

Will the real rainbow please stand up?

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Putting spacetime in its place

abstract

The function of this meander is 'putting spacetime in its place'; Though not overtly the theme. A quick look at a variety of ideas related to observation product production, (including rainbows.) Also considered is replacement of spacetime with uni-temporal space for the home of existential matter. Ending up at the need to reconsider the cause of gravity in that case.

Will the real rainbow please stand up?

Putting space-time in it's place

Visualization of photon reflection /or absorption and re-emission

Imagine photon particles being shed from the material in waves corresponding to vibration of the material. Frequency of vibration and hence frequency of waves produced depending on how hot (thermal energy) and atomic and chemical composition (affecting in what manner and how much vibration can happen.)

Intensity

The semblance of a material object can be seen because of the cascade of photons reflected from it when illuminated. The photons travel through the environment and some may enter an observer's eye. When stationary relative to the observer a constant intense reflection of photons is released. How many precisely depends on the amount of illumination or the amount of luminosity of the object. A light meter can be used to quantify brightness of the reflected electromagnetic radiation (EMR).

The chemical composition and thermal energy of the material object determines the wavelength of EMR the object re-emits into the environment. The colour of the seen 'object' is in part due to the wavelength of photon input to observer. Other issues play a part in colour perception, such as proximity of other objects/colours, intensity of illumination, capabilities/sensitivity of the photoreceptors.

For an observer organism: An electrical signal called a neural impulse is sent to the brain following capture of photons by the pigments in photoreceptor cells of the retina. Photons passing into the photoreceptor cells are not always absorbed by the pigment found there, some pass through unabsorbed. Absorbed or not depends on frequency. The photoreceptors have different sensitivities to different wavelengths. The brain processes the impulses it *receives*.

“The brightness of a given light stimulus will depend both on

(1) the intensity, or number of photons per second

(2) on the wavelength of the photons, since capture probability depends on wavelength.”

<https://minerva.union.edu/malekis/CVision2003/MainPage/Course%20Content/Color%20Perception/ColorPerception.htm> I. Spectral absorption functions of pigments. [3]

Rainbows [4]

Formed by each observer of the phenomenon, from received ‘light’ that has passed through a unique collection of raindrops, out of a multitude of such raindrops. ‘Light’ has entered the raindrops and there has been refraction followed by internal reflection and further refraction on exiting happening. The photons emerging from the unique raindrop collection reaching the eye of a particular observer at a viewing angle of 42.4 degrees for a primary rainbow (colours: ROYGBIV). Viewing angle 50.4 degrees for a secondary rainbow, colours reversed. In both cases viewing with sun behind the observer. *Each observer sees their own unique rainbow* observation product, from the particular raindrop reflections they received. There isn’t one singular rainbow object or phenomenon, *the* real rainbow, that all observers are seeing.

Seeing

We can use what’s known about rainbow production to think about seeing in general.

The relative orientation of the material object, source of reflected photons, and type of observer and relative motion will affect how the manifestation semblance of the material object will appear. There is no singular photon collection in the environment that is *the* one. That’s how observers of the same object can disagree about what it is like and what it is doing. Each is making their own observation product from the unique collection of photons they have received.

When thinking about scenarios where Special relativity has been used. The wrong language is being used if we talk about what the object has become. The observation product is *newly generated* by the

observer using the photon input which is a selection of many possible collections of photons in the environment.

There is a difference between potential sensory data being *within the environment* and the observation product made using it. It's not right to say or imply the unprocessed collection of photons, potential stimuli, reflected or emitted from a source material object is the seen 'object'. What is seen depends not just on which photons are available but how what is there is focused, received and that input processed by the observer organism, apparatus or device into a unique observation product.

The seen Present product generated by the observer, by processing photon input, is temporal composite. As the input photon stimuli used to form the product do not all have the same temporal origin, and processing of different parts of the input can take different amounts of time. By temporal origin I mean the configuration of existence during which it was produced. Therefore the *product* is a kind of virtual space-time. A clear example of an image product; a foreground owl semblance, distant moonlit mountains semblance, the night sky semblance. The product being space time composite does not mean the environment the photons received traveled through was space-time. The product has semblances of objects as they were at different times co occurring in the same image, whereas when considering any singular configuration of existence itself, a time, there is only that time, that configuraion and no other to be at.

It is reasonable to assume that all that materially exists does so at one and the same time and does not have parts spread over different times. (Evidence in favour is prevention of time travel paradoxes.) We can confidently state that the experienced Present's content is not uni-temporal. Meaning by that, there can be amalgamation of distinct images pertaining to different temporal origins. That's because the stimuli weren't generated during the same material configurations of uni-temporal existence.) There can also be temporal blurring where data from different times is combined giving an approximation. Uni-temporal -Now, the material configuration of all *existing* is ever changing into a new Uni-temporal-Now. Which can be thought of as sequential uni-temporal (same time everywhere) passage of time. It can be called Foundational time.

Rates of spatial change can vary but that isn't difference in passage of foundational time. The ever changing configuration of all that exists is unitary, uni-temporal yet within the configuration there can be places of more and places of less spatial change.

This means the photons are travelling through space as time passes (the configuration of existence changes). In this way, Foundational time is not mixed with space but is the always unitary configuration or pattern of existence.

### Temporal blurring

The brain strives to make an understandable product from the sensory stimuli received. Making a seemingly smooth visual experience from jerky eye and body movement and inconsistency, such as due to blinking and changing light conditions. Amalgamating information received for up to **15 seconds** previously. Consequently change is consciously appreciated more slowly than it has occurred.

