

RELATIVITY AND IMAGINARY TIME

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Abstract -

This article takes the form of 3 "microarticles". They are 1) *Relativity says science overvalues experiments*, 2) *Time dilation to co-moving and non-comoving observers* and 3) *EXPLORING VENUS, MARS, ETC BY ENTANGLING THEM WITH EARTH*. Each microarticle was originally written to stand alone, but I decided they should be combined into one article.

Everybody (even including Nobel-winning physicists) seems to have a preference for experiment instead of theory. This reminds me of a movie I saw about Alexander the Great. Aristotle (played by Christopher Plummer) was teaching the young Alexander and said Greeks use their minds while other races rely on their senses, and what they can see and hear etc. While science acknowledges the importance of theory and mind, it appears to be following Aristotle's "other races" when it declares that observation and experiment always have the last word.

This is justified by saying the ancient Greeks made mistakes because they didn't always rely **enough** on mathematics and experiment. However, it's well known that experimenters make mistakes too - from the days of Galileo to the recent experiments with faster-than-light neutrinos, and with the cosmic microwave background. This article hopes to plant a seed that will grow into a science which doesn't automatically assume observation and experiment must always have the last word.

The entire universe, along with all of the past and present and future, appears to be becoming unified by our science into one entity/event. Consider the 19th century's union of electricity and magnetism into the one force of electromagnetism (light, and every type of radiation, are forms of this). Consider the unifying attempts of Einstein's Unified Field Theory, as well as the union of space and time into space-time, in the 20th century - and of physics' subatomic String Theory and Theory of Everything in the 21st century. A vital player in this trend is quantum mechanics, with its experimentally verified quantum entanglement that says particles can affect each other regardless of distance in space-time.

The way things are going, the mathematics used on Earth will end up being revised. After all, it's based on the limited perceptions of our senses and the

idea that a virtually unlimited set of separate observations and experiments can be made ie it says $1+1=2$. But if absolutely everything is actually a single thing/event, $1+1$ will have no choice but to equal 1.

Article -

Part 1 -

RELATIVITY SAYS SCIENCE OVERVALUES EXPERIMENTS

Abstract -

Regarding the question of length contraction in Special Relativity - Einstein wrote in 1911, "... it doesn't exist for a co-moving observer; though it 'really' exists (for) a non-comoving observer" (by experiments performed by scientists). This would apply to the mass increase also predicted by the Special Relativity Theory. So particles both do and don't undergo mass increase. A mechanism is proposed that, in the case of an electron having no mass increase, means the increase would take the form of radioactive atoms possessing a larger number of neutrons than protons. The process is described without quarks, but with a more basic quantum process that says space and all particles are, ultimately, composed of virtual particles and binary digits and mathematics (including quarks, if they exist). The end suggests an explanation for the quantum entanglement of particles over light years, and might even challenge inflation's idea that the uniformity in the cosmos means particles in the universe must have once been in physical contact.

Microarticle -

Regarding the question of length contraction in Special Relativity - Einstein wrote in 1911, "It doesn't 'really' exist, in so far as it doesn't exist for a co-moving observer; though it 'really' exists, i.e. in such a way that it could be demonstrated in principle by physical means by a non-comoving observer." [1] This would apply to the mass increase also predicted by the Special Relativity Theory i.e. in atoms with high atomic number and high nuclear charge, orbiting electrons that attain velocities corresponding to a considerable fraction of the speed of light [2] both do and don't undergo mass increase.

Mass increase really exists and "could be demonstrated in principle by physical means by a non-comoving observer" (by experiments performed by scientists). In this case, Relativity's implications for the properties of atoms would cause some inner orbitals to contract and, in turn, other orbitals to expand. This would account for gold's yellow colour and mercury being liquid at room temperature [2].

At the same time, mass increase doesn't really exist "for a co-moving

observer" i.e. a scientist moving along with an electron would see the particle's energy content remain identical (there'd be no mass increase), and wouldn't see or detect any change in the energy levels of the electron orbits (they wouldn't contract or expand).

