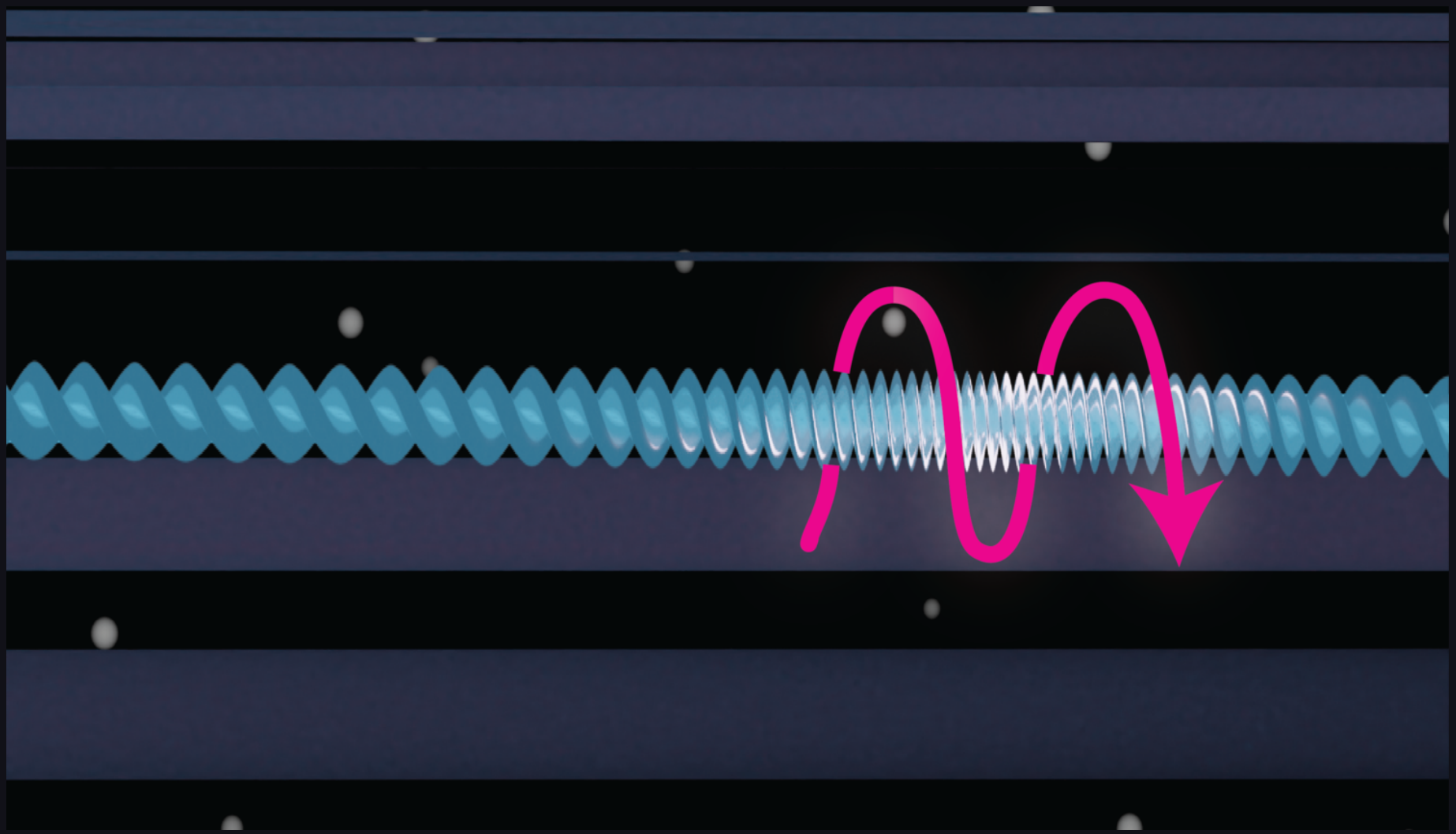

Feb 22

What is a Photon? What is Light?

Mechanics, Material Science, Light & Gravity

Where Does Light Come From?

Humans are visual animals. Unlike many of our mammalian cousins who depend upon smell, like the rats that we love to use as models for so many of our pathologies, we absolutely prize visual sensation in our daily lives. So much of our language points to this paradigm being deeply rooted in our evolutionary history.

