Why Einstein Did Not Receive the Nobel Prize for His Theory of Relativity

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Abstract: What follows is an exploration of a number of probable and possible reasons why Einstein did not receive the Nobel Prize for his famous theories on relativity; reasons that include a misinterpreted historic experiment, the prior claims of others, the disturbing lack of causal mechanisms for the phenomena being formulated, the various biases and concerns of the Nobel selection committee, and the incompleteness of the theories. In a most fundamental way *relativity* was (and is) contrary to the evidence. Relativity is a theory that denies the presence of aether or at least claims it is not detectable; while in the real world positive results of its presence were repeatedly obtained in the form of measurable aether motion. A measurable aether frame-of-reference implies the reality of absolute motion. Einstein denied this reality. Both special and general relativity are therefore incomplete. The weight of evidence seems to indicate that Einstein was not awarded the Nobel for his *relativity* because of the famous Miller aether-drift experiments. American physicist Dayton Miller, over the course of many years during the first three decades of the 20th century, accumulated irrefutable evidence of the flow of aether. Equations employing motion with respect to aether-space are introduced.

Résumé: Ce qui suit est une exploration d'un certain nombre de raisons probables et possibles pour lesquelles Einstein n'a pas reçu le prix Nobel pour ses théories célèbres sur la relativité; raisons qui incluent une expérience historique mal interprétée, les réclamations antérieures par d'autres, le manque inquiétant de mécanismes causaux pour les phénomènes étant formulés, les divers polarisations et soucis du comité de sélection Nobel, et l'imperfection des théories. De la manière la plus fondamentale la *relativité* était (et est) contraire à l'évidence. La relativité est une théorie qui nie la présence de l'éther ou au moins réclame qu'elle n'est pas détectable; tandis qu'en monde réel les résultats positifs de sa présence étaient à plusieurs reprises obtenus sous forme de mouvement mesurable d'éther. Un cadre-de-référence mesurable d'éther implique la réalité d'un mouvement absolu. Einstein a nié cette réalité. La relativité spéciale et générale sont alors inachevée. L'évidence semble indiquer qu'Einstein n'a pas été attribué le prix Nobel pour sa *relativité* en raison des expériences célèbres d'éther-dérive de Miller. Le physicien Américain Dayton Miller, au cours de beaucoup d'années pendant les trois premières décennies du 20ème siècle, a accumulé une évidence irréfutable de l'écoulement de l'éther. Des équations utilisant le mouvement en ce qui concerne l'éther-espace sont présentées.

Keywords: Einstein; Nobel Prize; Lorentz; Miller; Lorentz transformation; Special relativity; General relativity; absolute motion; aether-space; relativistic effects.

That they [relativity theories] are revolutionary there can be no doubt, in so far as they substitute mathematical symbols as the basis of science and deny that any concrete experience underlies these symbols, thus replacing an objective [universe] by a subjective universe. –Louis Trenchard More

1. Ancient "Relative" Motion

Let us go back in time. Way, way, back ... to the 5th century BC. In the Classical period there had been physical philosophers: men such as Parmenides and Zeno, both natives of Elea, a seaport on the western coast of Italy. They had sought for the *physis* or nature of external things, the laws and constituents of the material and measurable world.[1]

Parmenides tried to see the ultimate reality behind natural phenomena —the essentials which lie behind what is observed. But there were also "things" that were not observable, not perceivable; things, nevertheless, that were conceivable. In his simple classification system Parmenides was able to included both observables and non-observables. But it was not a classification *between* observables and non-observables but rather between “Being” and “non-Being.” He believed that everything can be classified into Being (reality) and non-Being (not reality). *Being* is changeless, eternal and motionless; *non-Being* is change, transitoriness, and motion. According to Parmenides motion and change are unreal and merely illusory.[2]

> *In the time of Parmenides motion was explained as an illusion: It did not exist*.[3]

The Parmenidean philosophy held that the universe was continuous and unchanging. Obviously Parmenides reached conclusions quite the opposite to those of Heraclitus, to whom flux and change were the true reality, but for a time the motion-as-illusion view exerted a considerable influence.[2]

The great defender of the motion-as-illusion position was Zeno, a friend and follower of Parmenides. He had devised a series of “proofs,” in the form of paradoxes, to show that motion was quite impossible. The most famous “proof” involves a race between Achilles and the tortoise and argues that motion is not what it appears to be.[A]

The argument is that if Achilles and the tortoise run a handicap race, Achilles can never overtake his competitor. Suppose the tortoise starts a certain distance down the track, then while Achilles runs up to the starting point of the tortoise, the latter will have moved somewhat further ahead. While Achilles runs to this new position, the tortoise again will have gained a point slightly further on. Every time Achilles closes in on the tortoise’s previous position, the creature will have crawled away. Achilles does of course come closer and closer to the tortoise, but he will never catch up with it.[4] (See Fig. 1)

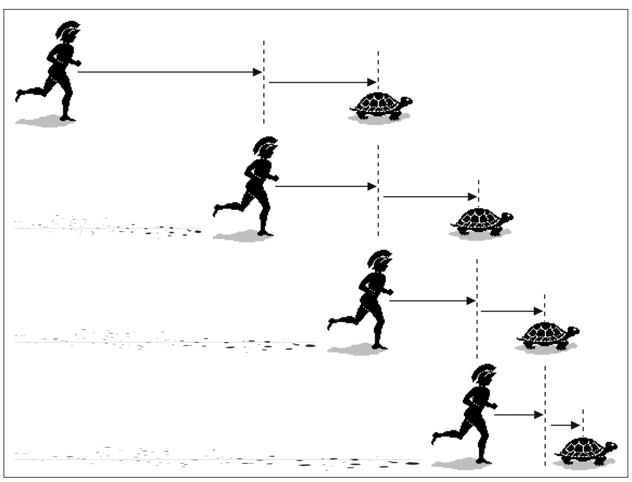

Fig. 1. *Achilles' double handicap race.* First handicap, the tortoise is given a head start. Second handicap, Achilles is denied the use of absolute motion. Zeno has deemed that Achilles' motion must be relative to the tortoise but, perversely, *always and forever towards the tortoise*. Every time Achilles reaches the tortoise’s previous position the creature, as fast as it can slowly advance, has moved out ahead.

Zeno’s proof uses a peculiar form of relative motion.

Achilles’ position is relative to some in-between point; a moving point which by the defining aspects of the race can never reach the tortoise’s position. And since the motions are not continuous but incremental, Zeno leads us into an infinite regression of infinitely smaller advancements. Achilles and the in-between point, although moving, stay on the trailing side of the tortoise. Achilles, forever finds himself merely catching-up; forever on the losing side.

Notice that Zeno equates subsequent motion to *a fraction* of the prior motion. He does so recursively, repeatedly, and without end. A truly clever form of relativity. Zeno ignores Achilles’ absolute speed, applies his peculiar relative speed, and ends up with *no motion* (at least no perceptible motion).

Obviously the paradox arises only if you ignore the fact of absolute motion. Zeno, of course, was wrong because he ignored the absoluteness of motion.

Jumping forward in time and into the 19th century, the concept of absolute motion was long the norm and near the end of that century a working theory of relativity *based on absolute motion* had been developed. Notably, it worked at all speeds up to the speed of light. Then, at the beginning of the 20th century the modern physical philosopher Albert Einstein (1879-1955) formulated a new theory of relative motion —and, in the spirit of Parmenides and Zeno, he too ignored the absoluteness of motion.

