Chapter 30

APPLICATIONS OF EINSTEIN'S KINEMATICS TO ELECTROMAGNETICS

After Einstein described his theoretical concepts of relativistic kinematics in Part I of his Special Theory, he applied them to certain electromagnetic and optical phenomena in Part II of his Special Theory, entitled the "Electrodynamical Part." Einstein's main purposes in Part II were: 1) to attempt to justify and confirm his ad hoc *relativistic and mathematical concepts by applying them to so-called experimental data, and 2) to extend his relativistic kinematics to mechanics, electrodynamics, electricity and beyond. In this Chapter 30 and in Chapter 31, we will demonstrate that Einstein did not succeed in this endeavor.*

A. The invariance of Maxwell's equations for empty space, and a description for the induction of an electric current.

The next Section 6 of Einstein's Special Theory was entitled:

"§ 6. Transformation of the Maxwell-Hertz Equations for Empty Space. On the Nature of the Electromotive Forces Occurring in a Magnetic Field During Motion." (Einstein, 1905d [Dover, 1952, p. 51])

In Section 6, Einstein had two primary goals. First, to demonstrate that the Maxwell-Hertz equations for empty space,[1] when properly transformed, are invariant (or rather 'covariant') in all inertial frames of reference. Second, to attempt to resolve the "asymmetry in the case of magnet and conductors in relative motion" (Miller, p. 270); this was the problem that Einstein cited at the beginning of his Special Theory. The Maxwell-Hertz equations are written as follows:

"
$$\nabla \times \mathbf{E} = -\frac{1}{c}\frac{\partial \mathbf{B}}{\partial t}, \qquad \nabla \cdot \mathbf{D} = 4\pi\rho_{\text{true}},$$
$$\nabla \times \mathbf{H} = \frac{1}{c}\frac{\partial \mathbf{D}}{\partial t} + \sigma\mathbf{E}, \qquad \nabla \cdot \mathbf{B} = 4\pi m_{\text{true}},$$
" (Miller, p. 12)

[1] The term 'Maxwell-Hertz field equations' was coined by Abraham in 1902-03. (Miller, p. 24) In 1890, Hertz axiomatically proposed that the electrodynamics of moving bodies could be described by four equations (which are shown by Miller on p. 12 of his book) and that they were invariant in different reference frames. (*Id*., pp. 12, 14) Hertz wrote his equations relative to a system that was theoretically fixed in the ether, and he assumed that when such system moved the ether was totally dragged along. (*Id*., p. 13)

A threshold question is: Why did Einstein choose Hertz's 1890 ether reformulation of Maxwell's equations rather than Lorentz's 1892 ether reformulation?[2] Most likely the answer is that Hertz's four Maxwellian equations applied both to Maxwell's theory of electromagnetism in the presence of charges (i.e. electric currents), as well as to Maxwell's theory of electromagnetism in the absence of charges (i.e. light and EM radiation); whereas, Lorentz required a separate set of four equations to describe Maxwell's theory of electrodynamics in the presence of charges. (see Figure 6.3) Thus, with the Maxwell-Hertz equations Einstein could discuss both the invariance of such equations when applied in empty space (i.e. light and EM radiation) and with respect to the induction of an electrical current.[3]

As the title for Section 6 implies, Einstein limited his discussion during the first two pages of Section 6 to the invariance of Maxwell's "equations of electrodynamics for the case of radiation [i.e. light] in 'free space'…in the absence of charges."[4] (Miller, p. 270) Einstein discussed the invariance of Maxwell's equations in the presence of electric charges (and electric currents), and the invariance of such electric charges, separately in Section 9 of his Special Theory (see Miller, pp. 305 – 307), which we will discuss in

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[2] The Maxwell-Lorentz equations are shown on Figure 6.3. Another question is: How mathematically valid is either set of equations since they were formulated with respect to the hypothetical stationary ether, which does not exist? Remember that when the Michelson & Morley experiment was analyzed and computed relative to the stationary ether, the result was completely wrong (see Chapters 9 and 12), and its paradoxical null result plunged physics into a theoretical tailspin (i.e. Special Relativity) from which it has yet to recover.

