Gravitational Holomovement and Rotation

D. Chakalov[1]
chakalov.net

Abstract

We model the *physicalized* manifestation of the Universe as bootstrapped 'Brain of the Universe' and seek evidence for its brain-like functional organization, resulting from the **Holon** of the Universe facilitated by space-like correlated gravitational holomovement and rotation. The orthodox model of gravity, based on "tangent vectors" and "curvature of spacetime", is replaced with the proposal that the *physicalized* clocks and rulers are very flexible 'jackets' (cf. John's jackets parable in CEN.pdf), which can slow down or speed up viz. shrink or expand, leading to perfectly correlated Brain of the Universe living in so-called 'relative scale' (RS) spacetime. The question of Universal Mind, complementing the Brain of the Universe, pertains to physical theology and the doctrine of *trialism*, and was examined in previous publications (Sec. **6** in spacetime.pdf).

1. Introduction

Perhaps the best way to launch a new theory is to compare it to the one it seeks to replace. Here I will briefly criticize the ideas of the orthodox model of gravity by focusing on gravitational radiation bounded by gravitational "mirrors" at null-and-spacelike infinity, and the nonlinear transport (if any) of energy-momentum and angular momentum by gravitational waves (gw_miracles.pdf and GW150914.pdf) and torsion waves (if any).

Let me begin with pointing out that the coupling of gravity to matter (Fig. 1), as suggested in today's textbooks, is marred by mysteries and controversies, to say the least.

Which goes first, matter or geometry? Is their mutual determination "instantaneous", resembling EPR correlations? How is the *next* matter-geometry negotiation prepared, to produce gravitational radiation 'in time'? If gravity is not a *bona fide* 'force', how could 'the grin of the Cheshire cat *without* the cat' (Fig. 1.1) *interact* with the 'cat' (Fig. 1.2) placed in the right-hand side of Einstein's field equations?

Fig. 1.1   Fig. 1.2

Now, the proponents of "GW astronomy" claim that the massless ($T^{ab} = 0$) 'grin' (Fig. 1.1) would *only* (Sic!) produce *metric* perturbations of the 'cat' (Fig. 1.2), e.g., squeezing and stretching of a plastic bottle, but here's the catch: the 'cat' (Fig. 1.2) is not a light beam, and it will inevitably gain *or* lose energy-momentum, angular momentum, and **stresses** (ref. [10] in gwa_rip.pdf) by gravitational radiation, after which the massless 'grin', which has nothing but Weyl curvature, will become a brutal physical **force**. Or some gravitational "ghost", if you prefer GW parapsychology.

Moreover, the observable universe has *perfectly* correlated structure (e.g., the Dipole Repeller) endowed with large-scale rotation and preferred axis of rotation, which simply cannot fit in today's model of gravity. There are no GW "mirrors" at null-and-spacelike infinity, in the first place. We face a brand new kind of 'open system' (ref. [8] in CEN.pdf) that defies the strong energy condition (SEC) and hence **all** energy conditions.

How come the cosmos does *not* break down? We should have observed all sorts of severe catastrophes (if we were around to see them), but none of them has happened. The situation strongly resembles the ultraviolet catastrophe, and calls for new physics.

Let's try Arthur Koestler's Holon. As Wolfgang Pauli remarked, "Das noch Ältere ist immer das Neue".

2. The Holon of the Universe

The so-called 'matrix' (p. **3** in hi_numbers.pdf) has the peculiar feature that it is both 'one' and 'many'. We suggest that all 'matrix' belong to the Holon of the Universe. The Holon is not physical reality but **Res potentia**. It stores the *intangible* energy from gravity and fixes the entire spacetime *en bloc* (Slide **12**). Without the matrix(es) nested in the Holon, no quantum particle, such as the proton, could be assembled (Slide **10**). Let me try to explain by comparing the current model of spacetime with ours (cf. spacetime.pdf).

The topological dimensions of spacetime can only be suggested by imagination, and in special relativity we try to imagine a light beam that will introduce particular *structure* known as Minkowski diagram. So far so good, but then people suggest a 'spherical cow' approximation in terms of vacuum GR, which by definition contains only a massless 'grin without the cat' (Fig. **1.1**), and speculate about *real* "black hole" hidden by some "event horizon", which is Russian poetry. No apparent, trapping, isolated, dynamical, evolving, causal, Killing, non-Killing, universal, Rindler, particle, cosmological, or "putative" horizon (reference upon request) can solve the *teleological* problem of the mythical event horizon.

