The Arrow of Spacetime

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Abstract

The principle of locality (p. 27 in the manual[1]) asserts that an object is directly *influenced* only by its infinitesimal surrounding. Fine. But how come this 'influence', called causality (Wikipedia), points to only **one** "direction", as noticed by Heraclitus? Most importantly, why there is ***any*** 'influence' in the first place? Enter the *arrow of spacetime*[2].

To commemorate the seminal talk by Hermann Minkowski *Raum und Zeit* on 21 September 1908, I invited in June 2008 many theoretical physicists to my talk *The Arrow of Spacetime* on 21 September 2008: see p. 6 and ref. [16] in the manual[1]. I will explain the crux of my talk, ensuing from the Heraclitean river above. It is perfectly hidden by the invariant and non-relational "speed" of light (Wikipedia). With light, we can see only the irreversible past (Fig. C). We cannot in principle detect the *elementary cycle* of the global Heraclitean Time (Slide 1): see Fig. 4 on p. 5 in the manual[1]. If we could, the *atemporal* Platonic

Ether (p. 22 in the manual[1]) will be exposed to physical observations, which will demolish the theory of relativity. Let me start *ab ovo*.

Suppose a cat is walking with speed 1m/s, relative to the man on the floor at rest (Fig. A). The man is standing still and does not "consume" space, like the car in Fig. B. Where is the *arrow of spacetime* (Fig. C)?

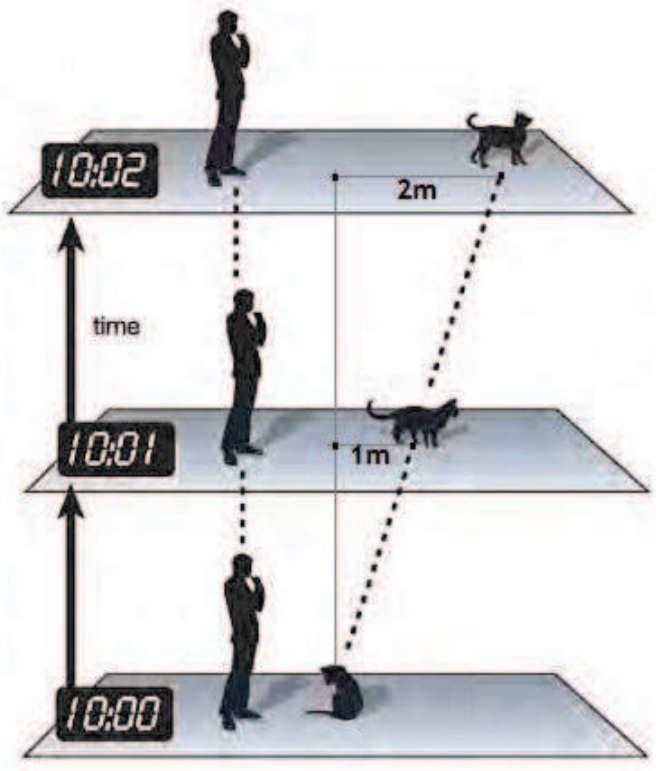

Fig. A, adapted from S. Carroll.

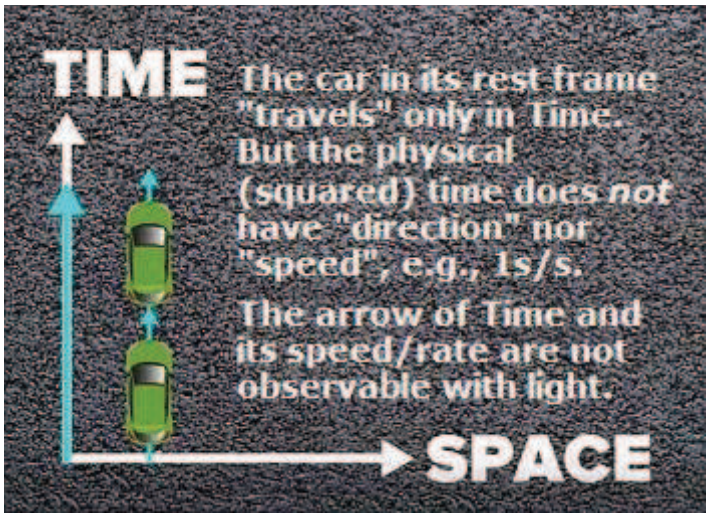

Fig. B, adapted from Don Lincoln.
See Fig. 9a and Fig. 9b, and pp. 8-9 in Intro.pdf.