Maybe photons and gravitons are ultimately composed of disturbances in a field that are analogous to the pulses of energy used in electronics (hence the term "gravitational energy"). These disturbances produce the bits (binary digits) of 1 and 0 encoding π , e , $\sqrt{2}$ etc. (because the universe appears to be fundamentally mathematical[3]). Matter particles [and even bosons like the Higgs, W and Z particles] are given mass by the energies of electromagnetic and gravitational waves interacting in matter particles' "wave packets" (interaction within this term from quantum mechanics conceivably explains wave-particle duality). The interaction of photons and gravitons would produce extra mass[4] and, in the case of an electron having no mass increase, the increase would take the form of a neutron (explanation follows).

Gravitational lensing is a prediction of General Relativity that massive galaxies can bend the light from more distant objects and focus that light. It's been observed. The mass of already-existing particles might use quantum-scale gravitational lensing to focus the atom's virtual particles into photons and gravitons that produce neutrons. This destabilizes the balance between forces in the atomic nucleus and can lead to a radioactive atom of lawrencium-257 which possesses 103 protons and a significantly larger number of neutrons (154).

Detailed models of decay normally point to transformation of quarks within nucleons (protons and neutrons). But it's always good to have alternatives to choose from. As a well-known book [5] puts it, "It is certainly possible that some alien beings with seventeen arms, infrared eyes and a habit of blowing clotted cream out their ears would make the same experimental observations that we do, but describe them without quarks." So I'm going to turn into that book's alien being and describe observations without quarks, but with a more basic quantum process that says space and all particles are, ultimately, composed of virtual particles and bits and maths (including quarks, if they exist).

Bits can potentially go far beyond unification of many pixels (the smallest elements of a screen's graphic image) into one image. They could unify everything in space and in time into one entity and one event. This offers an explanation for the quantum entanglement of particles over light years, and might even challenge inflation's idea that the uniformity in the cosmos means particles in the universe must have once been in physical contact.

References

- [1] Einstein, Albert [1911]. "Zum Ehrenfestschen Paradoxon. Eine Bemerkung zu V. Varičaks Aufsatz". *Physikalische Zeitschrift* 12: 509–510
- [2] "Lawrencium bridges a knowledge gap" by Andreas Türler - *Nature* **520**, 166–167 (09 April 2015) doi:10.1038/520166a
- [3] "Our Mathematical Universe" by Max Tegmark – Random House/Knopf, January 2014
- [4] A. Einstein, "Speilen Gravitationfelder in Aufbau der Elementarteilchen eine Wesentliche Rolle?" (Do gravitational fields play an essential role in the structure of elementary particles?), *Sitzungsberichte der Preussischen Akademie der Wissenschaften, (Math. Phys.)*, 349-356 (1919) Berlin.
- [5] Stephen Hawking, Leonard Mlodinow – "The Grand Design" – Bantam Press, 2010, p.49

Part 2 -

Time dilation to co-moving and non-comoving observers

My previous microarticle deals with Special Relativity's length contraction and mass increase. Something should be said regarding the theory's 3rd prediction, time dilation.

IMAGINARY NUMBERS AND IMAGINARY TIME

The space we live in is described by ordinary [or "real"] numbers which, when multiplied by themselves, result in positive numbers e.g. $2 \times 2 = 4$, and -2×-2 also equals 4. Inverted positive space becomes negative hyperspace which is described by so-called imaginary numbers that give negative results when multiplied by themselves e.g. i multiplied by itself gives -1 . Space exists in an indissoluble union with time known as space-time. So imaginary numbers were naturally also applied to time, creating an entity called imaginary time.

Imaginary time is a concept derived from special relativity and quantum mechanics. Physicists use a mathematical technique called Wick rotation - named after Italian theoretical physicist Gian Carlo Wick (1909-1992) – to transfer solutions from the 2 dimensional planes and 3 dimensional geometry of Euclidean space to the 4 dimensions (3 of space, 1 of time) of Minkowski space.