Moreover, in the real world of the 'cat' (Fig. **1.2**), it is impossible to produce a perfect "event horizon", so even one single time-like naked singularity will **inevitably** kill the entire cosmos — *reductio ad absurdum*. You will need a quantum theory of spacetime "singularities" (ref. [**21**] in CEN.pdf) to speak about *any* "black hole". I will be happy to explain in details, if needed.

In our model of spacetime, the topological dimensions are **re**-assembled **by re**-created dynamical events 'here and now' (Fig. **4** in CEN.pdf): both the 'grin' and its 'cat' (Fig. **1**) are *flexible* 'jackets' (p. 3 in CEN.pdf). The back bone of the *physicalized* universe is the Holon made by nested matrixes. We use *Res extensa* and *Res potentia* (Slide **13**). It's a **bundle** (p. 3 in hi_numbers.pdf). Hence we could in principle reproduce (Sic!) **all** effects of gravity, not just the fact that an apple can fall and hit your head, as observed by Newton.

Namely, the *physicalized* clocks and rulers are very flexible 'jackets', which can slow down or speed up viz. shrink or expand, leading to *perfectly* correlated *physicalized* universe, at **all** length scales (p. **77**; see also pp. **30-32** and pp. **80-83** in gravity.pdf).

As an example for spacetime *matrix,* consider the invariant spacetime interval. No physical process alone could *assemble* 'one second', say. In metrology, its operational definition is "the duration of 9,192,631,770 periods of the radiation corresponding to the transition between the two hyperfine levels of the ground state of the caesium 133 atom" (Wiki), but such "definition" is only a vague description of a **totally** unknown phenomenon, which can assemble an *exact* finite time interval. Surely an invariant 'one second' cannot be assembled *only and exclusively only* by the 'cat' (Fig. **1.2**). We need the *matrix* for 'one second' as well: it's a **bundle**.

So what kind of stuff makes a *matrix* that can produce *identical* 'one second'? Sir Arthur Eddington suggested in 1927 that "the stuff of the world is mind-stuff." I strongly suggest replacing 'mind' with *Res potentia* (pp. **2-3** in hi_numbers.pdf), because the matrix only *resembles* the human memory: once created, it can never decay or disappear from the Holon — the "memory" of the Brain of the Universe.

Again, the matrix is not 'mind' nor anything labeled with *Res cogitans*. It is *Res potentia,* "just in the middle between possibility and reality" (Heisenberg, Slide **7**).

3. The Origin of Gravity

Gravity is *always* accompanied by rotation, and extragalactic astronomy has discovered amazing correlations among distant structures (see above). The most reasonable, in my opinion, assumptions are that some new gravitational law governs the *self-organization* of astronomical bodies, based on gravitational *rotation* and two tug-of-war manifestations of gravity in *dynamic equilibrium* — centripetal attraction and centrifugal repulsion. As Jim Lucas explained (October 15, 2015): "If you are observing a rotating system from the

outside, you see an inward centripetal force acting to constrain the rotating body to a circular path. However, if you are part of the rotating system, you experience an apparent centrifugal force pushing you away (Fig. 2 – D.C.) from the center of the circle, even though what you are actually feeling is the **inward** centripetal force that is keeping you from literally going off on a tangent."

Fig. 2

We conjecture that rotation/spin is *topological* property of spacetime (Fig. **9.2** in CEN.pdf) and that the **inertia** of bodies (p. **89** in gravity.pdf) arises "from the gravitational field of a **moving** (Fig. **1** in CEN.pdf – D.C.) universe", as a result of "the **interaction** of matter with the rest of the matter in the universe" (Dennis Sciama, 1952). What *we* experience is the **inward** (Sic!) centripetal force (Fig. **2**) corresponding to our 'weight' on Earth, which will be smaller if we are walking on the Moon, and can disappear if we orbit Earth in free fall.

Many issues here need explanation. Universal *topological* rotation means that the *physicalized* universe only acquires **local** "spin" in terms of **local** centripetal attraction and centrifugal repulsion, whereas the **global** 'merry-go-round' is not observable, just as the global cosmic time. Secondly, gravity is not modeled with some "curvature" but with variable 'rate of time' (R_t) fixed by the spacetime matrix (see above): it "shrinks" the spacetime metric to produce **local** centripetal attraction and/or "inflates" the spacetime metric to produce **local** centrifugal repulsion (p. **89** in gravity.pdf), until the tug-of-war manifestations of gravity reach dynamic equilibrium, and their net effect is **zero**.

