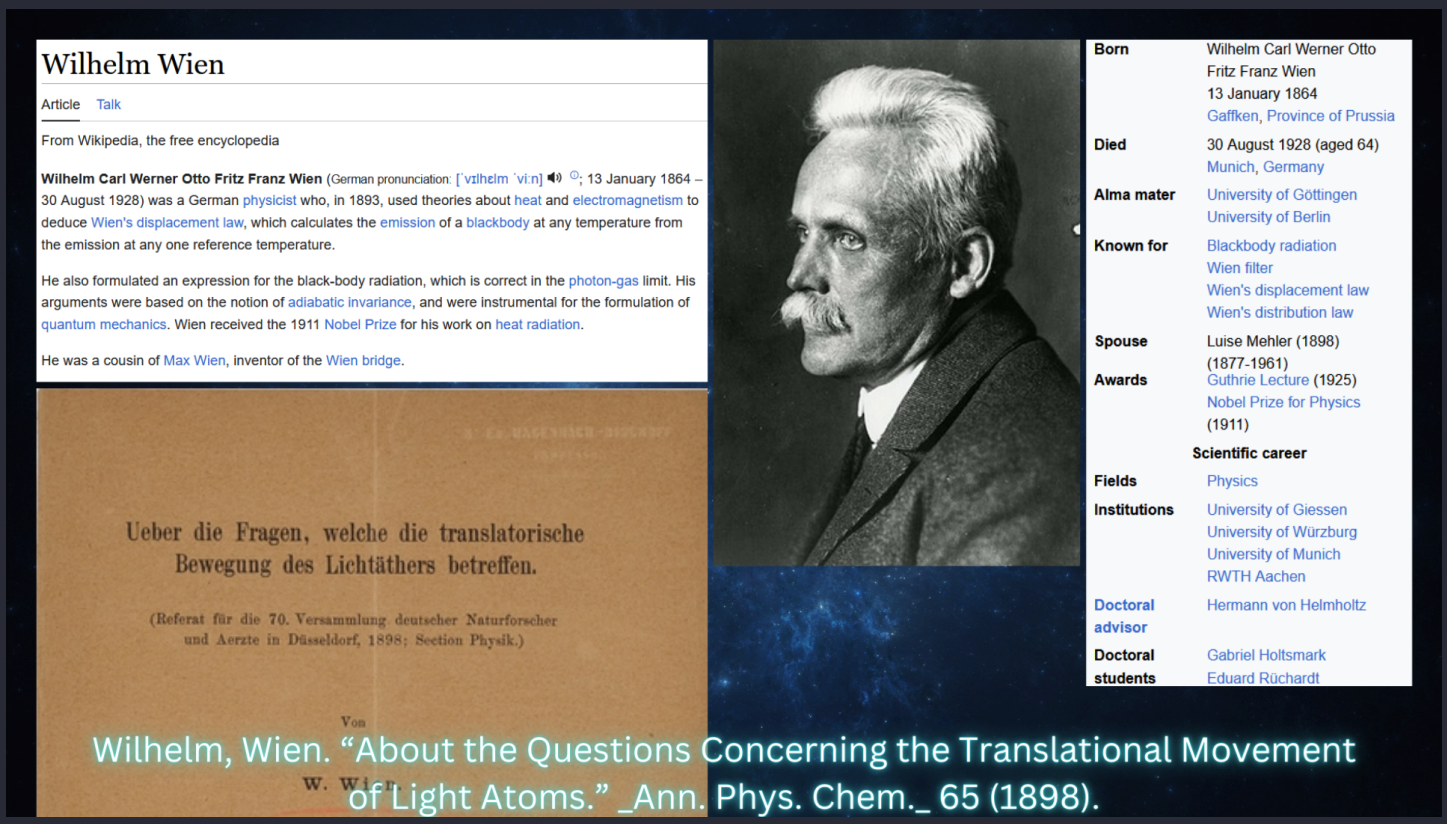
Twitter Pres - Special Relativity Fundamentals Title

sub title

Contact info:

Notes:



Notes:

- The state of physics and heliocentrism
- measurements of velocities, none 30 km/s

- Knew they could measure translation velocity
- Supposes Earth's rotations and/or velocity is somehow canceling out the ability to make the measurements

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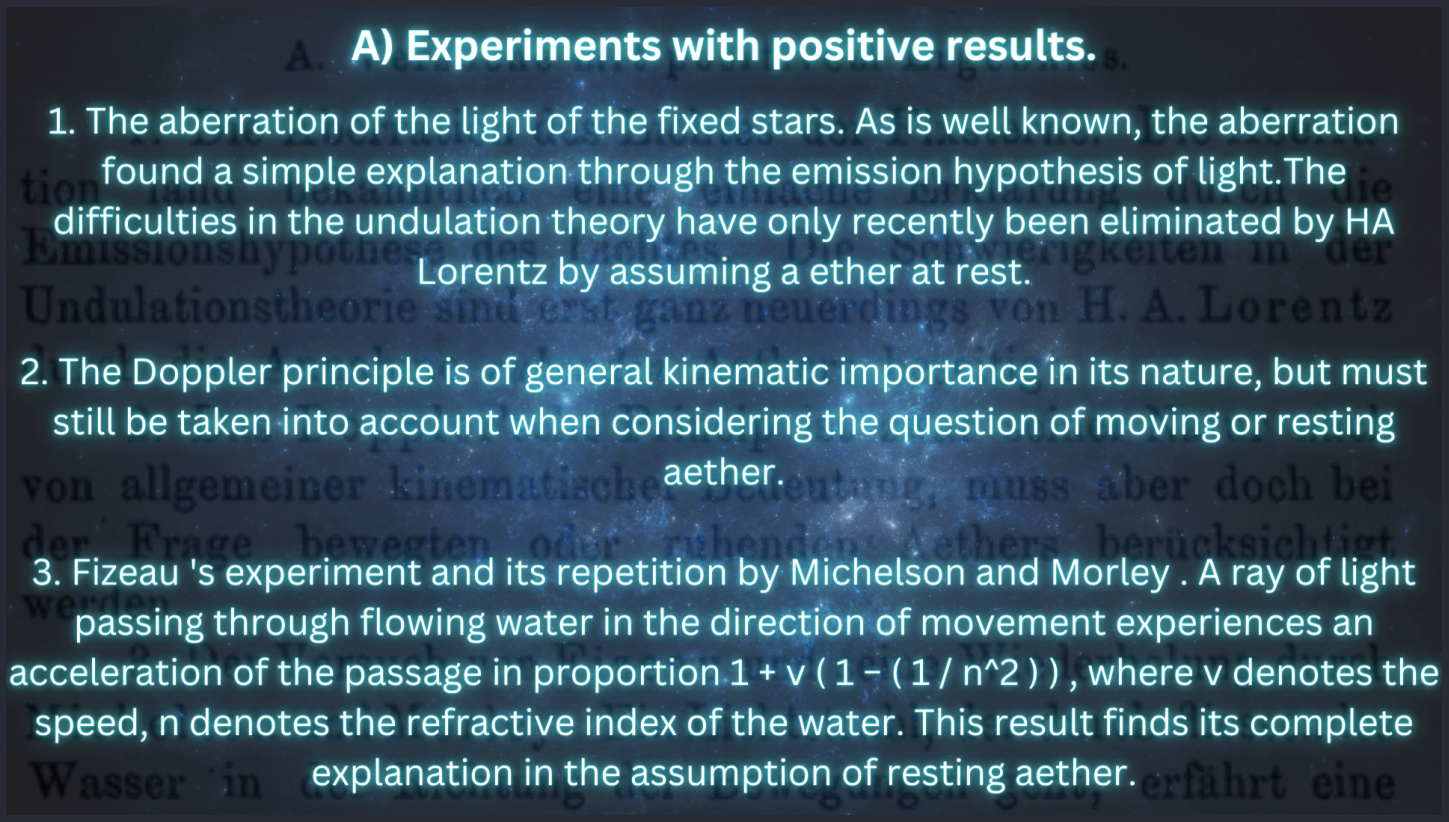

Notes:

- Stellar Abe. = Kinematics != Experimental verification
- Airy's failure to obtain a velocity correction with a water-filled telescope
- Doppler Prince Apparent freq shift in waves relative to the velocity between emitter and observer => medium for the waves to be relative to for observers to make their apparent freq measurements
- Fizeau & MMX Translational velocity measured in moving material media (water)

B) Experiments with negative results.

