy of 'the shoal of fish' gets smuggled into the quasi-local points of the emergent geodesic, check out S. Weinberg, p. 68 (links and emphasis added):

"Although inertial forces do not exactly cancel gravitational forces for freely falling systems in an inhomogeneous or time-dependent gravitational field, we can still expect an approximate cancellation if we restrict our attention to such a small region of space and time that the field changes very little over the region."

I will address (1) the localization of gravitational energy and (2) the notion of 'isolated system'.

1. See A. Abbassi and S. Mirshekari, arXiv:0908.0286v1 [gr-qc], p. 2; excerpts from their ref. [10] can be read above.

In fact, the problem arises when we want to extend special relativity to GR. In special relativity and even in classical mechanics we can show the differential form of energy-momentum conservation law by

\[ T_{\mu\nu} = 0, \]

where \( T_{\mu\nu} \) is the symmetric energy-momentum tensor which refers to the local flux and density of energy and momentum related to matter and all non-gravitational fields such as electromagnetic field. But, in GR, by using the Bianchi’s identities \( C_{\mu\nu\lambda} \) in field equations \( C_{\mu\nu} = 8\pi T_{\mu\nu} \) we obtain [10]

\[ T_{\mu\nu} - \frac{1}{\sqrt{-g}} (\nabla_{\lambda} T_{\mu\nu})_{\lambda} = \Gamma^{\lambda}_{\mu\sigma} T_{\lambda\nu} = 0, \]

where \( \Gamma^{\lambda}_{\mu\sigma} \) are the connection coefficients. This means that in GR energy-momentum tensor can not satisfy the conservation law \( (T_{\mu\nu} \neq 0) \). Thus, we should look forward for an alternative quantity which its ordinary derivative is zero in each point of manifold, and therefore can be localized.
I'm afraid the task for "alternative quantity" in the last sentence is not feasible with tensors (R. Penrose), and because I don't accept parapsychology in terms of "pseudo tensors", the only way out seems to develop a VGP formulation of GR for Machian universe (there isn't such animal as "vacuum equation", Ric(g) = 0), cf. [Ref. 1]) to define energy and angular momentum (A. Helfer) as quasi-local variables, in a way resembling a school of fish.

2. See my comments to Bjoern Schmekel here. In order to fix energy densities at a "point", we need 'the whole spacetime' to be self-wrapped with "boundaries" along spacelike and null directions. It's a package. We also need some linearized and flattening "collapse", as I argued here; crucial details here, here, and here.

If you're interested, please read the text by following the links, and email me with your questions. Anything you weren't able to understand will be entirely my fault.

The most difficult puzzle to me is that our wristwatches are 'canonical clocks' that are at rest with respect to [we-do-not-know-it], and read our common 'cosmological time', so we have miracles in GR. Related to this puzzle is the long standing issue with the energy in the vacuum: it has an additional and unique freedom to stay in some "latent state", such that it may not contribute to "curvature", hence people can afford to look for 'energy differences' only (cf. John Baez' online paper here). If you measure the temperature of your bath tube, and find out that it as 'slightly above 37°C', you can ignore such minuscule temperature increase (and publish your paper in Nature), but in our case we have two infinitely large and powerful sources of "cold and hot water", which cancel out their input almost exactly, to produce a minuscule observable increase 'slightly above 37°C'. And this "slightly above" is manifestation of 'the ether'.

The usual renorm recipes won't work, because we cannot pinpoint some latent yet "carefully defined limit for the continuum of values" kept in the vacuum. The same vacuum can empower, in different circumstances, the most violent energy release we've seen, such as an equivalent in energy to 5 solar masses emitted in under 60 seconds in the form of X-rays and gamma rays.

In other words, the "cracks" left for the holistic ("dark") energy of 'the shoal of fish' (see above) are incredibly flexible -- an upper limit, if any, on these "cracks" is totally unclear (cf. Eq. 1 on p. 35 from ExplanatoryNote.pdf).

All this unfolds from the textbook interpretation of those 'twice contracted Bianchi identities', as stressed by Hans Ohanian. Aren't you interested? Please feel free to disagree, and explain why.

But if you trust Chris Isham -- don't bother to reply. Follow 'comma to semicolon rule', whenever possible, and be happy with the available "boundary conditions" and "geodesic hypothesis".

D. Chakalov
November 8, 2010
Last update: November 11, 2010

Special Relativity must manifest in sufficiently small regions of his gravitational field and that these regions can be located anywhere in his gravitational field.

\[ \text{Ric} = 0 \] describes a universe that contains no matter, by construction. But if that is so then there is no matter present to cause the gravitational field, bearing in mind that the field equations are also claimed to couple the gravitational field to its sources. One cannot remove matter by setting \( \text{Ric} = 0 \) (i.e. \( \text{Tuv} = 0 \)) and then insert a mass, post hoc, by means of Newtonian two-body relations, into the resulting metric in order to introduce a cause of the alleged gravitational field "outside the body".

General Relativity is a non-linear theory and so the Principle of Superposition does not apply. Consequently one cannot simply add masses to a given solution to the field equations. Every different configuration of matter requires a corresponding set of field equations to be solved. There are no known solutions to Einstein's field equations for two or more masses and no existence theorem by which it can even be asserted that the field equations contain latent solutions for multiple masses.

Furthermore, point-mass singularities occur in Newtonian theory – they are called centres of mass. The centre of mass of a body is a mathematical artifice, not a physical object. Once can go to a shop and buy a bag of marbles but one cannot go and buy a bag of centres of mass of those very same marbles.

According to the astrophysical scientists it takes an infinite amount time for an observer to detect an event horizon. But nobody has been and nobody will ever be around for an infinite amount of time in order to confirm the presence of an event horizon. Consequently the concept has no validity in science. In addition, the aforementioned observer cannot be present in a spacetime that by construction contains no matter, assuming that observers are material. I do not see how an observer can be anything other than material.

Concerning Einstein gravitational waves, none have been detected. This is also not surprising because the search for such waves is destined to detect none. Since \( \text{Ric} = 0 \) violates the physical principles of General Relativity Einstein’s field equations form an identity with zero so that the total energy of the gravitational field is always zero; so that the Einstein tensor and the energy-momentum tensor must vanish identically; so that the localisation of gravitational energy is impossible; and so that the field equations violate the usual conservation of energy and momentum so well established by experiment. I wrote a paper on this which contains no mathematics:

[www.sjcrothers.plasmaresources.com/GW.pdf](http://www.sjcrothers.plasmaresources.com/GW.pdf)

That an erroneous theory can seemingly account for various observed phenomena is not new to science. The Ptolemaic system of epicycles accounted for various celestial phenomena but is nonetheless an erroneous theory.

I now give you a simple recipe to prove me wrong. Prove that matter can be present in a spacetime that by construction contains no matter, prove that Einstein's pseudo-tensor is not a meaningless concoction of mathematical symbols, and prove that \( r \) in Hilbert’s metric is not the inverse square root of the Gaussian curvature of the spherically symmetric geodesic surface in the spatial section of the Hilbert manifold.

All of my papers on aspects of General Relativity are on my webpage:
Dear Steve,

Thank you for your reply from Fri, 12 Nov 2010 13:55:44 +1100.

My request for opinion was:
http://www.god-does-not-play-dice.net/#Bianchi

"Q: How would you design a "geodesic" if the conditions for "conservation law" (non_conservation.jpg) are not fulfilled? I am referring here to the so-called "dark energy", which could spring from the l.h.s. of Einstein field equation."

> Whether one considers Einstein's covariant derivative on \( T_{uv} \) as a
greater conservation of energy law or as an energy transfer law seems to me
> to be a matter of semantics and of no great importance. In any event
> it is my view that \( \text{Ric} = 0 \) is inadmissible and so the Einstein field
> equations violate the usual conservation of energy so well established
> by experiment. The total energy of Einstein's gravitational field is always
> zero and this is disastrous.

I am unable to relate your opinion to the question above. One obvious answer would be 'one cannot design such "geodesic" under these conditions', because, as M. Montesinos stressed in arXiv:gr-qc/0311001v1, pp. 4-5:

"More precisely, \( t_{uv} = 0 \) tells us that the 'reaction' of the dynamical background metric is such that it just cancels the effect of 'flux' associated with the matter fields. It is impossible (and makes no sense) to have a locally non-vanishing 'flux' in this situation. If this were the case, there would be no explanation for the origin of that non-vanishing 'flux' (it will look "dark" - D.). Moreover, that hypothetic non-vanishing 'flux' would define privileged observers associated with it (the ether would come back!)."

I believe we all agree to keep the metric dynamical: it should keep playing its double role in the sense that it is both a field variable and defines the geometry *at the same time* (L. Szabados, private communication).

Then my approach to incorporating "dark" energy in GR is two-fold. On the one
hand, keep the 'flux' vanishing up to $10^{-122}$, that is, "the 'content' of energy and momentum densities and stress associated with the matter fields [$\psi$] (which is characterized in $T_{\mu\nu}$) and the 'content' of energy and momentum densities and stress associated with the gravitational field [XXX]" (M. Montesinos) should cancel each other *almost* exactly.

On the other hand, introduce a (brand new?) dynamics of this *almost exact* cancellation by two kinds of time (global mode and local mode) pertaining to *two standing gravitational waves*, such that we have *at the same time* (L. Szabados) an almost exact cancellation à la John Cramer, http://www.god-does-not-play-dice.net/#Evans

To be precise: the hypothetical 'two standing gravitational waves' pertain to the global mode of spacetime, and their perpetual cancellation re-creates the instants (plural) at which the negotiations b/w the two sides of Einstein equation ("space acts on matter, telling it how to move; in turn, matter reacts back on space, telling it how to curve", John Wheeler) are completed -- one-negotiation-at-a-time, along an Arrow of Space, http://www.god-does-not-play-dice.net/#Zinkernagel_note

That's the "crack" through which the vacuum energy gets smuggled into GR. Details at http://www.god-does-not-play-dice.net/#Hehl_note

Please notice that the total energy of Einstein's gravitational field is tending asymptotically toward zero at each and every instant of *completed* negotiation, which is why people can introduce initially wrong assumptions (e.g., "vacuum equation" with $\text{Ric} = 0$ and linearized approximation of GR, to name but a few), although all these assumptions sound like the Born Rule in QM.

The whole 'geodesic hypothesis' looks clear only to undergraduates -- check out A. Rendall's Irr-2005-6, 9.6 The geodesic hypothesis.

But of course you may have quite a different approach toward designing a "geodesic" under the conditions spelled out above. A penny for your thoughts!

I extend this request to your colleagues as well.