In a way, the *self-organization* of astronomical bodies resembles a holistic school of fish (Fig. 3) in which the gravitational properties and dynamics of every **local** fish are being **negotiated** (Fig. **1** in CEN.pdf – D.C.) with the entire 'school of fish' (cf. ref. [**11**] in hi_numbers.pdf), i.e., "with the rest of the matter in the universe" (Dennis Sciama, 1952).

Fig. 3

Nowadays people believe that the metric space of the universe is *absolutely* fixed, which leads to *absolute* spatial structure, from 1.6×10^{-35} m (Planck scale) to the "largest" object beyond the observable universe. But I am relativist and do not accept absolute structures. Instead, I proposed at my website 'relative scale' (RS) spacetime (p. **77** in gravity.pdf).

Consider two observers, Alice and Bob, at the length scale of tables and chairs, and a table with length **1m** in front of them. In RS spacetime, the **matrix** (Sic!) of the table will *shrink* toward the Small and *inflate* toward the Large. So if Bob is co-moving with the table, he will **always** inhabit *the same* spacetime/table in front of him. Relative to Alice ($R_t = 1$), however, Bob's table will *shrink* to the size of a proton and beyond, while *at the same instant* (Sic!) the same Bob and the same table will *inflate* to the size of galaxy cluster and beyond, after modulating Bob's **matrix** with $R_t \in (0, \infty)$. Yet the table will **always** have "invariant" length **1m** to both Alice and Bob, in their respective domains.

Who has 'the right meter', Alice or Bob? **Wrong** question. Their RS 'meter' and 'second' are <u>not</u> observer-independent quantities, but *flexible* 'jackets' (cf. John's jackets parable in CEN.pdf) determined by their *atemporal* (Slide **3**) matrix.

In my opinion, RS spacetime is **the only way** to unite quantum theory with gravity, since they will be "separated" only to Alice, while Bob will be *both* "small" like a proton *and* "large" like a galaxy, and will EPR-like correlate the entire RS spacetime *en bloc* (Fig. **3**). For in RS spacetime **gravity** is determined by the same spacetime matrix that creates the *entire* spacetime (Slide **12**), only applied **locally**: shrink the RS metric to produce "cold dark matter" or inflate the RS metric to yield "dark energy", in dynamic equilibrium.

Needless to say, all this is a very brief exposé of the origin of gravity, which one day will (hopefully) be expanded to the mathematical theory of spacetime, based on the so-called hyperimaginary numbers.

4. Conclusion

I believe it is safe to say that the only thing we know for sure about inertia is what it is **not:** "The equality of inertial and *active* gravitational mass then remains as puzzling as ever. It would be nice if the inertial mass of an accelerating particle were simply a back-reaction to its own gravitational field, but that is not the case" (Wolfgang Rindler, p. **22**). The experts in gravitational physics stubbornly continue to describe inertia as some "fictitious force", because the gravitational "field" cannot be a *physical* field, like in the case of electromagnetism. I tried for many years to explain that, although gravity is not physical field, it is not *classical* field either. Unfortunately, nobody showed any interest. Many people can fly in the air by temporarily switching off the inertia of their bodies, but in our society the only digestible stereotype for REIM is "magic". Hence the alleged GR experts are "safe": academic scholars are serious people, which is why they are not interested in "street magic". How about extragalactic astronomy? It will be also "magic", if they try to explain the facts with the current GR textbooks. So they keep quiet as well.

Can't win. The only available option, it seems, is to fly over Thames in London, so that many journalists will pull out their smartphones and record REIM. Then perhaps they will start asking questions and I will offer them this brief online paper. Then perhaps they will request the opinions of their trusted academic scholars and GR experts, who will have to get professional, and the ball will start rolling. Which is why I decided to write this paper and suggest an alternative to Penrose's conformal recipe viz. BMS group B (Paper VII) and its empirical validation by Prof. Dr. rer. nat. Chuck Norris.

Addendum

My name is Dimitar G. **Chakalov** (pronounced *tcha-KA-lov*), age 64. I am **independent** researcher, interested in foundations of Mathematics, quantum gravity, and cosmology. Apart from my family and a few friends, no institution whatsoever nor any individual has *ever* supported my work (p. **81** in gravity.pdf), in any way, shape or form. I do not accept any donations. I have nobody to say 'thank you' to, and prefer to keep it that way.