1. Arago's experiment as to whether the movement of the earth influences the refraction of the light coming from the fixed stars.

2. Ketteler’s interference experiment. The two beams of an interferential refractor are sent through two tubes filled with water and inclined towards each other in such a way that one beam hits one tube after the first reflection (on one glass plate), the other beam hits the second tube after the second reflection (on the other glass plate), i.e. runs in the opposite direction. Although both tubes are carried along by the earth's movement, there is no change in the interference fringes, although one beam is accelerated and the other is delayed.

3. Klinkerfues' experiment to determine whether the absorption line of sodium vapor was influenced by the movement of the earth.

Notes:

- Arago; half-covered telescope; crystal prism; correction angle independent of medium; ie no motion; already comes in at an angle
- Ketteler's; attempting to use aether dragged in material media to see if the water held the 30 km/s in it.
- Not familiar with Klinkerfues' sodium vapor experiment; noted the effect was small, could be in error; not a make or break

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B) Experiments with negative results.

10. The Michelson and Morley experiment . If the aether is at rest, the time it takes for a ray of light to travel back and forth between two plates of glass must change as the plates move. The change depends on the size v^2 A^2 but should be observable when interference is used.

The negative result is incompatible with the assumption of resting aether. This assumption can only be maintained by the hypothesis that the length dimensions of solid bodies are changed in the same proportion by the movement through the resting ether in order to compensate for the lengthening of the path of the light ray.

The assumption of moving aether would give rise to the possibility that the aether is carried along by the movement of the earth and rests relative to it. This would explain all negative test results. But then the explanation of the aberration would remain.

Notes:

- Biggest concern w/ moving v_aether and v_earth is it cannot explain stellar aberration
- If you take the 5 - 6 km/s as is and make wrt a stationary earth instead of a co-moving Earth, you immediately solve all the problems
- you can acknowledge aberration's for what it is; a drift in the sky relative to a fixed Earth
- Experimentally shown by Airy, Arago, et al; List of 10 experiments from Wilhelm Wien

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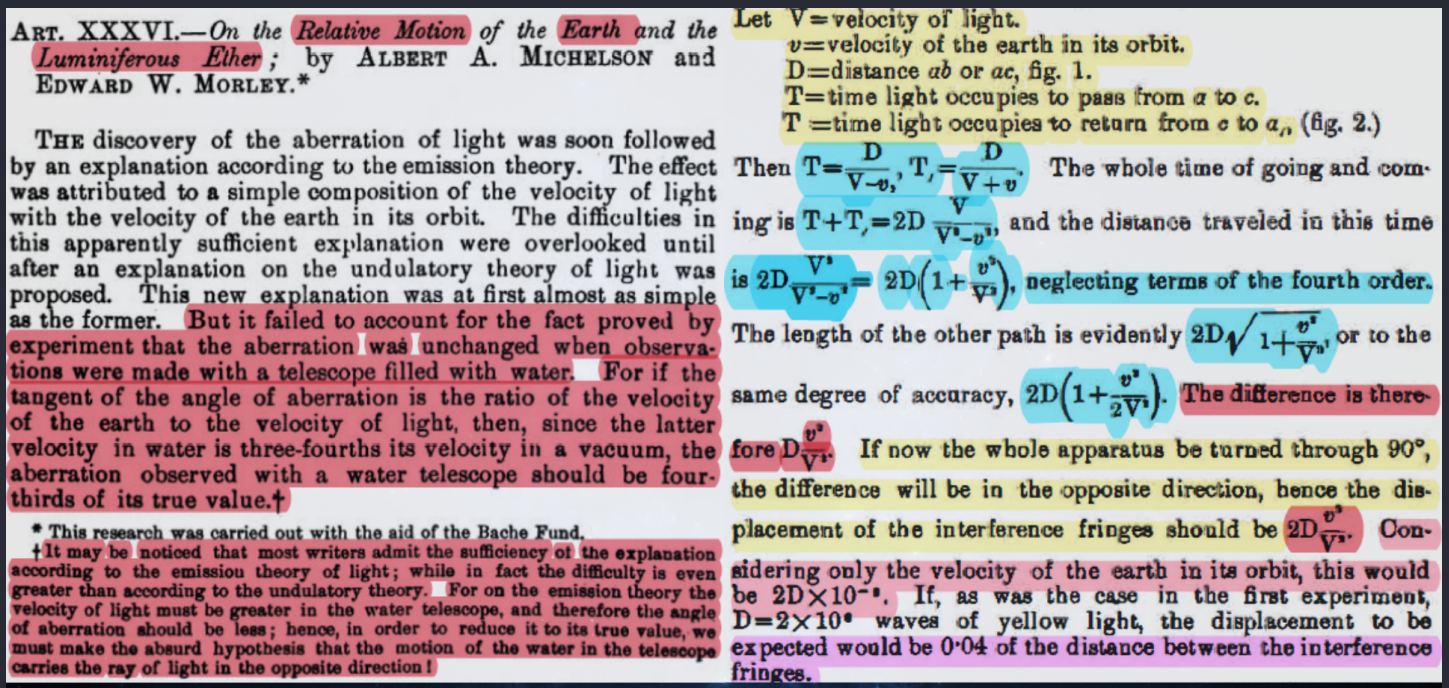

ART. XXXVI.—*On the Relative Motion of the Earth and the Luminiferous Ether*; by ALBERT A. MICHELSON and EDWARD W. MORLEY.*

THE discovery of the aberration of light was soon followed by an explanation according to the emission theory. The effect was attributed to a simple composition of the velocity of light with the velocity of the earth in its orbit. The difficulties in this apparently sufficient explanation were overlooked until after an explanation on the undulatory theory of light was proposed. This new explanation was at first almost as simple as the former. But it failed to account for the fact proved by experiment that the aberration was unchanged when observations were made with a telescope filled with water. For if the tangent of the angle of aberration is the ratio of the velocity of the earth to the velocity of light, then, since the latter velocity in water is three-fourths its velocity in a vacuum, the aberration observed with a water telescope should be four-thirds of its true value.†

* This research was carried out with the aid of the Bache Fund.

†It may be noticed that most writers admit the sufficiency of the explanation according to the emissiou theory of light; while in fact the difficulty is even greater than according to the undulatory theory. For on the emission theory the velocity of light must be greater in the water telescope, and therefore the angle of aberration should be less; hence, in order to reduce it to its true value, we must make the absurd hypothesis that the motion of the water in the telescope carries the ray of light in the opposite direction!

Let V = velocity of light.
v = velocity of the earth in its orbit.
D = distance ab or ac, fig. 1.
T = time light occupies to pass from a to c.
T' = time light occupies to return from c to a, (fig. 2.)