Now why would he do that?

2. Why Einstein Ignored Absolute Motion

In a famous 1887 experiment, known as the *Michelson and Morley aether experiment*, it was reported that the speed of the aether wind measured far less than had been expected. Subsequently, others began referring to the Michelson and Morley *null result*. The experiment was hailed as the death blow to the previously popular aether concept.

Evidently the experiment and the contemporary reaction had an influence on Albert Einstein.

> *Einstein referred several times to the interferometer experiment, stating that he ‘had thought about the result even in his student days’... that after 1905 he and [Hendrick] Lorentz had discussed the Michelson-Morley experiment many times while he was working on the general theory of relativity.* –R. S. Shankland[5]

Years later (in 1931), in a public tribute to Michelson’s extensive contribution to science, Einstein acknowledges the experiment’s influence to his own work:

> *My honored Dr. Michelson, it was you who led the physicists into new paths, and through your*

[A] Zeno’s defense of Parmenides’ theory is indirect; his argument is more an attack on the quantization model of the Pythagoreans.

marvelous experimental work paved the way for the development of the theory of relativity.[6]

Einstein must have reasoned that if the aether could not be detected then there could be no way to detect absolute inertial motion. So he abandoned the idea of an absolute frame of reference to which motion could be referenced. Motion could only be referenced to other objects and other observers. In other words motion was relative and nothing more.

As far as Einstein was concerned there was no aether substance that fills space.

It must be pointed out that a perfectly sound explanation of the smallness of the Michelson-Morley measurements had been developed. In 1891 the Irish physicist George F. FitzGerald explained the "null" result "on the hypothesis that the forces binding the molecules of a solid might be modified by the motion of the solid through the [a]ether in such a way that the dimension of the stone base of the interferometer would be shortened in the direction of motion and that this contraction ... neutralizes the optical effect sought in the Michelson-Morley [aether] experiment."[7, p207] It was a brilliant hypothesis.

Essentially, FitzGerald's aether had *the relativistic ability to contract the dimensions of any object*: contraction occurring in the direction of motion and in proportion to the speed through the aether!

Then in 1895, the Dutch physicist, Hendrick A. Lorentz (1853-1928) developed the FitzGerald hypothesis into a sound theory. Given that the atoms of all solids are held together by electrical forces, then the motion of a body as a whole would, according to Clerk Maxwell's physics, superpose upon the electrostatic forces between the atoms a magnetic effect due to the motion. "There would result a contraction of the body in the direction of motion which is proportional to the square of the ratio of the velocities of translation and of light and which would have a magnitude such as to annul the effect of [a]ether-drift in the Michelson-Morley interferometer."[8]

The validity of this interpretation, the FitzGerald-Lorentz interpretation, was later confirmed. Whenever the experiment was performed ***in a vacuum*** the aether-effect on the optical interferometer was (and still is) totally annulled.

But experimental results were only of secondary importance to Einstein. He was a theoretical physicist —a mathematical physicist. He was a Platonic physicist to whom numbers were more real and important than apparent reality or even objective reality. If you find that strange, then prepare yourself.

It is stranger by far that Einstein would actually ignore the phenomenon that his own theory predicts. His theory of special relativity deals with the speed-of-light constancy, time dilation, mass change, and ***length contraction***! The FitzGerald-Lorentz explanation was essentially *a theory of aether-induced length contraction*. Einstein, who frequently communicated with Lorentz, most certainly was aware of it. The mathematical physicist rejected the aether-induced length contraction.

Einstein preferred to postulate length contraction, not relative to an aether type of space, but relative to the observer —a relatively moving observer. Now since the degree of apparent length contraction is proportional to the relative speed (between observer and object) it is easy to see that different observers moving with different speeds will measure different length contraction for the same object! I hasten to add, there is nothing wrong with this; special relativity *does* give a logical explanation. However, special relativity gives no hint as to what the *actual* length contraction may be. It simply cannot. It cannot deal with the *absolute length contraction* because it has no causal mechanism. These concrete considerations are outside the scope of the theory. That is why it is a theory of relatively moving frames-of-reference, and *not a theory of length contraction*.

When Einstein turned his back on the *aether medium* he abandoned not only the phenomenon of absolute motion but he also abandoned all hope of attributing a cause for the length contraction associated with an object's motion.

What makes all this into a fascinating multilevel puzzle is that, as we now know, Einstein and Lorentz were both right with respect to length contraction. *Special relativity* can account for **apparent contraction** while *Lorentz's aether theory* can account for **absolute contraction**.

The FitzGerald-Lorentz Explanation

Historically it has been argued that the motion through the aether shortens the arm (and base) of the Michelson-Morley apparatus *in the direction of motion*. And this shrinking, now called *Lorentz contraction*, is just enough to compensate for the calculated longer light path. Consequently, the longer light path is *not longer* after all and very little, if any, interference shift should be expected.

Einstein rejected the actuality of absolute motion for two main reasons: He misinterpreted the Michelson-Morley results, choosing to believe that absolute motion could not be detected. He sought a purely mathematical theory of motion.

3. The Aether Evidence and Detection of Absolute Motion

And so, believing absolute motion could not be detected, Einstein confined his arguments to relative motion. But it was not a blind belief; he knew that if absolute motion could be detected then his relativity theory would be wrong.

Einstein fully realized that his theory could not stand if the claimed discovery of aether is ever confirmed (or equivalently, if absolute motion, that is, non-rotational absolute motion, is ever detected). And of particular concern to Einstein were the claims then being made by American physicist Dayton Miller.

In letters written to colleagues he expressed his grave concern.

Einstein stated in a letter, July 1925, to Edwin E. Slosson,

> *My opinion about Miller's [aether] experiments is the following. ... Should the positive result be confirmed, then the special theory of relativity and with it the general theory of relativity, in its current form, would be invalid. Experimentum summus judex. Only the equivalence of inertia and gravitation would remain, however, they would have to lead to a significantly different theory.*[11]

In June of 1921, Einstein wrote to the physicist Robert Millikan:

> *I believe that I have really found the relationship between gravitation and electricity, assuming that the Miller experiments are based on a fundamental error. Otherwise, the whole relativity theory collapses like a house of cards.*[12]

Einstein revealed (privately, at least) the vulnerable conditional component by which his theory could be shaken to its foundations. Centuries earlier, another intellectual giant, René Descartes, did much the same thing when he wrote that if the speed of light could be proved to be finite, his natural philosophy would be "shaken to its foundations" by the findings.

As the chronicles of history record, absolute motion, and therefore aether itself, was detected. It was detected repeatedly.

In 1902 Morley and Miller increased the sensitivity of the Michelson optical interferometer by making the arm length 430 cm (more than three times the length used in the 1887 experiment). The aether drift measured 10 km/s. Their next experiment was in 1904 and saw the first use of the Michelson interferometer mounted on a steel-girder base. Each arm was again 430 cm long. The instrument registered about 7.5 km/s. A year later, in 1905, the same steel-girder apparatus recorded 8.7 km/s. These experiments took place in Cleveland.