Geometrically, imaginary numbers are found on the vertical axis of the Complex Number Plane, allowing them to be presented perpendicular to the real axis. One way of viewing imaginary numbers is to consider a standard number line, positively increasing in magnitude to the right, and negatively increasing in magnitude to the left. At 0 on this x-axis (the so-called 'real' axis), a y-axis (the so-called imaginary axis) can be drawn with "positive" direction going up - "positive" imaginary numbers then increase in magnitude upwards, and "negative" imaginary numbers increase in magnitude downwards.

"This has an interesting effect on space-time: the distinction between time and space disappears completely" (1). A few pages later, Hawking writes: "In real time, the universe has a beginning and an end at singularities that form a boundary to space-time and at which the laws of science break down. But in imaginary time, there are no singularities or boundaries. So maybe what we call imaginary time is really more basic, and what we call real is just an idea that we invent to help us describe what we think the universe is like." (2).

When Professor Hawking says there are no singularities in imaginary time, can his statement relate to physics? Or is it purely mathematical, in which case it would reinforce the idea that the universe began with a singularity and a Big Bang? If there's a real axis of time united into one entity with an imaginary-time axis, both times* would be interacting parts of the universe. This could result in a hybrid universe that has a singularity within its nature, but did not originate in a Big Bang - see scenario in panel below.

* "There isn't just one dimension of time," Itzhak Bars of the University of Southern California in Los Angeles tells New Scientist. "There are two. One whole dimension of time and another of space have until now gone entirely unnoticed by us."

("Are we missing a dimension of time?" By Roger Highfield, 10 Oct 2007, <http://www.telegraph.co.uk/news/science/large-hadron-collider/3309999/Are-we-missing-a-dimension-of-time.html>)

What is needed is a fantastically tiny model of the whole universe - one that humans could easily manipulate.

This model could be truly infinitesimal - a singularity (for those interested, proposed details are in "Binary Digits and Topology Create Hybrid Big-Bang/Steady-State Universe Unified as One Qubit" at

[binary-digits-and-topology-create-hybrid-big-bang-steady-state591.html](#)) - and projection of bits (the binary digits of 1 and 0) could create the universe, perhaps being unified into a single qubit by the deletion of distance (between 1's and 0's) spoken of in Part 3's microarticle. In this way, we'd have a totally new understanding of the concept of the universe's origin. Our present ideas of the big bang would be mistaken. The cosmos would be more like a Steady State in which projection of bits (projection is reminiscent of today's theory of a Holographic Universe) IS the arrangement of virtual particles known as gravitons. The arrangement causes new space to displace old space[^] as it proceeds, which inevitably means space expands. If the universe is a projection from an infinitesimal qubit, everything used to be in contact and is now quantum entangled (wherever and whenever it is).

[^] The first generation of stars formed after the currently-accepted Big Bang are called population III stars, and they are "metal free" (don't contain elements heavier than hydrogen, helium and lithium). There is now strong evidence that such stars no longer exist only in theory, but have been observed in the "early" Universe's galaxy CR7 ("Primordial stars brought to light" by Bethan James - Nature 526, 1 October 2015, 46-47). Why do these stars exist if there was no Big Bang? As virtual particles form new space, old space is displaced and new galaxies form in the new space. Since hydrogen makes up approximately 74% of the universe, and helium 23-25%, new stars could be metal-free population III stars. It has been predicted that galaxies containing population III stars might also have formed at later times in low-density regions of the universe (Stiavelli, M. & Trenti, M. *Astrophys. J.* 716, L190–L194 [2010]).

So a computer using the vertical axis of imaginary time* can perform calculations at the familiar rate of time's passing while the horizontal axis of "real" time sees absolutely no change (no time passes in the normal sense). Such "imaginary computers" or "hyper-computers" would possibly be the ultimate breakthrough in Information Technology.