Then $T=\frac{D}{V-v}$, $T'=\frac{D}{V+v}$. The whole time of going and coming is $T+T'=2D\frac{V}{V^2-v^2}$, and the distance traveled in this time is $2D\frac{V^2}{V^2-v^2}=2D\left(1+\frac{v^2}{V^2}\right)$, neglecting terms of the fourth order. The length of the other path is evidently $2D\sqrt{1+\frac{v^2}{V^2}}$, or to the same degree of accuracy, $2D\left(1+\frac{v^2}{2V^2}\right)$. The difference is therefore $D\frac{v^2}{V^2}$. If now the whole apparatus be turned through 90°, the difference will be in the opposite direction, hence the displacement of the interference fringes should be $2D\frac{v^2}{V^2}$. Considering only the velocity of the earth in its orbit, this would be $2D\times10^{-8}$. If, as was the case in the first experiment, $D=2\times10^8$ waves of yellow light, the displacement to be expected would be 0·04 of the distance between the interference fringes.

A. A. Michelson and E. W. Morley. “On the Relative Motion of the Earth and the Luminiferous Ether.” American Journal of Science s3-34, no. 203 (1887): 333.

Notes:

- Quick rundown on Airy's explanations; corpuscle & undulatory
- Math derivation
- 2D v^2/V^2 = Exact => They knew exactly what they were looking for and this was the last attempt to measure the Copernican principle

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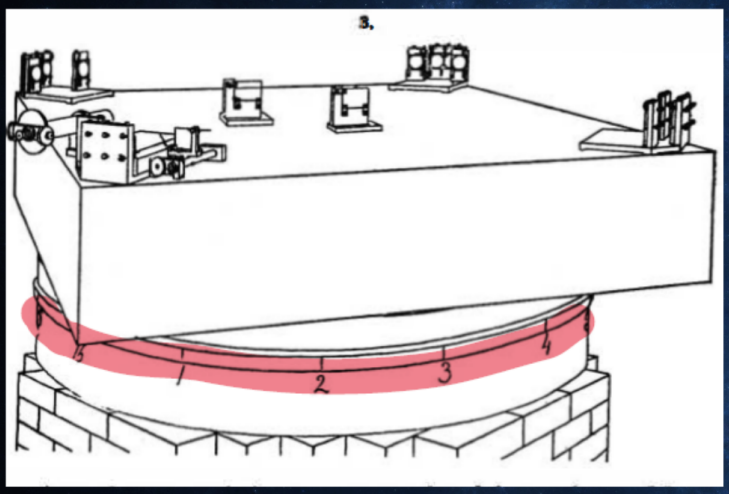
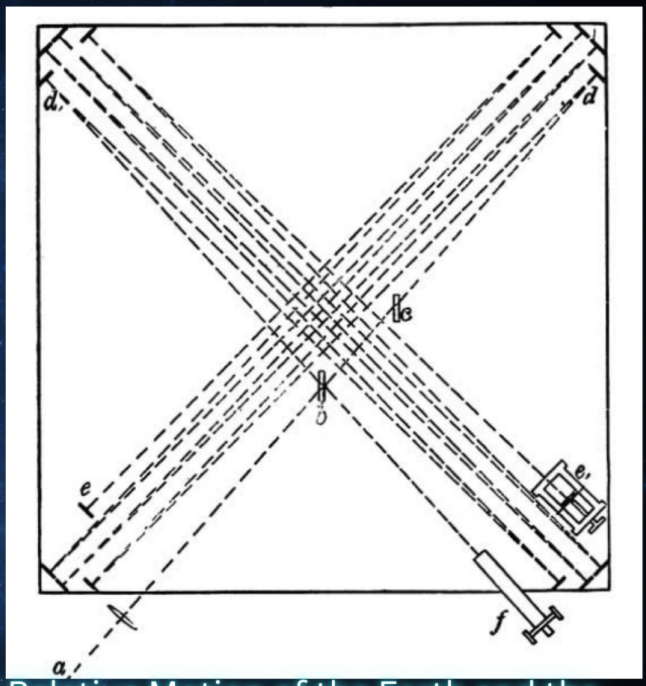




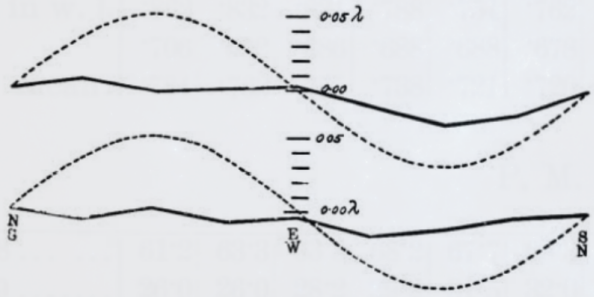
A. A. Michelson and E. W. Morley. “On the Relative Motion of the Earth and the Luminiferous Ether.” American Journal of Science s3-34, no. 203 (1887): 333.

Notes:

- Orthogonal setup, MMX-style, right angle interferometer
- Control = Known wavelength & refractive index of medium (air)
- IV = Orientation wrt to time
- DV = Fringe of x amount (predicted by ratio v/c)

The results of the observations are expressed graphically in fig. 6. The upper is the curve for the observations at noon, and the lower that for the evening observations. The dotted curves represent *one-eighth* of the theoretical displacements. It seems fair to conclude from the figure that if there is any displacement due to the relative motion of the earth and the luminiferous ether, this cannot be much greater than 0·01 of the distance between the fringes.

6.



displacement should be $2D\frac{v^2}{V^2}=2D\times10^{-8}$. The distance D was about eleven meters, or 2×10^7 wave-lengths of yellow light; hence the displacement to be expected was 0·4 fringe. The actual displacement was certainly less than the twentieth part of this, and probably less than the fortieth part. But since the displacement is proportional to the square of the velocity, the relative velocity of the earth and the ether is probably less than one sixth the earth's orbital velocity, and certainly less than one-fourth.

In what precedes, only the orbital motion of the earth is considered. If this is combined with the motion of the solar system, concerning which but little is known with certainty, the result would have to be modified; and it is just possible that the resultant velocity at the time of the observations was small though the chances are much against it. The experiment will therefore be repeated at intervals of three months, and thus all uncertainty will be avoided.

It appears, from all that precedes, reasonably certain that if there be any relative motion between the earth and the luminiferous ether, it must be small; quite small enough entirely to refute Fresnel's explanation of aberration. Stokes has given a theory of aberration which assumes the ether at the earth's surface to be at rest with regard to the latter, and only requires in addition that the relative velocity have a potential; but Lorentz shows that these conditions are incompatible. Lorentz then proposes a modification which combines some ideas of Stokes and Fresnel, and assumes the existence of a potential, together with Fresnel's coefficient. If now it were legitimate to conclude from the present work that the ether is at rest with regard to the earth's surface, according to Lorentz there could not be a velocity potential, and his own theory also fails.

A. A. Michelson and E. W. Morley. “On the Relative Motion of the Earth and the Luminiferous Ether.” American Journal of Science s3-34, no. 203 (1887): 333.

