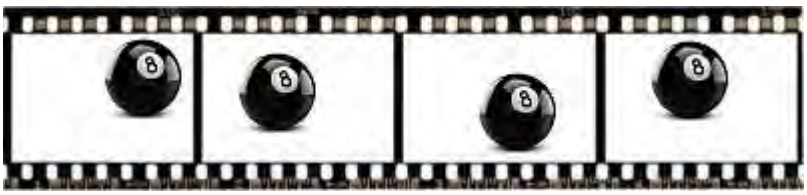
What is the fabric of spacetime made of?

Dimi Chakalov, *Quora*, 24 November 2019

Surely "what is the fabric of spacetime made of?" is the billion dollar question. One cannot paint a picture without its canvas, but there is no 'background' (dubbed Aether) in General Relativity, resembling bare colorless nails. The Riemannian manifold is by definition *perfectly* smooth: any finite in size area, no matter how small, will contain *infinitely many* (non-denumerable) "points", whereas the "colorless" Aether cannot have any "point**s**" whatsoever. It is just dimensionless.

We only know what the "colorless" fabric of spacetime is *not* made of. If we imagine the drawing below as matter affected by gravity, the fabric of spacetime is not made of the physical stuff in the right-hand side of Einstein's field equations, nor from the geometric presentation of spacetime in the left-hand side. The grin of the Cheshire cat *without* the cat has no "points".



Read p. 21 in Brain-Controlled Cold Plasma (BCCP) at chakalov.net. As we know after the negative result from the Michelson-Morley experiment, the Aether is not compatible with the theory of relativity: there can be no motion *in relation to* the Aether (Albert Einstein). There is no "window" toward the Aether in the *physical* spacetime (the grin on the face of the *physical* cat) made exclusively by consecutive 'billiard balls': we cannot even imagine two geometric points along a finite spacetime interval, fixing the *width* of the dark strips in the drawing above, and hence talk about motion *in relation to* the Aether. There is no 'background Aether' in the *physical* world. The 4D spacetime continuum is **perfect**.

We can observe, by physical observations, only *colored* physical stuff – the 4D billiard balls above – whereas the 'colorless' film reel, including the dark strips separating consecutive 4D instants 'here and now', must be *completely* eliminated: the so-called 'speed of light in vacuum' is sheer metaphysics. Physically, this "vacuum" or Aether does not emit or reflect light, so its energy must be *perfectly* "dark".

But how could we even speak of 'the fabric of spacetime' if the latter is "colorless" and hence UNspeakable? It would "look" to us like **one single** mathematical "point" stretched to infinity!

Read p. 21 in BCCP above. Plato suggested the answer many centuries ago.

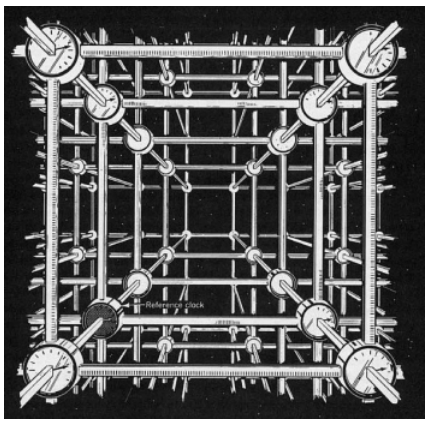
Note

The operational definition of 'time' is "what a clock reads" (Wikipedia). Try to imagine a caesium atom in its ground state at a temperature of *exactly* **0** K. Why? Because the official SI definition of 'one second' is as follows (Wikipedia):

The second 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.

The operational definition of 'one meter' (BIMP) is "the length of the path travelled by light in **vacuum** (Sic! – D.C.) during a time interval with duration of 1/299 792 458 of a second."