* Also referred to as negative time and the 6th-dimensional hypertime associated with 5th-dimensional hyperspace (which may be occupied with what we call dark matter).

TIME DILATION AND IMAGINARY TIME

The relativistic slowing of time cannot occur on the x-axis of real time but is necessarily on the y-axis where its rate of passing can vary. Everything known exists on the x-axis since we're moving along with real time ie we're

co-movers with it. And according to (3), co-movers don't experience length contraction or, by extension of Special Relativity, mass increase and time dilation.

The slowing of time only occurs to non-comovers ie someone or something on the y-axis of imaginary time. According to Einstein's letter explaining length contraction, "it could be demonstrated in principle by physical means" (also by experiments performed by scientists) to people in a different frame of reference - in this case, to a comoving observer like you or me.

Time dilation caused by the extreme concentration of gravitational waves in a massive body such as a black hole demonstrates, by means of the laws of physics, this prediction of relativity to time's co-moving observers. And the Global Positioning Satellites with their high-precision atomic clocks that compensate for relativity-driven time differences between orbit and the ground are equivalent to a scientific experiment.

Besides computers performing infinite calculations in literally no time, imaginary time provides interstellar and intergalactic travel that's literally instant. Since space and time are united into space-time, instant travel to the remotest regions of the universe must be equivalent to instant travel to areas light could only reach by traversing positive or negative space for centuries or even many billions of years ie to the future and past, respectively.

References not included in text

(1) "A Brief History of Time" by Stephen Hawking - Bantam Press, 1988, p. 134

(2) "A Brief History of Time" by Stephen Hawking - Bantam Press, 1988, p. 139

(3) Einstein, Albert [1911]. "Zum Ehrenfestschen Paradoxon. Eine Bemerkung zu V. Varičaks Aufsatz". *Physikalische Zeitschrift* 12: 509–510

Part 3 -

EXPLORING VENUS, MARS, ETC BY ENTANGLING THEM WITH EARTH

Being in 2 places at once is not a subject exclusive to quantum physics. It can also be related to so-called imaginary numbers/imaginary time and electrical engineering.

A 2009 electrical-engineering experiment at America's Yale University, together with the ideas of Albert Einstein, tells us how we could travel to

other stars and galaxies in literally no time. Electrical engineer Hong Tang and his team at Yale demonstrated that, on silicon-chip and transistor scales, light can attract and repel itself like electric charges or magnets ["Tunable bipolar optical interactions between guided lightwaves" by Mo Li, W. H. P. Pernice & H. X. Tang - Nature Photonics 3, 464 - 468 (2009)]. This is the "optical force". For 30 years until his death in 1955, Einstein worked on his Unified Field Theory with the aim of uniting electromagnetism (light is one form of this) and gravitation.

Achievement of this[^] means the microscopic components (gravitons) of warps of space (gravity, according to General Relativity) between spaceships and stars could mimic the Optical Effect and be attracted together, thereby totally eliminating distance (this is similar to traversing a wormhole, or shortcut, between two folds in space-time). Distance is not only deleted in space. There would no longer be any "distance" in time. Just as we can journey to particular stars, we could take trips to particular years in the past or future. Instantly traversing 700 light years in space enables a spaceship to arrive at a spot which a light beam could only reach by travelling for 7 centuries, putting the ship 7 centuries in the future.

This paragraph refers to "Dark Matter and Travel into the Past"

(dark-matter-and-travel-into-the-past-t554.html) -

Entering hyperspace with its negatives (energy, matter, distance, time) permits travel to the past since it would be impossible to travel 700 lightyears there, and only possible to travel minus 700 lightyears. Doing so instantly would enable a spaceship to arrive at a spot in the past which a light beam could only reach by traversing negative distance for 7 centuries. Though negative distance or time is totally alien to us, it must exist as surely as positive distance or time if the universe is mathematical.

[^] Deleting external and internal distance between photons and gravitons allows them to exist simultaneously i.e. in "quantum superposition". This unites electromagnetism with gravitation.