Notes:

- Predicted dotted line; measured solid line
- Needed .05 fringes for 30 km/s
- Measured 5 - 6 km/s
- Conclusion: slower velocity than expected
- Should do more experiments throughout the year (equinoxes)
- The same failures to explain Airy's applies to MMX; Event Lorentz's
- You have to assume the measurement is error to make Lorentz's (Einstein's) theory tenable

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Notes:

- No velocity measured velocity
- Undermines the Newtonian and Kelper equivalence of the solar system
- Reveals the dynamic solution is just a proportionality based off a ratio wrt "universal" constants; the same way Kelper did it

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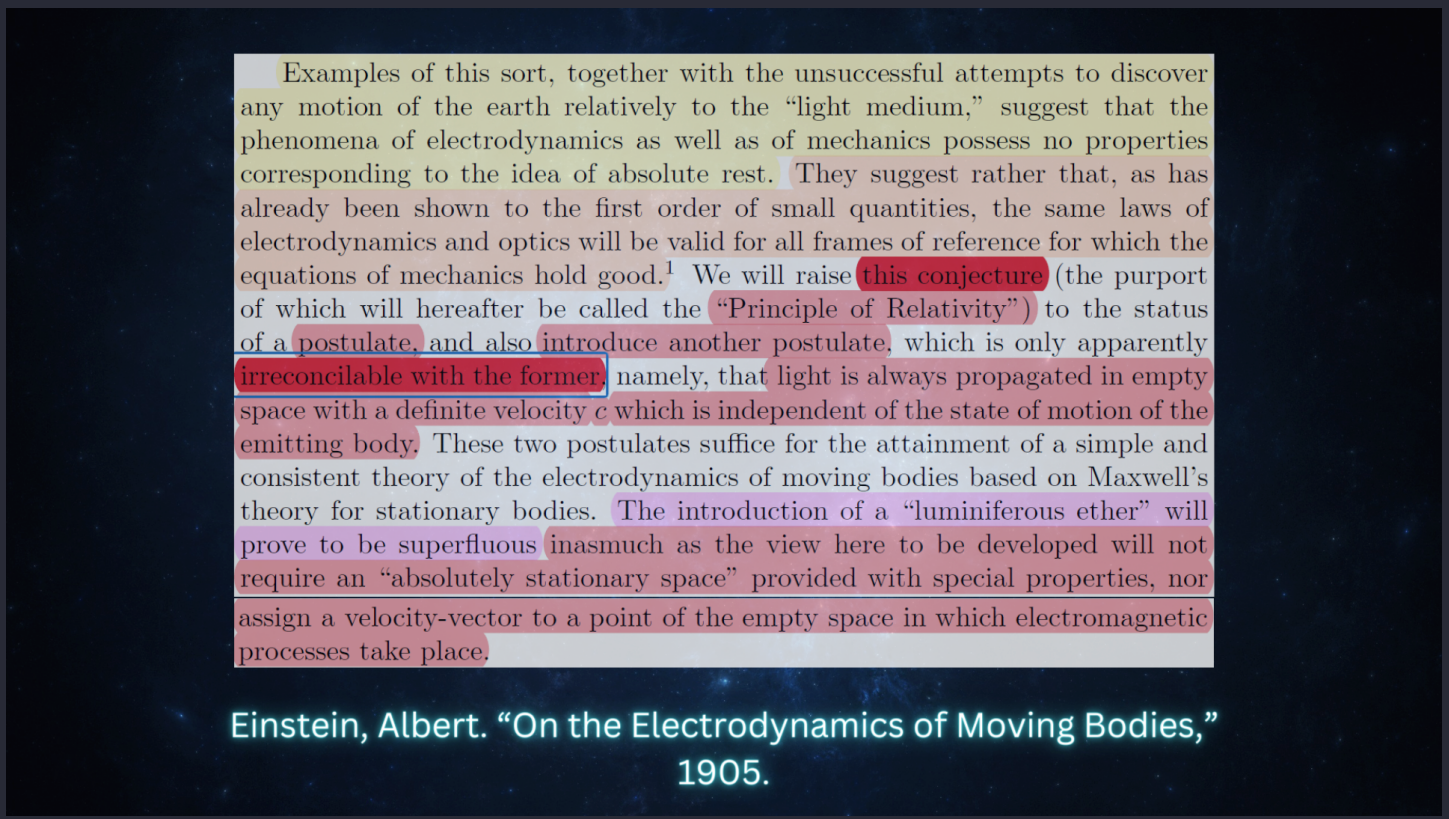
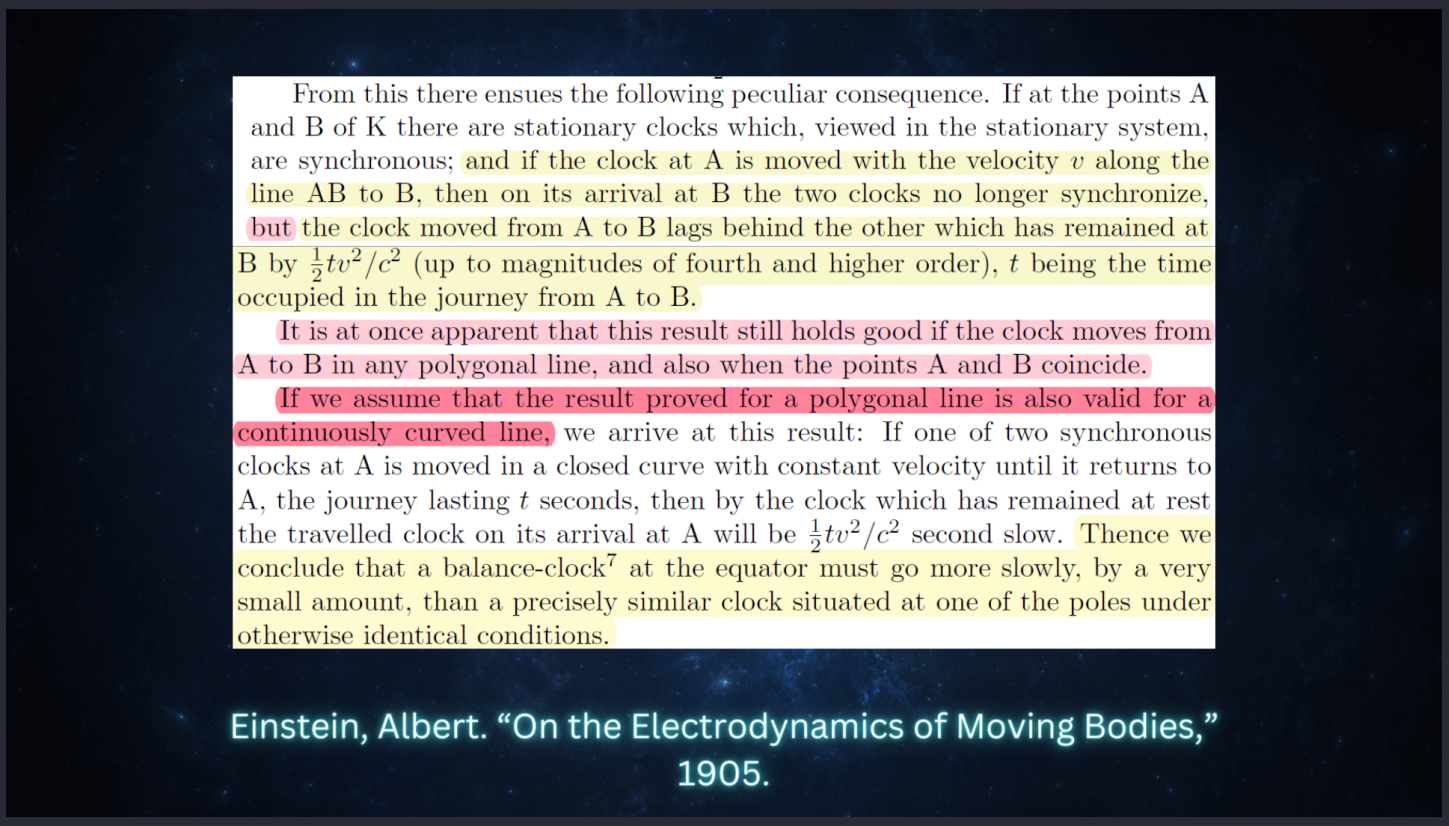