These are, of course, just "operational" definitions in metrology. Nobody asks the question how come nothing goes wrong during the *process* of fixing 'one second' and 'one meter' by Nature. The "rate" of time would have to be 'one second per second', which makes no sense. If we look at the billiard balls above, we may not say that **X** number of tiny little instantaneous snapshots could assemble *exactly* 'one meter'. Ditto to 'one second' from the *invariant* "speed of light". Here's more: look at Fig. 9 in *Spacetime Physics*, by E.F. Taylor and J.A. Wheeler, reproduced below (source here).



NB: What phenomenon could "calibrate" the **ideal** rods and clocks (MTW p. 397) that are pre-build in spacetime? For if we manage to *tweak* the **matrix** of light-travel time, we should be able to alter the ***rate*** of the light-travel time and **reproduce** **all** attributes of spacetime related to gravitation, including the *relational* "Large" and "Small": see **1 RS** meter on p. 20 in BCCP.

As the authors acknowledged: "We assume that *every* clock in the latticework, whatever its construction, has been calibrated in meters of light-travel time."

Calibrated? By *what*? By the billiard balls above? Or maybe because, as we know from thermodynamics (Wikipedia), if you open the window in your kitchen in a freezing winter day, your kitchen will get cold, not the other way around? Check out the **matrix** at p. 7 in BCCP.

This is why we need the *atemporal* Platonic reality. Only the Mathematics is still uncovered.

D. Chakalov
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The three cats in quantum gravity

"Space acts on matter, telling it how to move. In turn, matter reacts back on space, telling it how to curve." J.A. Wheeler in Gravitation, p. 5 (p. 3 in Zenon Manifold).

There are three cats in quantum gravity: the Cheshire cat above (as observed by Alice, p. 15 in Platonic Theory of Spacetime), the Schrödinger's cat, and T.S. Eliot's cat Macavity.

Why is this important? Read Hermann Bondi and p. 28 (last) in Brain-Controlled Cold Plasma (BCCP). I have explained there the crucial importance of spacetime engineering for combating climate change. It is *the* only chance we have to save our planet. Nothing else could fit the bill.

To understand the coupling of **matter to matter** via gravity, read pp. 23-27 in BCCP and focus on the *alterations* (depicted as "curvature" in the drawing above) of the metric "field" in GR, placed in the left-hand side of Einstein's equations (the grin of the Cheshire cat *without* the cat). The GR effects that are widely known to the public are those implemented in GPS navigation (Richard W. Pogge). However, in this case the *alteration* of the "rate" of time is (**i**) minuscule and (**ii**) does *not* explicitly involve energy transfer (Sic!) in the coupling of **matter to matter** via gravity – we cannot in principle witness this 'GR cat' effect in real time "online", as it unfolds (recall time dilation). This effect from *alteration* of the "rate" of time is not only minuscule, but its magnitude is fixed in time as well: at every instant we look at our GPS navigation, the matter (the Cheshire cat in the right-hand side) has *already* reacted "back on space". The negotiation between the two sides of Einstein's equations above is *already* completed and dead fixed in time: "nothing changes" (Bob Geroch). And GR "experts" do not even discuss spacetime engineering.

As a remote analogy, consider the reading of an air thermometer at your terrace in a summer day: suppose it shows 25° Celsius, and also that it does *not* change, being *already* fixed. Any time you look at the thermometer, you will see only 25° Celsius. The air temperature is obviously caused by the Sun (the Cheshire cat in the right-hand side of the equation above), so if you decide to *alter* the reading of your thermometer (the left-hand side of the equation above) locally, e.g., by heating it with a hair dryer to 35° Celsius, the air temperature at your terrace viz. the Sun's temperature will not increase. Hence people believe spacetime engineering were "impossible".