[3] There is also another possibility. Einstein may not have known much (if anything) about Lorentz's 1892 reformulation of Maxwell's equations in June 1905. In order to become a patent clerk in 1902, Einstein read just enough about Maxwellian electromagnetism from Föppl's 1894 text on the Hertz-Heavyside version of Maxwell's theory and from Hertz's 1892 book in order to pass the patent exam. (see Miller, pp. 142, 148, 165) In his 1892 book Hertz opined that "Maxwell's theory is Maxwell's system of equations," which, of course, is not correct. (see Chapter 6) From studying his Special Theory, it is evident that Einstein didn't know much about Maxwell's theory of electromagnetism and optics beyond the so-called Maxwell-Hertz equations.

[4] The last page of Section 6 dealt primarily with Einstein's problems concerning the induction of a point charge of electricity.

Section D of this chapter.

Einstein began Section 6 by assuming that "the Maxwell-Hertz equations for empty space hold good for the stationary [inertial] system K…" [Einstein, 1905d [Dover, 1952, p. 51]) In other words, "as in prerelativistic electromagnetic theory, he accepted the exact validity of [Hertz's version of Maxwell's] field equations, and the constancy of light velocity [at *c*] in…the resting [inertial] system K." (Miller, p. 271)

Einstein then applied the Lorentz transformation equations to the above Maxwell-Hertz equations with respect to inertial reference system k moving with velocity v relative to system K. (Einstein, 1905d [Dover, 1952, p. 52]) This process, of course, distorted the Maxwell-Hertz equations in system k. (see Einstein, 1905d [Dover, 1952, p. 52]) Einstein sidestepped this problem by asserting that such distorted equations were substantially equivalent to the equations in K, except for one algebraic factor and the vectors. (*Id*., p. 53) He then reformulated the equations so that the reformulation would apply in both inertial systems. (*Id*., pp. 53 – 54) In other words, after all of such algebraic manipulations Einstein's modified Maxwell-Hertz equations for light were algebraically 'covariant' in both inertial frames.[5]

But why did Einstein go through this *ad hoc* and artificial process? What relevance do any transformation equations have with respect to non-material light? What relevance do covariant algebraic equations have with respect to anything? Einstein's attempted justification was that:

"the <u>principle of relativity requires</u> that if the Maxwell-Hertz equations for empty

[5] Actually, Einstein was required "to undertake additional transformations besides those concerning the space and time coordinates, in order to maintain the <u>covariance</u> of the equations of electromagnetism." (Miller, p. 271)

space hold good in system K, they also hold good in system *k*."[6] (*Id*.)

In 1905, at the beginning of his Special Theory, Einstein axiomatically described *ad hoc* his expanded principle of Galileo's Relativity, which included electrodynamics and optics as well as mechanics. Einstein's expanded principle of relativity was described as a postulate (an unchallengeable statement which must be accepted on face value). It was asserted without any justification for such radical generalization.[7] The year before, in 1904, Henri Poincaré had asserted a similar generalized 'principle of relativity' which also included electrodynamics and optics (see Chapter 16B), and Einstein was cleverly attempting to ride on Poincaré's coattails.[8] However, by 1916, Einstein found it necessary to attempt to justify such generalization of Galileo's Relativity. (see Chapter 24) As we have previously demonstrated in detail in Chapters 16B and 24, both Poincaré's and Einstein's generalizations of Galileo's material principle of relativity (Chapter 5) were completely *ad hoc*, meaningless, and empirically invalid, despite Einstein's 1916 attempted justification.

Because Einstein's *ad hoc* principle of relativity had no empirical verification, he had no scientific justification to declare that "if the Maxwell-Hertz equations for empty space hold good in system K, they also hold good in system k." Einstein needed his expanded postulate of relativity in order to axiomatically make such declaration. He also needed such postulate in order to justify applying transformation equations from one inertial reference frame to another, so that observers in each system could theoretically

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[6] Here Einstein was just assuming the validity of his *ad hoc* principle of relativity with respect to electromagnetics and optics.