The subject of imaginary time is being discussed, and space-time is a unity that's united with another unity called hyperspace-hypertime. So in preference to saying warps of space are attracted together to eliminate distance, the focus can be placed on the temporal aspect - and we travel at 90 degrees to time as it's known. See my article "New Way of Developing Information Technology and Imaginary Time for the Purpose of Building the Universe" and its subsection "Are Hypertime and Imaginary Time the Same Thing?" at <http://vixra.org/abs/1503.0169>

Movement forwards through hypertime is always in the "up" direction and,

whether the trip is a relatively short one to Mars or one of countless billions of light years, absolutely no motion occurs in ordinary time's horizontal direction (Relativity's time dilation ^ implies time might be stopped, making travel instant). And the journey is thus instant. Another way of viewing this phenomenon would be to say the object (though macroscopic) is in 2 places at once. So we can produce the effect of faster-than-light travel for both matter and information, without engaging in actual faster-than-light travel (that is impossible).

^ Special Relativity shows that time slows down for anything moving, but this is only noticeable at significant fractions of the speed of light.

The macroscopic object is in 2 places at once* as a result of manipulations based on the electrical-engineering experiment at Yale University. Similarly, lasers and displacement put a quantum particle (or calcium ion) in 2 places simultaneously. Whether the object is macroscopic or quantum, only one of it actually exists because the deletion of distance spoken of unites every particle in the universe (or anywhere in time) into a single entity.

Borrowing from the term "unified field", this unified entity explains quantum entanglement and "spooky action at a distance" (in time, in space, on Earth). And now to borrow from "What's Real?" ([post1220.html#p1220](#)) - which proposes that the universe is composed of virtual particles generating the binary digits 1 and 0. Eliminating digital distance superposes all the 1's and 0's, forming a cosmos that is one qubit. Richard Feynman once wondered if the universe contained just one electron (I think it's the unifying entity of one qubit).

* EXPLORING VENUS, MARS, ETC BY ENTANGLING THEM WITH EARTH (AND/OR THE SUN)

Using Yale University's 2009 electrical-engineering experiment and physics' concept of imaginary time, it was seen earlier in this article that travel can be instant. An instantaneous journey puts an object, e.g. a spaceship, in two or more places at once (the start and end of its trip occur simultaneously).

Departure from Earth orbit and arrival in Mars or Pluto orbit can occur at the same time; avoiding cosmic and solar radiation, as well as muscle and bone weakening, resulting from extended space travel. Maybe the extremely high temperatures associated with planets like Venus and Mercury, or the extremely high pressures of Venus and Jupiter, can be overcome (balanced) by a spaceship simultaneously existing in the extreme coldness and near-vacuum of multiple regions of space near Earth while experiencing temperatures and pressures of opposite nature at other planets.

With a planet like Saturn, the lack of a solid surface and lack of oxygen might possibly be compensated for by explorers simultaneously being entangled with Earth. The cold is potentially compensated for by an "instant trip" from Earth to Saturn that includes not a gravitational slingshot but an "entanglement slingshot" through a region sufficiently close to the Sun.

And if "Binary Digits and Topology Create Hybrid Big-Bang/Steady-State Universe Unified as One Qubit" (binary-digits-and-topology-create-hybrid-big-bang-steady-state-591.html), the qubit means everything in time as well as space is unified into one event. Space and time are, as first proposed by mathematician Hermann Minkowski early last century, united into spacetime. It's then feasible to not only investigate different cities, planets and galaxies simultaneously. Different days, years and centuries (in the past, present and future) can be experienced at the same time.

All this sounds incredibly weird! But free yourself from immersion in this limited reality, and give your mind the chance to deliberate these ideas (perhaps for decades). Like me, you may find that they make sense. We should not believe the human, and cosmic, condition cannot be fundamentally different from what we know simply because we'd prefer what we know - or what we think we know - to be all there is.

END