

## What is Light?

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The simple answer to this question is that we really do not know. On the other hand, we do know a lot about light behavior, and it is this behavior that provides clues about the true nature of light but, unfortunately, not enough to know light's true nature.

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Before getting into the main topic, it seems appropriate to briefly discuss some of the known behaviors of light. Although most 'facts about light' make references to stuff like the velocity of light and usually include something about photons, here are a few different facts.

- Some frequencies light can be harmful to humans and other living things.<sup>1</sup>
- Unlike gravity, normal visual light can be easy to block.
- Light influences metals such as antennae.
- Various frequencies seem not to interfere with each other. The immediate space around us is full of electromagnetic radiation from a plethora of sources such as radio transmitters, cell phone towers, microwave ovens, cell phone towers, and so on.
- Some frequencies can penetrate wood and other non-metallic objects, which is how we are able to use a radio inside a building without windows.

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<sup>1</sup> The electromagnetic spectrum - wherein visible light is part of this spectrum – ranges from AM radio which has a wavelength of around 100 meters to x-rays and gamma rays which have wave lengths of about 0.1 nanometers while visible light is in the 400 to 700 nanometer range.

- Regarding a previous bullet, it seems obvious that visible light is easy to block – for example, a thin piece of cardboard can block most sunlight. This is strange since visible light is about in the middle of the electromagnetic frequency spectrum it should have more energy than radio signals which are said to have lower frequencies and, on the other hand, x-rays and the like have far more energy than light signals. As is well known, both radio signals and x-ray signals can easily penetrate solid matter while visible light cannot! So, what is going on?

It is not surprising that more energetic signals can penetrate solid matter, but if visible light signals – unless amplified greatly – cannot penetrate solid matter then why are the less energetic radio signals able to do so?

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Anyway, this discussion will deal partially with what we know about light behavior and offer a supposition (speculation) about light itself in a general sort of way – since that is about all that we can really do. That is, only hints or vague statements can be made about the true nature of light – even though there are those who mistakenly claim to know that true nature.

Regarding the behavior of light there is one thing that has been known for more than two-hundred years and for all that time has been a conundrum. This is the *duality problem*, where depending on the fact that light sometimes behaves like a wave and at other times like a particle.<sup>2</sup> In fact, as I

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<sup>2</sup> Thomas Young (English polymath, 1773–1829) first performed the experiment that indicated this dual nature of light in 1803. This experiment is sometimes referred to as the ‘two-slit’ experiment.

have mentioned elsewhere herein, the Nobel Prize in physics was awarded to one person for demonstrating the light consisted of particles, and some years later his son won for demonstrating the light was a wave [See page xxx]. So, there you go, sometimes you can have it both ways.

Before getting into the subject itself, I should mention that the rendering of this discussion is tightly bound to ideas put forward by Alios Wenzl (German philosopher: 1885 – 1967) in his 1949 essay written for the *Library of Living Philosophers* volume that honored Albert Einstein [numbered quotes are from this essay].<sup>3</sup> But enough of this...

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The Problem of Light: [partially quoting Wenzl] How can light from a moving source (for example: the sun) that spreads out [1] “*independently of the motion of the source – equally in all directions, if it is a [physical] reality – which moves, then it cannot proceed with objectively equal velocity with reference to an observer A, on the one hand, and with reference to an independent observer B [Emphasis added].*” To resolve this difficulty, Einstein proposed that the velocity of light was constant. That is, in opposition to the above intuitive statement about light as a *moving reality* is the constancy of the velocity of light postulate,<sup>4</sup> which is at the heart of Einstein’s theories of relativity and has been criticized over the years as being arbitrarily determined. However, despite this criticism this notion has also been consistent with experience [That is, experimentally verified].

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<sup>3</sup> *Albert Einstein: Philosopher– Scientist*, The Library of Living Philosophers, Ed. Paul Arthur Schilpp. Tudor Publishing Company NY, NY (1949).

<sup>4</sup> This postulate states that light velocity does not change due to relative motion between the light source and the light recipient.

How is it possible when considering the preceding comments about the two independent observers (A, B), along with the constancy of the velocity of light postulate, and the duality problem while at the same time [2] “*avoid the contradiction that a physical reality [physical body], which moves, cannot move with objectively identical velocities with reference to different observers* [See quote #1]? *This indeed can be done, but one must draw the conclusion that light may neither be treated nor be viewed as a material body [particle] nor as a wave moving in three-dimensional space* [Emphasis added].”

Before continuing, it should be remembered that, today, most physical scientists consider light to be composed of microscopic particles called photons, which means that if light were particles, these particles would necessarily be finite in number such that during transit they would separate according to an inverse square rule and would therefore become extremely diluted. For example, if stellar light is in transit for millions or even billions of years – as is now declared by astronomers, astrophysicists, and so on – this dilution seems likely to make any detection of these remote sources difficult or even impossible.

However, since we apparently can detect light that has been in transit over such an immense number of years, it seems a reasonable and even necessary conclusion that- [3] “*we dare not regard light as moving particles nor as real waves of a system-bound medium. On the other hand, there is no reason why light should not be regarded as a signal which actually behaves toward all systems disinterestedly and impartially, which is neither imprisoned in nor bound to a material system but is super-systemic (or above all systems). Only in that case we may not regard it [light] as something already material but*

*must consider it as something ‘immaterial,’ ‘pre-material,’ [or] ‘potential’ [Emphasis added].”*

The last mentioned, the notion of potential, has been around at least as far back as Aristotle and, today, is very much a part of modern physics where, for example, potential energy is regarded as a basic concept. This raises the question: [4] *“What does it mean to say that light is above all systems?”*

One answer is that light can be regarded as [5] *“the signal of a change in existential relations, no longer and not yet materialized and therefore not yet system bound, but rather, as the dissolution of a former material order, the mere announcement and communication of a new possibility. It is as yet a potential situation, which does not refer to a single system, but which restores the disturbed order precisely because of its reference to all [systems].”* Put another way, light – in transit – can be considered [6] *“as a field of possibilities to which all systems belong,”* and it is this field of potential which successively actualizes according to the relative distances of recipients from the signal’s origin. It is this actualization that we refer to as photons or in Wenzl’s words – [7] *“potential energy propagates in order to actualize itself again when it hits a wall.”*<sup>5</sup>

What moves ahead is therefore the *super-systemic* potential such that in every system the changed existential situation can [7] *“announce itself” successively according to the distance relation between the origin of the disturbance and the*

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<sup>5</sup> There apparently is a threshold such that the density or quantity of substantive matter determines whether this actualization takes place. For example, normal atmospheric air will not cause actualization but with sufficient water vapor being present in the atmosphere the ‘light’ potential is actualized and we observe this water vapor as clouds.

*recipient.*” In this manner the duality of light is resolved such that the wave nature corresponds to its potential state and the particle state with its actualization in a system. [8] “*If, therefore, one speaks of the undulatory or corpuscular nature of light, the contradiction, which has created so many difficulties, is solved.*”

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As noted at the beginning of this section, Wenzl’s essay dates from 1949 and I suspect was soon forgotten. It is obviously a stretch of the imagination, and such a notion would be difficult to verify since the only way to experiment with light is to have a recipient intercept the light which would – according to this speculation – change its nature through actualization.

To be sure, I promised something vague, and the term *super-systemic* certainly meets that goal. Nevertheless, since this notion is based on known behaviors of light, I do believe that there may be something worth considering in this notion which seems more reasonable than some of the other ideas such as *cosmic inflation* and the *multiverse* fantasies that, are without any physical or experimental evidence, but have been put forward as being scientific when, in fact, they are just made-up stories.

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