

Does Gaede's "Rope Hypothesis" of Light Align with a Standing-Wave Aether?

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Famous dissident physicist, Bill Gaede, has a unique theory as to the nature of light. He postulates that light consists of electromagnetic "ropes" where electric and magnetic "threads" intertwine to connect all atoms in the universe. This is akin to a concept I have entertained that the "aether," if it exists, can be viewed as standing waves making similar connections. Such "waves" may consist of contiguous "aether particles," each the size of the electron or smaller (neutrino?). At least on a cursory level, it appears that these two independent concepts may be consistent with light speed being constant with respect to its source, but variable with respect to an observer when the observer or the source (or both) are in motion. Of course, in the presence of an all-pervading aether whose perturbation constitutes light itself and limits its speed to c , this variation in light speed would not occur, but would be manifest instead as Doppler shifts.

1. Introduction

The incredible speed of light, not to mention its wave-like behavior, is difficult to imagine in the absence of a medium, as such would require not only propelling particles, such as photons, at the incredible speed of $c = 3.00 \times 10^8 \frac{m}{s}$ (which, for some unknown reason, is constant in a complete vacuum regardless of the motion of the source or observer), but also propagate in such a way as to exhibit wave-like behavior. While the latter might be envisioned by considering light to be some sort of "matter wave" [1, 2], the former is difficult to fathom from a ballistic viewpoint without "friction." A unique theory that addresses both these aspects has been postulated by Gaede [3, 4], entitled the "rope hypothesis."

If light interacts with matter, we have no choice but to replace the abstract wave of mathematics with a physical entity ... the correct configuration ... that underlies the phenomenon we call light ... We replace the mathematical wave with a physical rope-like mediator. The wave is alleged to consist of a magnetic field and an electric field. The physical electromagnetic rope is comprised instead of a magnetic thread and an electric thread [Figure 1].

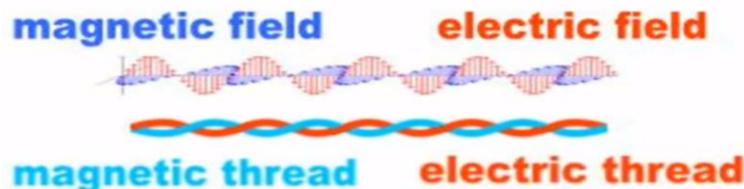


Figure 1. Gaede's Electromagnetic Rope [4]

The anti-parallel threads of a taut rope have no choice but to coil around an imaginary axis. Whereas mathematical waves travel in a single direction, torsion along the rope travels in both directions simultaneously [Figure 2]... [T]he mathematical establishment has no idea what physically restrains light to a constant speed ...

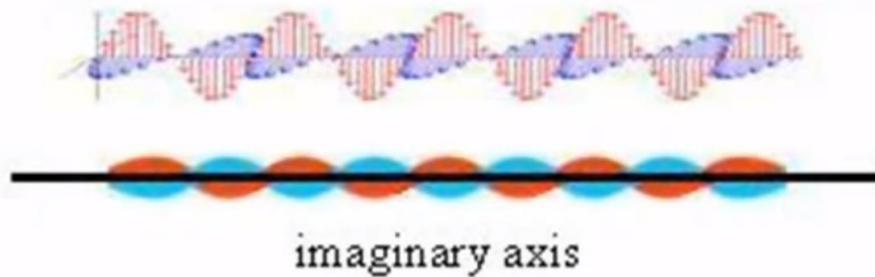


Figure 2. Torsion in Gaede's Electromagnetic Rope [4]

Under the rope model of light, the longer you make the links, the fewer links you can fit in any given length of rope. The rope model justifies why frequency and wavelength are inversely proportional and why light [speed] is a constant ... Under the rope model, when an atom is approaching another one, it reels in the electromagnetic threads which now form part of its body. An atom slides along any given rope like a bead on an abacus ... Under the rope model of light, there is no mystery as to why the speed of light is independent of the speed of the source ... The electromagnetic rope interconnects any two atoms in the universe. Torsion has no chance of getting lost irrespective of where an atom moves ... [A]ll atoms in the universe are interconnected [Figure 3].