Needless to say, I do not entertain people with "street magic" to promote some beverage or new cat food, say. My agenda is *totally* different.

The *only* reason I would demonstrate '**r**eversible **e**limination of **i**nertial **m**ass' (REIM) is to initiate an honest discussion of the open questions in GR (Sec. **4**). Einstein himself was acutely aware that his project is still 'work in progress' (ref. [**18**] in spacetime.pdf), as neither he nor any of his colleagues managed to suggest the crucial coupling of 'pure geometry' (Fig. **1.1**) to its physical world (Fig. **1.2**):

> The right side 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.

We have to address and discuss all foundational issues in GR with scrupulous intellectual honesty. I will make sure that all experts in gravitational physics and numerical relativity, who agree to comment on my model of gravity and its prediction about REIM (Sec. **4**), will first demonstrate their unbiased opinions on gravitational radiation 'in time' (**Sic!**) and also comment on the mysterious "event" dubbed GW150914 (p. **15** in gwa_rip.pdf).

This is the ultimate test for their scrupulous intellectual honesty (invitation list here).

To be specific, I expect from all experts in GR (Sec. **4**) to first explain their professional opinions on the alleged GW astronomy (gw_miracles.pdf), and then comment on the bold statement by Kip Thorne that GW150914 were "by far the most powerful explosion humans have ever detected except for the big bang" (5.4×10^{54} erg), except that GW150914 was *totally* invisible to Fermi GBM and INTEGRAL, as it did **not** produce *any* physical effect in the 'cat' (Fig. **1.2**): "In classical general relativity, a *vacuum* BBH merger does not produce any EM or particle emission whatsoever" (LVC Publications, arXiv:1602.08492v4, p. **9**).

Are we living in some massless ($T^{ab} = 0$) vacuum? The first time I raised my objections to LIGO was fourteen years ago, on 19 February 2003, yet nobody, up to this day, has paid *any* attention to the **facts** known since 1944, thanks to Hermann Weyl (ref. [**3**] in gwa_rip.pdf).
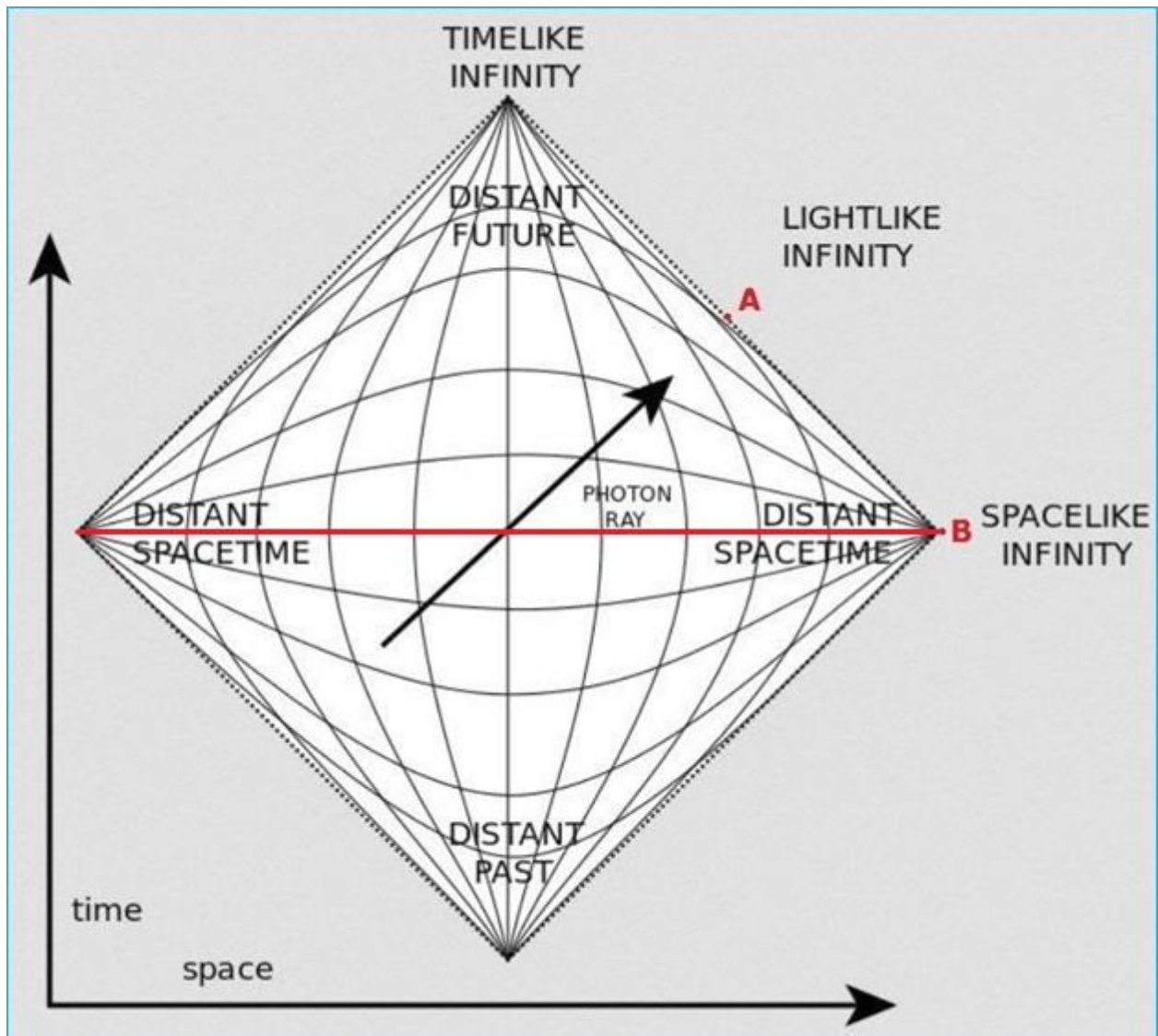
Billions of US dollars and euros are already wasted for "GW astronomy", and billions of Indian rupees will be wasted for LIGO-India (p. **17** in gwa_rip.pdf). Enough is enough.

