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 “points” 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](https://en.wikipedia.org/wiki/Time)). 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](https://en.wikipedia.org/wiki/Second)):

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](https://physics.nist.gov/cuu/Units/meter.html)) is “the length of the path travelled by light in vacuum ([Sic! – D.C.](https://www.physics.nist.gov/cuu/Units/meter.html)) 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](https://www.physics.nist.gov/cuu/Units/meter.html)).

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](https://en.wikipedia.org/wiki/Thermodynamics)), 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
24 November 2019
Last update: 25 November 2019, 11:05 GMT
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.

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 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.

Subsequently, people refuse to even discuss spacetime engineering, as if it were “impossible”.

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. 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
26 November 2019
Last update: 28 November 2019, 20:40 GMT
The question of what is the substance or “fabric” (read above) of spacetime has its precedent in philosophy. Some philosophers dare to call the Kantian thing-in-itself ‘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. If so, it may only be non-reality, totally outside the ability of human comprehension. Sounds like the question of how many angels could dance on the head of a pin (Quora), right? Well, see the drawing at p. 8 in Platonic Theory of Spacetime and pp. 29-30 therein. You’ll be the judge.

Let me try to shed some light on the substance of spacetime. I am not smart enough to offer a crash course in Lucretius’ De Rerum Natura, and will only argue that these purely metaphysical issues could have clear practical implications, for example, for the correct understanding of the “expansion” of spacetime metric (Quora) viz. the so-called “dark energy” (read above). 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 the physical origin of the “accelerated expansion” of the observable universe, only to fail miserably. In neuroscience, we are acutely aware that there is no “homunculus” in the human brain. Nobody is trying to explain its self-acting faculty with some “dark” physical mechanism.

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 underlying Platonic world: read p. 9 in BCCP and recall 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 a physical object ‘out there’, whereas the “colorless” matrix (p. 7 and pp. 10-11 in BCCP) is atemporal Platonic reality (Res potentia) nested in the substance of spacetime. Notice that the matrix is presented as ‘John’ in Schrödinger’s cat, and with a new kind of ‘zero’ in Macavity cat above. In symbolic terms, \(1 + 0 = 1\), in which the “probabilities” for observing John’s jackets sum up to 1: read Erwin Schrödinger from 1935 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. God exists as mathematical object. You can’t argue with Mathematics.

D. Chakalov
29 November 2019
Last update: 30 November 2019, 12:55 GMT