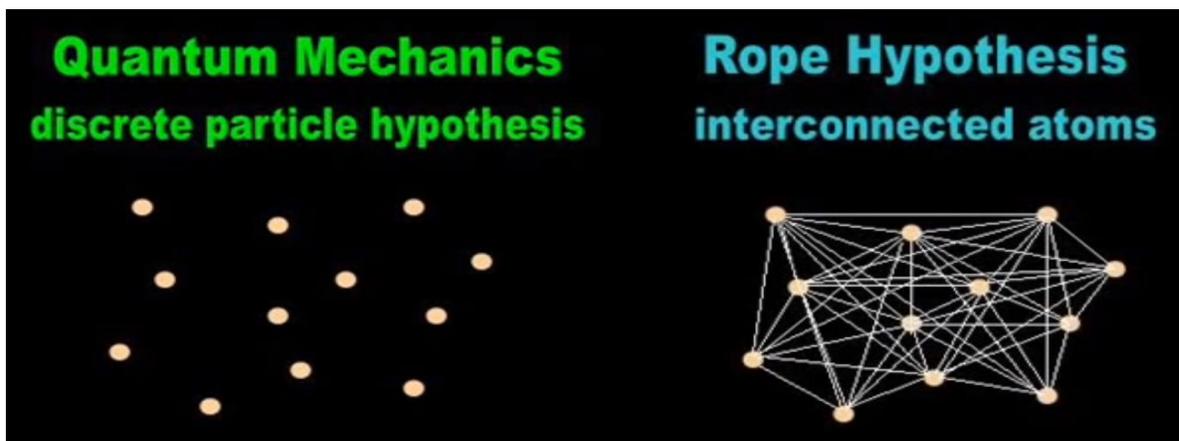


Figure 3. Atomic Interconnection under Gaede's Rope Hypothesis [4]

2. Light Speed

Figure 4 illustrates a pulse of light traveling from one source, first stationary, then moving, to another that is stationary as the result of a “quantum jump” that generates this pulse. The pulse “travels along” the electromagnetic rope at speed c , “reeling in” the rope as it travels. The top depiction shows three light pulses emitted one time unit apart (0, 1 and 2) from a stationary source that is $c \times$ one time unit distant. Each pulse travels at c and covers the distance in one time unit. Thus, the observer will see three pulses equally spaced in time after three time units (3). To the observer, the effective light speed is $3c/3 = c$. Light itself has traveled a total distance of $3c$ in three time units, verifying an actual speed of c .

The middle depiction assumes the source, after releasing its first pulse at time zero, travels at $c/3$ toward the observer, releasing its second pulse after one time unit, just when the first pulse reaches the observer. This second pulse, traveling at c , reaches the observer in $2/3$ of a time unit since it starts at only $2/3$ of the previous distance. Thus, the observer sees the second pulse after only $1\frac{2}{3}$ time units, i.e., it arrives $1/3$ of a time unit earlier than when the source is stationary.