In a remarkable 1913 experiment, known as the Sagnac Experiment, it was shown that the aether has a dramatic effect on the speed of light. On a rotating platform, M. G. Sagnac split light from a single monochromatic source into cw and ccw rays that traveled identical paths in opposite directions around the platform. He combined the returning rays to form a visible interference pattern, and found that the fringes shifted as the speed of rotation changed.

How Einstein Won the Nobel
(But Not for Relativity)

In 1902 Philipp Lenard, professor at Kiel, won the Nobel award for the discovery of the *photoelectric effect*. But he couldn't explain it. In 1905 the young Einstein gave the correct explanation, and in 1921 won his Nobel for it.[9]

The 1921 award honored Einstein only for his light-quanta hypothesis as it explained the ***photoelectric effect*** for which Robert Millikan's experiments already had provided confirmation. The citation read "for discovery of the law of the photoelectric effect, through which quantum theory received a new especially vigorous renewal."[10]

Thus, though Einstein did not win for his renowned relativity theories, he did win the Nobel Prize for what he considered his most revolutionary idea.[10]

The procedure involved measuring the difference in the travel time of light rays circumnavigating the rotating disk (radius of 25 cm) in opposite directions. The circular path is achieved by the use of mirrors mounted on the disk along the circumference. As in the Michelson and Morley experiment, the time difference was detectable as a fringe shift of the interference pattern of the recombined light beam. Sagnac found, in agreement with prediction, a significant fringe shift. In fact, a rotational speed of 13 m/s produces a full fringe shift.

If the speed of light were locally invariant and always equal to *c*, then speeding up or slowing of the rotation rate of the platform should not change the location of the fringes. However, *the fringes do change* with speed and "*we can determine a preferred frame* —in violation of the second relativity postulate and the hypothesis of locality."[13]

In April of 1921 Dayton Miller's steel-girder apparatus was tested on Mt. Wilson, California, and measured an aether flow of 10 km/s.

In Dec of 1921 the steel base was replaced with a concrete one to exclude any possible magnetic effects. Same result, 10 km/s.

Miller's experiments back in Cleveland during 1922-24: Various apparatus changes and procedural methods were extensively tested. Some improvements were made. Tests of intentional temperature variations in "these experiments proved that under the conditions of actual observation, the periodic displacements could not possibly be produced by temperature effects"[7, p220] as is so often claimed. Throughout the many trials the optical interferometer never failed to produce consistently positive results.

In 1924 Miller again conducted experiments on Mt. Wilson and again measured about 10 km/s.

The years 1925-26 witnessed Miller's definitive experiments (on Mt. Wilson). While in previous experiments the direction of relative motion between Earth and aether had been assumed, this series of experiments was designed to actually measure the direction. Readings were made throughout 24-hour periods; naturally during the 24-hour rotation of the Earth on its axis there would occur two instances when the fringe shifts became maximum thereby indicating the approximate direction of aether drift (somewhat in the manner by which the ocean tides indicate the direction of the moon). Then, by checking the direction —by repeating the 24-hour test— during different seasons of the Earth's annual Solar orbit, the experiment establishes whether or not the main component of the aether wind is local or cosmic in origin. A more or less constant direction (in the celestial sphere) indicates a cosmic origin.[7]

Data were collected April 1, August 1, and September 15, 1925 and February 8, 1926. The line of motion was established but there was some uncertainty as to which diametrically opposite direction actually represented the apex of the motion. Eventually Miller concluded that the cosmic direction of motion of the Earth and the Solar System is (Right Ascension ~5h; Declination ~70°S) towards the constellation Dorado. The speed was calculated to be 208 km/s.[7]

Many years later, in a non-optical experiment (performed by Roland DeWitte, in 1991) the Right Ascension direction of ~5h was dramatically confirmed.

During subsequent decades of the 20th century there were several other significant experiments giving positive results.

Then, in the year 2002 the Michelson and Morley data —as well as Miller's data —were re-analyzed and it became clear for the first time why their measurements of aether drift were so much smaller than had been predicted. The re-analysis, undertaken by Australian Professor Reginald Cahill, actually took the Lorentz contraction into account along with the dielectric nature of the gas (air) affecting the light paths and found that the tangent-to-earth-orbit component of the aether wind matched the predicted 30 km/s.[14]

Absolute motion became an established fact.

What Einstein had feared has come to pass. ... Zeno's Nemesis finally awoke and dutifully struck another blow against abstract relativity.

A Brief History of the Lorentz Transformation Equations

In the latter part of the 19th century equations were developed for the purpose of converting the position-coordinates, velocities, and clock-time from one frame of reference into corresponding values for some other (relatively moving) frame of reference.

It seems that Woldemar Voigt, in 1887, was the first to write down the transformations. They were revised by Joseph Larmor (1897, 1900).[15]

Lorentz used the transformations in his paper of 1899 (and 1904), being the third person after Voigt and Larmor to write them down. The paper showed that the *FitzGerald-Lorentz contraction*, the predicted phenomenon affecting the Michelson apparatus, was a consequence of the Lorentz transformations.[16]

In 1905, on the 5th of June, Henri Poincaré published an important work *Sur la dynamique de l'electron* which claimed that *it was impossible to demonstrate absolute motion* and provided an explanation for the Michelson-Morley "null" result. In this paper *the transformations* are expressed in their modern form and, for the first time, named after Lorentz. Einstein's paper on *special relativity* ("On the Electrodynamics of Moving Bodies") appeared a few weeks later on the 30th of June.[16]

The Lorentz transformations code the geometry of special relativity. In modern textbooks they are written as:

$$y' = y$$
$$z' = z$$
$$x' = \gamma\,(x - v\,t)$$
$$t' = \gamma\,(t - v\,x/c^2)\,,$$

which relate the coordinates (x', y', z', t') of an event in *moving frame S′* (moving in the positive x-direction) to coordinates (x, y, z, t) in *stationary frame S*.

The inverse transformation set is:

$$y = y'$$
$$z = z'$$
$$x = \gamma\,(x' + v\,t')$$
$$t = (t' + v\,x'/c^2)$$

where γ, the Lorentz factor, is: $\gamma = \dfrac{1}{\sqrt{1-(v/c)^2}}$.

4. Special Relativity is Based on the Works of Voigt, Larmor, Poincaré, and Lorentz

Some readers may wonder, *why was not Einstein awarded for the brilliant mathematics?* ... There are two reasons. First, the equations upon which relativity is based were not developed by Einstein. Second, mathematics is not one of the five award categories. Alfred Nobel, the famed "dynamite king" had for some personal reason excluded mathematics from his testament.[17]

The *special relativity* theory is based on the transformation equations known as the Lorentz transforms. These famous equations had been developed by others years before Einstein published his special-relativity paper in 1905.

As for the variance-of-length phenomenon, it was stated earlier that FitzGerald and Lorentz had already formulated a theory of length contraction. Einstein used it for his special relativity paper after stripping away the aether.

Lorentz's theory included the relationship of the variation of mass with speed. According to his theory no body can reach the speed of light because the mass becomes infinitely large at this speed.[18] The mass concept of Lorentz (including Lorentz's two distinct masses known as longitudinal and transverse mass) was incorporated into Einstein's relativity —again after discarding the aether.[19]

The effect known as time dilation was first noticed by Joseph Larmor in 1897. Lorentz measured it for the frequency of oscillating electrons in 1899. Lorentz had postulated that the motion of the clock *through* the aether changed its rate.[20]

What about Einstein's postulate dealing with the constancy of the speed of light —light propagates through empty space with *a definite speed, c, independent of the source or observer*? But if it is to be independent of the source or observer then what is a light-particle's motion

Variable Speed-of-Light Theories

There are 21st-century theoretical physicists such as Paul Davies, João Magueijo, and Andreas Albrecht and others who are exploring the "revolutionary" idea that the speed of light may not actually be constant. They believe that changing the cherished rules of Einstein's relativity may solve certain problems —observational and fundamental— in astrophysics and cosmology.