[7] Einstein raised his expanded principle of relativity "to the status of a postulate" in his Special Theory for one primary reason: so that it could not be challenged when he applied it in his Special Theory.

[8] Poincaré was a legendary mathematical physicist and his similar expanded 'principle of relativity' gave Einstein's postulate and principle of relativity an air of credibility.

measure magnitudes of all physical phenomena in the other system. In other words, without an empirically valid expanded principle and postulate of relativity, Einstein had no relativistic Special Theory whatsoever.

For all of the above reasons, Einstein could not justifiably apply the principle of relativity and the Lorentz transformations to the Maxwell-Hertz equations. Nevertheless, Einstein did misapply the principle of relativity, he did adopt the Lorentz transformations, and he did misapply them to light and to the Maxwell-Hertz equations for light. Therefore, we must respond to these invalid, irrelevant and unnecessary acts, to Einstein's bizarre conclusions, and to the resulting mathematical consequences.[9]

Guilini points out that this non-mechanical covariance was established before Einstein by Lorentz in 1904, by Poincaré in 1905 and by Voigt in 1887; but "nobody before Einstein connected these results to the principle of relativity." (Guilini, p. 81) The reason for this failure to connect such non-mechanical covariant results to the principle of relativity was (as we have again just explained) that such algebraic electromagnetic results do not apply to Galileo's mechanics concept of material relativity. The two concepts (Maxwell's electromagnetic equations for non-material light and Galileo's mechanics concept of material inertial relativity) are completely incompatible and mutually irrelevant. (Chapters 5, 6, 23 and 24)

Theoretically, when one applies the Lorentz transformations to anything, a Length Contraction of matter and a Dilation of Time results. (see Chapters 26 and 28) But Einstein did not mention either of these relativistic mathematical consequences with respect to the covariance of the Maxwell-Hertz equations for empty space. Not to worry,

[9] Very importantly, all of the above analyses and conclusions apply equally to every other relativistic concept described in this treatise. All of Einstein's concepts and mathematical conclusions that rely on either of his two *ad hoc* postulates are in turn themselves *ad hoc*, irrelevant and empirically invalid.

his resourceful followers have taken up the imaginary theoretical slack.

According to Guilini, the Length Contraction manifests itself with respect to the Maxwell-Hertz equations by the spherical point charges in a Coulomb field contracting in the direction of relative velocity so that at v = 0.8*c* they become horizontally weakened ellipsoids. (Figure 30.1) Similarly, the Time Dilation supposedly manifests itself by a reciprocal enhancement (strengthening or elongation) of the point charge's vertical component which in turn results in a desired variation in the charged particle's ionization (decay) rate. (see Guilini, pp. 83 – 85) Aside from such imaginary and dubious conjectures, has either of such relativistic effects ever been detected or observed? Of course not.

Toward the end of Section 6 of his Special Theory, Einstein interpreted such covariant Maxwellian equations for empty space (i.e. light) in terms of a moving electrical charge and the principle of relativity.[10] Einstein then determined that the mysterious 'electromotive force' that was generally described for the induction of an electric current was none other than an electric force, and "that electric and magnetic forces do not exist independently of" relative motion.[11] (Einstein, 1905d [Dover, 1952, pp. 54 – 55])

Did all of the above mathematical theorizing make Maxwell's transmission velocity of light at *c* in a vacuum empirically invariant with respect to all linearly moving inertial reference frames? Remember that this was Einstein's primary goal for his

[10] One might ask: what relevance does an electric charge or current and the mechanics principle of relativity have to light? The answer, of course, is none.
[11] For Einstein, these conjectures removed the asymmetries which he referred to in the opening paragraph of his Special Theory. They also cleared up the problems that he had with the description of 'unipolar induction' which he read about in Föppl's text. (see Miller, pp. 144 – 150, 276 – 280)

Special Theory. (see Chapters 18 through 21) The answer is: of course not. [12]