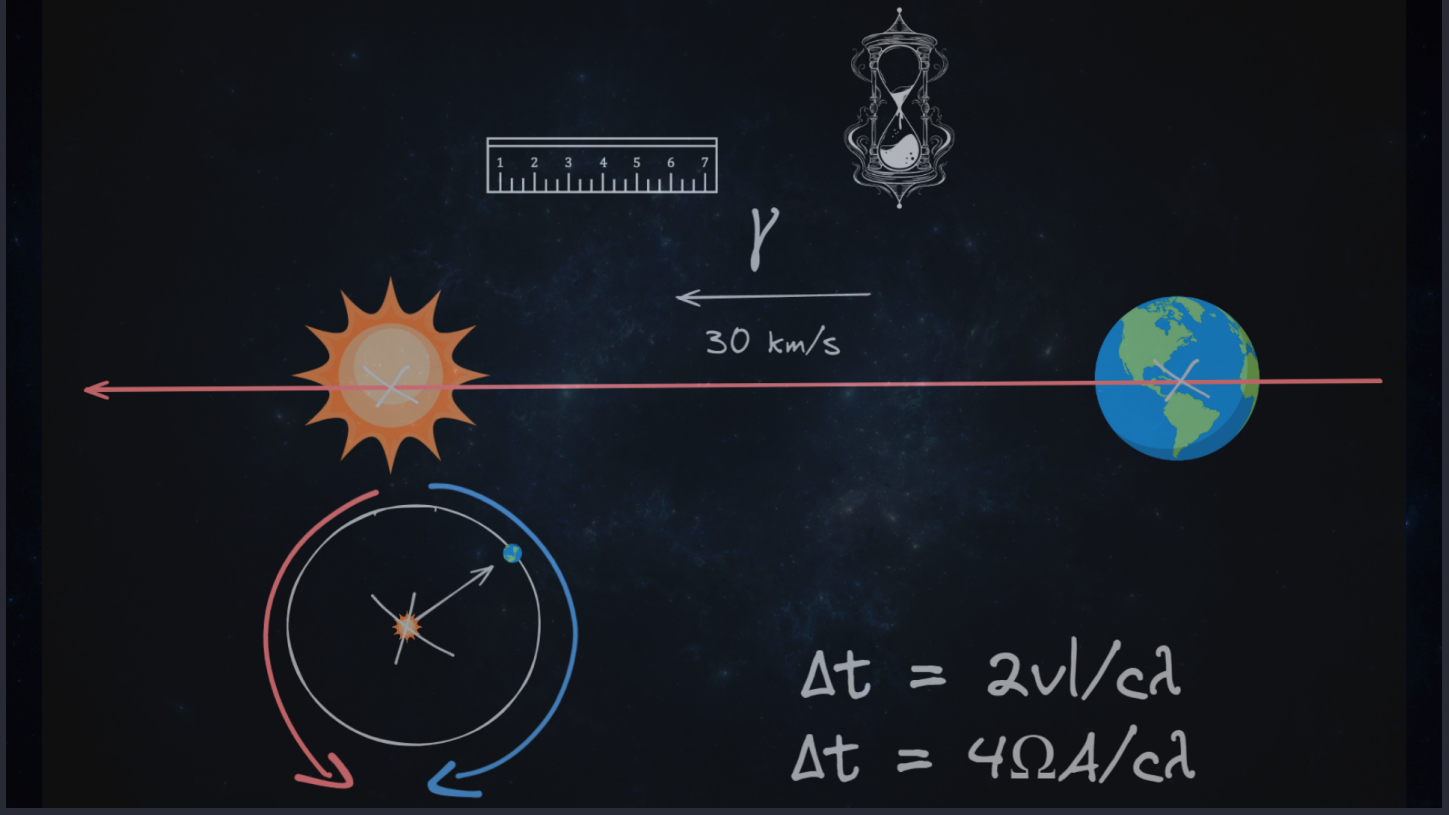
Notes:

- Postulates 1 and 2



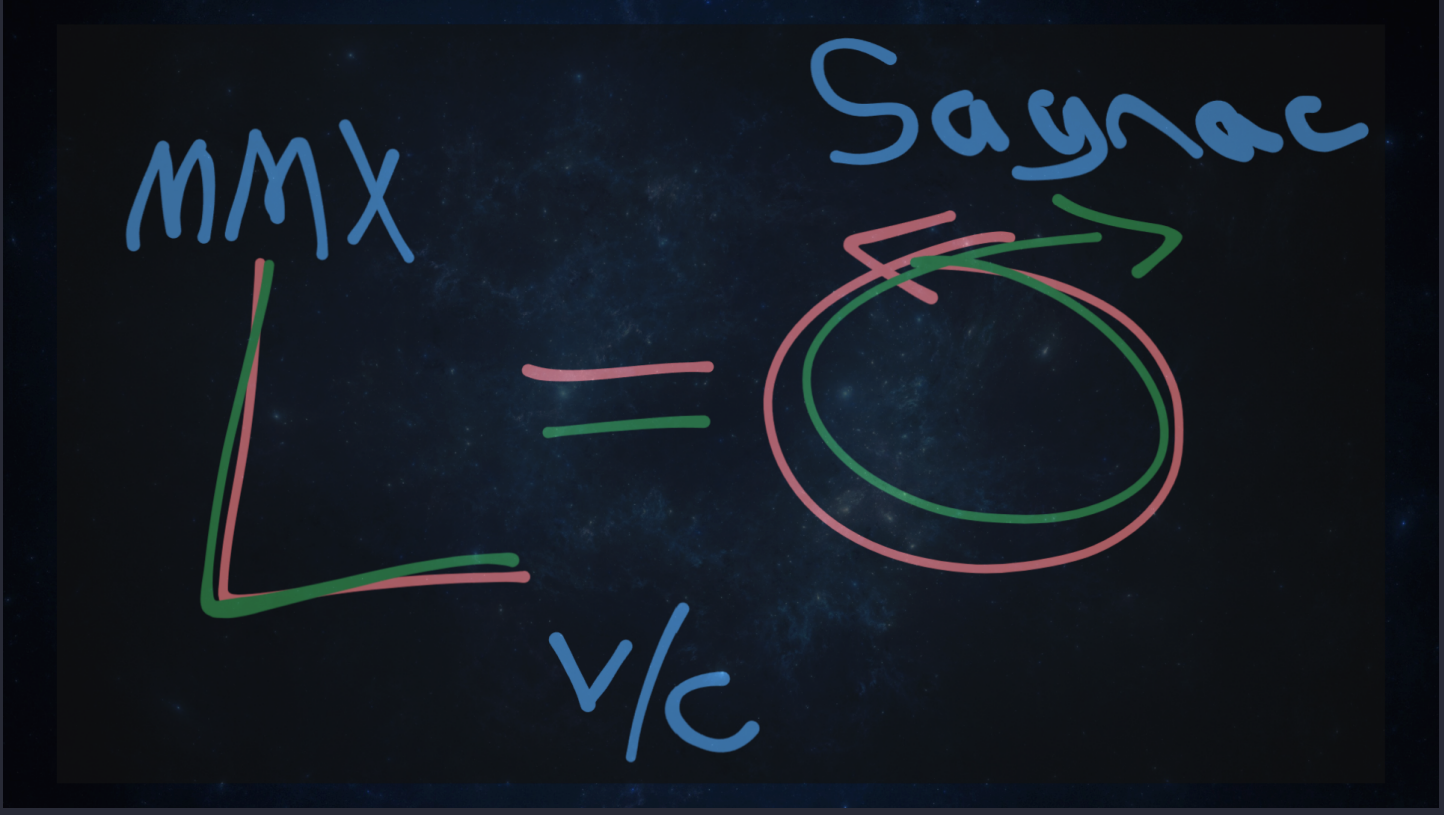
Notes:

- Where the equations apply
- Important for identifying how the theory can be falsified
- Need to know the rules of the game before you can call a foul
- Infinitely extended polygon; LINEAR rotation



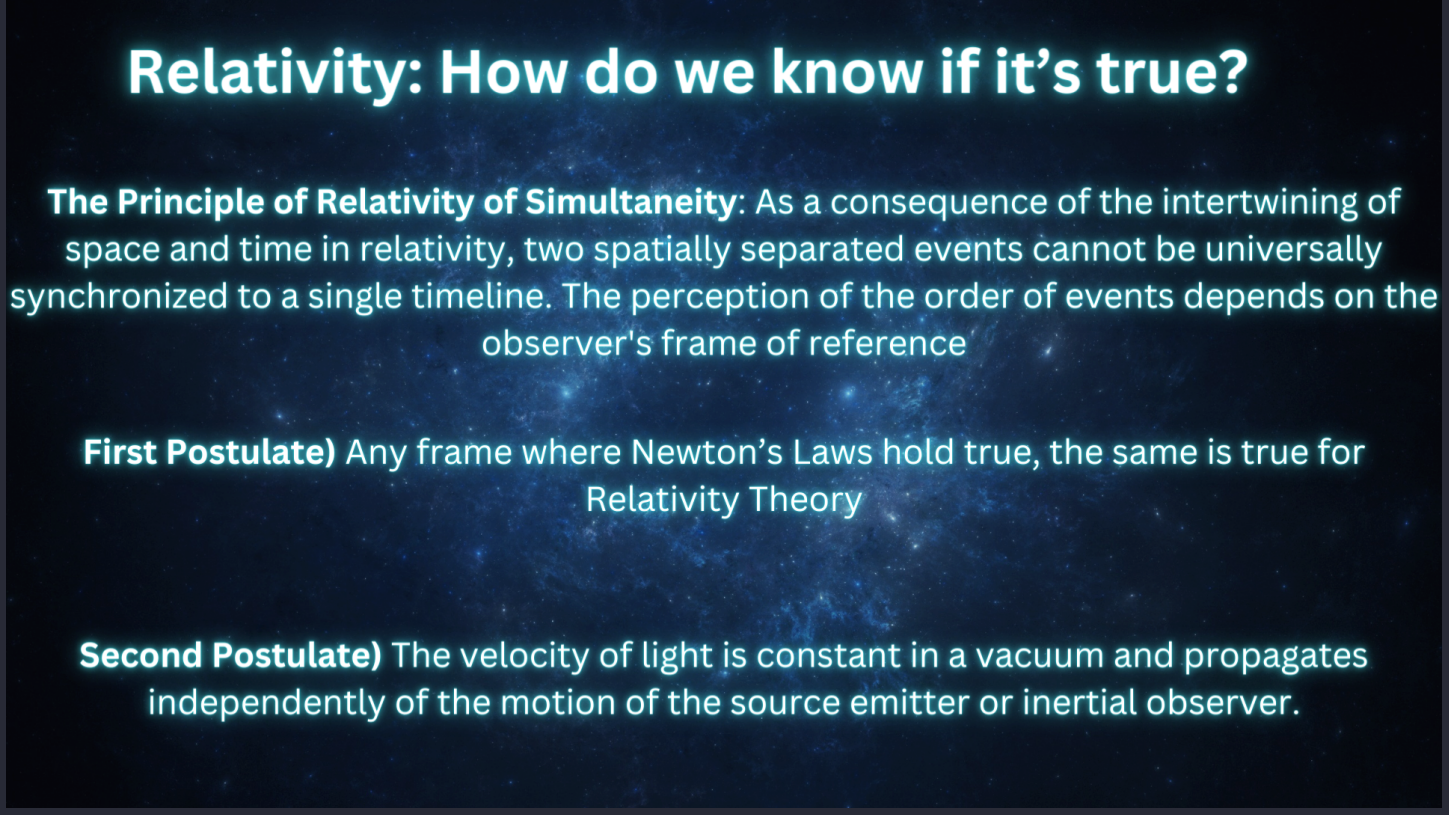
Notes:

- Absolute space and how it works
- White X's = Absolute space != NOT arbitrary
- interferometry measurements are made wrt absolute space and time
- if c = c for inertial lads & a uniformly rotating polygon is inertial => no fringe can be measured
- Speed = distant/time
- Ein says c = c for inertial lads and we can't use absolute space to assign vectors where EM prop once occurred.
- What's a Young Relativist to do?



Notes:

- Key factor in maintaining the deception re: light's ability to measure motion is orthogonal vs closed loop
- MMX-style = linear
- Closed loop = Angular != Angular & Tangential, translation, etc
- Later we'll go over an experimental that shows all motion can be detected irrespective of the configuration
- => MGP, GINGER, etc can't be measuring Earth rotation as the min/max of the translation fluctuations is in the thousands of miles per hour
- = Can't ignore the translation speed



Notes:

- Rule book, postulates,
- The Relative Simu = Raid Boss
- LC and TD depend on Relative Simu
- No Relative Simu, no justification for applying the postulates

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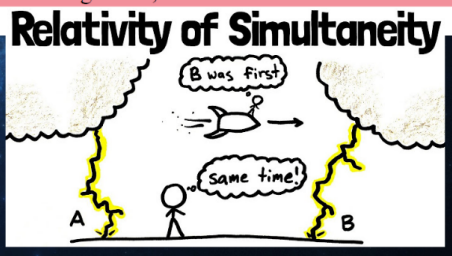
Experimental Test of Relativity's Core Principle

Global simultaneity vs. the relativity of simultaneity.