The fact that they find it necessary to modify Einstein's relativity comes as no surprise for we know (or should know) there is something deeply wrong with the theory. But the constancy of the speed of light predates Einstein's theory —and maybe the constancy is not the problem.

What these modern revolutionaries fail to realize (or are too orthodox to consider) is that having a ***variable speed of light*** would, effectively, be no different than having a light conducting medium which is itself in motion. Change the speed of the luminiferous aether of a region in a hypothetical astro-situation and you *will* observe a change in the speed of light. (And yet, speed with respect to aether itself remains fixed.)

Introduce an aether wind and you change the effective speed of light; as surely as atmospheric wind changes the speed of sound; as surely as a rushing stream changes the speed of water waves.

Before committing to revolutionary changes it may be more constructive to restore and refine the aether of the 19th century. –CR

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referenced to, in order to give meaning to the speed —the 300,000 km per second? The speed is *not* referenced to the source and not to the observer! It is "an absolute speed in terms of any system of inertial coordinates." So says Einstein's postulate! Einstein must mean that the speed is referenced to "empty space." There really is nothing else. Consider this: speed is an actual length (or distance) divided by travel time. Under Einstein's postulate we are required to use a measure of "emptiness" divided by time. Speed in *empty space* makes no sense. (Or consider Poincaré's argument. "If light takes several years to reach us from a distant star, it is no longer on the star, nor is it on the earth. It must be somewhere, and supported, so to speak, by some material agency." It was clear to Poincaré that *empty space* just will not work.[20]) But empty space is what Einstein is forced to turn to. Let's remove the smoke and mirrors and reveal what Einstein did. In order to give the *definite speed* its meaning, Einstein stealthily employed *space* as a conducting medium!

And again we are back to prior theories. The best known was that of Hendrik Lorentz who had a *luminiferous aether* theory in which light was conducted with constant speed measurable with respect to the aether medium.

As for the practical aspect, astronomers had always assumed that light has a constant speed. A theory that proclaimed the obvious did not concern them.

All in all it is not surprising to read that Einstein did not think his relativity theories very revolutionary at all. In 1921, by which time he had long developed both the special and the gravitational theories, he described them as only the "natural completion of the work of Faraday, Maxwell and Lorentz."[21]

And whose work did Einstein consider most outstanding and therefore would be expected to have had the greatest influence on his own research? ... When Einstein was asked, "Who were the greatest men, the most powerful thinkers whom he had known?" he responded without hesitation, "Lorentz." Lorentz was in a class all his own; he stood out above all others. Einstein praised the man's mastery of physics and mathematics. "His near idolatry for Lorentz had lasted all his life," and near the end Einstein wrote: "Everything that emanated from his supremely great mind was as clear and beautiful as a good work of art."[22]

Special relativity also includes what is known as *the postulate of relativity*. In 1921 Lorentz credited Poincaré for establishing *the principle and postulate of relativity* and wrote:

> *Poincaré ... has obtained a perfect invariance of the electro-magnetic equations, and he has formulated 'the postulate of relativity', terms which he was the first to employ.*[23]

Although he clearly understood Einstein's papers, it seems Lorentz never quite accepted their conclusions. He preferred the substantiality found in the aether theory in which space and time can be sharply separated.[16]

Despite Lorentz's caution Einstein's abstract version of relativity theory was quickly accepted. In 1912 Lorentz and Einstein were jointly proposed for a Nobel Prize for their work on special relativity. The recommendation was made by Wien, the winner of the 1911 physics award, and states

> *... While Lorentz must be considered as the first to have found the mathematical content of the relativity principle, Einstein succeeded in reducing it to a simple principle. One should therefore assess the merits of both investigators as being comparable...*[16]

Wien acknowledges Lorentz's prior claim as well as Einstein's success at reducing a working principle into a mere abstraction.

Einstein never received a Nobel Prize for relativity. The committee was understandably cautious (wisely so, in light of the evidence) and, it is said, waited for experimental confirmation.[16]

Einstein's greatest contribution to physics is undoubtedly the formulation of mass-energy equivalence. The famous relationship $E = mc^2$ was derived by Einstein in 1905 and follows from the consequences of the Lorentz transformations and the relativity principle. What Einstein had recognized —and what Poincaré's paper in 1900 had not fully exploited— was that matter itself loses or gains mass during the emission or absorption of electromagnetic energy (radiation).

The mass-energy equivalence formula, because it represents mass-to-energy conversion (or energy-to-mass conversion), made the old mass-conservation law merely a special case of a *total-energy conservation law*.[24] Therein lies Einstein's greatest achievement.

5. No Award for General Relativity

Einstein's *general theory of relativity* generalizes special relativity to non-inertial frames of reference. It deals with events occurring in frames of reference that are accelerating due to motion or are accelerating due to gravitation. It is called a geometrodynamic theory. *Geometric* because, having no aether-space, it uses a mathematical space defined by four coordinates. *Dynamic* because its mathematical space curves in accordance with the presence and motion of mass particles and bodies. And what is *space curvature*? Well, that is one of Einstein's abstractions. In fact, it is an abstraction in geometry borrowed from Georg Friedrich Riemann (1826-66) and Nikolai Lobachevski (1792-1856).

The general relativity theory first appeared in 1915. Because it deals with gravitational acceleration it is called a *theory of gravity*.

Others, including Lorentz, Poincaré, and Le Sage, had made attempts to formulate a theory of gravitation. They all used an aether medium to communicate the gravity effect. The idea of using a *gravitational aether* has a long tradition going back to the days of Isaac Newton himself; and even earlier to René Descartes with his large and small vortices of aethereal dust producing what we would call gravitational effects.

Did Einstein use a gravitational aether? ... In 1920 Einstein compared his "gravitational ether" with Lorentz's aether and made it clear that *the aether of general relativity has no mechanical properties.*

> *The ether of the general theory of relativity is a medium which is itself devoid of all mechanical and kinematical qualities, but helps to determine mechanical (and electromagnetic) events. ... the ether of the general theory of relativity is the outcome of the Lorentzian ether, through relativization.* –A. Einstein[25]

Relativization!? ... In plain English, for Einstein, the aether serves no purpose; it is simply ignored, and might as well not exist. Einstein the mathematician gives aether four-dimensional coordinates, discards the aether medium, and retains the coordinates. That procedure is called relativization.

The term symbolized a new vision for a new age. Einstein's *general relativity* was the dawn of the age of the mathematical universes. The four-dimensional *relativization* of the cosmos became a serious enterprise.

In 1916 and into 1917 Einstein developed the very first model of the universe based on the new gravity theory. It was a failure. Although it was designed as a static universe it turned out to be unstable. The instability was pointed out by the Russian mathematician Alexander Friedmann. Gravity and Lambda (a cosmic antigravity effect) were initially balanced but with the slightest disturbance Einstein's universe will either contract and ultimately collapse into a self-made black hole or, alternately, expand to infinity. Nevertheless, this incipient application set the trend for the science of cosmology for the rest of the century.