All the best,

Dimi

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**Note:** My efforts are too specific and may not attract the attention of experts in GR, so let me briefly explain why we need quantum gravity to understand GR. I will reproduce excerpts from the text offered by R. Aldrovandi and J. G. Pereira, An Introduction to GENERAL RELATIVITY, March-April/2004, http://www.ift.unesp.br/qcg/igr.pdf

1. A real observer ($\S 3.11$) is not 'point-like', and therefore we need a quantum version of the strong equivalence principle (R. Aldrovandi, J. G. Pereira, K. H. Vu, Gravity and the Quantum: Are they Reconcilable? gr-qc/0509051 v1). This
is a big can of worms -- check out the macro-objectification problem from GianCarlo Ghirardi, ref. [11] above. The solution proposed here is quasi-local emergent geodesic, resembling the trajectory of a fish -- it gets its nonlocal gravitational corrections and contributions from 'the whole school of fish', and follows locally a trajectory comprised of "points" -- one-correction-at-a-point along AOS. It makes no sense of talking about "curvature" (§3.81), because an ideal observer (§3.11) doesn't have Akasha-like memory to "recall" its experience without such corrections and contributions from gravity. The quantum-gravitational "fish" is a contextual and Machian-like relational entity, hence it must never be "free from external forces" (§3.11).

2. You need (I don't) a constant gravitational field to make sense of "coordinate time" (cf. §3.36) and "finite distances in space" (§3.42), pertinent to "the scale factor R(t)" as defined above, with cosmological "constant" set to zero.

If, however, we have "time-dependent gravitational field, we can still expect an approximate cancellation if we restrict our attention to such a small region of space and time that the field changes very little over the region", says Steven Weinberg. There is too much poetry in this excerpt, as well as in other crucial ideas explained here.

The solution to the two tasks above is utterly needed. Do it, and if you come up with ideas different than those proposed here, I will consider my work redundant, hence wrong.

Good luck.

D. Chakalov
November 13, 2010
Last update: November 15, 2010
§ 3.11 As we have said, curves are of fundamental importance. They not only allow testing many properties of a given space. In spacetime, every (ideal) observer is ultimately a time-like curve.

The hub of the equivalence principle is the concept of observer:

An observer is a timelike curve on spacetime, a world-line.

Such a curve represents a point-like object in 3-space, evolving in the time-like 4-th “direction”. An object extended in 3-space would be necessarily represented by a bunch of world-lines, one for each one of its points. This mesh of curves will be necessary if, for example, the observer wishes to do some experiment. For the time being, let us take the simplifying assumption above, and consider only one world-line. This is an ideal, point-like observer. If free from external forces, this line will be a geodesic.

And here comes the crucial point. Given a geodesic γ going through a point \( P \) (\( \gamma(0) = P \)), there is always a very special system of coordinates (Riemannian normal coordinates) in a neighborhood \( U \) of \( P \) in which the components of the Levi-Civita connection vanish at \( P \). The geodesic is, in this system, a straight line: \( y^a = c^a s \). This means that, as long as \( \gamma \) traverses \( U \), the observer will not feel gravitation: the geodesic equation reduces to the forceless equation \( \frac{dy^a}{ds} = \frac{d^2y^a}{ds^2} = 0 \). This is an inertial observer in the absence of external forces. If \( \Gamma = 0 \), covariant derivatives reduce to usual derivatives. If external forces are present, they will have the same expressions they have.

§ 3.13 How point-like is a real observer? We are used to say that an observer can always know whether he/she is accelerated or not, by making experiments with accelerometers and gyroscopes. The point is that all such apparatuses are extended objects. We shall see later that a gravitational field is actually represented by a curvature and that two geodesics are enough to denounce its presence (§ 3.46).

§ 3.36 A gravitational field is said to be constant when a reference frame exists in which all the components \( g_{\mu\nu} \) are independent of the “time coordinate” \( x^0 \). This coordinate, by the way, is usually referred to as “coordinate time”, or “world time”. The non-relativistic limit given above is an example of constant gravitational field, as the potential \( V \) in (3.54) is supposed to be time-independent.

§ 3.42 Finite distances in space have no meaning in the general case, in which the metric is time-dependent. If we integrate \( \int dl \) and take the infimum (as explained in § 2.45), the result will depend on the world-lines. Only constant gravitational fields allow finite space distances to be defined.
Dear Iegor,

Thank you for your [snip].

> What do you mean when saying (in your last email): it is what I see by zooming?

In the case of your *brain* (not mind),

http://www.god-does-not-play-dice.net/Azbel.html#self

... the UNdecidable KS state is explained with two sayings at

http://www.god-does-not-play-dice.net/#Brun

1. You can't hide a piece of broccoli in a glass of milk.

2. Don't wear polka dot underwear under white shorts.

The UNdecidable quantum state of your *brain* is not about broccoli, underwear, milk, or shorts, nor anything we can put in Dirac brakets. It doesn't live in Hilbert space either,

http://www.god-does-not-play-dice.net/#KS_details

I tried to "zoom" on it, and it looks to me like a hedgehog,

http://www.god-does-not-play-dice.net/#Hehl_note

I wonder what you would see!
Best regards,
Dimi

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Subject: "Fantastically stupid students ... "
Date: Fri, 26 Mar 2010 14:57:49 +0200
Message-ID: <bed37361003260557x34e959b3n9581ea36185d6e06@mail.gmail.com>
From: Dimi Chakalov <dchakalov@gmail.com>
To: John Baez <baez@math.ucr.edu>
Cc: david.corfield@tuebingen.mpg.de, alex@math.ucr.edu,
t.leinster@maths.gla.ac.uk, shulman@math.uchicago.edu,
urs.schreiber@gmail.com, s.willerton@sheffield.ac.uk

"Fantastically stupid students - five times I repeat proof, already I understand it
myself, and still they don't get it."
This Week's Finds in Mathematical Physics (Week 294)
http://math.ucr.edu/home/baez/week294.html

John:

Regarding your last email from 14 Jan 2002, check out a simple explanation,
with two clear drawings, at

http://www.god-does-not-play-dice.net/#Bahn

Any chance to qualify for your 'This Week's Finds in Mathematical Physics' ?

Or maybe the grapes are too high for you ?


Dimi

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Subject: Re: Black Holes and Schwarzschild's actual solution
Date: Mon, 15 Nov 2010 13:06:03 +0200
From: Dimi Chakalov <dchakalov@gmail.com>
To: Christian Corda <cordac.galilei@gmail.com>
Cc: Stephen Crothers <thenarmis@gmail.com>,
Diego Lucio Rapoport <diego.rapoport@gmail.com>,
Jeremy Dunning-Davies <J.Dunning-Davies@hull.ac.uk>

On Mon, Nov 15, 2010 at 12:11 PM, Christian Corda
<cordac.galilei@gmail.com> wrote:
[snip]

> Mr. Chakalov is a poor man who understand NOTHING about physics
and mathematics. He contacted my in the past by trying to convince me that gravity-waves do not exist but I stopped to discuss with him when I realized that he does not understand the principle of overlapping waves, i.e. a principle that people learn during High School...

Instead of shouting with capital letters, all you have to do is prove me wrong:

http://www.god-does-not-play-dice.net/Szabados.html#SBG

On Thu, 18 Sep 2008 14:07:04 +0200 (CEST), Subject: Re: Netiquette, <christian.corda@ego-gw.it> wrote:
> I can agree with your point of view, but the important point here is that such a overlapping and conflating, like *spaghetti bolognese*, could in principle, generate a signal which is different from zero in the arm of an interferometer.

So, you agreed with my point of view -- see SBG argument at the link above -- but claim that one can "generate a signal which is different from zero in the arm of an interferometer".

How would you extract such signal from the *spaghetti bolognese*?

You've keeping quiet for two years.

Don't be shy, Christian. Go ahead. Make your best shot.

D.

Note: Regarding the subject of this email correspondence, Black Holes and Schwarzschild's actual solution, I will post Christian Corda's reply to Stephen Crothers, regarding 'The Schwarzschild Solution and its Implications for Gravitational Waves: Part I' at


Stephen Crothers: "The quantity \( r \) appearing in 'Schwarzschild’s solution’ has never been correctly identified by the physicists. It is irrefutably the inverse square root of the Gaussian curvature of a spherically symmetric geodesic surface in the spatial section, not a distance of any kind in the manifold. The signatures of the black hole, an infinitely dense point-mass singularity and an event horizon, have never been identified anywhere, and so no black hole has ever been found."

Here’s what Christian Corda wrote to Stephen Crothers:

Subject: Re: Black Holes and Schwarzschild's actual solution
Date: Mon, 15 Nov 2010 11:11:32 +0100
Message-ID: <AANLkTima0pZPngN1fbWUg5GcHxVX53PcBFHnzJ3ne=F@mail.gmail.com>
From: Christian Corda <cordac.gallilei@gmail.com>
To: Stephen Crothers <thenarmis@gmail.com>
Cc: Diego Lucio Rapoport <diego.rapoport@gmail.com>, dchakalov@gmail.com
Christian Corda: "I want have NOTHING to do with lowest people like Mr. Dimi Chakalov and Mr. Diego Lucio Rapoport.

[snip]

"Originally, I was "philosophically" in agreement with you (Stephen Crothers - D.C.).

"Unfortunately, by performing the computation, I realized that you (Stephen Crothers - D.C.) should be wrong. In fact, I have shown in my latest paper [link to arxiv.org/abs/1010.6031] that the "original Schwarzschild solution" results physically equivalent to the solution re-adapted by Hilbert, i.e. the solution that is universally known like "the standard Schwarzschild solution", and the authors like you, who claim that "the original Schwarzschild solution" implies the non existence of black holes give the wrong answer. The misunderstanding is due to an erroneous interpretation of the different coordinates. I further clarify this point.

"In my opinion, it is wrong also claiming that Hilbert's supposed mistake spawned the black hole. The concept of black-hole arises from the study of the INTERNAL geometry of the collapsing star, not from the EXTERNAL solutions like the ones of Schwarzschild, Hilbert, Brillouin etc. The key point is that, when you match the internal solution with the external solutions, ALL the geodesics of the collapsing matter look to fall in a single point in the core of the star. This happens in both of the cases of the original Schwarzschild line element and of the Hilbert's one.

"I have shown this point in my paper [link to arxiv.org/abs/1010.6031]. It is also simple to show that this key point remains when one matches ANY other EXTERNAL solution given by any other analytic function R(r) without violation of spherical symmetry and without violation of Ric = 0 with the internal solution.

"Thus, the infinite number of analytic functions that satisfy Ric = 0 become, for this reason, i.e. for the collapsing of the matter in a single point in the core of the star in the internal solution, NOT infinite different solutions for the external geometry, but THE SAME solution in infinite different coordinate systems!! They describes the singular and EXTERNAL spacetime of a sole un-dimensional point where all the mass is collapsed. If one finds the way to avoid ALL the geodesics of the collapsing matter to fall in a single point in the INTERNAL, not in the EXTERNAL solution the matter does not arrive to the horizon and the black-hole does not form.

