

Title: Slow light

with commentary on spacetime and the  
impossibility of traveling backward in time

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## Slow light

### The fiction of slow light, of backward time, and of spacetime

Despite what you might have read in the news about scientists "slowing down" the speed of light -- a photon is massless, meaning it exists as pure energy; and therefore individual photons cannot be slowed in the sense of true motion. Thus, we see here and there 'slow light' referred to as "slow light", and correctly so.

Of course, the quantum probabilistic nature of everything implies photon location events of a probabilistic nature, rather than actual movement of a photon. That means we can regard the speed of light to be the result of probability. Considering the vast number of such events for a given pulse of light, it's not surprising that the speed of light in a vacuum is consistent for all practical purposes.

When scientists speak of slowing light for modern applications, what they are actually referring to is the vector slowing -- due to intentional quantum interference -- of a light pulse of width, consisting of a multitude of photons, inside a condensate.

Two laser beams traveling perpendicular to each other through a particular condensate, as well as other methodologies, create quantum interference which affects the probability of photon absorption and transmission due to the canceling effects of the interference: "The probability amplitudes for the different paths interfere destructively." [Wiki]

Note "paths" in the quoted sentence. A light pulse of width is simply slowed as an overall vector quantity as long as it is in the condensate. A vector's magnitude is a 'point to point' quantity, not the magnitude of any particular path between the end points.

As mentioned, an individual photon itself is not slowed in the classic sense of true motion. There is no interference within a photon. It has no interior space. Thus, the nature of light is not changed. In the quantum picture, a vast number of photons are needed to facilitate a reliable canceling effect on probability distributions of photon location events.

The effect of such interference in a condensate is in the same broad category as the vector slowing of light in a solid material absent of intentional quantum interference.

Any light that escapes the condensate will travel at the usual speed. And that is what's relevant in special relativity.

Another -- and just plain silly -- topic in the news is the claim that positrons travel backward in time.[1] And in a completely different fashion, crackpots have found solutions to Einstein's field equations of general relativity that they claim indicates that traveling backward in time is possible. Rather, it simply shows the limitation of the theory.

Any young child should be able to easily debunk ludicrous claims of traveling backward in time. If you haven't yet debunked 'traveling backward in time' for yourself, then get busy. It should take you less than five seconds.

This is what we're up against: Physicists are eager to present things in glamorous ways, which are attention-getting. Neither the slowing of a photon, traveling backward in time, nor [spacetime](#) are physical realities. We have freedom of movement in space, but we do not have freedom of movement in time. "t" has a completely different status from that of "x, y, z". Small wonder that spacetime adherents fail to resolve, by way of employing spacetime diagrams, a paradox of their own making. It's time-keeping (i.e., clocks, whether of a chemical, biological, mechanical or electromagnetic nature), that change -- not time in the sense of the march of time (the march of history).

Time-keeping is strictly dependent on the absolute nature of light. It is that simple, as we diagram in: [Symmetry of measure in relativity](#)

1. It is true that way back 46 years ago, when I was 24, it had occurred to me that the sum of 'free will' actions might determine the specific parameters of The Big Bang, rather than the specifics of The Big Bang determining the course of history.

That was before I was introduced, three years later, to quantum probability, which somewhat changes the philosophical consideration of a Big Bang.

At any rate, the notion that positrons (opposite-charge version of electrons) violate causality doesn't add up to backward time-travel in a universe where everything else is moving forward in time.

At the level of elementary particles, "cause and effect" is different from the "cause and effect" that emerges from the soup. That is, emergence applies, and in a probabilistic manner of course. The possibility of "cause and effect" violation becomes vanishingly small as complexity increases. Relativistic effects, as we experience them, depend on emergence, i.e., complexity.

As with "cause and effect", "time" in the inner realm of an atom is different from what emerges. "Backward or forward in time" are mere labels at the level of elementary particles.