Of course it is possible. We only need the mental correlate (qualia) of the so-called vacuum, which does not emit or reflect light (p. 3 in BCCP), so its energy must be *perfectly* "dark", as explained above. Tweaking the complex phase (Chen N. Yang) of quantum "waves" does not require energy, like with the heating of the thermometer above. We don't even touch the right-hand side above. Watch 'Spacetime Engineering 101' on 15 January 2020 at this http URL. To obtain the password for watching the video (720p, MP4), follow the instructions at pp. 2-3 in Spacetime Engineering. For other inquiries, notice the excerpt from my website at this http URL.

D. Chakalov
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Über die Substanz von Raum und Zeit

The question of the substance or "fabric" of spacetime (read above) has longtime precursor in philosophy. Some philosophers call the Kantian Ding an sich 'substance', arguing that **it** "is a property-bearer that must be distinguished from the properties it bears" (Wikipedia). **It** may only exist "in itself," without being property of *any* other things. Therefore, **it** could be non-reality, totally outside human comprehension. But what if Mother Nature is smarter? See the drawing at p. 8 in Platonic Theory of Spacetime and read closely pp. 29-30 therein.

Let me shed some light on the issues surrounding the *substance* of spacetime, arguing that these metaphysical issues may have decisive implications for the understanding of the "expansion" of spacetime metric (Quora) and subsequently the alleged "dark energy" (read above). Very briefly:

1. The notions of 'energy' and 'spacetime' should be understood like adjectives, say, **red**. If we say '*this* is **red**', we must define what *physical* object has the property of being **red**. For example, the Cheshire cat in the right-hand side of the equation above. Physically, it will be impossible to observe 'space by itself' or 'time by itself', just as it is impossible to observe an ideal sphere. We observe only a football or a planet with spherical shape, and the latter is property *of* these objects.

2. The grin of the Cheshire cat *without* the cat, as depicted above, is the very *substance* of spacetime, yet **it** is *not* observable in Physics. If it were observable, we would immediately ask about its origin, which in turn leads to infinite regress known as 'turtles all the way down'. Many centuries ago, Aristotle proposed a special cutoff on these 'turtles', dubbed Unmoved Mover: 'that which moves without being moved' (Wikipedia). Subsequently, the entire physical world could be endowed with the property of **self-action**, being rooted on the physically-undetectable Unmoved Mover. However, many (otherwise smart) people reject the Unmoved Mover and try to detect some *physical* origin of the "accelerated expansion" of the observable universe, only to fail miserably. In life sciences (Case **II**, p. 27 in BCCP), we know that there can be no "homunculus" in the human brain. You can't explain brain's **self-acting** faculty with some "dark" physical stuff.

3. The **self-acting** substance of spacetime could be the origin of the *flow* of time, exhibited with four billiard balls in the drawing above. The latter are only 4D "shadows" of the Platonic world, like a Platonic **hand** in 4D "glove": read p. 9 in BCCP and the *calibration* of spacetime above.

To sum up, in the physical world at macroscopic scale we have "colorless" objects; for example, an octopus: read 'Reversible Elimination of Inertial Mass' (REIM). Yet an octopus is like the "colorless" hand above, whereas the colorless **matrix** (p. 7 and pp. 10-11 in BCCP) is atemporal Platonic reality (*Res potentia*) nested (Sic!) in the *substance* of spacetime. **It** (not "He") is neither matter (*Res extensa*) nor mind (*Res cogitans*): read the doctrine of trialism at p. 25 in BCCP. The Platonic **matrix** is presented as 'John' in Schrödinger's cat, and with a new kind of '**zero**' in the Macavity cat above. In symbolic terms, **1 + 0 = 1**, meaning that all "probabilities" for observing John's jackets sum up *exactly* to **1**, whereas the chance to observe the Platonic **matrix** is *exactly* **zero** (**A** in p. 10 in BCCP). Read Erwin Schrödinger at p. 6 in BCCP and pp. 13-14 therein.

Details at p. 6 in The Physics of Life and at p. 27 in BCCP. Nature is unique non-relational **ONE** entity (cf. trialism, p. 25 in BCCP). **It** (not "He") can be reached only with Mathematics.