As described in a study called 'Illusion of visual stability through active perceptual serial dependence' in Science advances, 2022.[1] Such effects are relevant when the observer forming the observation product is a human. Also relevant is the plasticity of duration of perceived visual products, for example in 'Detection performance for short visual stimuli depends on the duration of co-occurring auditory stimuli' in [Seeing and Perceiving](#), 2012 [2]

### Appearance of object moving at significant fraction of speed of light relative to observer

Let's imagine an ordinary object outside illuminated by Sol's light. When instead the object is moving at close to the speed of light the same number of reflected photons are distributed along the path of translation. This happening follows rules of reflection. So the photons will not emerge from an un-illuminated surface. They do not have the ability to take all paths.

The reflected photons are distributed over a significant fraction of 299792,458 km in one second. Which implies a greatly reduced intensity of photons at any fixed location along the translation route that might be received by an observer. That implies that the impression formed by an observer if possible must be formed from few photons, so having low intensity. This low intensity input might be obscured by the ambient light. Photon availability is amenable to calculation. Taking into account that not all photons entering the eyes will be absorbed by pigment molecules.

### Redshift /blue shift will happen

How the photon waves are distributed in the environment and relative speed of source and observer determine the character of the product formed. More speed difference between the material source, distributing photons, and observer, intercepting the photons distributed, the greater blue or red shift.

Advanced (earlier) interception produces blue shift. Retarded (later) interception produces redshift. This is not visible but can be measured for astronomic bodies.

### Appearance of observation product semblance Astronomic scale observation

Approaching the observer. Foreshortening. Decreasing interval between photon wave reflection from source material object and receipt by observer, The observation product built using more recently emitted photons. 'Becoming younger (more recent) in appearance' and seen as if closer to actual position of material source.

Moving away from observer. Foreshortening. Increasing interval between photon reflection from source material object and receipt by observer. Increasingly 'out of date' because of slowing updating of observation product. Increasing discrepancy from actual position of material source.

### Penrose and Terrell effect

Thinking about large objects moving at a significant fraction of the speed of light both gentlemen independently made the realization that it would take longer for 'light' photons to travel from further away parts of an object than nearer parts, setting off on their journey earlier, to arrive at the observer at the same time. Affecting what is seen. They were considering this happening in space-time.

### A twist in the tale

Descriptions of the Penrose Terrell effect, have differences in travel time of photons to the observer from further away compared to nearer. Theorized/calculated to result in the appearance of a distortion like but not actually a rotation; Rather than length contraction predicted by Special relativity being noticeable. Though that length contraction happens is not refuted by changing the description of what would be seen.

Their supposition of appearance applies to a context where Special relativity is affecting what is seen happening in space time. Differences in travel time of photons, though space time, to the observer is also affecting the appearance. That outcome doesn't apply if the material object, photons and observer are not at all traveling through/in space-time. Material object, photons and observer are not in spacetime.

Visual observation products can be considered a virtual space time. The 2D image of a scene has a virtual time dimension from foreground to background superimposed on a perspective spatial dimension. Scenery imagery gets less recent and appears smaller the further away the material subjects were.

Astronomical observations; the distance of objects from the observer are judged using other means than perspective, such as parallax, and luminosity compared to the luminosity of standard objects, called standard candles.

### The gravity of the situation

Who'd have thought that thinking about what's seen could lead to the need to rethink gravity. Existence not being within spacetime necessitates the re-examination of the cause of gravity. No existing spacetime means no curvature of 'the fabric of spacetime'. Instead replaced with a uni-temporal distribution of ordinary matter and particles and some chemically inert substance filling space between and possibly within the ordinary atomic matter.

For want of identification lets call it 'base substance' assuming it to be the simple substance from which all other organizations of material existence are formed. The Density of base substance and ordinary matter increases approaching the Earth (or other large body.) This is due to the attraction of base substance to matter and matter attracted to itself;. A property of matter, existence that has mass, mass attracts mass. The presence of mass will affect the uni-temporal distribution of base substance. Its distribution in turn will affect movement of mass through it.

Magnetic and electric fields can be explained by assuming base substance is affected by the movement of electrons. Also that base substance supports EM waves that can not exist in empty spacetime.

Change in distribution of base substance and atomic matter and particles in the atmosphere around the Earth will account for differences in amount of curvature of light beams and EM signals. No need to postulate curved spacetime. Newtonian gravity will apply but it is not acting through empty space.

What appears to be Spacetime is a product, effect, produced within uni-temporal space. The experienced Present, photographic and astronomic mages are 2D virtual spacetime products. Spacetime is not an ingredient of existential material reality. It is in existential material reality that physics is actualized /happening. That is within the ever changing material configuration of existence, Unitemporal-Now. Unintentionally, by meandering this way we have arrived at Einstein's grand castle in the air. It seems a small folly.

### References and sources

[1] Manassi M., Whitney D., 'Illusion of visual stability through active perceptual serial dependence' Science advances, 2022 ,Vol 8, 2 [DOI: 10.1126/sciadv.abk2480](https://doi.org/10.1126/sciadv.abk2480)

[2] Cullen H., Driver J., et al 'Detection performance for short visual stimuli depends on the duration of co-occurring auditory stimuli', 2012 *Seeing and Perceiving* 25:24-24

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[4] Ford K., Rainbows: Figuring Their Angles A Resource for Teachers, via [/www.basic-physics.com/rainbows-figuring-their-angles/](http://www.basic-physics.com/rainbows-figuring-their-angles/)

This essay is a supplement to an article entitled "Rainbows: A Graphical Approach" that appeared in *The Physics Teacher*, vol. 58, March 2020, page 152. <https://aapt.scitation.org/doi/10.1119/1.5145401>.