In the words of Julian Jaynes, we "'see' solutions to problems, the best of which may be 'brilliant', and the person 'brighter' and 'clear-headed' as opposed to 'dull', 'fuzzy-minded', or 'obscure' solution." Quite ironically, the process of vision, and the phenomenon of light in general, despite longstanding adulation from from the science and mathematics communities, remains one of the murkier processes in all of nature to imagine. That is...to visualize.

Everyone from Hooke to Newton and Descartes puzzled over the mechanism behind light. If the drama interests you, check out my deep-dive into the history of those investigations, which I've laid out in a multi-part blog series called the Life & Death of the Aether. Needless to say, several thousand years of study eventually resigned to a familiar, yet paradoxical stalemate explanation for light: it's both a flood of discrete bursts called photons that sometimes behave as bullet-like particles and at other times interfere with one another like periodic impulses, or waves. There is a litany of experiments that justify both of these opposing interpretations, but don't worry - we are

well prepared to rationalize each of them in due time with the mechanical visualization proposed below.

Often the atom and light are described schematically. This can be seen in the Bohr model, with electron beads circling a nucleus. Though mathematically, the atom is no longer considered to behave this way, visual representations of modern quantum descriptions of light are scant. We propose to improve upon contemporary "particle/wave" animations, while preserving the topology of the well-elaborated, empirically anchored maths.

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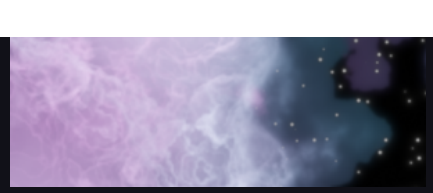
A Physical, Object-Based Model of the Photon



In the Lab...

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Apr 18, 2021, 2:12 PM

Light begins with atoms. We choose to invoke hydrogens as our atoms because they are the simplest, each having a single electron shell. From myriad empirical foundations, it has been established that 99.999% of that electron exists within 430 pm of the nucleus, while the remainder extends indefinitely. This bizarre characteristic of the atom is described under quantum mechanics by the radial distribution function (RDF) of the electron. We illustrate the tiny, thinned 0.001% of the electron (e-) shell as tiny radial filaments extending from the atomic surface. Experimentation and the corresponding RDF from quantum tell us that there is a small probability that the indefinitely extending electron-shells of any two atoms overlap, and we illustrate this possibility through these helically entwined filamentary extensions of each e-shell.