"On the other hand, you (Stephen Crothers - D.C.) also claim that the quantity r that appears in the "Schwarzschild solution" is NOT a radius of anything in the associated manifold and that it is NOT even a distance in the associated manifold but that it is the inverse square root of the Gaussian curvature of the spherically symmetric geodesic surface in the spatial section of the "Schwarzschild" manifold.

"Even admitting that you (Stephen Crothers - D.C.) are right, in my opinion this point is NOT important. In fact, you can call this quantity like you prefer, but in any case he remains a coordinate for a 4-dimensional manifold, i.e. the spacetime, that we use to describe physics. The interpretation of coordinates is NOT univocally defined in General Relativity."
Subject: arXiv:1002.4153v1 [gr-qc]
Date: Tue, 23 Feb 2010 07:23:51 +0200
Message-ID: <bed37361002222123g55b2b1b0j738aed180f0ff096@mail.gmail.com>
From: Dimi Chakalov <dchakalov@gmail.com>
To: Curt Cutler <Curt.J.Cutler@jpl.nasa.gov>,
    Michele Vallisneri <vallis@vallis.org>
Cc: Kip <kip@tapir.caltech.edu>

Gentlemen:

Your custom-made mock data will only mock you:

http://www.god-does-not-play-dice.net/Szabados.html#SBG

If this email does not automatically bounce back, I will consider it delivered.

Once the scandal with LIGO erupts, you will be kindly asked to explain your self-mocking. I'll be there to help.

Sincerely,

D. Chakalov

Subject: Allgemeine Relativitätstheorie Neufassung ?
Date: Thu, 25 Mar 2010 17:43:40 +0200
Message-ID: <bed37361003250843u104281c0h9e233d4ee4d2888b@mail.gmail.com>
From: Dimi Chakalov <dchakalov@gmail.com>
To: To: Helmut Friedrich <hef@aei.mpg.de>,
    Hermann.Nicolai@aei.mpg.de,
    Norbert Straumann <norbert.straumann@gmail.com>,
    Domenico Giulini <domenico.giulini@itp.uni-hannover.de>,
    John Stachel <john.stachel@gmail.com>,
    Claus Kiefer <kiefer@thp.uni-koeln.de>,
    Karel V Kuchar <kuchar@physics.utah.edu>,
    Charles Torre <torre@cc.usu.edu>

P.S. Details and drawings (25.03.2010) at

http://www.god-does-not-play-dice.net/#Bahn

Should you have questions, please write me back.

D.C.

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Subject: A future directed, time-like unit vector field
Dear Dr. Friedrich,

You acknowledged that a future directed, time-like unit vector field, for which no natural choice exists in general, is characterized indirectly and becomes explicitly available only after solving the equations (arXiv:0903.5160v1 [gr-qc], p. 17).

I've been trying to argue that this problem can only be solved by recovering the reference fluid in GR.

[snip]

Re: Allgemeine Relativitätstheorie Neufassung ?

P.P.S. Updates at

http://www.god-does-not-play-dice.net/#Bahn
http://www.god-does-not-play-dice.net/#light
http://www.god-does-not-play-dice.net/#SRP

Have a nice summer.

D.C.
Subject: ATTN Mike Lazaridis: Total confusion, total socialism at PI
Date: Mon, 29 Mar 2010 16:25:32 +0300
Message-ID: <bed37361003290625q7a232020w3ec65bf3bec8cbb8@mail.gmail.com>
From: Dimi Chakalov <dchakalov@gmail.com>
To: Neil Turok <nturok@perimeterinstitute.ca>,
    Robert W Spekkens <rspekkens@perimeterinstitute.ca>,
    Lucien Hardy <lhardy@perimeterinstitute.ca>,
    Chris Fuchs <cfuchs@perimeterinstitute.ca>,
    John Berlinsky <jberlinsky@perimeterinstitute.ca>,
    John Matlock <jmatlock@perimeterinstitute.ca>,
    psi@perimeterinstitute.ca,
    lsmolin@perimeterinstitute.ca, fmarkopoulou@perimeterinstitute.ca,
    elivine@perimeterinstitute.ca, dgottesman@perimeterinstitute.ca,
    hburton@perimeterinstitute.ca, tthiemann@perimeterinstitute.ca,
    rmyers@perimeterinstitute.ca, lfreidel@perimeterinstitute.ca,
    marzano@perimeterinstitute.ca, dbenedetti@perimeterinstitute.ca,
    sbilson-thompson@perimeterinstitute.ca,
    fconrady@perimeterinstitute.ca, bdittrich@perimeterinstitute.ca,
    jryan@perimeterinstitute.ca, psingh@perimeterinstitute.ca,
    ipremont-schwarz@perimeterinstitute.ca,
    cweinstein@perimeterinstitute.ca, ywan@perimeterinstitute.ca

Please pass this email to Mr. Mike Lazaridis, permalink
http://www.god-does-not-play-dice.net/#Lazaridis
-----

Dear Mr. Lazaridis,

I'm afraid your people are seriously confused.

For example, Neil Turok ("What Banged?", 5 March 2008) speculates that "a
cyclical model of the universe becomes feasible in which one bang is followed by
another, in a potentially endless series of cosmic cycles"; Lucien Hardy and
Robert Spekkens (arXiv:1003.5008v1 [quant-ph]) deeply believe that "the
mathematics of Hilbert space is sufficient for quantum theory"; and Chris Fuchs'
"best candidate" (arXiv:1003.5182v1 [quant-ph]) "involves a mysterious entity
called a symmetric informationally complete quantum measurement" (this
"mysterious entity" is also supported by U.S. Office of Naval Research Grant No.
N00014-09-1-0247, as Chris Fuchs acknowledged).

Perhaps you will be interested to check out KS Theorem,
http://www.god-does-not-play-dice.net/#KS

Please notice the letter by Schrödinger from November 1950, quoted at the link
above.

Your people have always ignored my arguments, and have never replied
professionally. Surely they all are "crazy enough", but I'm afraid they got your
money and their Barbies, and don't care anymore. That's the result from
working in a total socialism, after your generous financial support,

http://en.wikipedia.org/wiki/Mike_Lazaridis#Philanthropic_work

If you insist on supporting PI, that's your choice. Just don't expect anything but
total confusion & socialism.

Yours sincerely,

Dimi Chakalov

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Note: Here's the opposite opinion, by the former PR guru Howard Burton:

WATERLOO, ON, May 2007 - "Howard Burton, Founding Executive Director, has left Perimeter Institute for Theoretical Physics (PI) and is seeking new challenges. (...) Burton had headed the Institute, fostered through the determination and overwhelming generosity of Mike Lazaridis, PI's founder and Board Chair, since inception and achieved an impressive list of accomplishments."

Where is this "impressive list", I wonder. Check out Peter Knight. If you wish to play with your hobby, get a job at some university and teach there, like a typical Cambridge don. Don't waste Mike Lazaridis' money. Is this simple enough?

If I was in the shoes of Mike Lazaridis, I would introduce a few simple rules, effective immediately. For example: You want to study quantum cosmology, quantum gravity, quantum information, quantum computing, or quantum [whatever -- make sure it sounds very exciting]?

Fine, but you won't get paid for sheer philosophy anymore -- enough is enough. If you wish to work at PI, you must clearly define the underlying presumptions in your hypothesis, and declare -- in writings -- the conditions under which you will acknowledge that your hypothesis is wrong, after which you will have to either start from scratch, or leave PI. That's the difference between philosophy and science, and also the recipe for success, which I'm sure Mike Lazaridis knows very well.

Besides, just like with RIM Blackberry Bold, you need a healthy competition to top the competitors. I will be happy to compete with any quantum scholar at PI. Please don't hesitate.

D. Chakalov
March 30, 2010

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Subject: Global existence for the Einstein equations
Date: Tue, 6 Apr 2010 13:10:34 +0300
Message-ID: <w2pbed37361004060310t33f53375x866186ed0f69f6ed@mail.gmail.com>
From: Dimi Chakalov <dchakalov@gmail.com>
To: Philippe G LeFloch <pglefloch@gmail.com>, LeFloch@ann.jussieu.fr
Cc: Bing-Long Chen <mcscl@mail.sysu.edu.cn>, rendall@aei.mpg.de, blanchet@iap.fr, larsa@math.miami.edu, eric.gourgoulhon@obspm.fr,
Dear Dr. LeFloch,

May I share with you and your colleagues my concerns about your efforts.

In your latest paper with Alan Rendall (arXiv:1004.0427v1 [gr-qc]), you tackled the initial value problem for the Einstein equations, and tried to elaborate on "a global foliation of the maximal future development of a given initial data set", with "a local-in-time existence result in the class of spacetimes with bounded variation. The present work is a continuation of this work and is aimed at constructing a global foliation of such spacetimes."

You take for granted that the spacetime of GR is "time-oriented" (arXiv:0812.5053v1 [gr-qc]). In my opinion, the time-orientability of 3-D space can be achieved *only and exclusively only* if the 3-D space itself is dynamical. That is, the (global) time in GR comes from the dynamics of space: check out the "stack of Photoshop layers"

http://www.god-does-not-play-dice.net/#Bahn

and

http://www.god-does-not-play-dice.net/#light

If you stick to GR textbooks and consider some stuff that only changes its coordinates in 3-D space, without allowing the 3-D space itself to evolve (cf. the two drawings at the first link above), you are confined into a frozen block world, which will never, in *no circumstances* allow you to prove the global existence for the Einstein equations and solve the initial value problem. It's a dead turkey.

Sorry for being frank. Should you or any of your colleagues disagree, I will be happy to quote from your papers and pin down the exact cause of your insurmountable problems.

Kindest regards,

Dimi Chakalov

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Note: People like G. 't Hooft claim that "the energy in gravity and that in matter always balances out to zero" (see also M. Montesinos), and seek comfort in the Bianchi identities (George F R Ellis and Henk van Elst, Eq. 2); application in Sec. 15.2, 'Bianchi universes and observations', from Wainwright and Ellis' Dynamical systems in cosmology. Notice there Eq. 5.31, which (supposedly) fixes the relation between a "dimensionless time [tau] and clock time t". But all this pertains to GR without DDE: see Landau and Lifshitz, The Classical Theory of Fields, 4th ed., 1980, Ch. 11, p. 301; more from Denisov and Logunov.