Almost all the theoretical models of the universe developed during the 20th century are based, in one way or another, on general relativity. Einstein went on to design other versions of this genre. In 1932 he teamed up with Willem de Sitter and constructed an expanding universe known as the Einstein-deSitter model. It became a textbook standard for comparative big bang models.

However, no award was ever given for general relativity. And no one —not Einstein nor anyone else— ever received an award for a *relativized* theory of our Universe. The cofounders of the big bang theory of the universe, the Russian physicist George Gamow and his doctoral student Ralph Alpher (publishing in 1946 and 1948 respectively), never made it onto the Nobel list.[26]

There was no Award given for what has been called "the discovery of the expansion of the universe" and rightfully so; for no such discovery was ever made. Edwin Hubble (1889-1953), on whose behalf the claim is often made, did *not* discover the expansion of the universe —he discovered a *redshift versus distance relationship* for distant galaxies. The greater the galaxy's distance, the longer the wavelength of its light. To extrapolate this variation into proof of the expansion of the whole universe is pure speculation. (Nevertheless, when Modern Astrophysics gets its act together, it will belatedly recognize that Edwin Hubble's rightful claim is for the discovery of the expansion of aether-space!)

There are far too many problems with general relativity models to cover in this article. I will only highlight a few relevant issues. One is that when applied to the universe general relativity is a weak theory. Dennis Sciama describes the problem this way: "For instance, general relativity, ... is consistent with an infinite number of different possibilities, or models, for the history of the Universe. Needless to say, not more than one of these models can be correct, so that the theory permits possibilities that are not realized in Nature. In other words, it is too wide. We can put this in another way. In the absence of a theory anything can happen. If we introduce a weak theory too many things can still happen."[27]

There are so many problems with such models that papers are written in an effort to keep track of them: Legendary astronomer Allan Sandage came up with one titled *"23 astronomical problems for the next three decades"* and was submitted to the conference on Key Problems in Astronomy and Astrophysics (Sandage, 1995). The Russian physicist Yurij V. Baryshev has published the *"Conceptual Problems of Fractal Cosmology"* which includes several outright paradoxes and in which he concludes "The roots of many of the conceptual problems of modern cosmology ... actually lie in the gravity theory."[28] And there are web articles; for example, *The Top 30 Problems with the Big Bang*.[29]

Surely the most embarrassing problem is the inability to explain the observed large scale structure —the network of cosmic voids surrounded by linked galaxy clusters. There is far too much regularity. Furthermore, as plasma physicist and science writer Eric J. Lerner points out, to form these structures by building up the needed motions through gravitational acceleration alone would take in excess of 100 billion years.[30]

> *How the original unstructured universe evolved into its present highly structured state is a major unsolved riddle in cosmology.* –Edward Harrison[31]

In the year 2003 Jaan Einasto reminded the astrophysics community to take note that the big bang models neither predict the position, nor the presence and extent of the regularity of the supercluster-void network (the largest observed structural network in the Universe). The origin of the pattern regularity and the physical scale are unknown.[32]

Then there is the metaphysical nature. General relativity converts *time* into a special dimension. *Time was spatialized and reduced to a timeline by the* c *constant*. But, as we all know, our world only has three dimensions. When you transform time into a fourth dimension, as Einstein did, you are modeling an imaginary mathematical universe, not any kind of real universe. You are placing your theory outside the realm of physics and, in the context of the Nobel Prize, outside the realm of contenders. And doubt not that Einstein constructed an imaginary world, for in order to make *time* a 4th-dimension coordinate it was necessary to multiply "time" by the factor ($\sqrt{-1}$) thereby converting time into an imaginary number.

There is also the perennial problem pertaining to *cause*. The same problem that plagued Newton's gravity theory also infests Einstein's gravity —*no* causal mechanism.

It may never be known for certain whether these unreal aspects and metaphysical ambiguities influenced the Foundation to make policy changes for certain categories. What we do know is that after 1922 the Nobel Prize committee decided, in private, without making the decision public, to exclude discoveries and theories in astrophysics.[33]

Many years later an award was made for an astrophysics finding. Arno Penzias and Robert W. Wilson shared the Award for the "Discovery of cosmic background radiation"[34] —not for finding evidence of a big bang expanding universe. Their 1978 Award was for an observational phenomenon and not for its specific cause and certainly not for any general relativity theory of the universe.

In hindsight the selection committee's decision to withhold judgment, regardless of motivation, was fortuitous indeed. All general relativity universe models —Hot Big Bang, Cold Big Bang, Steady State, Quasi Steady State, and now the Double Dark model— all treat the universe as a single-cell entity. Each one models the universe as a monolithic mathematical sphere —formulated so that it is only partially visible to us. (Formulated so that no one making a critical assessment of one of these relativity-type models can say *Oh! look way over there, one can see the edge of the universe!*)

The models of the twentieth century were conceived as single cells. Einstein built the prototype; his legacy to cosmology built the others. However, it turns out that the Universe is actually multi-cellular; intrinsically so; and surprisingly regular.[35]

The eminent physicist Max Planck, who himself had been awarded the Nobel Prize of 1918, nominated Einstein for the 1919 prize, for general relativity, but in vain.[36]

6. Reasons and Reflections on Reasons

Einstein was not the founder of special relativity. As described above, it was based mainly on the work of Voigt, Larmor, Poincaré, and Lorentz. In fact, all supposed experimental verifications of *special relativity* can, with exactly the same justification, be used to verify Hendrik Antoon Lorentz's prior theory based on aether. The compatibility of the mass-and-velocity relation with Lorentz's theory was pointed out by Lorentz himself, and shown to agree with observations already made before Einstein introduced his theory.

The selection committee refused to honor either of the relativity theories. Einstein's special relativity theory long lacked experimental confirmation —at least that is how the story is usually told. The "absence" of such evidence was cited as a problem. As for general relativity, when supporting evidence was collected in 1919 it had a problematic 37% error.[37]

Earlier it was noted that the selection committee had, for several decades after 1922, excluded discoveries and theories in astrophysics.[33] But Einstein faced another bias, "The old Nobel bias against theoretical physics."[38] Furthermore, when we consider that Einstein's relativity theories were, for the most part mathematical, we can see that he was up against a triple bias: astrophysics, theoretical physics, and mathematics.

However, in the nomination process Einstein faced no such barriers. By 1922 he had been nominated about fifty times —most were for his relativity theories.[39]

The science historian Burton Feldman describes another factor. Alfred Nobel's will and the Statutes of the Nobel Foundation mention only "discoveries" and "inventions," certainly not *revolutionary* "discoveries." How could any prize-giving body evaluate ideas that attempt to reinvent the rules of physics?[40]

Turning now to the evidence.

Consider Einstein's admission of relativity's fallibility. *If the positive results of Miller's aether experiments are confirmed then "the whole relativity theory collapses like a house of cards."* Metaphorically we have Zeno making the admission "if absolute motion is ever proven then my relativity-with-respect-to-inbetween-point argument would be invalidated."