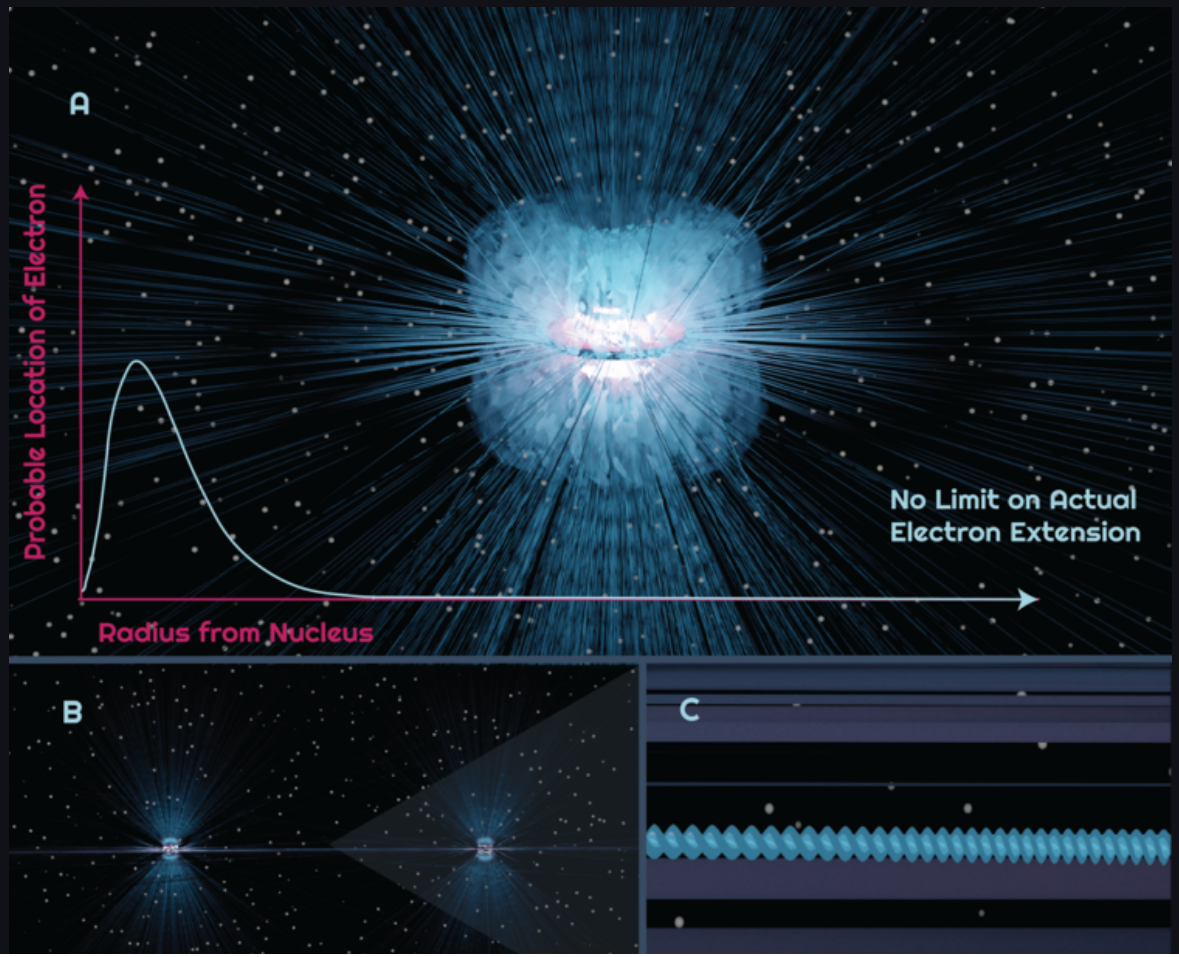


Fig 1| Overlapping e-shells Link Atoms. The radial distribution function of quantum mechanics **(A)** describes that a very thinned portion of the electron can be found to extend indefinitely, which we illustrate as a filament extending from the e-shell's surface. Any two neighboring atoms **(B)** can be considered linked to their neighbors since these thinned electron filaments overlap weakly. To visualize light, and later gravity, is useful to illustrate these overlapping e-shells with a helically entwined filaments, as shown in **(C)**.

Importantly, this overlapping e-shell substructure, as above illustrated as helically entwined e-shell filaments, is purely hypothetical. This means that while such structures are unknown and yet completely consistent with all of what *is* known. Descartes defined the term 'hypothesis' as a statement that is not submitted as necessarily true, but if true would be sufficient to explain the given phenomenon. By submitting this helical e-shell structure as consistent with the wealth of atomic data, we can begin to make sense of the photon using that hypothesis.

Now that we have a mechanism for how our atoms are connected, it is possible to imagine the photon as an elastic deformation of this hypothetical structure. Almost immediately, several features of light are clarified. First, the entwined and tensioned e-shells prepare a rectilinear path is between any two atoms. This captures the empirical fact that light follows a straight path like some sort of idealized bullet. It also secures a cause for gravity, but this is a story for another day*. We can also see that deformation of our interconnecting helix is easily be imagined to propagate as a wave, explaining the self-sustaining EM wave description of light. Recall that magnetism is produced by the motion of the e-shell orthogonal to the poles. Later posts will consider physicalizing interference of light using the model.

The natural question is – why does the intertwined electromagnetic structure deform and conduct light waves in the first place? We reflect classical photonics and quantum

mechanics in order to represent this *cause* of light. Presently, it is known that a photon is emitted when an excited electron transitions to a lower energy state. As such, we signify electron-energy through a vibratory breathing motion of the e-shell. High-energy electrons are depicted to expand and contract quickly while low-energy electrons breathe slowly. We know that the cause of this excitation may be a photon from another atomorelectric/chemical/thermal stimulation. Thus, it becomes clear that light begins with a dis-equilibrium between the energy state of two atoms and terminates dissipatively with energy equalization. It is a rebalancing process. But what can that possibly mean in terms of the work of physical atoms?