If you believe in such dubious things like 'dynamics of GR without DDE', try to define some "dimensionless time [tau]" that can be used to seek 'the right answer to the right question', to paraphrase MTW, p. 467. That's the test of the pudding: in what sort of time is the energy of gravitational field "conserved"?
As to the recent paper by Philippe LeFloch and Alan Rendall, I think the Gowdy symmetry assumption and the "future-oriented, time-like, unit vector" (p. 10) are 'searching for the right answer to the wrong question'. It reminds me of the old joke about a drunken man, who has lost his key somewhere in the dark, but is searching for it under the street lamp, simply because it is brighter there. Here, the key is in the "dark" energy from "empty" space.

D.C.
April 6, 2010

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Subject: Smooth ghosts in mathematical general relativity: a sampler
Date: Thu, 8 Apr 2010 05:32:15 +0300
Message-ID:
<g2qbed373610040719321b626bec9p9224645eb97610af@mail.gmail.com>
From: Dimi Chakalov <dchakalov@gmail.com>
To: Piotr Chrusciel <chrusciel@univ-tours.fr>, chrusciel@maths.ox.ac.uk
Cc: Gregory Galloway <galloway@math.miami.edu>,
Daniel Pollack <pollack@math.washington.edu>,
Torsten Asselmeyer-Maluga <torsten.asselmeyer-maluga@dlr.de>,
Carl H Brans <brans@loyno.edu>, Helge Rose <rose@first.fhg.de>,
Helmut Friedrich <hef@aei.mpg.de>, Hermann.Nicolai@aei.mpg.de,
Norbert Straumann <norbert.straumann@gmail.com>,
Domenico Giulini <domenico.giulini@itp.uni-hannover.de>,
John Stachel <stachel@uhsc.edu>, Claus Kiefer <kiefer@thp.uni-koeln.de>,
Karel V Kuchar <kuchar@physics.utah.edu>, Charles Torre
<torre@cc.usu.edu>,
rendall@aei.mpg.de, Robert M Wald <rmwa@midway.uchicago.edu>

Piotr,

Regarding my email from Wed, 21 Jun 2006 06:41:45 +0300: I'm afraid you've included too many ghosts in your latest essay [Ref. 1]. You and your co-authors listed twenty "Open problems" in Appendix A (ibid., pp. 69-70), none of which deals with the puzzle of "smoothness",

http://www.god-does-not-play-dice.net/#Torsten

Moreover, regarding the positive mass conjecture [Ref. 2], you believe it has been "solved", but how would you reconcile the so-called dark energy with the dominant energy condition [Ref. 1, p. 37]? You never mentioned this 'dark energy from empty space' in [Ref. 1].

If you wish to reply professionally, please write up an update to your essay, arXiv:1004.1016 v2 [gr-qc].

If you or any of your colleagues cannot understand the arguments at the link above, it will be entirely my fault. Feel free to write me back, and I will do my best to explain. The puzzle of 'smoothness' is very old, and there are two alternative approaches: one of them doesn't work, and the other is being explored at my web site.

Regards,
Dimi

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Sec. 2.1. Lorentzian manifolds, p. 3:
"A Lorentzian manifold is a smooth (Hausdorff, paracompact) manifold... 
"A Lorentzian metric is a smooth assignment to each point p ∈ M ...
--
p. 6: "The notion of a causal curve extends in a natural way to piecewise smooth curves, ...
"There are various ways to make the phrase “continuous assignment” precise, but they all result in the following fact (it isn't a 'fact' but mathematical poetry - D.C.): A Lorentzian manifold (Mn+1, g) is time-orientable if and only if it admits a smooth timelike vector field Z. If M is time-orientable, the choice of a smooth time-like vector field Z fixes a time orientation on M ...
"By a space-time we mean a connected time-oriented Lorentzian manifold (Mn+1, g). Henceforth, we restrict attention to space-times."
--
p. 9: "By a smooth time function we mean a smooth function t with everywhere past pointing timelike gradient. This implies that t is strictly increasing along all future directed causal curves, and that its level sets are smooth spacelike hypersurfaces.
--
p. 37: "The long-standing question of its positivity was resolved by Schoen and Yau [336] in dimension three, and is now known as the Positive Mass Theorem ...
... The result was generalized in [338,339] (compare [334]) to asymptotically flat initial data sets (M, h,K,F) satisfying the dominant energy condition (5.15)."


=================================
Subject: Re: Smooth ghosts in mathematical general relativity: a sampler
Date: Wed, 4 Aug 2010 13:17:53 +0300
From: Dimi Chakalov <dchakalov@gmail.com>
To: Piotr Chrusciel <piotr.chrusciel@univie.ac.at>
Cc: Gregory Galloway <galloway@math.miami.edu>,
Daniel Pollack <pollack@math.washington.edu>,
Torsten Asselmeyer-Maluga <torsten.asselmeyer-maluga@dlr.de>,
Carl H Brans <brans@loyno.edu>,
Helge Rose <rose@first.fhg.de>,
Helmut Friedrich <hef@aei.mpg.de>,
Hermann.Nicolai@aei.mpg.de,
Nobert Straumann <norbert.straumann@gmail.com>,
Domenico Giulini <domenico.giulini@itp.uni-hannover.de>,
John Stachel <john.stachel@gmail.com>,
Claus Kiefer <kiefer@thp.uni-koeln.de>,
Karel V Kuchar <kuchar@physics.utah.edu>,
Charles Torre <torre@cc.usu.edu>,

P.S. In the second version of your essay arXiv:1004.1016v2 [gr-qc],


you used "smooth" and "smoothness" 66 times. You declared that "the local accuracy of special relativity is built into general relativity" (p. 4), and regarding the [twice contracted](http://www.god-does-not-play-dice.net/#Piotr) second [Bianchi identity](http://www.god-does-not-play-dice.net/#Piotr), Eq. 2.10, you wrote (p. 5):

"This plays a fundamental role in general relativity, as, in particular, it implies (notice the poetry - D.C.), in conjunction with the Einstein equation, local conservation of energy, [XXX] = 0."

If everything were so "smooth", with "local accuracy of special relativity" pre-built into GR, how come you cannot cope with the [wegtransformierbar](http://www.god-does-not-play-dice.net/#Piotr) faculty of gravity "over a point"? References at


If you or some of your colleagues care about GR, please make an effort to reply professionally.

D.C.

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"The representation of matter by a tensor was only a fill-in to make it possible to do something temporarily, a wooden nose in a snowman."

Albert Einstein's Last Lecture, Relativity Seminar, Room 307, Palmer Physical Laboratory, Princeton University, April 14, 1954

Subject: Re: Albert Einstein's last lecture, April 14, 1954
Date: Tue, 27 Jul 2010 22:15:08 +0300
From: Dimi Chakalov <dchakalov@gmail.com>
To: Ted <newman@pitt.edu>
Cc: Richard Price <Richard.Price@utb.edu>, Josh Goldberg <goldberg@phy.syr.edu>

Dear Ted:

> You should allow us each to our own 'silliness' and 'errors'. If we
> are wrong then history will bare that out and we will look silly.

Sorry, this is not a professional response. The arguments at the links below are one-click away. Please check them out. We aren't taking philosophy here.

> But maybe there is a chance that we are correct.

But I'm not talking about your H-space nor arXiv:1007.4351v1 [gr-qc].
It's all about LIGO, which has been a dead turkey from the outset -- see ExplanatoryNote.pdf below.

Josh started all this mess, with the 1957 Chapel Hill "Conference on the Role of Gravitation in Physics", organized by Bryce De Witt with US Air Force money. See what he emailed me on 14 Jan 2009 (printed below): do you see any argument in support of the "theory" of LIGO?

Do you believe LIGO is designed to measure *anything* related to Bondi-Metzner-Sachs (BMS) group? See ExplanatoryNote.pdf below.

How long will you, Josh, and Richard keep quiet?

Please act professionally, and save hundreds of million US dollars -- taxpayers' money -- from wasting with the "advanced" LIGO and LISA.

It is not fair to keep quiet.

Yours,

Dimi

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On Wed, 14 Jan 2009 13:53:30 -0500, Message-ID: <496E34AA.2090703@phy.syr.edu>, Joshua Goldberg <goldberg@physics.syr.edu> wrote:
> > Dear Dr. Chakalov:
> > I have read most of your comments and don't agree with them. I no longer have the energy to detail my opinion. Apart from my own work in the '50's, for me the definitive paper on gravitational waves is that by Bondi et al written in 1960, but published in '62. Therefore, I make no comment on your work.
> > Josh Goldberg
> 

> > On Jul 27, 2010, at 8:11 AM, Dimi Chakalov wrote:
> > >> Dear Ted:
> >> >> In case you are professionally interested in GR, see
> >> >> http://www.god-does-not-play-dice.net/#Zinkernagel_note
> >> >> I trust you and Richard Price know that LIGO is for the birds:
> >> >> http://www.god-does-not-play-dice.net/ExplanatoryNote.pdf
> >> >> When are you going to respond professionally? Time is running out!
> >> >> Dimi
> > >
> >
Subject: Does the Universe Have a Handedness?
Date: Mon, 3 May 2010 06:24:01 +0300
From: Dimi Chakalov <dchakalov@gmail.com>
To: Michael J Longo <mlongo@umich.edu>
Cc: Craig J Copi <cjc5@po.cwru.edu>, Glenn D Starkman <glenn.starkman@case.edu>, Dominik Schwarz <dschwarz@physik.uni-bielefeld.de>, Dragan Huterer <huterer@umich.edu>

Dear Dr. Longo,

Regarding your arXiv:astro-ph/0703325v3, I think the answer to the question in the subject line could be YAIN, due to the totally different physics one can expect from the two modes of spacetime,

http://www.god-does-not-play-dice.net/#Bahn

In other words, you can have your cake and eat it. But you'd have to "challenge the model", as your colleagues put it.

Kindest regards,

Dimi Chakalov

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"Even so, the cosmological model we arrive at is baroque, requiring the introduction at different scales and epochs of three sources of energy density that are only detected gravitationally -- dark matter, dark energy and the inflaton. This alone should encourage us to continuously challenge the model ...
"

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Note: I won't pester the readers with any detailed speculations (D. Schwarz hasn't replied to my email sent in May 2003), and will only highlight the main puzzle:

Dragan Huterer (24 November 2005), Mysteries at Universe's Largest Observable Scales,


"Copi, Huterer and Starkman, together with Dominik Schwarz from Bielefeld University in Germany, found statistically significant and completely unexpected correlations of the CMB quadrupole and octopole with the ecliptic plane. In particular, planes defined by the quadrupole and octopole are perpendicular to the ecliptic plane."

That's what we observe:
As to the "cosmic equator", perhaps we'll have a better picture from the Planck mission (exposing the elusive "B-modes", which are believed be determined by the density of primordial GWs), once the angular power spectrum is revealed in 2012; animation here.