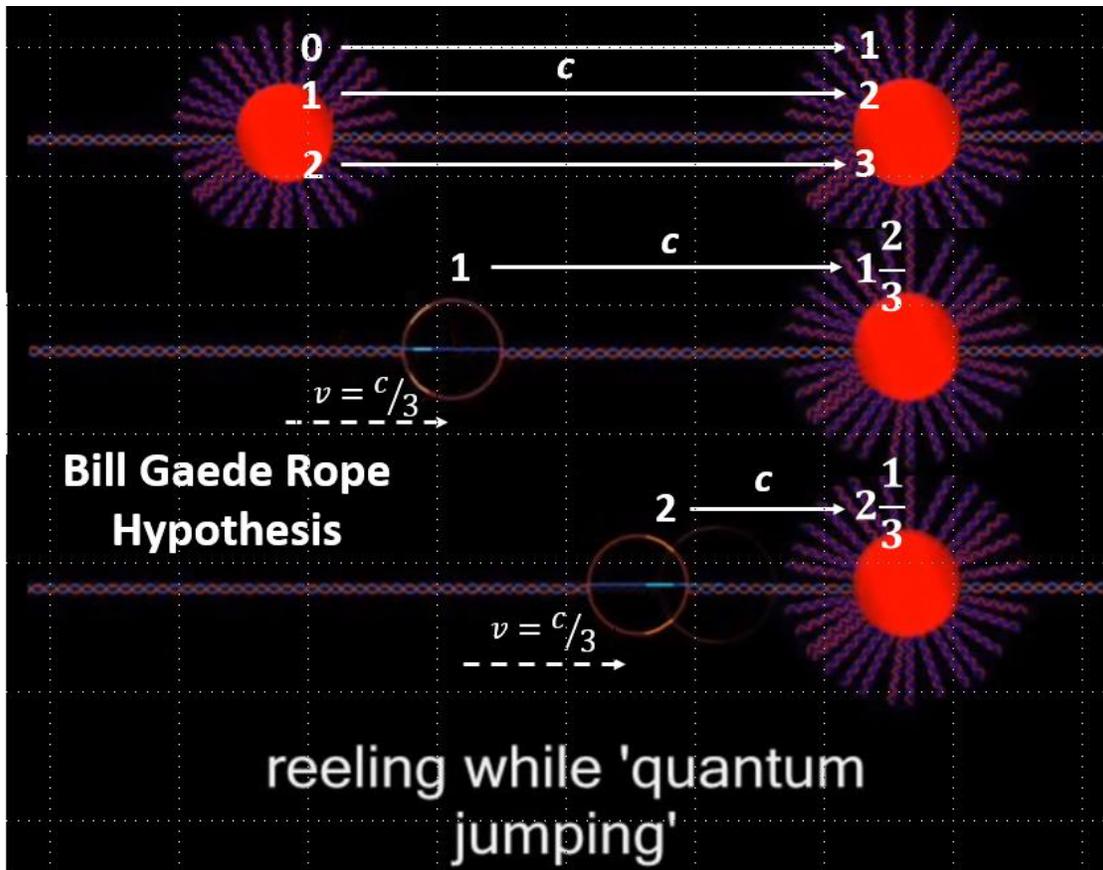


Figure 4. Light Pulse along Gaede’s Electromagnetic Rope due to Quantum Jump [4]

The bottom depiction assumes the moving source, after releasing its second pulse after one time unit, continues to travel at $c/3$ toward the observer, releasing its third pulse after two time units, $1/3$ of a time unit after the second pulse reaches the observer. This third pulse, also traveling at c , reaches the observer in $1/3$ of a time unit since it starts at only $1/3$ of the original distance. Thus, the observer sees the second pulse after only $2\frac{1}{3}$ time units, i.e., it arrives $2/3$ of a time unit earlier than when the source is stationary.

For the moving source, the three pulses travel a total distance of $c(1 + \frac{2}{3} + \frac{1}{3}) = 2c$ over an elapsed travel time of $(1 + \frac{2}{3} + \frac{1}{3}) = 2$ time units, for an actual light speed of $\frac{2c}{2} = c$. However, the observer sees the three pulses arriving with increasing frequency over only $2\frac{1}{3}$ time units. Not knowing the source is approaching, he assumes the three pulses covered the same distance $3c$ as for a stationary source, yielding an effective light speed of $\frac{3c}{2\frac{1}{3}} = \frac{9c}{7}$. The opposite situation for the source moving away at $c/3$ would show that the three pulses travel a total distance of $c(1 + 1\frac{1}{3} + 1\frac{2}{3}) = 4c$ over an elapsed travel time of $(1 + 1\frac{1}{3} + 1\frac{2}{3}) = 4$ time units, for an actual light speed of $\frac{4c}{4} = c$. However, the observer now sees the three pulses arriving with decreasing frequency over $3\frac{2}{3}$ time units (third is released after two time units have elapsed [second pulse still has $1/3$ of a time unit left before being observed] and must cover distance $= c \times 1\frac{2}{3}$). Not knowing the source is receding, he assumes the three pulses covered the same distance $3c$ as for a stationary source, now yielding an effective light speed of $\frac{3c}{3\frac{2}{3}} = \frac{9c}{11}$.

