

Re: what determines the speed of light?

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"PD" <[TheDraperFamily@xxxxxxxxxx](mailto:TheDraperFamily@xxxxxxxxxx)> wrote in message  
<news:1155310513.401152.34930@xx>

Mike Kamermans wrote:

Dear all,

While I appreciate the responses I have gotten (I am going through the links one by one) it seems no one really understood my question.

To quote myself, "does anyone feel they can explain what physically happens for the speed of light to be the constant that it is assumed to be (without having to resort to a single mathematical formula)?"

Most people seemed to think I meant "can you give me information on the mathematical physics of the speed of light", though I have to stress that I really didn't, that was exactly what I don't care about (I may not be a physicist but I do have books and classical and quantum dynamics, and I do have the relativity theory covered by those... none of the books I read so far go back far enough to truly explain "why", rather than "that").

Put simply, I am looking for an explanation in normal words that explains what exactly happens when a photon is generated, and why this leads to all photons having the same speed, regardless of the speed of the electron that generates them. I'd like to hear from someone who is able to write about physics in normal words what happens. It's seems surprisingly hard for many scientists to phrase answers in words only. I'd still like to find someone who actually can though...

Let me see if I can help.

The mistake you are making is assuming that the process of the emission of the photon from the emitter is what determines the speed of the photon. This implies that the photon has to "push off" something for it

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to acquire the speed  $c$ . This kind of thinking typically leads to two alternatives:

- a) The photon "pushes off" the source (say, an electron). This would make the speed of light dependent on the speed of the source in some way. Unfortunately, this is contrary to experiment.
- b) The photon "pushes off" a medium that the source emits the photon into. This would make the measured speed dependent on the motion of the observer through that medium. Unfortunately, this is contrary to experiment.

This immediately leads to a conceptual problem, because there doesn't seem to be much else imaginable that the photon could push off of. One answer is, "Well, that's impossible, there must have been a mistake somewhere." Another answer is, "For some reason, there is a conspiracy of factors that \*hides\* the dependency of the speed relative to the source or relative to the medium."

But there is another possibility: Light does not \*need\* anything to push off from at all. There simply needs to be no material reference point with respect to which light is moving at  $c$ . How can this be? One way of answering this is by taking a look at a teaching exposition of how light waves emerge in the first place from how electric and magnetic fields. The fact is, light is a combination of electric and magnetic fields. Furthermore, Maxwell's equations describe how the two are \*coupled\*: a time-slope in an electric field produces a space-slope in the magnetic field, and the time-slope in a magnetic field produces a space-slope in the electric field. For example, if you start with a moment of no fields, and for some reason the electric field at a spot increases with time, then this \*forces\* a difference in magnetic fields between adjacent locations in space. This of course means that the magnetic field at one of those locations has to change in time, which \*forces\* a difference in electric fields between two adjacent locations in space. The relationship between how a change of one in time affects the change of the other in space is a \*constant\* -- it is a feature of spacetime itself. It's not hard to figure out that this constant is related to something with units space/time (velocity).

Thus, the photon (which is nothing more than a chunk of these fields in some sense) does NOT push off anything OTHER THAN ITSELF. This is a hard concept for some folks to grasp, but it is precisely what Maxwell's equations (which describe completely the behavior of electric and magnetic fields) say happen.

PD

Unfortunately you cannot escape measurement of the same constant for the speed of light in a vacuum at any and all of an infinity of varying relative velocities. This leads to an inevitable conclusion on the part of some that the speed of light is source propagator dependent. On the part of others that there is nothing special about the speed of light or the infinity of varying relative velocities, but there is something very special to be

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looked into, studied and thought into concerning the physic of said  
"vacuum." On the part of still others.....

GLB

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