But instead of modifying gravity by introducing a "dynamical Aether (or time-like vector field) with non-canonical kinetic terms" (Glenn D. Starkman et al., arXiv:astro-ph/0607411v4), I suggest to replace the Aether with the so-called global mode of spacetime (cf. Fig. 2 above), and offer a scale relativity principle, pertaining to hypothetical symmetry presentations or "views" on objects in space. Then the "handedness" of spacetime arrow will cast its blueprints on the distribution of matter in 3-D space, since the space itself has become dynamical, endowing the whole universe with a (global) time. As to the "spin handedness" and torsion effects, recall that reference frames associated with 'spin' are different from those associated with motion along a line, as noticed by Ernst Mach many years ago. If you imagine an absolute or "meta" observer placed in the frame of "fixed stars" (called here 'global mode of spacetime'), she should be able to "see" the input from the global mode, cast on the local mode in terms of some "geometric force", but a physical observer will see these affects as "dark".

To explain such "dark geometric force", in the framework of 'the universe modeled as a brain', consider the text below:

Aoccdrnig to a rscheearch at Cmabrigde Uinervtisy, it deosn't mttaer in waht oredr the ltteers in a wrod are, the olny iprmoetnt tihng is taht the frist and lsat ltteer be at the rghit pclae. The rset can be a total mses and
you can still read it without a problem. This is because the human brain does not read every letter by itself, but the word as a whole. Pritie amzanig huh?

Your brain operates with 'potential reality' (recall the main demonstration above), and can "shuffle" the letters and re-construct the text, even ignoring the typo in the last sentence. If the universe also works as a brain, it can exert the asymmetry or "handedness" of spacetime arrow on the distribution of matter, and re-organize it along the pattern observed in CBM above, but an observer in the local mode of spacetime will interpret these geometrical effects as "dark".

I've acknowledged, on many occasions, that the mathematical presentation of these ideas is unknown to me. Tomorrow I will write to Prof. Amos Altshuler, regarding his paper on the topology of space, and will ask for advice. I can only hope he won't reply like Prof. Chris Isham.

D. Chakalov
May 3, 2010
Last update: July 9, 2010

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Subject: Machian gravity and the Bootstrap Principle
Date: Wed, 5 May 2010 03:31:33 +0300
From: Dimi Chakalov <dchakalov@gmail.com>
To: Amos Altshuler <alt@math.bgu.ac.il>, Amos Altshuler <amosalt@bezeqint.net>

Dear Professor Altshuler,

I very much like the statement by Einstein (Albert Einstein über Kepler, Frankfurter Zeitung, 9 November 1930): "Es scheint, dass die menschliche Vernunft die Formen erst selbständig konstruieren muss, ehe wir sie in den Dingen nachweisen können." (It seems that the human mind has first to construct forms independently, before we can find them in things.)

I have an immodest request for information and advice, prompted by your latest paper, entitled: "On Space's Topology", arXiv:1004.1831v1 [gr-qc]. I am trying to find papers or just ideas regarding some new 3-D manifold, which could supply the mathematical basis for Machian gravity and the Bootstrap Principle of Geoffrey Chew.

Regarding Fig. 1 from your paper: I imagine the 2-sphere, as shown in Fig. 1c, as a spherical balloon, which can be inflated by some "dark energy".
Is it possible to conjecture that any given point from the 2-sphere (balloon) surface can be *somehow* (I'm speechless here) produced by "gluing" all (infinitely many) points from the disk depicted in Fig. 1a? What I mean is the following: if some Flatlander living on the 2-sphere (balloon) surface decides to zoom on the "infinitesimal" from her balloon surface, she will find out that it actually has an inner geometrical structure -- not a dimensionless point but a 2-D disk that has shrunk to its infinitesimal "size". Also, if *the same* disk has been multiplied into infinitely many "points" from the 2-sphere (balloon) surface, the Flatlanders have to consider two types of connections on their (base) manifold: a "local" one, by ignoring the initial "mother" disk, and a "non-local" connection, which goes through *the same mother disk*, bootstrapping all points on the 2-sphere (balloon) surface. Thus, all interactions on the 2-sphere (balloon) surface will be inherently quasi-local from the outset.

Now, let's move up by one dimension. Can you think of some 3-D manifold, which can possess similar inner geometrical structure of its infinitesimal "points"? Namely, each and every "point" would be produced by shrinking *the same* 3-D "mother sphere", and again two types of connections will occur on the 3-D manifold, enabling quasi-local interactions.

Thank you for your time and consideration. I am aware that my efforts are not related to your latest paper, but hope you will be so kind as to advise me on these issues.

Kindest regards,

Dimi Chakalov

[snip]

Note: If you wish to construct a physical space out of this new 3-D manifold, make sure that its topology has been dynamically fixed as "asymptotically flat", so we could "look around, and see as far as we can" (Lee Smolin). Good luck.

D.C.
May 5, 2010

==============
Dear Amos,

Thank you for your reply from Sun, 16 May 2010 08:05:43 +0200.

> Sorry, but I don't know the answer to your question. I am also not sure
> that I understood the situation you described.

I suppose you've seen the collective behavior of a shoal of fish. Suppose every fish follows the rule 'think globally, act locally', such that every *point* from the trajectories of each and every fish is pre-correlated (Leibnitzian pre-established harmony) with 'the rest of fish' from the shoal. The ongoing correlation "takes place" in a putative 'global mode of spacetime', and the dynamics of every fish becomes *quasi-local*, in the sense that the "bi-directional" negotiation of every *next* point from the trajectories of all fish is being *already-completed* at the instant at which every fish makes the infinitesimal displacement \( x \to x + ds \): please see my email to Robert Geroch at

http://www.god-does-not-play-dice.net/#Geroch

In the quantum-mechanical version of the story above, replace the fish with dice. Think of four dice, which have to be correlated "in the air" (global mode of spacetime), in such a way that the sum of their readings must be confined in the interval \([10, 20]\) , at the instant they are fixed/dropped on the table. You can see only the dice on the table, where they exist as 'facts' (local mode of spacetime).

So, suppose you observe consecutive sets of readings like \((3, 5, 1, 6), (4, 4, 3, 5), (5, 6, 2, 5), (1, 3, 5, 1), \ldots\), all of which are correlated by the requirement \([10, 20]\) . The trajectories of all dice are composed of these quasi-local states 'on the table', and all dice will be pre-correlated like a shoal of fish. They will be pre-bootstrapped 'on the table', and will display a "quantum wave", without any localized source of such "wave", as we know from QM textbooks,

http://www.god-does-not-play-dice.net/#Zee

Only the math is unknown.

With all good wishes,

Dimi

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How do they do it?

"[This] question occurs naturally to anyone watching a school of silversides moving slowly over a reef in clear tropical waters. Hundreds of small silver fish glide in unison, more like a single organism than a collection of individuals. The school idles along on a straight course, then wheels suddenly; not a single fish is lost from the group. A barracuda darts from behind an outcropping of coral and the members of the school flash outward in an expanding sphere. The flash expansion dissolves the school in a fraction of a second, yet none of the fish collide. Moments later the scattered individuals collect in small groups; ultimately the school re-forms and continues to feed, lacking perhaps a member or two."


See also *Birds flock with scale invariance*: "a change in direction of one bird can affect the behavior of all its companions -- regardless of the size of the flock. (...) This means that information about the change of direction of any individual is quickly shared throughout the entire flock (the UNdecidable potential state -- D.C.), and its transmission is not limited by a fundamental distance scale."

See also 'Neurophysiology 101 For Quantum Physicists' here. If neuroscientists were following the "logic" of their colleagues from the established theoretical physics community, they would have to postulate some totally invisible, hence "dark", computer in the human brain, which could correlate some 100 billion neurons and 60 trillion synapses. Such "dark" computer would also have to remain unchanged during the life of all people, and would be the "neural correlate" of the human self.

In our case, the "dark" bootstrapping mechanism, which correlates every "fish" from the local mode of spacetime (cf. Fig. 1 above), is sought in the mechanism that fixes only one "charge" of mass, by cancellation of two gravitational "waves" in the global mode, as depicted in *Escher's hands*. The two tug-of-war effects of the bootstrapping mechanism (CDM & DDE), which produce 'asymptotically flat spacetime', do not originate from some physical stuff with positive energy density, nor from some stuff with negative energy density. The end result is perfectly embedded in the positive-mass "fish", and makes its trajectory quasi-local (cf. *Brown and York* and Cooperstock and Dupre below).
All this "happens" in the global mode (cf. Fig. 2 above), just like the invisible cat Macavity, which shows up "only when no one is looking at it".

That is, Macavity lives in the non-Archimedean, global mode of time, which is needed to define a finite bounded region of 3-D space (local mode) endowed with differentiable structure (cf. Brown and York). The 'time rate of change' is in turn defined by 'the arrow of space' (AOS) on a perfect continuum (local mode).

That's the meaning of 'quasi-local', be it a fish or quantum observable or "any observable of the gravitational field" (Laszlo Szabados).

Have a nice summer.

"just another crank"  D.C.
May 20, 2010
Last update: July 14, 2010


"In nonrelativistic mechanics, the time interval $T$ between initial and final configurations enters the action as fixed endpoint data. The classical action $S_{cl}$, the action functional evaluated on a history that solves the classical equations of motion, is an ordinary function of the time interval and is identified as Hamilton's principal function. Therefore $S_{cl}$ satisfies the Hamilton-Jacobi equation $H = -dS_{cl}/dT$, which expresses the energy (Hamiltonian) $H$ of the classical solution as minus the time rate of change of its action.

"By a similar analysis, we shall define the quasilocal energy for gravitational and matter fields in a spatially bounded region as minus the time rate of change of the classical action."


"The Positive Energy Theorem itself has been a major factor in the acceptance of the quasi-local approach, but it must be noted that it depends on the assumption of the dominant energy condition. However, recently, all the energy conditions of general relativity have come into question [10]."

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Subject: Re: Request for advice
Date: Wed, 11 Aug 2010 11:47:10 +0300
From: Dimi Chakalov <dchakalov@gmail.com>
To: Mark Burgin <mburgin@math.ucla.edu>

Dear Mark:
Thank you for your feedback.

> What do mean writing "construct a trajectory of such _already-correlated_ n-states "?

RE _already-correlated_ : if we look at a school of fish,

http://www.god-does-not-play-dice.net/#shoal

we can't notice the non-linear negotiation (modeled with the [10, 20] requirement below) b/w every fish and 'the rest of fish'. Perhaps the four dice will show a pre-correlated, wave-like rays.

If I knew how to calculate these correlations "in the air", I could perhaps make an animation, and model the emergence of a quantum wave, without any localizable source of such wave.