B. Einstein's relativistic Doppler effect of light.

In Chapter 8 we explained the concept of the current classical Doppler effect of light in empty space. We empirically discovered that as luminous bodies in space approach one another, the light waves emitted by one body are received more frequently by an observer on the other body, and vice-versa. Conversely, as such luminous bodies separate from one another the light waves emitted by one body are received less frequently by an observer on the other body, and vice-versa. These two different phenomena are empirically manifested, when light is received in a spectroscope on Earth, by a red shift of spectral lines for such separation, and by a blue shift of spectral lines for such approach. (see Figure 8.3)

Special Relativity declares that such classical Doppler effect of light is a meaningless concept, because *inter alia* at one time in the past it incorporated and referred to the fictitious medium of ether. (see Gill, p. 6) On the contrary, once the fictitious concept of ether is eliminated, the classical Doppler effect of light remains just as valid as Maxwell's transmission velocity of light at c in a vacuum is without the concept of ether.

Nevertheless, in Section 7 of his 1905 Special Theory, Einstein invented an abstract mathematical version of the classical and empirical Doppler effect of light. Why? In order to apply his Lorentz transformations and his kinematic theories to this long accepted optical phenomenon so that it would remain mathematically consistent with his two empirically invalid fundamental postulates and his *ad hoc* relativistic

[12] Maxwell's transmission velocity of light is always c with respect to its medium of a vacuum in empty space, but relative to linearly moving bodies it is quite naturally always $c \pm$ v. (Chapter 21)

kinematics; and also so he could claim that the empirical Doppler effect of light was an experimental confirmation of Special Relativity.

In *ad hoc* fashion, Einstein determined the equations for a light wave of frequency *ν* emitted from an infinitely distant co-moving star. Einstein axiomatically applied the Lorentz transformations to such equations as well as the transformations which he found in Section 6 for electric and magnetic forces. He then concluded that where "the connecting line 'source-observer' makes the angle *Φ* with the velocity of the observer" on Earth moving with velocity v, "the frequency *ν*' of the light perceived by the observer is given by the equation

$$\nu' = \nu \frac{1 - \cos\Phi \,.\, v/c}{\sqrt{(1 - v^2/c^2)}} \quad .$$

This is Doppler's principle for any velocities whatever.[13] When $\Phi = 0$ the equation assumes the perspicuous form

$$\nu' = \nu \sqrt{\frac{1 - v/c}{1 + v/c}}$$,"[14] (Einstein, 1905d [Dover, 1952, p. 56])

The implication from the above scenario is that Einstein's relativistic formula is able to mathematically predict the empirical Doppler effect of light, and thus all observed Doppler effects of light are experimental confirmations of Special Relativity.

Dingle interpreted Einstein's relativistic Doppler equations to mean the following:

> "The formula has the required characteristic that it gives opposite frequency changes for approach and recession, and is a function of <u>the relative velocity of the bodies only</u>. But this view of the matter <u>compels</u> us to assume that the observer, and not the source of light, is the moving body. If the source moves and

[13] Figure 30.2 graphically depicts the frequency *ν*' as a function of the velocity v and the angle Φ in such equation.
[14] Neither of Einstein's equations actually describes the specific magnitude of any frequency. They merely describe the theoretically different emitted frequency *ν* of the light wave when the observed frequency *ν*' is known. Actually *ν* should be ν_0 in both equations, because the emitted frequency of the light at its source (the star) constitutes its proper 'rest frequency.' (see Miller, p. 286)

> the observer remains at rest, it requires [a different equation].[15] The two ways of regarding the motion are thus not equivalent, and the postulate of relativity is violated." (Dingle, 1961, p. 24)

There are also other problems.

Einstein's relativistic concept, of course, begs the questions: Is there a relative motion between bodies, in which directions are such bodies moving, and what is the magnitude of their relative velocity? For the answer to these questions we must first empirically determine the classical Doppler effect of light by observing the magnitude of blueshifts or redshifts, interpreting their meaning and computing their magnitudes. Do these additional prerequisite requirements not suggest incomplete, conjectured and circular relativistic reasoning on the part of Einstein?

Based on Einstein's Special Theory, Dingle asserted that: "we have no basis for assuming any [Doppler] formula at all." (Dingle, 1961, p. 22)

> "The postulate of constant light velocity speaks only of the velocity of light; it does not require that light shall even show a periodicity [frequency]. That we infer quite independently from experiment [vis. by theory], and therefore the Doppler effect can have only an empirical basis."