D. Chakalov
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The Doctrine of Trialism

Sometimes it is difficult to realize what the world is made of. Eskimos, for example, have hundreds of words for different types of snow, but no general notion of 'snow'. We are a bit better – we can formulate the ultimate notion of 'substance' (Plato suggested the term Form) from which matter and spacetime emerge, stressing that we refer to the *origin* of all types of matter. Obviously, what we call 'substance' is *not* observable in principle – read Aristotle above. Metaphorically speaking, **it** (not "He") is like a Platonic **hand** in 4D "glove" (p. 3 in Zenon Manifold). As C.J. Isham and J. Butterfield noticed, it will be ferociously difficult to understand the *emergence* of spacetime from 'something else'. But who cares about 'something else'?

We do, very much indeed, for at least two reasons: if we wish to fix something, first we must know how it works. Here by 'fixing' I mean spacetime engineering, which is rooted on the oldest proposition on the origin of mind and matter, as Gottfried Wilhelm von Leibniz has elucidated it in 18th century: read again the doctrine of trialism at p. 25 in BCCP. The second reason to seek the common origin of mind and matter is the *emergence* of 'mind' (*Res cogitans*): the mind does *not* originate from its brain, much like the images on a TV screen do not spring from it. Nothing in the human brain could even remotely resemble *anything* we know from psychology, by means of brain-mind isomorphism. The human brain and mind have *nothing* in common. They are two ontologically different 'elements of reality', in line with the doctrine of trialism (p. 25 in BCCP).

Thus, we care about the *origin* of mind as well. As Thomas H. Huxley noticed, the fact that "a state of consciousness comes about as a result of irritating nervous tissue, is just as unaccountable as the appearance of the djinn when Aladdin rubbed his lamp". Physicists can afford to ignore the puzzle of 'substance', as the common origin of mind (*Res cogitans*) and of matter and spacetime (*Res extensa*), but we are constantly aware of it: read p. 31 in Platonic Theory of Spacetime.

These are the prerequisites to the so-called doctrine of trialism. But what can we make from it? Read p. 6 and p. 9 in The Physics of Life. As noticed earlier, spacetime engineering works better than a Swiss watch (p. 2 in Zenon Manifold). Don't ever say that you knew nothing about it.

Finally, let me go back to the main question above, about what the world is made of, and offer a simple way to reject the doctrine of trialism. You only have to show that the underlying Platonic theory of spacetime is *not* unique, namely, to offer an *alternative* to Platonic reality: **It** (not "He") is the **origin** of physical reality, yet **it** does <u>not</u> exist as physical reality. The latter is explained, in symbolic terms, with **1 + 0 = 1** above. To be specific, recall the quantum vacuum (Peter Milonni) and the spacetime "vacuum" in the "definition" of the *invariant* "speed of light" (J. Christensen at pp. 23-24 in Zenon Manifold). These two manifestations of "vacuum" explicitly show that we cannot consider them 'physical reality *out there*', like the water in toilet's reservoir (*ibid*., p. 11).

Physically, this "vacuum" *must not* exist. Otherwise the radius of the universe "could not even reach to the moon," as calculated by Wolfgang Pauli, and the Michelson–Morley experiment would have proved some *physical* medium of EM waves viz. *physical* absolute reference frame, which could provide *absolute* coordinates to the 'billiard balls' in the 'movie reel' above, fixed on their 'movie screen' (or 'canvas', known as Aether) at *absolute* rest: *reductio ad absurdum*.

Ergo, this "vacuum" can only exist as Platonic reality. Q.E.D.

D. Chakalov
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Spacetime Engineering 101

Wednesday, 15 January 2020, available at this http URL

You only have to swing – effortlessly – the carrot (*potential* future) toward your desired destination, and the donkey will carry you and the cart there. Read p. 28 (last) in Brain-Controlled Cold Plasma (BCCP).