All the best,

Dimi

> Dimi Chakalov wrote:
>>
>> Dear Dr. Burgin,
>>
>> I read with great interest your latest "Interpretations of Negative Probabilities", arXiv:1008.1287v1 [quant-ph], and wonder if you could advise me how to formalize a Gedankenexperiment with four dice at
>>
>> http://www.god-does-not-play-dice.net/#bootstrap
>>
>> Think of four dice, which have to be correlated "in the air", in such a way that the sum of their readings on the table must be confined in the interval [10, 20], at the instant they are fixed/dropped on the table. You can observe only the dice on the table, where they exist as 'facts'.
>>
>> So, suppose you observe consecutive sets of readings like n_1: (3, 5, 1, 6), n_2: (4, 4, 3, 5), n_3: (5, 6, 2, 5), n_4: (1, 3, 5, 1), etc., all of which are correlated by the requirement [10, 20] . How can we construct a trajectory of such _already-correlated_ n-states ?
>>
>> Hope you can help. I extend my immodest request to Dr. Hájek as well.
>>
>> Kindest regards,
>>
>> Dimi Chakalov

Subject: Machian quantum gravity
Date: Tue, 17 Aug 2010 02:02:37 +0300
From: Dimi Chakalov <dchakalov@gmail.com>
To: Mario Novello <novello@cbpf.br>
Hi Mario,

May I offer two suggestions. In your recent paper, you posed the following question (p. 9):

"We start by considering Mach principle as the statement according to which the inertial properties of a body A are determined by the energy-momentum throughout all space. How could we describe such universal state that takes into account the whole contribution of the rest-of-the-universe onto A ?"

My suggestion: include the contribution of A onto the rest-of-the-universe. It's a bi-directional "talk".

You also wrote: "There is no simpler way than consider this state as the most homogeneous one and relate it to what Einstein attributed to the cosmological constant or, in modern language, the vacuum of all remaining bodies."

There is a simpler way to find this "universal state": solve the main problems of QM

http://www.god-does-not-play-dice.net/#KS

and GR,

http://www.god-does-not-play-dice.net/#Levi_Civita

First things first.

Take care,

Dimi

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Subject: The scale factor R(t): Why would "distance" change with time, and if so, in what "time" ?
Date: Sat, 22 May 2010 04:16:48 +0300
From: Dimi Chakalov <dchakalov@gmail.com>
To: Alain Blanchard <alain.blanchard@ast.obs-mip.fr>
Cc: Elemér Rosinger <eerosinger@hotmail.com>

Dear Dr. Blanchard,

Regarding your comment on Newton theory of gravity and the "unexpected new element in modern physics" [Ref. 1, p. 39]: it seems that the definition of the scale factor R(t) and the Hamiltonian formulation of GR may be wrong.

Instead of adding time "as the fourth coordinate" [ibid., p. 3] and speculate
about "distance changes with time" [ibid., p. 7], we may introduce a global, Heraclitean, and non-Archimedean [Ref. 2] time, as depicted in Fig 2 at

http://www.god-does-not-play-dice.net/#Bahn

Specific considerations at

http://www.god-does-not-play-dice.net/#bootstrap

Kindest regards,

Dimi Chakalov

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Footnote 1: "Newton theory of gravity is wrong, but nevertheless it remains a high quality scientific theory because of its past (and present) successes. It is in this sense that modern cosmology should be regarded as successful, and this will remain in the future, even if it might be regarded as being “wrong”...

....

p. 3: "R is a characteristic size (in the spherical case, that is the radius of the 3D-sphere embedded in a 4D space). We then add the time as the fourth coordinate ...

....

p. 7: "2.6 The proper distance

"In GR, space changes with time, and there is no proper time, so that the "intuitive" notion of distance between two points is not a well defined quantity. (...) The fact that this distance changes with time is the direct consequence of the expansion of the Universe.

....

p. 25-26: "5.2 Einstein Cosmological constant or Vacuum contribution

"The most direct explanation one can provide to the cosmic acceleration it that it is due to a true cosmological constant appearing in the geometrical part of Einstein’s equation, i.e. the left hand side of eq. 4. However, it is much more common to believe that this term arises from some contribution to the energy-momentum tensor on the right hand side. As we have seen, from a classical point of view the vacuum might have a non zero density and behaves identically to a cosmological constant. In addition, quantum mechanics provides an intriguing hint in this direction. (...) This non-zero value is often noticed in standard text book of quantum mechanic, but, because observable quantities correspond to transitions from one state to an other one, is not regarded as being problematic. However, as soon as gravitational interaction has to be added, one cannot avoid to take the absolute energy into account. (...) For all energy scales in physics does p_v end up with an unacceptable large value, which looks like a fundamental problem (footnote 9).

....

Footnote 9: "It has been suggested that the zero-point fields should not be regarded as real, despite the fact that they are at the basis of the calculation of
the Casimir effect (167)."


......

p. 39: "... the actual origin of dark energy remains totally unknown and the presence of dark energy in the present day universe represents probably the most fundamental and unexpected new element in modern physics."


"3.1. Why Hold to the Archimedean Axiom ?

"It is seldom realized, especially among physicists, that ever since ancient Egypt and the axiomatization of Geometry by Euclid, we keep holding to the Archimedean Axiom. This axiom, in simplest terms, such as of a partially ordered group G, for instance, means the following property

(3.1.1) [XXX]

"or in other words, there exists a “path length” u, so that every element x in the group can be “overtaken” by a finite number n of “steps” of “length” u.'

Note: Regarding the notion of a global, Heraclitean, and non-Archimedean time, recall the proposal of William G. Unruh, from 1988, about a Heraclitean time -- an "explicit (but unmeasureable) time", also called "nondynamical time". To explain the core idea of "explicit (but unmeasureable) time", I'll use a simple metaphor of a flat 2-D section of 3-D sphere: the Flatlanders will notice that their dynamics involves an "explicit but unmeasureable" time and space, in the sense that all points from their 2-D world are also points from the 3-D sphere, yet the intrinsic dynamics of the 3-D world will be "unmeasureable". Again, this is just a metaphor in Euclidean space; the real case may be far more complicated -- check out Fig. 2 above, and notice that the infinitesimal displacement in spacetime (compare it with ADM presentation) is completely sealed off by the so-called speed of light, rendering the local mode of spacetime a perfect continuum. Thus, the global mode of spacetime is totally "dark" from the outset. Hence the confusion in GR.

Now, let's see if we can unscramble some 'explicit but unmeasureable time and space' in our 3-D world made of finite things obeying the Archimedean Axiom.

If you ponder on the operational definition of 'second', you will notice that it is an unverifiable Gedankenexperiment: it is being "defined" as the sum of durations of 9,192,631,770 transitions between the two hyperfine levels of the ground state of the cesium 133 atom, provided the cesium atom is "at rest at a temperature of 0K, such that the ground state is defined at zero magnetic field" [Ref. 3].

Here's how we are conditioned to think about such Archimedean second: imagine that every two neighboring dots from the closed interval of 'one second' below refer to one transition between the two levels of the ground state of the cesium-133 atom, and that the number of dots below is exactly 9,192,631,768:
Surely your wristwatch does somehow read this finite interval, but you can't claim that 'time in GR' is a relativistic observable if the determinant of the metric itself (cf. Einstein's talk from April 1919 below) is a variable determined in turn by the global Expansion of Space (EoS) -- read Michal Chodorowski [Ref. 4].

To cut the long story short: the principles of GR explicitly ban the global mode of space (see Fig. 2 above) from direct observation. We cannot directly observe any 'absolute space' or 'aether', just as we cannot directly observe the Undecidable KS state. The "bare points" (cf. 'bare finger nails' and 'absolute structures', James L. Anderson) can exist only in the global mode of spacetime. Once the singularity is resolved, a vast new region of 'the universe as ONE' appears (compare with A. Ashtekar, p. 15). It provides a global, Heraclitean, and non-Archimedean matrix for finite things in the local mode of spacetime, such as 'one second' or 'one meter'.

Without the global mode of spacetime, the existence of finite things like 'one second' and 'one meter' will be a miracle, since no physical phenomenon alone (local mode of spacetime) can reproduce them as comprised from finite number of finite things -- see the dots above.

NB: The duration of the transition between the two levels of the ground state of the cesium-133 atom -- the distance between two neighboring dots above -- is an Archimedean entity, a finite "path length" u. Were the emergence of "more and more space" [Ref. 4] an Archimedean phenomenon, the Hubble Law would correspond to actual velocities of distant bodies, as inferred and calculated from their red-shifted light, and we would directly observe an effect of 'absolute space', endowed with "an additional attribute: expansion." [Ref. 4] But notice that you can inject any "number" of infinitesimal "points" into the global, Heraclitean, and non-Archimedean space, and it won't "expand" a bit. Not at all.

The explanation is with the famous song "Aleph-null bottles of beer on the wall", only here the "expansion" of space is produced by adding 'bottles of beer' -- "more and more space" [Ref. 4] emerges along the arrow of spacetime denoted with w in Fig. 2 above. Notice also that, in present-day GR, the "horizontal" cross-sections of the arrow of spacetime (the local mode of spacetime, like Photoshop layers) are "flattened", and the local mode of spacetime becomes a perfect continuum -- no "dark gaps" from the global mode of spacetime are present in the local mode -- so it is impossible to get a glimpse at the global Expansion of Space (EoS) pertaining to the 'absolute space' and 'reference fluid'.

Stated differently, we may talk about a 'real actual expansion of space' only to the extent to which we can talk about any other 3-D blueprint from the global (Heraclitean, and non-Archimedean) mode of spacetime. Example: the global position of Earth in the 'absolute' reference frame of the cosmic equator -- the "handedness" of the universe, produced by the arrow of spacetime, can show up only through the cosmic substratum [Ref. 4], yet its source and "force" will never be directly observable or traceable (try an experiment with your brain above).

Even if 'one meter' can "expand" due to the emergence of "more and more space" [Ref. 4], the underlying 'body of reference' -- the global Expansion of Space (EoS) -- will not be physically observable. It is GR itself that makes it
"dark". You can trust the present-day 'GR without DDE' only for adjusting the GPS system.

Needless to say, you cannot capture 'the entire space' with some conformal recipe either, being confined within the Archimedean local mode of finite things. Sorry for repeating this all over again; the crux of the argument is known after Lucretius. He didn't use math, but neither did Karel Kuchar some 2060 years later, regarding the "hidden unmoved mover".