Because we may consider the atoms to be physically connected through entwined e-shells even at extraordinary distances, we can finally rationalize the atomic electron transitionthat results in the emission of photons. When any two entwined atoms have e-shells that are energetically equalized, breathing in harmony such that no pressure is exerted on their connecting structure, there is darkness…the silence of light! We can imagine that as one atom expands, the other contracts. A back and forth torsion of the interconnection proceeds harmoniously and incessantly. But only until the balance is upset.

When one atom's electron becomes excited and begins to breathe more quickly, this puts a progressively antagonistic torsional pressure upon their entangled e-shell filaments. The result is that this e-shell induces its partner to also expand and contract more quickly, elevating her energy-state in the process. In compelling the second atom to transition into an excited state, the first atom stresses their shared interconnection to progressively deform. This synchronous deformation of the partner atom's e-shells is the photon of radiation. This is not a new theory but rather a visual restatement of the facts. After the photon, the first atom breathes slightly slower, signifying energetic dissipation, and the latter slightly faster. With energy-states matched, darkness resumes between the atoms.

*Note: This idea of photonics, including the expanding and contracting e-shells idea was initially inspired by, but not to be conflated with Gaede's "Rope Hypothesis," which you can learn about here.***

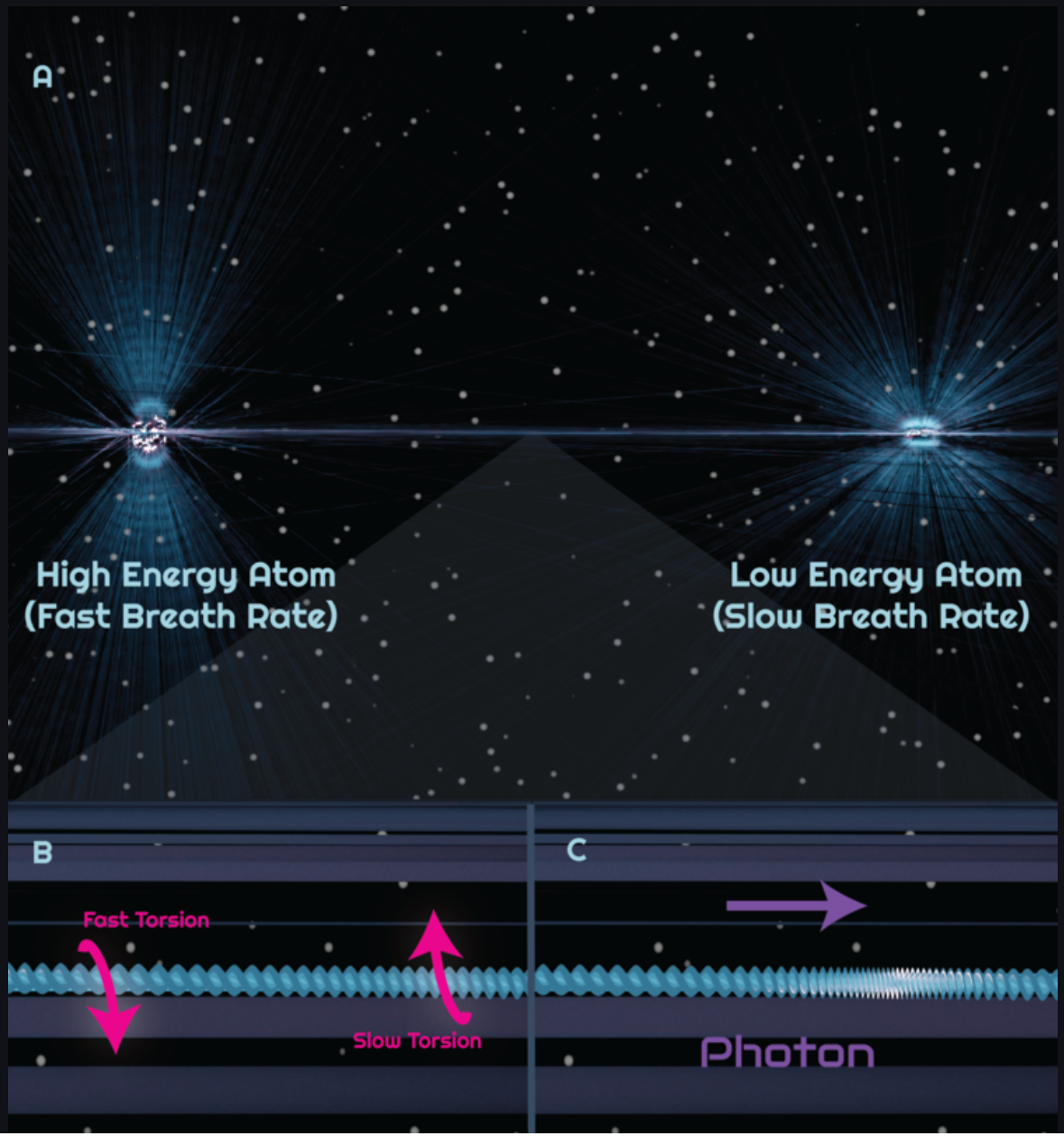
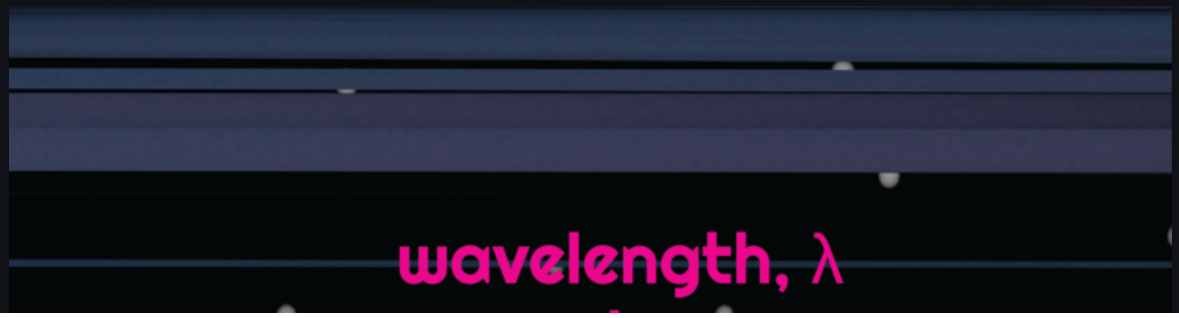