I will be more than happy to discuss these issues with experts in gravitational physics and numerical relativity in London. We'll have a jolly good time!

11 May 2017
Latest update: 24 May 2017, 11:24 GMT

Penrose-Norris Diagram

Adapted from Wikipedia

"Penrose diagram of an infinite Minkowski universe. The diagonal boundary lines of a Penrose diagram correspond to the "infinity" where light rays **must** (Sic! - D.C.) end."

To quote from Wikipedia, the Penrose diagram "introduces a system of representing distant spacetime by shrinking or "crunching" distances that are further away. Straight lines of constant time and straight lines of constant space ordinates therefore become hyperbolas, which **appear** (Sic! - D.C.) to converge at points in the corners (not at **A** – D.C.) of the diagram. These points represent "conformal infinity" for space and time."

This is not a joke — check out Penrose_omega_zero.jpg.

In the drawing above, I marked null infinity (Scri₊) with **A** and spacelike infinity (Spi)

with **B**, to help you define null-and-spacelike infinity (Scri U Spi viz. Trautman-Bondi mass & ADM mass) *exactly* at **A≡B** : "Essentially nothing is known" (Bob Geroch). True, because Scri and Spi are apples and oranges — there is no room whatsoever for *any* **dynamics** (Bob Geroch) along spacelike directions. The entire universe is **already** fixed *en bloc* and the horizontal **red** line above shows the "trajectory" of some transcendent tachyon, which will be absolutely everywhere in no time, that is, at absolute rest.

How about the first *direct* observation of vacuum spacetime, dubbed GW150914? You have to install GW "**mirrors**" *exactly* at **A≡B** (p. **3** in Schutz.pdf), to confirm Penrose's conformal recipe and BMS group B (Hermann Bondi *et al.*, Paper VII). They were validated empirically by Prof. Dr. rer. nat. Chuck Norris (announcement below).

Chuck Norris' idea was to jump into the so-called "unphysical manifold **M**" suggested by Roger Penrose, reach the very "edge" of spacetime (Ω = **0**), and safely come back, contrary to the *insoluble* Thomson's lamp paradox. Is this mathematically possible?

Yes it is possible, but iff the "unphysical manifold **M**" actually belongs to the *entire* pub in the example below, including the **red** "edges" (Ω = **0**) of the two pint beer:

An infinite (*actual* infinity) crowd of mathematicians enters a pub. 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.