The implications for "GW astronomy" are obvious: LIGO, Virgo, GEO, LCGT, LISA, etc., are supposed to detect the "ripples" of metric, as visualized below, in line with Kip's mantra:

\[
\frac{\Delta L}{L} = h(t)
\]

Notice that one space dimension is omitted in the animation below: it shows a 2-D plane (not 3-D space), which is being modulated by a passing GW, propagating along an axis orthogonal to that flat plane, yet the very same axis of GW propagation is supposed to match the "direction" of GW scattering in 3-D space as well. Which is why Kip Thorne and his colleagues suggested an L-shaped (x/y) "antenna" to catch the signal coming from the orthogonal (to that plane) z direction. Do you smell a rat?

Markus Pössel, "The wave nature of simple gravitational waves", Einstein Online, Vol. 2 (2006), 1008

Take a look at the non-relativistic picture from NASA above, and notice that the very same "direction" of GW propagation, used to make the GW animation, has been employed to display an accelerated "expansion" of space -- again by omitting one space dimension. Now, if we were 2-D Flatlanders, we'd introduce a "temporal" dimension to model our 2+1-D universe, but we would not like that "temporal" dimension to pertain to 'the whole 2-D Flatland en bloc',

http://www.god-does-not-play-dice.net/#XXX
because it will point to some anti-relativistic aether, and any force from it will be totally "dark". Not surprisingly, Michal Chodorowski doesn't like some global Expansion of Space either [Ref. 4], yet the **global** "direction" of GW propagation, orthogonal to the 3-D space *en bloc*, is perfectly fine for LIGO Scientific Collaboration: they simply use an L-shaped (x/y) "antenna" and wait, patiently, for the GW strain to come from the orthogonal (to that plane) *z* direction. Isn't this GW parapsychology?

To make the case decipherable, recall the (utterly misleading) picture of "GW lake", in which the **two** spatial dimensions of the expanding/contracting plane in the animation above are omitted: you can imagine the GW lake below only by compactifying all "stretching 'n squeezing distances" on the 2-D plane into **one point** from the 1-D "radius" of the GW lake *below*. Notice that the 1-D "radius" is the alleged "longitudinal direction" of GW propagation (cf. Jose G. Pereira *et al.*).

You also need another "axis" [Ref. 4] for the **dimensionless** wave amplitude, and yet another axis to picture the GW lake in 3-D (to impress your taxpayers), which makes the picture below an utterly misleading muddle.

LIGO is supposed to be located "near the shore", where the lake is "effectively flat", so you can think of LIGO as some **point-like** fishing rod float waiting, patiently, for the (initially strong) GW from the lake center to wiggle it, **transverse** to the 1-D "radius" of the GW lake. But in order to picture the **transverse** (to the 1-D "radius") directions of GW strain, you need to endow the **point-like** fishing rod float (LIGO) with two **spatial** dimensions, hence recover the 2-D plane in the animation above.

Total mess. For if you "upgrade" the **point-like** fishing rod float to 3-D space, where would the "longitudinal direction" point to? To "the center of the Galaxy"?

Let me quote Ray Weiss, from a video clip "Gravity: Making Waves", intended to the taxpayers who pay for all this mess (video transcript, American Museum of Natural History, November 2004).

Ray Weiss in lab, stretching and collapsing a mesh wine bottle protector:

"The waves can be represented by this object I found on a wine bottle. And it's a mesh that you can see. And the waves cause transverse to the direction in which they're moving. They're moving forward, and transverse to that the space gets **tugged** like this, and **collapses** like that. Tugged like this. And if you look carefully at this, and I'll do this a few times, you'll notice that the little squares in this, how they're exercising a motion where along one direction, it's obvious which direction -- I mean, the direction I'm pulling in -- space is getting **expanded**. But transverse to that, up and down, space is getting **contracted**. And that's the key to the whole thing."

That's the key to the whole thing: you can't monitor some "expanding" [Ref. 4]
or "collapsing" space if you are confined inside that same space: measurements "across" space are unphysical (B. Schutz, Fig. 24.3, p. 349).

However, B. Schutz and his colleagues from LIGO Scientific Collaboration (LSC) need exactly such measurements "across" 3-D space to determine the amplitude of the "passing" -- with respect to some absolute space [Ref. 4] -- GWs, and also "see" the animation above as ripples of the 3-D metric itself.

No background (regardless of being "undisturbed" or "disturbed") can exist for (i) "expansion" of 3-D space [Ref. 4] nor for (ii) GW propagation, yet Bernard Schutz and his LSC colleagues managed to "obtain" it for case (ii), with their spherical cow approximation.

There is also a tantalizing story by B. Schutz, regarding the "time parameter" of the propagation of GWs, depicted with the horizontal line in Fig. 22.1 below, from his book "GRAVITY from the Ground Up" (Cambridge University Press, Cambridge, 2003), p. 312. Notice also that the small vertical line refers to "something that is dimensionless" (exact quote from Kip Thorne's Physics 237-2002 Course).

B. Schutz argues that "the force of the Moon comes from the curvature of time" (ibid., p. 310), and "the deformation produced by the Moon is partly directed towards the Moon (the longitudinal direction), whereas gravitational waves are transverse" (ibid., p. 311).

Therefore, LSC members have to separate two crucially distinct cases:
curvature of time, as in the example with the tidal effect on Earth caused by the Moon (no GWs in principle), from curvature of space, as in the case of time-dependent spatial curvature (lots of GWs waiting for the "advanced" LIGO and LISA), depicted with the horizontal line in Fig. 22.1 above, and denoted with $t$ as well.

To elucidate the situation, let me quote further from B. Schutz: "The fact (there are no "facts" here - D.C.) that gravitational waves are transverse and do not act like the Moon does on Earth implies that they are not part of the curvature of time, since that is where the Newtonian forces originate. They are purely a part of the curvature of space (emphasis mine – D.C.). When gravitational waves move through a region they do not induce difference between the rates of nearby clocks. Instead, they deform proper distances according to the pattern in Fig. 22.1" (ibid., p. 312). More from Bernard Schutz [here](http://www.god-does-not-play-dice.net/#XXX).

Perhaps LSC members will try to separate (safely) the curvature of time from the curvature of space at GR19. I wish them best of luck with the SBG argument too.

In my "just-another-crank" opinion, the splitting of 3-D space into some $x/y$ plane and an orthogonal "transverse direction" of GW scattering, denoted usually with $z$, is sheer parapsychology. Check out the precise recipe for detecting "local perturbations in the space-time metric from astrophysical sources", by LIGO Scientific Collaboration (540 people), [arXiv:1007.3973v1 [gr-qc], p. 11:

```
NB: If someone tells you that the ongoing "expansion" of spacetime metric, driven by [we-do-not-know-it], is along a straight line in space (say, 'from the center of the Galaxy toward Earth'; cf. my email to Gabriela González from 8 June 2005), would you believe it? Of course not. Then how come people believe in the drawing above? Can you separate the "expanding" metric in the two cases?

Notice also the dimensionless GW amplitude and the analogy with the EM waves in 3-D space, suggested by Bernard Schutz: you can prove that light is a transverse wave by using Polaroid, hence a simple Gedankenexperiment with GW "amplitude" will require that it will inevitably acquire dimensionality, upon projecting the "amplitude" on the transverse $x/y$ plane.
```
The proper GW detectors should be endowed with the faculty of self-acting (resembling the human brain), in order to be triggered by GWs. But this is a different thread.

Notice the crucial global "direction" of GW propagation, orthogonal to the whole 3-D space en bloc, in Fig. 2 above, and its holistic effect in the shoal of fish here; more from Anthony Zee above. Just as there is no source that is "waving" to produce quantum waves, there is no material source that is "waving" to produce GWs propagating from one location in 3-D space to another location. It would be tantamount to claiming that some material source, located somewhere in 3-D space, can produce a finite period of cosmological time (say, 8 min). If we use such Archimedean geometry for 'the source of DDE' [Ref. 4], the task for understanding the cosmological "beginning" and "end", as well as the problems with singularities and 'boundary of space' will be insurmountable. There is a lot to be done for revealing Einstein's "total field of as yet unknown structure."

Here comes a difficult (to my teenage daughter) exercise: try to recover the ripples of the 3-D metric following the 1-D case (see the GW lake) and 2-D case (the Flatland animation above).

If you endow the "stretching 'n squeezing" 2-D plane (Ray Weiss' mesh) with a third space dimension, the "direction" of GW propagation will be omnipresent in 3-D space, similar to the 2-D case in which it was "acting" on the whole 2-D plane en bloc. To explain 'omnipresent', imagine a brand new axis in 3-D space, along which you can discriminate between Small and Large. The spherically symmetrical 3-D "breathing" of the metric is along this new T-invariant axis, so if you dare to talk about the dynamics of the metric-filed "breathing", you have to use different signs for t, say, +t for the "inhaling" mode and -t for the "exhaling" mode. Then the arrow of spacetime will require another axis, denoted with w in Fig. 2 above, which is orthogonal to the omnipresent axis of the Small viz Large in our good old 3-D space.

Thus, the cosmological arrow [Ref. 4], as well as the dynamics of GW scattering in 3-D space, can only be defined w.r.t. the unobservable, global, Heraclitean, and non-Archimedean time (see above): once we "look" at 3-D space from the global mode, the very nature of time changes accordingly. As explained in Wiki, we would see "all points in 3-dimensional space simultaneously, including the inner structure of solid objects and things obscured from our three-dimensional viewpoint". However, our (inanimate) wristwatch can read only one instant from this global mode of time. It can't read +t ("inhaling" mode) and -t ("exhaling" mode) simultaneously, hence it will report the global mode of time as "atemporal" and "frozen" (recall the problem of time in canonical quantum gravity).

I bet nobody at GR19 will make the slightest effort to mention the unobservable, global, Heraclitean, and non-Archimedean time, pertaining to GWs and the global expansion of space. Eight years ago, B. Schutz explained only a fraction of the problems, and didn't even mention the problems of GW dynamics stemming from the global expansion of space: you cannot detect GWs along the time read by your wristwatch, as Kip Thorne speculated above, just as you cannot take the stand of some meta-observer to monitor the global GW dynamics 'on the whole spacetime en bloc', or count to infinity, like Chuck Norris.

The usual excuse of LIGO Scientific Collaboration is that they use a linearized approximation of GR, only this 'spherical cow' is "a shadow without power" -- check out Hermann Weyl.
Yet LSC persistently ignore all arguments against the "theory" of GW detection with LIGO and the like. Okay, I used their linearized approximation of GR to derive the conditions under which LIGO Scientific Collaboration (700+ people) might succeed: LIGO needs a schizophrenic behavior of gravity, as explained here. But of course nobody at GR19 will mention Hermann Weyl nor the SBG argument.

LIGO Scientific Collaboration stubbornly refuse to acknowledge that there are no bans on the dipole radiation anymore, simply because the alleged conservation of gravitational mass-energy and momentum, in a world dominated by an evolving cosmological "constant", is a wishful thinking: all the energy conditions of GR have come into question.