Fig 2| The Photon. The photon is long considered a product of the atomic electron transition, where a high energy electron relaxes to a low energy state. We illustrate electron energy with speed of the e-shell's expansion and contraction; a breathing motion where breath-rate signifies energy state **(A)**. Using this model, a high energy electron loads more torsional pressure upon the linking structure **(B)**. Eventually, this lop-sided torsion transmits impulse to the neighboring atom and deforms their interconnecting e-shells in the process, observed as a photon **(C)** and resulting in equalized energy between the atoms.

The photon can thus be easily imagined as a physical signal from one atom to its neighbor across their overlapping e-shells, which can be thought of as entwined e-shell filaments. This is essentially dissipation of surface tension, where the surface of the atom is the electron shell. Light is thus imagined as a discrete torsional deformation of the thinned, elastic tails of atomic e-shells, such that each photon is a singular event with a specific strength, or energy.

The more that atoms are energized, the more wound up the electron interconnection, even after equilibration. Note that the helical interconnection displays a natural periodicity, or wavelength, which signifies the wavelength of photon that might pass from one to the other. The wavelength of the helix naturally shortens as the filament is wound tighter and tighter during progressive excitation. This feature of the interatomic helix symbolizes the well-established inverse relationship between wavelength and energy of the photon.



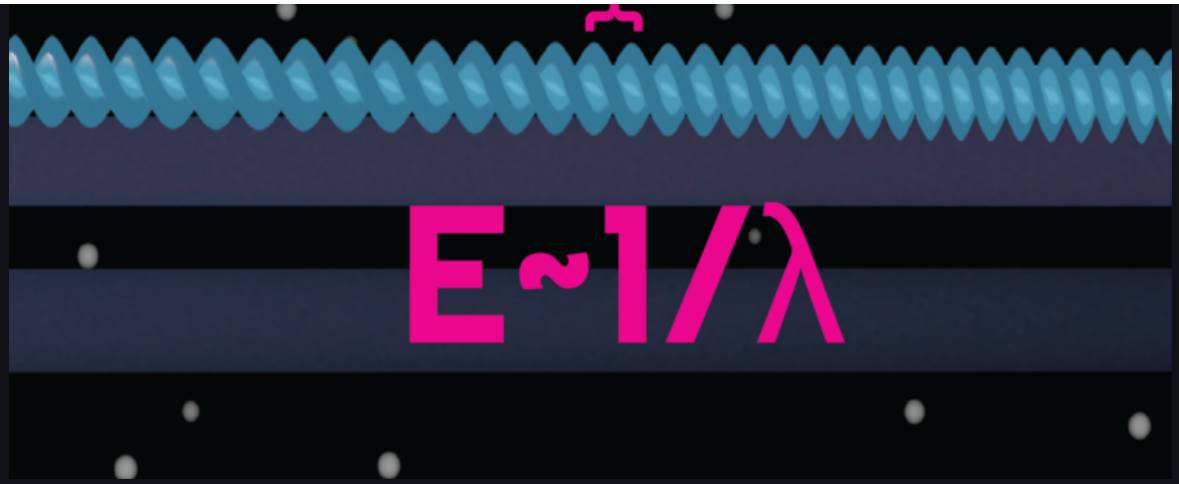


Fig 3| Wavelength-Energy Relationship. By representing entwined e-shells as a helical interconnecting structure that deforms to produce the photon, we can easily capture the energy-wavelength relationship. We can imagine that as the interconnecting structure is loaded torsionally, it will store energy elastically in proportion to the emitter atom's electron energy much like a torsion spring.

We hope this model of light serves you well. Future posts will follow up on the nuances of light's bizarre behavior. We'll use our nodal atomic model to explain reflection and relay/transmission as well as "wave interference" issues like diffraction and dispersion. Eventually we'll make it through all of your favorite atomic phenomenon. Please share your ideas in the meantime – the comments section on YouTube is wide open or feel free to shoot us an email!

Notes:

* Entwined e-shells can be termed "photogravitational helix" for this reason. These PGHelices will be invoked to physicalize gravity in an upcoming post.
** The atoms illustrated above are made of fiber, which is consistent with empirical findings, unrelated to Bill Gaede's thread world.

Michael Shilo DeLay, Ph.D.

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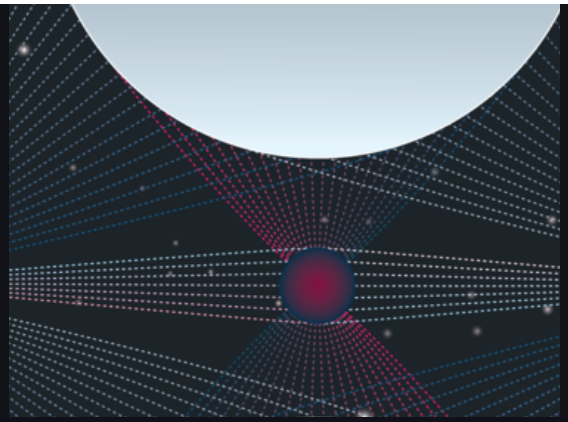

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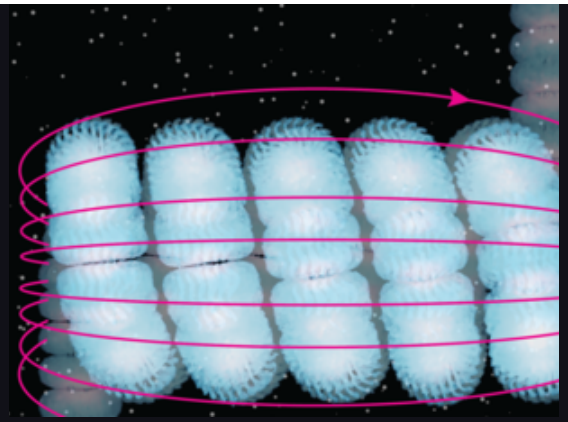

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