[two pint beer]

The **[beer]** is embedded in the pub

Under this crucial condition, Penrose-Norris will <u>not</u> be approaching asymptotically the **red** "edges" (Ω = **0**) of the **[**two pint beer**]** "as closely as desired" (Adolf Fraenkel), but will *actually* hit them and **stop** (Sic!) *exactly* at the **[**GW "**mirrors**"**]** at Ω = **0** — **twice**. Needless to say, the *entire* pub, including the two edges (Ω = **0**) of the **[**two pint beer**]**, cannot be conformally equivalent to the **[**beer**]**, and therefore Penrose's recipe for reaching infinity is manifestly **false**. Besides, keep in mind that the **beer** is 95% "**dark**".

Alternatively, check out holon.pdf and CEN.pdf and the references therein. The 'two pint beer' above is endowed with *dual* mode of spacetime, global and local. The *global* mode defines the **inertia** of the two pint beer (Fig. **2**, p. **4** in holon.pdf) *en bloc* (Sic!). It is *quietly* (**A2** in Slide 19) residing within the *entire* "pub" above (Fig. **4** in CEN.pdf). It is intrinsically **nonlocal** and cannot be detected — the physical bodies are made by asymptotic "beer" approaching the "edges" of spacetime *asymptotically*, as closely as desired, and we can <u>only</u> detect local finite *physicalized* 4D "jackets" (p. **3** in CEN.pdf) cast in the *local* mode of spacetime, with positive mass only (Eq. **1**, p. **4** in CEN.pdf).

See also p. **36** in spacetime.pdf, and Fig. **12** (dual age cosmology) and p. **15** in CEN.pdf. All this is encapsulated in the old story below (Fig. **22** in spacetime.pdf).

οὐροβόρος

The enclosed words mean 'The All is ONE'

Any time you look at your watch to record your local 'here and now', the Dragon has already caught its tale in the **past**, and the next **new** state of the tail (Heraclitus river) has already been shifted one infinitesimal step (**dt**) ahead in the **future**, *ad infinitum*. The **past**/**future** *polarization* of spacetime unfolded "after" [John 1:1], of course.

This is just a casual outline of the dynamics of spacetime; more in p. **6** in holon.pdf and p. **67** in gravity.pdf. The full version is expected by Christmas 2017, hopefully.

D. Chakalov
10 March 2015
Latest update: 3 June 2017, 11:33 GMT

ADDENDUM

> Truth never triumphs — its opponents just die out.
> Geheimrat Max Planck

Thirty years ago, on Thursday, 5 February 1987, I presented the widely known fact of 'quantum reality' at a seminar at the Institute for Nuclear Research and Nuclear Energy at the Bulgarian Academy of Sciences in Sofia: check out Slide **7**. I spoke for 40 min, from 11AM to 11:40AM, arguing that the human brain and all living organisms utilize 'quantum reality', which is not present in QM textbooks. There was 20 min felt for discussion until 12PM, but, strangely enough, none of my colleagues attending the seminar raised *any* questions. It was unprecedented reaction on behalf of these academic scholars, all of whom had very high academic credential, mostly from Dubna in Russia. I interpreted their silence to the fact that I was sharply challenging the official dogma of Marxist-Leninist philosophy, presented by Vladimir Lenin in his pamphlet 'Materialism and Empiriocriticism' (1909), and they didn't want to get involved — we were living in a dreadful communist country, totally controlled by the communist mafia and Bulgarian branch of KGB. But I nevertheless decided to speak out, and was *very* well prepared to answer all questions about 'quantum reality' in QM and in QED. But again, my presentation on 5 February 1987 was met with dead silence, and none of my colleagues mentioned anything about it afterwards, even privately.

On Monday, 16 March 1987, the communist mafia struck back: I was informed that I have lost my job, effective *immediately*. Why? The official explanation was that the Bulgarian Academy of Sciences does not have money for *my* salary. It was a devastating moment, which I can never forget. But what doesn't kill you only makes you stronger.

Now we all live in a normal world, and nobody has to talk communist bullshit in order to keep her/his job. Yet the reaction to my work from hundreds of mathematicians and theoretical physicists, from many countries around the world, is *exactly* the same — **dead silence** (p. **81** in gravity.pdf).

Do I have to fly over Thames in London (pp. **5-6** in holon.pdf) to eventually trigger their interest in theoretical physics?