Metaphorically, *Miller's aether* was the Achilles' heel of Einstein's relativity. In the minds of the Nobel decision makers, we may reasonably surmise, *Miller's aether* was a persistently wiggling worm of doubt. How could a decision be rendered? Those annoying measurements of Miller ... they refused to go away. And worse, they kept accumulating! The experiments of 1906 in Cleveland, of 1921 on Mt. Wilson, of 1922-1924 back in Cleveland, of 1924 back on Mt. Wilson, and the definitive experiments of 1925-1926 on Mt. Wilson —all gave positive results.

> *While Miller had a rough time convincing some of his contemporaries about the reality of his ether-measurements, he clearly could not be ignored in this regard. As a graduate of physics from Princeton University, President of the American Physical Society and Acoustical Society of America, Chairman of the Division of Physical Sciences of the National Research Council, Chairman of the Physics Department of Case School of Applied Science (today Case Western Reserve University), and Member of the National Academy of Sciences well known for his work in acoustics, Miller was no 'outsider'. ... [H]e produced a series of papers presenting solid data on the existence of a measurable ether-drift, and he successfully defended his findings to not a small number of critics, including Einstein. –* James DeMeo[[11]]

Miller continued to publish and defend his findings until 1941, the year he died. The aether evidence had always been subjected to criticism but with Miller gone, there was no one to defend the data. Miller had entrusted all the notebooks and research documentation relating to the aether experiments to his former student of many years Robert S. Shankland. But Shankland it seems treated science not so much as a search for truth but more as a political game. After Miller's passing, Shankland, the opportunist gauging the popular trend, switched sides and became an ardent supporter of Einstein and an advocate of Einstein's relativity. Henceforth Shankland built his professional career upon publications misrepresenting the aether experiments and denigrating the aether concept. He also published widely-read interviews with Einstein (published in 1963, 1964, and 1973); however, he rarely discussed Miller's positive aether-drift measurements in any of his papers except one —the now infamous Shankland paper of 1955.[[11]]

Shankland had decided that something had to be done with Miller's persistent "inexplicable" positive results (those documented measurements entrusted to him). Heading a team whose members were all Einstein advocates, Shankland initiated a critical review of Miller's work. As reported by historian Loyd Swenson,

> *...Shankland, after extensive consultation with Einstein, decided to subject Miller's observations to a thoroughgoing review ...*[[41]]

The "critical review" amounted to a malicious discrediting of Miller and the evidence. It suggests an extreme bias and deliberate misrepresentation — misrepresenting Miller's data in several ways, and misrepresenting itself as a definitive rebuttal, which it most certainly was not. The details of the extensive misrepresentation may be found in Dr James DeMeo's article *Dayton Miller's Ether-Drift Experiments: A Fresh Look*.[[11]]

Shankland sent a pre-publication manuscript of the critique to Einstein. Considering the abundance and impeccable nature of the evidence, the critique was more than Einstein could have hoped for. His relativity now seemed safe. Unaware, or unconcerned with the paper's flaws, he gave his approval thereby propelling Shankland's paper to a status of authority that it otherwise may not have attained. "Einstein saw the final draft and wrote a personal letter of appreciation for having finally explained the small periodic residuals from [Miller's] Mount Wilson experiments."[[41]]

Dayton Miller (1866-1941). (Photo courtesy of the Case Western Reserve University Archive)

In that reply letter to Shankland, Einstein stated:

> *I thank you very much for sending me your careful study about the Miller experiments. Those experiments, conducted with so much care, merit, of course, a very careful statistical investigation. This is more so as* ***the existence of a not trivial positive effect would affect very deeply the fundament of theoretical physics as it is presently accepted.*** *You have shown convincingly that the observed effect is outside the range of accidental deviations and must, therefore, have a systematic cause [having] nothing to do with 'ether wind', but with differences of temperature of the air traversed by the two light bundles which produce the bands of interference.* [(emphasis added) [42]]

The letter was dated August, 1954.

The Shankland paper was published the following year, in 1955. It argued that there must have been "thermal effects" in Miller's Mt. Wilson measurements, but provided no direct evidence of this. This is a remarkable claim given the fact that the cited *thermal effects* were below the sensitivity range of the apparatus when operated with its thermal shield. And *nowhere did the Shankland group present evidence that temperature was a factor in creating the periodic sidereal fringe shifts observed by Miller in his published data, even though this was the group's stated conclusion.*[[11]]

The Shankland team casually dismissed the most import aspect of Miller's data —the clear demonstration of a systematic sidereal periodicity.[[11]] There was an unequivocal direction in which the aether-wind was maximum; this direction was completely independent of the time of day or season of the year in which measurements were made; the direction indicated a cosmic origin.[[7]]

The aether-wind, as the Miller measurements showed, was oriented with respect to the celestial sphere (and not with respect to Earth's orbital position around the Sun). If one claims that some "systematic thermal effects" are somehow responsible then these thermal effects must also be timed to the sidereal day —then one faces the formidable task of determining how the stars in the heavens could possibly cause, in Einstein's words, "*differences of temperature of the air traversed by the two light bundles*" in Miller's thermally-insulated apparatus, inside his shielded observation hut, isolated on Mount Wilson. How could the relative rotational motion between Earth and the stars cause *cyclical* "thermal effects"? ... Exactly! It is not possible (astrology is not a science). But Shankland cleverly dispensed with any kind of meaningful explanation and simply stated his seemingly pre-planned conclusion.

Many years later, in 1981, Shankland made explicit his belief that Miller's opposition prevented Einstein from receiving the Award. In the Archives of Case Western Reserve University there is an interview (conducted by Margaret Kimball, presumably a journalist) in which *Shankland blamed Miller for having blocked the awarding of a Nobel Prize to Einstein for his relativity theory*.[43] Clearly, Miller's work was a major obstacle to the Einstein theory of relativity.

During the many years of Einstein's eligibility, the Nobel committee members had been the observers — impartial or otherwise— of the controversy surrounding the relativity theory. But their debates and deliberations will forever be locked within the bosom of the Swedish Academy of Science (at least if each member's pledge to secrecy was honored). Thus, although some of the reasons for Einstein not receiving the Award for relativity are well understood, there may be others we may never know.

From a purely scientific point of view the relativity theories are contrary to reality. It is the reason why the theories are considered highly abstract. It is the reason why Lorentz admitted despairing at how physics "had taken an enormous step down the road of abstraction."[44] Einstein's theories ignore the absoluteness aspect of space and motion and, in doing so, they stand as mathematical theories but not as physical theories. *General relativity* led to the mathematical universes of the 20th century; a seemingly endless variety of single-cell universes such as the expanding open, the expanding closed, the expanding flat, the expanding-in-stages, and the oscillating. But according to the theory currently challenging standard cosmology, the real Universe is not a single cell and is not even expanding. *General Relativity* predicts gravity waves but none have ever been detected. As for *special relativity*, one would expect the theory to play an important role in the highly-accurate Global Positioning System. But it does not. Again, it is not a physical theory. Newton's gravity suffices to give the first-order potential differences used in adjusting GPS clock rates for gravity, and only the definition of proper time, $d\tau^2 = dt^2 - dr^2 / c^2$, is needed for orbital-motion corrections —not the full kinematics of the Lorentz transformation.

Nevertheless, the usefulness of the theories cannot be denied. *General relativity* as a mathematical theory of gravity is credited with reasonable agreement with observations. These include the gravitational redshift of light moving from one point to another in a gravitational field; the bending of a ray of light passing through a gravitational field; and the precession of the perihelion of the planet Mercury. *Special relativity* as a mathematical theory is an essential tool in the field of particle physics.