In October last year, I asked 75 physicists to endorse the submission of my manuscript "Taxpayer's perspective on GW astronomy" to ArXiv.org server. Two of them refused (Jonathan Thornburg and Stanley Deser), while the rest didn't even bother to respond to my email. Surely GWs exist, but we may have to construct brand new detectors for the dipole radiation, and even re-examine the crux of GR [Ref. 5]: the quasi-local energy density of the gravitational field and the "boundary conditions" [Ref. 6] fixed in the global non-Archimedean spacetime. In simple words, the wegtransformierbar quality of gravity "over a point" (Afriat and Caccese, p. 27) indicates its specific quantum origin; details above.

Nobody from GR19 has so far responded to my email. I cannot argue with silent spherical cows either, once they have collected all the money -- taxpayers' money -- to play with Einstein's GR.

There is no sense to "enhance" the sensitivity of LIGO, for it has been a dead turkey from the outset. I suggested in March 2006 that LIGO tunnels should be converted to wine cellars, but what can be done with LISA? How much will cost that space junk?

When is enough, enough?

"just another crank" D.C.
June 1, 2010
Last update: July 29, 2010


"In practical terms, one defines the second, the fundamental unit of time, as 1/86400 of the duration of the average solar day, or 9,192,631,770 periods of transition the radiation corresponding to the transition between the two hyperfine levels of the ground state of the cesium-133 atom. (4)

Footnote 4: "This definition concerns a cesium atom at rest at a temperature of 0K, such that the ground state is defined at zero magnetic field.

"Another interesting idea is the so-called "Heraclitean time proposal" [63, 64]. This is based on a suggestion by Einstein [65] according to which the determinant of the metric might not be a dynamical quantity."
"We argue that, unlike the expansion of the cosmic substratum, the expansion of space is unobservable."

"To 'explain' these and other GR effects in cosmology, the idea of the Expansion of Space (EoS) is evoked. ...

"• On a philosophical level, it suggests that the expansion of the universe can be detached from the matter that is participating in the expansion. However, we know that, as he was constructing GR, Einstein was greatly influenced by the thoughts of German physicist and philosopher Ernst Mach. In the words of Rindler (1977), for Mach "space is not a 'thing' in its own right; it is merely an abstraction from the totality of instance-relations between matter". Therefore, the idea of expanding space 'in its own right' is very much contrary to the spirit of GR.

"• On a physical level, it suggests that the EoS is a geometric effect, so space itself is absolute. Then, though abolished in SR, in cosmology absolute space reenters triumphally the cosmic arena, endowed with an additional attribute: expansion.

"• Again on a physical level, it suggests the existence of a new mysterious force. If so, one can expect non-standard effects also on small scales. For example, one might expect particles to be dragged along by the EoS. ...

"Still, isn’t space expanding from a global point of view? Spatial sections of a closed FL model are three-spheres, whose radius of curvature increases as a(tau). Here, a(tau) is the so-called scale-factor, a universal function of cosmic time which describes how the distances between all elements of the cosmic substratum (or, fluid) grow with time. Therefore, the proper volume of a closed FL universe increases as [a(tau)]³; more and more space thus appears."

"Ideal inertial (non-Archimedean - D.C.) observers are imaginary and do not really exist (yes they do exist: check out the UNdecidable KS state above - D.C.).

The locality postulate states that an accelerated observer is at each instant physically equivalent to an otherwise identical momentarily comoving inertial
observer. The latter follows the straight world line that is tangent to the world line of the accelerated observer at that instant. Thus an accelerated observer may be replaced in effect by an infinite sequence of hypothetical momentarily comoving inertial observers; mathematically, the world line of the accelerated observer is the envelope of the straight world lines of the corresponding hypothetical inertial observers (for reality check, see Alan Rendall - D.C.).

"This locality assumption originates from Newtonian mechanics, where the state of a point particle is determined at each instant by its position and velocity. The (hypothetical - D.C.) point particle and the hypothetical comoving inertial particle of the same mass share the same state (only in Newtonian mechanics - D.C.) and are thus physically equivalent."


"Hence [lambda] may take on any value whatsoever with no difficulty (and with no explanation) in classical General Relativity.

.....

"This is a clear indication, confirmed by experiment, that the measurable effects associated with vacuum fluctuations are infrared phenomena, dependent upon macroscopic boundary conditions, which have little or nothing to do with the extreme ultraviolet modes or cutoff of the integral in (1.4).

.....

"In calculations of the Casimir force between conductors, one subtracts the zero point energy of the electromagnetic field in an infinitely extended vacuum (with the conductors absent) from the modified zero point energies in the presence of the conductors. It is this subtracted zero point energy of the electromagnetic vacuum, depending upon the boundary conditions imposed by the conducting surfaces, which leads to experimentally well verified results for the force between the conductors.

.....

"In the case of the Casimir effect, a constant zero point energy of the vacuum, no matter how large, does not affect the force between the plates. In the case of cosmology it is usually taken for granted that any effects of boundary conditions can be neglected (can't and shouldn't - D.C.).

"It is not obvious then what should play the role of the conducting plates in determining the magnitude of \( \rho_v \) in the universe, and the magnitude of any effect of quantum zero point energy on the curvature of space has remained unclear from Pauli's original estimate down to the present.

.....

NB, p. 4: "A vacuum energy with \( \rho > 0 \) and \( w = p_v/\rho_v = -1 \) leads to an accelerated expansion, a kind of "repulsive" gravity in which the relativistic effects of a negative pressure can overcome a positive energy density in (1.6). Taken at face value, the observations imply that some 74% of the energy in the universe is of this hitherto undetected \( w = -1 \) dark variety [3, 4]. This leads to a non-zero inferred cosmological term in Einstein's equations ... (Eq. 1.7).

.....

"A naturalness problem arises only when the effects of quantum zero point energy on the large scale curvature of spacetime are considered. This is a
problem of the gravitational energy of the quantum vacuum or ground state of the system at *macroscopic* distance scales ... "

Subject: Quantum mechanics needs no consciousness (and the other way around)
Date: Mon, 27 Sep 2010 17:51:05 +0300
From: Dimi Chakalov <dchakalov@gmail.com>
To: Shan Yu <yushan.mail@gmail.com>,
    Danko Nikolic <danko.nikolic@googlemail.com>
    Cc: Thomas Metzinger <metzinger@uni-mainz.de>,
    Philip Pearle <ppearle@hamilton.edu>,
    Hans Primas <primas@ggaweb.ch>,
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    Wolf Singer <singer@mpih-frankfurt.mpg.de>,
    Horst Stöcker <stoecker@uni-frankfurt.de>,
    Karlheinz Langanke <k.langanke@gsi.de>

Dear Dr. Yu,

May I comment on your latest arXiv:1009.2404v2, "Quantum mechanics needs no consciousness (and the other way around)".

I fully agree with you and Dr. Nikolic that (pp. 5-6) "quantum mechanics may have not left any space for the observer's consciousness to manipulate the experimental results". There is no need for any "observer" in QM, provided we can formulate the latter in accordance with 'no observer' requirement from quantum cosmology -- please see Sec. Summary, pp. 35-36, at

http://www.god-does-not-play-dice.net/ExplanatoryNote.pdf

Instead, the whole universe should act as "observer" (or rather "chooser", Philip Pearle), in line with 'the universe modeled as a brain',

http://www.god-does-not-play-dice.net/#history

http://www.god-does-not-play-dice.net/#KS


I will appreciate your professional comments. I trust your German colleagues have received my previous email (Mon, 20 Sep 2010 08:19:34 +0300), regarding the physics of binding phenomenon. It's all about the brain, again.

Kindest regards,

Dimi Chakalov
Subject: "Robert P. Crease loves priority battles. Robert P. Kirshner does not."
Date: Fri, 8 Jan 2010 12:59:59 +0200

From: Dimi Chakalov <dchakalov@gmail.com>
To: Robert P Kirshner <kirshner@cfa.harvard.edu>
Cc: Robert P Crease <rcrease@notes.cc.sunysb.edu>, Saul Perlmutter <saul@lbl.gov>, Adam Riess <ariess@pha.jhu.edu>, Mike Turner <mturner@uchicago.edu>, Josh Frieman <frieman@fnal.gov>, Norbert Straumann <norbert.straumann@gmail.com>, Sean Carroll <seancarroll@gmail.com>, Lawrence M Krauss <lmk9@cwru.edu>, Paul Davies <deepthought@asu.edu>, Laszlo Szabados <lbszab@rmki.kfki.hu>, Luca Bombelli <luca@phy.olemiss.edu>, Adam Helfer <adam@math.missouri.edu>, Malcolm A H MacCallum <m.a.h.maccallum@qmul.ac.uk>, Chris Isham <c.isham@imperial.ac.uk>

Dear Dr. Kirshner,

Regarding your note from Jan 6, 2010, [link]

I'm glad that you don't like 'priority battles'. In your words, "Dark Energy is bigger (much bigger!) than any of us, and we are all incredibly lucky to be astronomers at the time when humans first found out about it."

Let me assume that nobody likes priority battles. I would just like to ask Adam Riess for the *exact date* in the fall of 1997, on which he did these calculations:

[link]

After Adam Riess recorded his calculations, they existed as a 'fact'. It was not yet "official" nor "published", but that doesn't really matter, because nobody likes priority battles. Yet it is instructive to notice that Adam Riess made the discovery of Dark Energy, because he converted it into a *fact*.

In the same vein, may I draw your attention to two facts, recorded on my web site. They are not yet "official" nor "published", but that doesn't really matter, because nobody likes priority battles.

The crux of the puzzle of DDE is in its *source* (I firmly disagree with the adjective "dark", because I think it is highly misleading, but unfortunately Mike Turner had a different opinion).

Specifically, the puzzle is that "more space comes into existence": see R. Rakhi & K. Indulekha and S. Carroll at

[link]
I claim that *the only possible* explanation of the source of DDE is with *two modes of spacetime*, for reasons explained at my front web page.

Fact #1: My claim was recorded on 26 November 2009.

I also claim the priority of another solution, regarding 9/11 at

http://www.god-does-not-play-dice.net/9_11.html

Fact #2: My claim, in its final version, was recorded on January 7, 2010.

Regrettably, I cannot publish anything on *paper*, but that doesn't really matter, because facts can be recorded on the Web as well.

Should you or any of your colleagues have questions regarding these two facts, please write me back.

If my email does not *automatically* bounce back, I will consider the delivery of my email message as a *fact*.

With all good wishes to you and your colleagues,

Dimi Chakalov

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http://tinyurl.com/steel-evaporation

The hottest places in Hell are reserved for those who in times of great moral crises maintain their neutrality.
Dante Alighieri