What if I am talking to Russians and Max Planck is right?
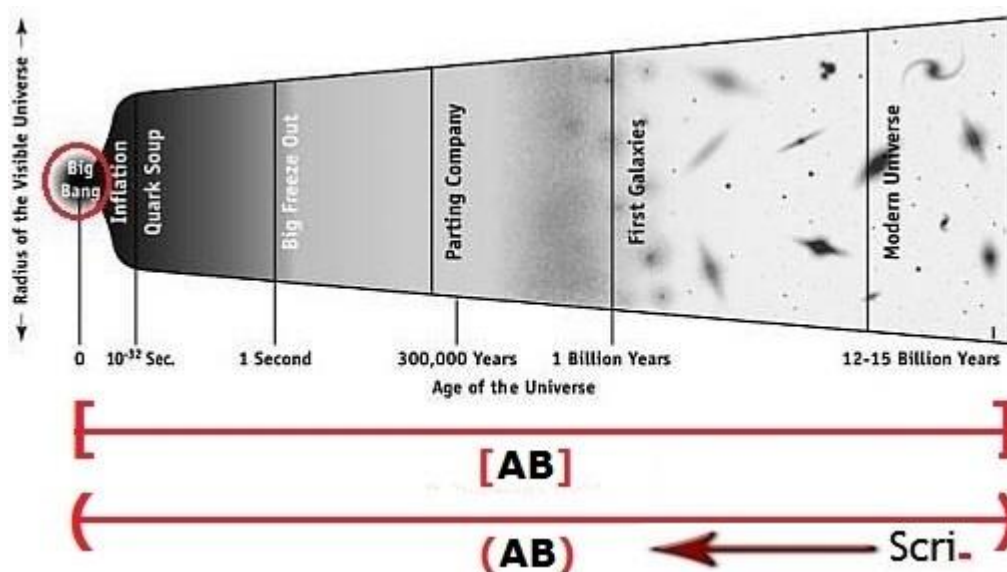

D. Chakalov
16 May 2017, 14:24 GMT

NOTE

As of today, 5 June 2017, no reply to my email messages from May 11th and May 16th (gravity.txt) has been received. Nobody even wrote back just to say something to the effect of I-am-too-busy-go-to-hell. The only professional feedback to my work came five years ago, from Prof. Dr. rer. nat. Maurice de Gosson at the University of Vienna: "Buzz off, idiot!" (Mon, 21 May 2012 18:47:46 +0200).

If you do *not* believe that I am an idiot, and understand the problem with 'boundary' at null-and-spacelike infinity, read ref. [**21**] in CEN.pdf (links and emphasis mine):

José M.M. Senovilla, Singularity Theorems in General Relativity: Achievements and Open Questions, 30 April 2006, arXiv:physics/0605007v1, p. 6.

> 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 (Sic! – D.C.), it is accessible **from within it** (Sic! – D.C.). Thus the necessity of a rigorous definition of the **boundary** of a space-time.

Denote the "boundary of a space-time" with Ω from Penrose's recipe, and place it *exactly* on the endpoints of the *closed* interval [two pint beer] above, depicted with [**AB**] in the drawing below, from Slide **12**. **NB**: Your clock reads an "expanding" (**AB**).

[**AB**] must be "somehow" accessible from *within* (**AB**), although
[**AB**] is "some kind of boundary, or margin", which is not part of (**AB**).

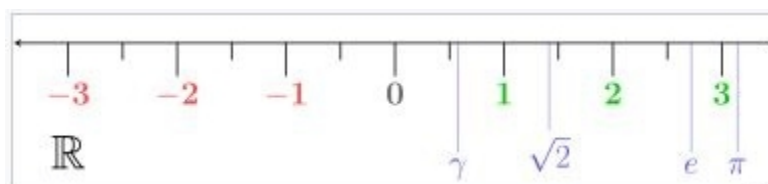The only possible solution is explained above. The *polarization* of spacetime points 'here and now' (Fig. **4** in CEN.pdf) **assembles** the spacetime "**sideways**", with (**i**) *global* mode *en bloc* (actual infinity by [**AB**]) and (**ii**) an *orthogonal* (Sic!) local mode endowed with potential infinity within (**AB**), from (**i**) *global* spacelike infinity (Spi) and (**ii**) *local* null infinity (Scri$_{+/-}$). See the *orthogonal* axis W on p. **14** in spacetime.pdf.