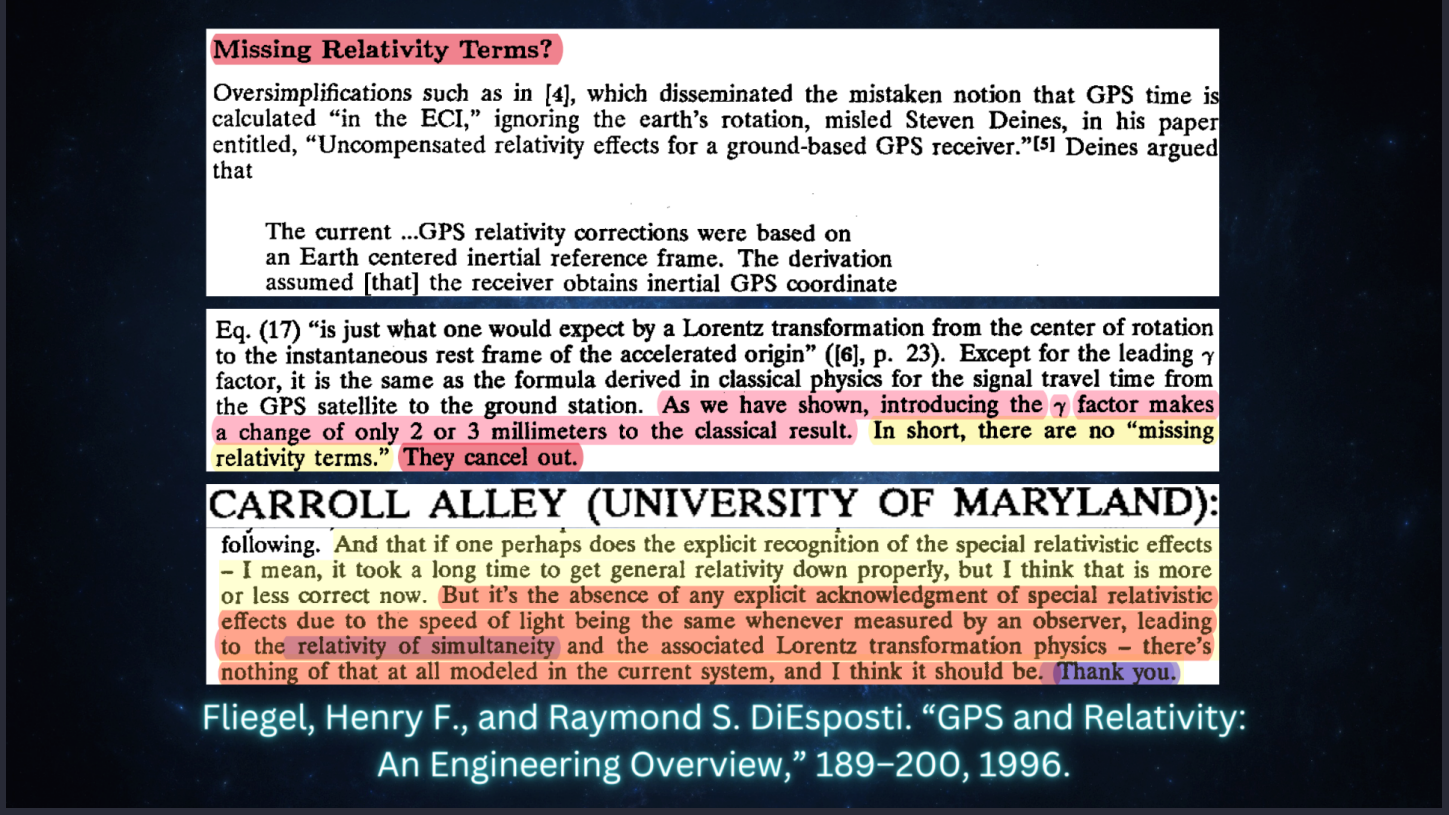
In any debate about the speed of light, the problem of simultaneity is always a focus. Special Relativity claims the relativity of simultaneity which states that two events occurring at two different places which are viewed as simultaneous for an observer in a system, usually will not be simultaneous if viewed for an observer in another system. But contrary to this, simultaneity is the key to GPS operations. GPS is a Timing – Ranging system: it does not directly measure the distance between two places where two events, i.e. signals transmitting and receiving, occur. It measures the difference of the two instants when these two events happen and then, the distance is calculated using the range measurement equation. GPS, especially its space segment and control segment, makes a huge effort to establish and maintain a GPS system time, or simply, GPS time [4]. In a scope where GPS is applied, roughly a scope with diameter of 50,000 km or bigger, if one is using GPS, one is using GPS time and therefore the concept of simultaneity of GPS: two events happened at two different places, (x_1, y_1, z_1, t_1) and (x_2, y_2, z_2, t_2), are simultaneous if $t_1 = t_2$. This is true no matter who the observer (receiver) is, where the receiver is, what its status is, or what its speed is. This is the basic operational principle of GPS. We can call it Global Simultaneity.

In the books about Special Relativity, the most commonly cited example about the relativity of simultaneity is the example about the railway platform and the moving train [5]. It says that two events (e.g., the two strokes of lightning A and B) which are simultaneous with reference to the platform are not simultaneous with respect to the moving train and vice versa. But now GPS receivers have been utilized extensively on railway platforms and moving trains, and lightning at two different places, A and B, conceptually is the same as the emissions of GPS signals from two satellites or two DGPS stations. In fact, if two signals are emitted from two satellites or two DGPS stations at the same GPS time, both the GPS receiver on the railway platform and the GPS receiver in the moving train would acknowledge the two events, the emissions of the signals, to be simultaneous. Without this basic acknowledgement, the GPS receivers can not function at all.



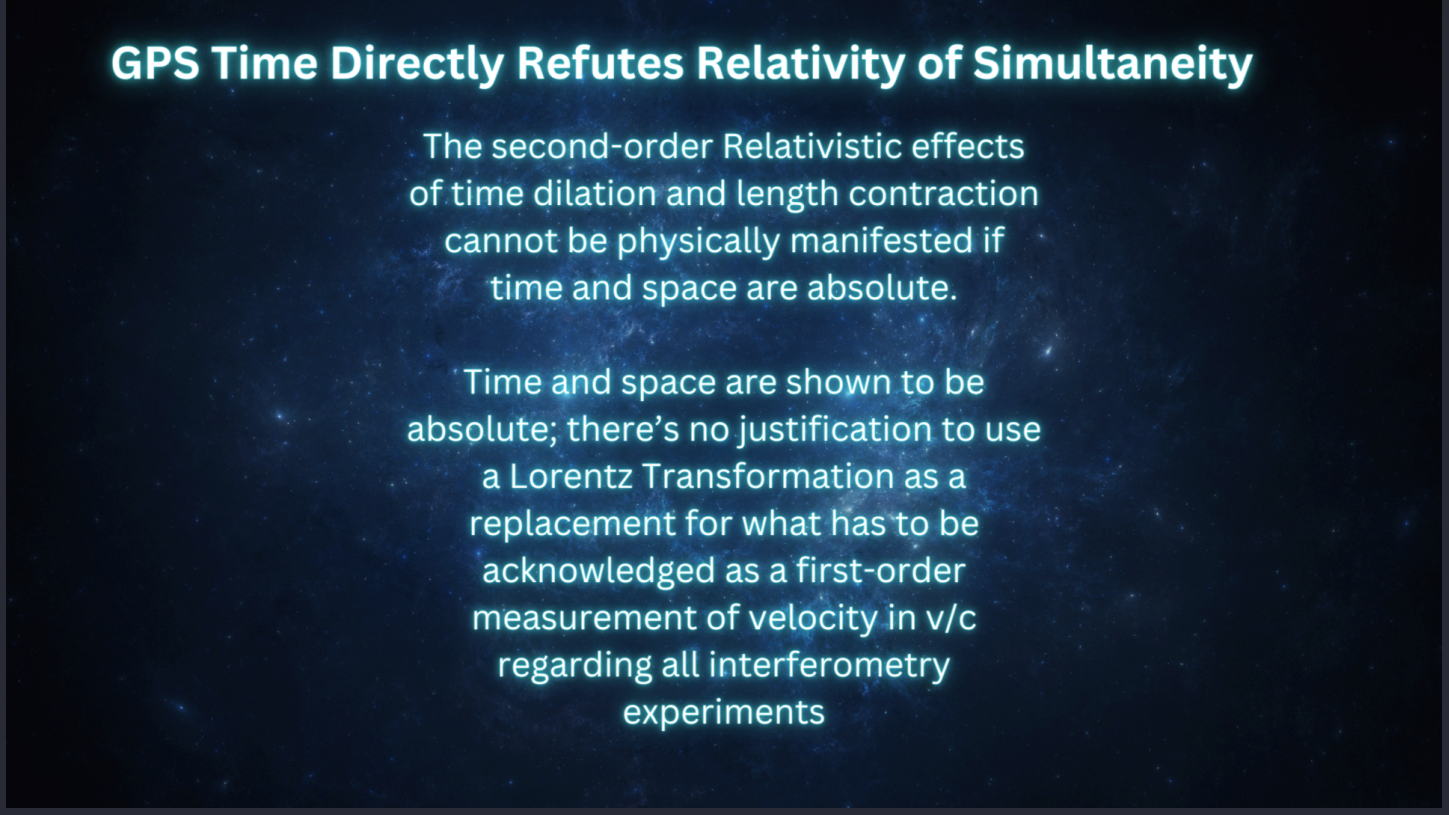
Notes:

- Einstein's thought experiment that lead him to LC and TD as consequences of Relative Simu
- No cohesive timeline
- Never experimentally verified; from Einstein's dome
- Directly contradicted by GPS



Notes:

- GPS built off in classical mechanics
- Relativity "cancels out"
- We promise to add them later
- Biggest issue; no Relative Simu corrections.
- GPS works off a cohesive timeline of multiple events happening for co-moving and stationary observers
- Actual correction equations used are 1:1 = Sagnac corrections
- Einsteinian clock synch doesn't work
- c is anisotropic as shown by Wolf and Petit (1995)
- No noon-midnight redshift
- Failure of a prediction of GR and gravitational mass
- Gravitational influences based on gravitational mass not manifesting in reality
- Atomic clock synch should require corrections for gravitational potential based fluctuations due to their position wrt to the sun and Earth relative to the time of day (noon and midnight) where the retardation would the lowest and greatest
- Another example of external velocities and mass influences not manifesting their predicted effect in reality

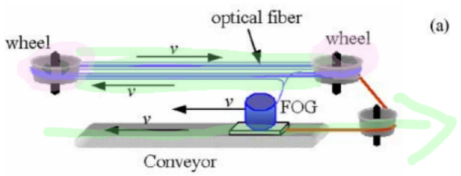


Notes:

- Core tenant of the theory not present in reality
- Apologetics: "GPS Time" is local to the Earth; Relative Simu exists in all other ref. frames.
- Earth's g-field locks in a local aether that shield's us from measuring Relativistic velocities and allows for pseudo-absolute time and space (locally)
- LOL ^

Generalized Sagnac Effect

To study the relationship between the motion of the fiber and the fiber orientation, we conducted an experiment in which the fiber zigzags and has an angle θ with respect to the direction of fiber motion. Thus, for a fiber segment having an actual length of Δl, its effective length is $\Delta l \cos\theta$, which is a projection of the fiber onto the motion direction. As shown in Fig. 2, our experiment demonstrates that the effective length contributes the phase difference, not the actual length; therefore, the phase difference $\Delta\phi$ is not $4\pi v \Delta l/c\lambda$, but



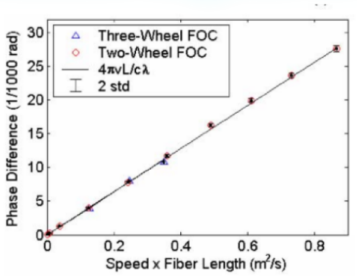
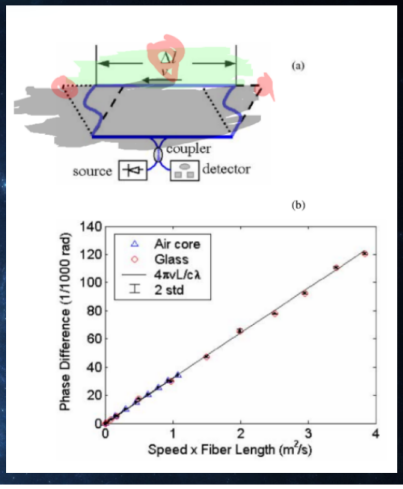


FIG. 1 Experiment for detecting the phase difference of two counterpropagating light beams in a moving fiber loop. (a) Experimental setup. The fiber loop is driven by the conveyor at a velocity v. The conveyor has a length of 1.5 m and can move from 0.001 to 0.25 m/s. The diameters of the wheels are 0.3 m. The FOG consists of a 1310-nm superluminescent light-emitting diode as the light source and a phase difference detector that has an output rate of 1162.6 mV per rad. (b) Phase differences of two counterpropagating beams in a moving air-core fiber.



According to our experiments, we can draw a conclusion about the generalized Sagnac effect that in a moving fiber loop or waveguide, a segment $\Delta \boldsymbol{l}$ with a velocity $\boldsymbol{v}$ contributes $\Delta\phi = 4\pi \boldsymbol{v} \cdot \Delta \boldsymbol{l}/c\lambda$ to the total phase difference between two counterpropagating beams in the loop. The contribution $\Delta\phi$ is independent of the refractive index of the waveguide, and the motion of the segment

Note:

- Measurement of linear motion made wrt absolute space
- Lab time and moving apparatus time = same
- Fringe pattern produced in an inertial frame
- Effective length i.e. not wrt the loop or gyro coil
- Relativity makes the wrong prediction in c ∓ v = c for the conveyor and loop
- Excuse wrt gyro coil

Year	Creator	Title
1887	A. A. Michelso...	On the Relative Motion of the Earth and the Luminiferous Ether
1900	Drude	The Theory of Optics
1913	Sagnac	The Existence of the Luminiferous Ether Demonstrated by Means of the Effect of a Relative Ether...
1925	Michelson and ...	The Effect of the Earth's Rotation on the Velocity of Light, II
1925	Michelson and ...	The Effect of the Earth's Rotation on the Velocity of Light, II
1925	Michelson	The Effect of the Earth's Rotation on the Velocity of Light, I
1925	Miller	Ether-Drift Experiments at Mount Wilson
1929	Michelson et al.	Repetition of the Michelson-Morley experiment
1930	Miller	Ether Drift Experiments in 1929 and other Evidences of Solar Motion
1942	A. Dufour	On a Fringe Displacement of Fringes Recorded on a Platform in Uniform Rotation
1979	Brillet and Hall	Improved Laser Test of the Isotropy of Space
1984	Atwood et al.	Neutron Phase Shift in a Rotating Two-Crystal Interferometer
1993	Bilger et al.	Ring Laser for Precision Measurement of Nonreciprocal Phenomena
1993	Hasselbach an...	Sagnac Experiment with Electrons: Observation of the Rotational Phase Shift of Electron Waves i...
1993	Stedman et al.	Canterbury Ring Laser and Tests for Nonreciprocal Phenomena
1998	Allais	The Experiments of Dayton C. Miller (1925-1926) and the Theory of Relativity
2001	Galaev	Etheral Wind in Experience of Millimetric Radiowaves Propagation
2002	Galaev	Measuring Ether-Drift Velocity and Kinematic Ether Viscosity within the Optical Waves Band
2003	Müller et al.	Modern Michelson-Morley Experiment using Cryogenic Optical Resonators
2006	Múnera et al.	Observation During 2004 of Periodic Fringe-Shifts in an Adialeiptometric Stationary Michelson-...
2014	DeMeo	Does a Cosmic Ether Exist? Evidence from Dayton Miller and Others
2020	Bennett	Sagnac (1913) Completed by Dufour & Prunier (1942)

Notes:

- Generalized Sagnac = all interferometry stands as is
- First-order measurements of a velocity gradient
- Attenuation in the wrong direction (inward instead of outward)
- Periodicity measured falsifies mechanism as Earth's rotational speed
- Min/max peaks plotted against sidereal time for closed loop experiments to match Earth rotation
- Min/max peaks in a orthogonal match sidereal time and show a velocity of 5 - 6 km/s @ 200ft above sea level
- Translation velocity is as is; can't be Earth rotation