These examples should make it fairly clear that Gaede’s “rope hypothesis” supports light traveling at constant speed c relative to its source, but perceptible at speeds greater than or less than c depending upon relative motion between source and observer. In the presence of an all-pervading aether whose perturbation constitutes light itself and limits the speed of light to c , these speed differences would be manifest as Doppler shifts (“blue” for relative motion “toward,” “red” for relative motion “away from”).

3. Aether as a Standing Wave

Travel speed of a standing wave along a taut “string” is $v = \sqrt{\frac{TL}{m}}$, where T = tension, L = length, and m = mass. For light, $v = c = 3.00 \times 10^8 \frac{m}{s}$. Any mass of an “aether particle” is speculative, since the aether itself is speculative. However, assume such a particle would have the smallest mass of the “standard” atomic particles, the electron ($m = 9.11 \times 10^{-31} \text{ kg}$). With a classical radius of $2.82 \times 10^{-15} \text{ m}$ [5], an “aether string” of length L will have $m = \left(\frac{L}{2[2.82 \times 10^{-15} \text{ m}]}\right) (9.11 \times 10^{-31} \text{ kg}) = 1.62 \times 10^{-16} (L) \text{ kg}$. The corresponding tension becomes $T = \frac{mv^2}{L} = \frac{1.62 \times 10^{-16} (L) (3.00 \times 10^8 \frac{m}{s})^2 \text{ kg}}{L} = 14.5 \text{ nt}$. Considering that piano strings have a typical tension of approximately 160 lbf, or 700 nt, T = 14.5 nt is certainly conceivable. [6]

What if we postulate an aether particle to be the least massive (and smallest?) subatomic particle currently surmised, i.e., a neutrino?¹ Assume an aether particle has neutrino mass on the order of $1 \text{ eV} / c^2 = 1.79 \times 10^{-36} \text{ kg}$ and “charge radius” on the order of $\sqrt{(1 \times 10^{-32} \text{ cm}^2) (0.01 \frac{m}{\text{cm}})^2} = 1 \times 10^{-18} \text{ m}$. [7] Now, an “aether string” of length L will have $m = \left(\frac{L}{2[1 \times 10^{-18} \text{ m}]}\right) (1.79 \times 10^{-36} \text{ kg}) = 8.93 \times 10^{-19} (L) \text{ kg}$. The corresponding tension becomes $T = \frac{mv^2}{L} = \frac{8.93 \times 10^{-19} (L) (3.00 \times 10^8 \frac{m}{s})^2 \text{ kg}}{L} = 0.0805 \text{ nt}$, again quite conceivable.

4. Summary

Is there consistency between Gaede’s rope concept for light and an aether consisting of standing waves, possibly comprised of contiguous “particles” of size ranging from an electron down through a neutrino? Implied is an “aether ‘string’ tension” from ~ 0.08 to 15 nt, much less than that of a typical piano string. Such implies light traveling at constant speed c, with respect to its source, but with variable speed with respect to an observer if either or both the source and observer are moving (or Doppler shifts if there is an all-pervading aether whose perturbation constitutes light itself and therefore limits light speed to c).

References

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¹ This is consistent with a theory from proponents of the Electric Universe (EU): “[T]he EU paradigm has—because of both sound evidence and reasoning—confidently settled on the conclusion that the volume of the physical universe is filled with an aether. In other words, the existence of an aether is next to being axiomatic. Currently the thinking is that this aether is composed of polarizable neutrinos where these are matter particles that have a vanishingly small amount of mass/energy and dipolarity in their ‘empty’ state. These dipolar particles can spin axially, rotate radially, and oscillate between the charges. The internal mass/energy would be some combination of these three ‘internal’—there is no skin—motions.” [8]