

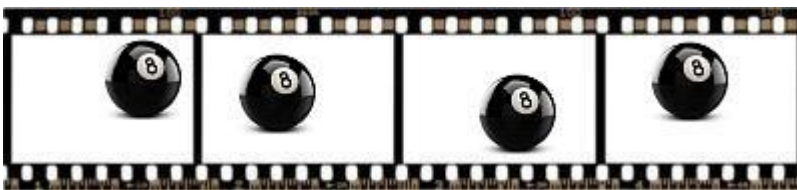
What is the fabric of spacetime made of?

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](#)). 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](#)):

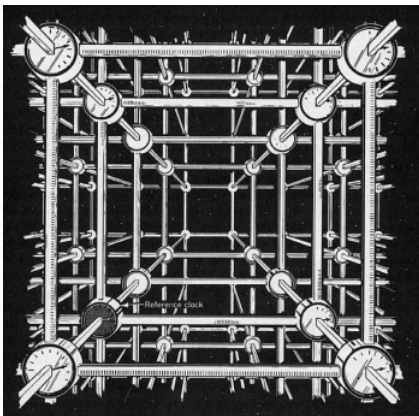
The second is the duration of 9,192,631,770 periods of the radiation corresponding to the transition between the two hyperfine levels of the ground state of the caesium 133 atom.



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](#)).



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](#).

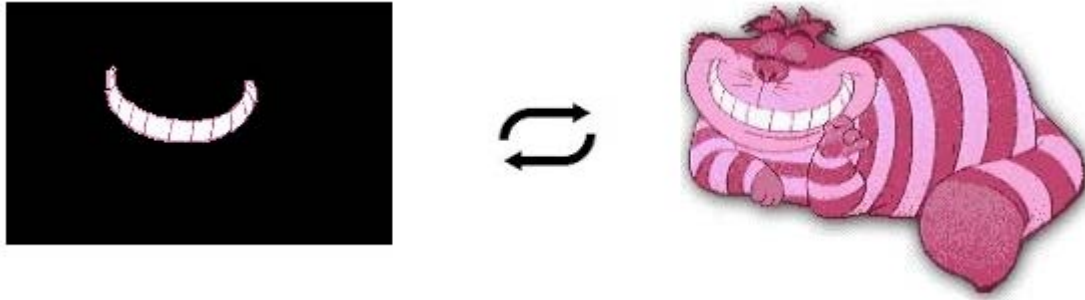
This is why we need the *atemporal* [Platonic reality](#). Only the [Mathematics](#) is still uncovered.

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](#).

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

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Über die Substanz von Raum und Zeit

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-undetected 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, $1 + \mathbf{0} = 1$, 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.

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