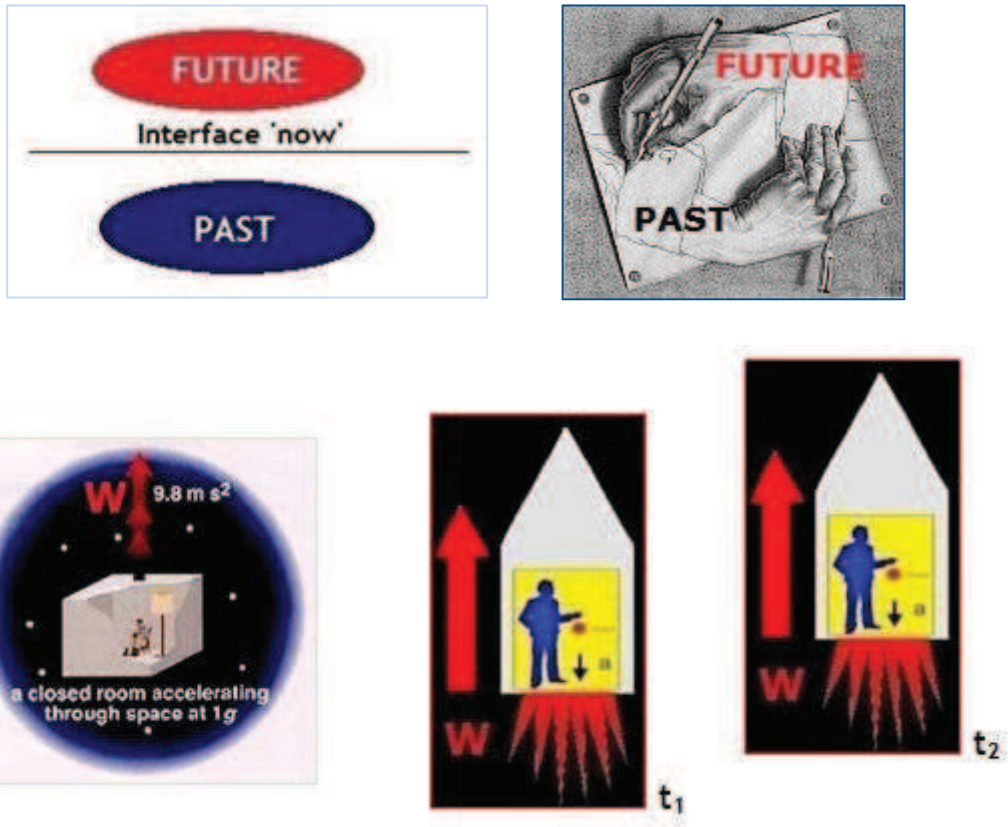

Fig. C. See Fig. 7 on p. 11 in the manual[1].

The *arrow of spacetime* (Fig. C) is non-relational, just like the "speed" of light (Wikipedia). They both exist, but cannot be seen with light. We can only demonstrate evidence (not proof) of the *arrow of spacetime* — a global *atemporal* phenomenon working "outside" 4D spacetime, depicted with the black strips separating the instantaneous snapshots (the two states of the rocket in Fig. C) from a movie reel (Fig. D).

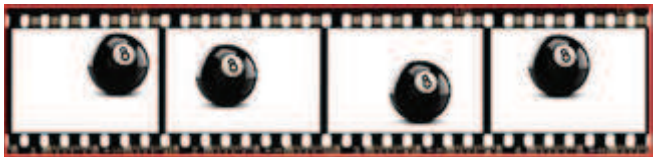

Fig. D. Read p. 24 in the manual[1].

The black strips in Fig. D belong to the global *atemporal* Ether in which the photon is 'at rest' and its proper time is **zero**: "A photon arriving in our eye from a distant star will not have aged, despite having (from our perspective) spent years in its passage" (Wikipedia).

As a concrete example of the global *atemporal* phenomenon[2] working "outside" 4D spacetime (dubbed **matrix**, p. 5 and p. 9 in the manual[1]), recall the global *atemporal* phenomenon of *creating and calibrating* the invariant spacetime interval (Wikipedia), based on the *ideal* rods and clocks that are pre-built in 4D spacetime (MTW p. 397).

Suppose the separation in 4D spacetime between the two states of the rocket in Fig. C above matches 1m in Fig. A, i.e., 10:01 – 10:00 = 1s with speed 1m/s yields 1m. I will convert *this* **1m** (not shown in Fig. C) to **3.3** ns of light-travel time. To quote E.F. Taylor and J.A. Wheeler (Fig. E): "We assume that every clock in the latticework, whatever its construction, has been calibrated in meters of light-travel time."

Fig. E

Calibrated? By ***what***? By the *arrow of spacetime*[2]. We can see only the past and only *post factum*, such as the *already* balanced apples below.

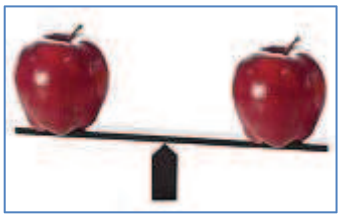

Fig. F

NB: Everybody can learn spacetime engineering. It is a very simple skill, like learning to juggle three balls in the air (p. 8 in the manual[1]). For details, RDFM[1].

26 September 2021, 02:25 GMT

References and notes

1. D. Chakalov (2021), *Notes on Spacetime Engineering*.
http://www.god-does-not-play-dice.net/SE.pdf

2. The *arrow of spacetime* (Slide 1 and Slide 2) is empowered by the self-energy of the Unmoved Mover (Wikipedia). This is the **fifth force**. A rough estimate of the **fifth force** in the human brain, facilitated by brain's *atemporal* **matrix** (p. 4), is suggested on p. 25 in the manual[1].