Would "usefulness" qualify the theory for the Nobel Prize? ... It is not an easy question. The Ptolemaic theory was useful for well over 1200 years yet few would suggest a posthumous award. And then again, *relativity* is based on an algebraic method of transforming coordinates from one frame of reference to another frame (a relatively moving frame). As described earlier the method was discovered by others.

The problem of the missing cause. The relativity theories are contrary to reality because they give no cause. They formulate the effect(s) but not the cause. It is even worse.

Larmor and Lorentz, with their aether theory, could point to a plausible cause for the time distortion phenomenon. They could if they wished hypothesize some kind of interaction with aether. Einstein threw it out. He kept the concept of relativistic slowing of clocks but rejected the absolute motion that aether made explicit and in the process lost all hope of attributing a cause to a very real phenomenon. Thus, Einstein not only gives no cause, he has no way in the world to ever introduce a cause! (All he has is geometry!)

The lack of a causal mechanism extends to all the relativistic phenomena —including length contraction and the variance of mass and the speed of light (what causes it to be 300,000 km/s and not 150,000 km/s?). The problem further extends to the gravity theory. As the Physics Community is painfully aware, gravitation itself, the very force/effect that rules the universe, is given no causal explanation. (It is true also of Lambda, the other side of the gravitational coin.) And all there is to work with is geometry!

The problem of the apparent versus the real relativistic effects. Physics is all about cause and effect. Einstein formulated the effect but could give no cause. He even suggested not to bother looking for one! But now we come to the checkmate argument of why the relativity theories are contrary to reality. Since they give no cause they therefore cannot make the distinction between apparent and real relativistic effects. And there definitely is a distinction.

So when Einstein used the Lorentz equations (as Lorentz himself did) to formulate the phenomenon of the variance of mass and energy there must have been that nagging question —like the one discussed earlier for the phenomenon of length contraction. Is the increase in mass due to motion real? or is it merely apparent? or even some combination of the two? Einstein's formulation cannot tell us. Not without some causal mechanism.

The measured mass of an object depends on the observer's relative motion. Changing the motion, changes the apparent mass value. But, of course, the mass object cannot change its mass in response to the various motions of multiple observers. And yet intrinsic mass change can, and does, take place. But for *that* you need absolute motion. Achilles really can beat the tortoise; but to do so he needs absolute motion.

To be sure, there is relative motion —but there is also absolute motion. Sometimes there are both.

On the question of *apparent versus real relativistic effects* Einstein fails to make the distinction. His abstract theory of relativity does not allow him to make such a distinction.

As a last reflection on possible reasons there is **the issue of incompleteness**: Special relativity is an incomplete theory without the concepts of absolute motion and an aether-medium —also known as the *luminiferous aether*. General relativity is an incomplete theory without the concept of a dynamic aether-space — also known as the *gravitational aether*.

7. What Might Have Been

Everyone knows the implications of Miller's *positive effect*. It means that there exists a preferred frame of reference (the rest frame of aether-space) and therefore absolute motion becomes an undeniable reality. But what did Einstein mean, when he stated in his letter to Shankland *"the existence of a not trivial positive effect would affect very deeply the fundament of theoretical physics as it is presently accepted"*? ... For one thing he meant that the **principle of equivalence**, an important part of relativity theory whereby the gravitational force of acceleration is undistinguishable from the inertial force of acceleration, would be rendered invalid. Moreover, all motion would be affected. Einstein meant that all significant motion would have to be referenced to the newly-discovered preferred frame. He meant that the mathematics of physics would have to include both relative velocities and absolute velocities.

Although the inclusion of absolute velocities in practice may be subject to debate, inclusion *is* necessary at the fundamental level. What would those equation changes look like and how would they compare to Einstein's physics? ... For some of the highlights see Tables 1 to 5 in Section 8. The tables also include a comparison with classical Newtonian physics.

When *relativity* was originally being formulated there was an option open to Einstein. We know that Einstein reflected a certain ambivalence towards aether. His main concern was detectability. His option was this. He could have accepted the aether's existence and built it into his theory —even though it seemed to be undetectable. Then, if the then popular opinion turns out to be wrong and aether-motion actually becomes measurable, his theory and equations would be wholly accommodating.

If Einstein had incorporated the aether frame into the development of relativity theory he would most likely have come up with absolute motion equations like the ones in the first column of the tables and derived in similar fashion as the actual special relativity equations —derived from the Lorentz transformations. Then, acknowledging the contemporary belief that absolute motion was, for some unknown reason, undetectable, he would have set the value v_A of the observer to zero and relegated v_B, the velocity of some moving frame, to serve as a purely relative motion. The absolute-motion equations would have delivered the special-relativity equations shown in column 2.

The remarkable fact (not to mention the irony) is that Einstein's relativity can be derived from an aether theory! The remarkable fact is that the conventional Einstein equations can easily be derived from the aether-motion equations!

Imagine what might have been. If Zeno had recognized the difference between absolute motion and narrowly-defined relative motion then Achilles would have won the race.

If Einstein had recognized the validity of Miller's aether wind and absolute motion experiments then the relativity theories would have looked quite different.

If Einstein had adopted not only Lorentz's equations but also his aether (admittedly with some modifications) then he would have had a *preferred frame-of-reference* and a causal mechanism for *real* relativistic effects. Furthermore, if he had adopted Lorentz's static aether and made it into a *dynamic aether* —the essential modification— then he would have had a causal mechanism for gravitation as well. In other words, *he would have had a complete and paradox-free theory of motion and gravitation.*

If he had employed the Lorentz transforms in conjunction with the observable aether, the various equations we associate with relativity would be expressed as shown in the first column of the Tables. In column 1 all the "frame" velocities are subscripted to indicate that they are absolute velocities. It means they are referenced with respect to aether-space. Column 2 gives the Einstein version; velocities are purely relative. Column 3 gives the Galilean-Newtonian version; all velocities are "low speed" with no relativistic concerns.

Without the incorporation of absolute motion and without specifying causes for what is being postulated, the theoretical physicist is wandering through dunes of shifting sands. Let there be no doubt; the theoretical path he so carefully constructs is vulnerable and forever at the mercy of the wind. The impartial observer attempts to follow the path, assess the way-stops, but the wind blows and the sands keep shifting. ... What is an Awards Selection Committee to do?

I am bewildered and awed by an image that may be more substantive than caricature of a genius of a man who, after 1915, spent the remaining forty years of his life searching for the missing cause. ... With sincere respect, I give Professor Einstein the last word.

> *You imagine that I look back on my life's work with calm satisfaction. But from nearby it looks quite different. There is not a single concept of which I am convinced that it will stand firm, and I feel uncertain whether I am in general on the right track.* –Albert Einstein, on his 70th birthday, in a letter to Maurice Solovine, 1949 March 28[45]

8. Comparison Tables

Table 1: Time Dilation

DSSU Relativity[46]			Einstein's Relativity	Galilean-Newtonian Physics
Observer in frame *A* calculates own actual time dilation as:	Observer in frame *B* calculates own actual time dilation as:	Relating time intervals on identical clocks having absolute motion:	No absolute motion	Applicable to low speeds
$\gamma_A\ \Delta t_A$ which means: $\Delta t_{ABS.REST} = \gamma_A \Delta t_A$	$\gamma_B\ \Delta t_B$ which means: $\Delta t_{ABS.REST} = \gamma_B \Delta t_B$	$\Delta t_A = (\gamma_B / \gamma_A)\ \Delta t_B$	$\Delta t_{OBSERVER} = \gamma\ \Delta t_0$ Choice of who is in motion is ***arbitrary***.	$\Delta t_A = \Delta t_B$ (no time dilation)

Notes: DSSU is the acronym for Dynamic Steady State Universe. DSSU theory is based on the premise that all things are processes.