The reason to this video lecture is twofold. There is nothing "mysterious" or "anomalous" in the human perception and action, and the same applies to spacetime engineering. In both cases, people are ignorant of the *physics* of living organisms. However, the physics of Life cannot be ignored in spacetime engineering anymore. This is the only "difference" between a simple motor skill, such as moving your arm (e.g., N.A. Bernstein), and spacetime engineering. On the other hand, many so-called "magicians" show off and entertain bystanders on the street, by taking advantage of the current lack of understanding of the physics of Life, hence promote some weird out-of-this world "magic". All the *indisputable* demonstrations of spacetime engineering, shown and discussed in the video lecture here, are available at YouTube, but have been produced by some (immensely wealthy) people camouflaged as "magicians". No, there is no "magic" here.

To understand the "carrot" in the drawing above, you need basic knowledge in (**i**) QM and QED and (**ii**) the *origin* of gravity (read above) viz. the transport of mass-energy by gravitational radiation. Regarding (**ii**), read LISA Pathfinder is a scam! (over 450 million euros were wasted), p. 24 in BCCP, and p. 13 in Zenon Manifold. Nobody knows how much money, earned with hard labor and taken from our taxes, are already wasted for "GW astronomy". Many **billions**, for sure.

Needless to say, we need spacetime engineering right now, to save our planet (p. 28 in BCCP). EU will not meet 2030 climate goals, simply because it can't. We need a breakthrough – **now**.

To obtain the password for watching the video (720p, MP4), follow the instructions at pp. 2-3 in Spacetime Engineering. For other inquiries, notice the excerpt from my website at this http URL.

In the spring of 2020, I plan to release the updated version of my first paper from 15 January 1990, entitled *How to Bind Mind to Matter?* (abstract here). Thirty years ago, I suggested the broadest type of relativistic causality, dubbed biocausality, covering all living organisms and the quantum world (p. 20 in BCCP). Now I will happily add gravitation (p. 15 in Zenon Manifold) and elaborate on (**ii**) above. Regarding biocausality: it includes '*atemporal* quantum reality', as suggested at a seminar in Sofia (BG) on 5 February 1987 – read p. 4 in Penrose-Norris Diagram.

Why am I writing a sequel to my 30-year old paper *How to Bind Mind to Matter*? Because now I can claim, with the benefit of the hindsight, that I could have offered my theory of spacetime and its testable predictions over twenty years ago, iff there was a trace of interest in Mathematics and quantum gravity by the theoretical physics community. I also believe we could have *unlimited* ecologically clean energy by the end of 1999 (Sic!), instead of going to war on Iraq and killing 650,000 people, as estimated in the second *Lancet* survey from 11 October 2006, and spending $6.4 trillion for the endless 'war on terror'. Also, we could have avoided the climate catastrophe (p. 28 in BCCP) from the outset. As of today, it is still possible to save our planet, but now the task is *far more* difficult. And yes, spacetime engineering is *the* only option we have to reduce emissions by 7.6 per cent *each and every year* from 2020 to 2030. If we fail now, by 2025 the cut needed will steepen to 15.5 per cent *each year*, which is absurd, plain and simple. Read about the UN Environment Program (UNEP) 2019 Emissions Gap Report from 26 November 2019 at this http URL. On 11 December 2019, Greenpeace EU spokesperson Franziska Achterberg said: "A 50-55 percent emission cut by 2030 is not sufficient. Nature doesn't negotiate. The longer we wait to make the necessary changes in our economy, the more damage will be caused and the more difficult and expensive it will be. By delaying its proposal for the 2030 EU emissions reduction target to summer 2020, the Commission risks undermining the Paris agreement and any hope for EU climate leadership."

Check out the forthcoming video lecture 'Spacetime Engineering 101', 15 January 2020, above.

We **must** defend our children (p. 28 in BCCP). They cannot fight for their future. We can.

D. Chakalov
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