In summary, we can *in principle* define "the gravitational field of the universe as a whole", pertaining to a "moving universe" (Dennis Sciama), with the *dual* mode of spacetime, global and local (Fig. **4** in CEN.pdf): think **globally** act locally. Check out the analogy with a school of fish in pp. **89-90** in gravity.pdf and Fig. **3** in holon.pdf.

Alternatively, if the wegtransformierbar gravitational energy were localizable (think locally act locally), we could define local gravitational energy density as 'energy per unit volume' and find its derivatives with respect to 'time as read with a clock' (**dt**), then calculate the *total* energy, including the input from gravity, in some finite volume of spacetime, much like we find volume of sphere with the diameter **[AB]** above. Then we could calculate the gravitational **time** during which the total energy of the sphere stays conserved, and of course the two **edges** Ω at **[AB]** above, à la Penrose & Norris.

Thank God, Nature is smarter.

Now, if you are *professional* mathematician (not like Chuck Norris or Roger Penrose), recall that people strive for mapping numbers to the *continuum* of points from a 'line' ($\mathbb{R}^1$), as explained in Wikipedia — *we* invented what we call 'numbers', whereas Nature has given us 'points' building up the *continuum* without **any** "gaps" between them.

Is the real line a genuine *continuum* ?

We can make the real line a genuine *continuum*, but only with new Mathematics. As Robin Le Poidevin noted (*Travels in Four Dimensions*, 2003, p. 121), "If between any two points in space there is *always* a third point, can anything touch anything else?"

Yes it can. We can "touch" **absolutely all** points from the real line and prove that it is indeed a linear *continuum*, but only with the two *ontologically* different presentations of infinity **[AB]** and **(AB)**: we can "touch" with **[AB]** but can't *stop* (Sic!) there due to **(AB)**, as explained above. The idea of 'differential' is *essentially* incomplete (David Bohm and Fig. **6.1**, p. **8** in hi_numbers.pdf): we can't differentiate "over" the points from **[AB]** and have to exclude the endpoints, as in **(AB)** from the cosmic time.

Don't try to sweep the garbage under the rug with some "local differential geometry" (Bob Geroch): the *Ghosts of departed Quantities* (George Berkeley) belong to the continuum as well. We need the *hyperimaginary* numbers, as they provide the unique "**zero**" that is quietly ($t_2 \equiv t_1$ in Slide **19**) residing "between" any two points viz. numbers from the real number line, hence making it a *genuine* continuum. Namely, at every 4D instant 'here and now', Nature (not "He") has *already* created **absolutely all** points within **[AB]** by *actual* infinity, and at *the same* instant **it** (not "He") has *already* created an orthogonal (Sic!) *open* interval **(AB)** for brand new events to unfold in the unbounded *potential* future by potential infinity, *ad infinitum* — see the Dragon above.

To sum up, the spacetime continuum is a *living* entity, like a zygote, but its lifetime is unbounded, as it grows up indefinitely in the infinite future — the *arrow* of time points to the *unbounded* future toward Scri$_+$, whereas the *irreversible* past toward Scri$_-$ is bounded by The Beginning [John 1:1].

Also, the spacetime continuum has unique kinematics, dynamics and non-trivial topology (pp. **13-16** in CEN.pdf) embodied in the so-called *biocausality* (p. **16** in spacetime.pdf). Due to the *polarization of spacetime*, all points are nothing but the very *interface* "between" the *potential* **future** and its irreversible **past** (Slide **13**), which makes all points equal — the "edge" of spacetime at null-and-spacelike infinity, denoted with **A≡B** above, is *indistinguishable* from the "edge" of every single point in it (**t$_2$ ≡ t$_1$** in Slide **19**). The "edge" of both the entire spacetime and every point is one and the same *atemporal* background of the *physicalized* spacetime (dubbed 'causal field', p. **14** in spacetime.pdf), which is perpetually **nullified** "after" The Beginning [John 1:1] — once-at-a-time (Fig. **1** in CEN.pdf), as read with your wristwatch. God is always *within* us (Luke 17:21), but **it** (not "He") is *perfectly* hidden by the "speed" of light. Otherwise we would be able to detect some *physical* and completely motionless aether, and the theory of relativity will be false.

Perhaps our problems with understanding the *continuum* are rooted on the fact that we have to "freeze" it in order to "see" it mathematically. Obviously, we need to dig into Mathematics much deeper — check out p. **19** in CEN.pdf.

That's all folks. Let me know if you're interested.

D. Chakalov

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