The gamma symbol, γ, is the conventional *relativity Lorentz factor*. It is equal to $(1-(\mathrm{v}/c)^2)^{-1/2}$, where v is the relative speed along a line joining the observer and the moving object.

The symbols γ_A and γ_B are *aether-frame Lorentz factors*. An *aether-frame Lorentz factor* is equal to $(1-(\mathrm{v_a}/c)^2)^{-1/2}$, where $\mathrm{v_a}$ is the intrinsic motion with respect to aether-space. One such factor is assigned, by subscripting, to each observer (or to each object). Of course, c is the speed of light in vacuum.

It is assumed that the two clocks have been calibrated by measuring the same time interval while the clocks are at rest in the aether-space rest frame; then $\Delta t_{ABS.REST} = (\gamma_A\ \Delta t_A) = (\gamma_B\ \Delta t_B)$ and therefore $\Delta t_A = (\gamma_B / \gamma_A)\ \Delta t_B$.

Einstein's equation is comparable to a special case of the DSSU equation. Simply set one observer's speed to zero and consider the speed of the other observer as the un-subscripted relative speed. In essence, γ_A becomes unity and γ_B becomes γ.

Table 2: Velocity Transformation

Relating the velocity u' of an object, as measured in frame *A*, and the velocity u'', as measured in frame *B*.

DSSU Relativity Derived from the Lorentz transformations.	Einstein's Relativity Derived from the Lorentz transforms.	Galilean-Newtonian Physics
$u' = \dfrac{u''\left(1+v_A v_B/c^2\right)+\left(v_A+v_B\right)}{\left(1+v_A v_B/c^2\right)+u''\left(v_A+v_B\right)/c^2}$ (transforms an apparent velocity u'' within one frame into an apparent velocity u' for an observer in another frame). v_A and v_B are the parallel velocities of the two reference frames with respect to aether-space.	$u' = u = \dfrac{u''+v}{1+\dfrac{u''v}{c^2}}$ No absolute motion. v is the relative velocity between the two frames.	$u' = u = u'' + v$ v is the relative velocity between the two frames.

Notes: There are sign rules that apply to all three equations.

The Einstein equation is comparable to a special case of the DSSU equation: When observer in frame *A* is at absolute rest, then $v_A = 0$ and $v_B = v$ (that is, the motion of frame *B* becomes the relative motion) and the DSSU equation reduces to Einstein-relativity form.

At low speeds both DSSU and Einstein's Relativity reduce, as they must, to the Galilean-Newtonian expression.

Table 3: Length Contraction

DSSU Relativity			Einstein's Relativity	Galilean-Newtonian Physics
Observer in frame *A* calculates own actual length contraction as:	Observer in frame *B* calculates own actual length contraction as:	Observer calculates apparent length *L* of a moving object whose *proper length* is L_0 :	No absolute motion	Applicable to low speeds
L_0 / γ_A	L_0 / γ_B	$L = \dfrac{1}{\gamma_A \gamma_B} \times \dfrac{L_0}{1+\left(v_A v_B/c^2\right)}$	$L = (L_0 / \gamma)$	$L = L_0$ No length change

Notes: L_0 is a *proper length*; which simply means it is a length that is directly measured within the same frame. The length can be that of an object or a spatial distance and parallel to the line of motion. Also, see **Table 1** notes regarding the *Lorentz factors*.

The Einstein equation is comparable to a special case of the DSSU equation: When observer in frame *A* is at absolute rest in aether-space, then $v_A = 0$ and $v_B = v$ and the DSSU equation reduces to Einstein-relativity form. At low speeds both DSSU and Einstein's Relativity reduce to the Galilean-Newtonian expression.

Table 4: Momentum

Expressions for the momentum $\boldsymbol{p}$ of a particle having mass m.

DSSU Relativity momentum in terms of absolute motion	Einstein's Relativity momentum in terms of relative motion	Galilean-Newtonian Physics
$p = \gamma_A \gamma_B m(v_A + v_B)$ v_A is the intrinsic velocity of the observer along an axis. v_B is the intrinsic velocity of the particle parallel to the axis. (motions are with respect to aether-space)	$p = \gamma m v$ v is the apparent velocity of the particle.	$p = m v$ Basic definition of momentum

Notes: There are sign rules that apply. Also, see **Table 1** notes regarding the *Lorentz factors*.

Again, the Einstein equation is comparable to a special case of the DSSU equation: When observer is at rest in aether-space, then $v_A = 0$ and $v_B = v$ and the DSSU equation reduces to Einstein-relativity form. At low speeds both DSSU and Einstein's Relativity reduce to the Galilean-Newtonian expression.

Table 5: Doppler Equation

DSSU Relativity Doppler equation for absolute motion[47]	Einstein's Relativity Doppler eqn in terms of relative motion	General Doppler Equation
$f_D = f_S \sqrt{\frac{1-(v_S/c)}{1+(v_S/c)}}\sqrt{\frac{1-(v_D/c)}{1+(v_D/c)}}$ v_D is the velocity of the frequency Detector (observer) along an axis joining Source and Detector. v_S is the velocity of the Source along the same axis. (motions are with respect to aether-space)	$f_D = f_S \sqrt{\frac{1-(v/c)}{1+(v/c)}}$ v is the relative velocity between Detector and Source.	$f_D = f_S \frac{v - v_D}{v + v_S}$ "Slow waves" Doppler eqn for sound, water waves, etc. Here, v is the wave speed characteristic of the medium.

Notes: f_D is the frequency received by the wave Detector and f_S is the frequency transmitted by the wave Source. And c is the speed of light in vacuum. There are sign rules that apply to velocities.

Note carefully that the special-relativity expression *cannot* be reduced to the General Doppler Equation for "slow waves." What is most interesting about this set of equations is that *the DSSU equation can be reduced to both the Einstein-Relativity and the General-Doppler versions* (by simply imposing the appropriate speed conditions). The Einstein expression is obtained by removing the absolute motion of the Detector (observer) so that $v_D = 0$. Then v_S automatically becomes Einstein's relative velocity. Thus, the Einstein equation works as a special case of the DSSU equation.

To obtain the General-Doppler expression: the absolute velocities v_D and v_S are deemed to be much less than the speed of light. Then, by applying the binomial theorem to the DSSU equation,

$$f_D \approx f_S \frac{1-(v_D/c)+\tfrac{1}{4}(v_D/c)^2}{1+(v_S/c)+\tfrac{1}{4}(v_S/c)^2}\ , \text{ where } v_D \text{ and } v_S \ll c.$$

The two squared terms are quite insignificant since the motions of Source and/or Detector will never be much above the speed of sound. Thus the squared terms are dropped. Finally, c is replaced by v as the speed of the wave propagation in its material medium. The result is the *general Doppler effect* expression.

* * * *

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