> "it would be entirely consistent with Einstein's theory if there were no Doppler effect at all—i.e. if motion had no effect on the observed frequency of light." (*Id*.)

Nor does Einstein's Special Theory express any relation between frequency and velocity. (*Id*.) Again we must turn to observation and the classical Doppler effect of light to supply this necessary connection. The ultimate conclusion is clear: "there is no necessary relation at all between the relativity theory and the Doppler effect." (Dingle, 1961, p. 21)

Regardless of all of Einstein's *ad hoc* deductions, rationalizations, and

[15] We will soon be informed of another reason why we are compelled to the above conclusion.

transformations, the relativistic Doppler formula cannot be correct because the Lorentz transformations, the other transformations and the relativistic concepts upon which it was based, are all *ad hoc* and meaningless false assumptions. (see Chapters 21 through 29) For example, one can see from the denominator of Einstein's relativistic Doppler equations, as Einstein specifically pointed out in Section 5 of his Special Theory, that the relative velocity between bodies can never mathematically exceed *c*. On the other hand, this feature of his relativistic Doppler formula posed seemingly insolvable problems and conflicts for Einstein and other relativists during the 1930's when distant galaxies were interpreted (based upon their gigantic redshifts) to be receding from Earth at several times the velocity of light. These interpretations of gigantic recession velocities of all the galaxies are called 'the expanding universe theory.' (see Figure 30.3) In apparent desperation, Einstein and his followers suggested *ad hoc* that perhaps the non-material <u>space</u> of the Universe was doing the expanding and that it merely carried the material galaxies along with it. (see Einstein, *Relativity*, p. 153) This ridiculous attempted solution to the conflict was referred to as the 'expansion of space' theory. (see Eddington, 1933)

Perhaps the most self-contradictory assertion of Einstein's relativistic Doppler effect of light is its assertion that such relativistic effects are <u>due solely to the relative velocity</u> between two luminous bodies in space. In other words, according to Einstein and his followers, the only thing that is relevant to the relativistic Doppler effect of light is such relative velocity. Einstein denied that there is any meaning to a unique motion or velocity of one luminous body (the source or the observer), or to an identifiable time of such unique motion, when such motions are considered separately. In other words, Einstein and his followers "claimed that all that enters into the picture is the relative motion between source and observer, and to ask which one moves is to ask an unanswerable question."[16] (see Gill, p. 14)

Dingle agreed with the first part of Gill's conclusion: "the relativity postulate requires that [Einstein's relativistic Doppler effect] must not enable us to distinguish in an absolute sense between the motion of the emitter with respect to the receiver and that of the receiver with respect to the emitter." (Dingle, 1961, pp. 21 – 22) French even praised Einstein's Doppler formula as being a simpler way of expressing the phenomena in that it only depended upon relative motion without any distinction as to which body was doing the moving. (French, p. 134)

Resnick in turn asserted that: "the theory of relativity introduces an intrinsic simplification over the classical interpretation of [the Doppler effect] in that the two separate cases which are different in classical theory, (namely, source at rest—moving observer and observer at rest—moving source) are identical in relativity." (Resnick, 1968, p. 91) In other words, in Special Relativity there is no observational distinction between the two cases. This claim of identity has also been made by many other relativists. For example, "the relativistic result is a kind of unification of the moving-source and moving-observer results…"[17] (French, p. 137)

It follows from the above discussion that (in Einstein's symmetrical relativistic Doppler theory) the relative velocity of the source and the observer produces one and the same effect (either a blue shift or a red shift), and that either the "observation of the

[16] On the contrary, in Chapter 8 we have demonstrated that there are some situations where there is an observable distinction.

[17] The mathematical relativists also attempt to justify the relativistic effect because of its "special symmetry that the previous result lacks." (French, p. 137) But what has symmetry got to do with anything?

movement [motion] is immediate in both cases, or it is delayed in both cases." (Dingle, 1972, p. 216) Which is it?

We know from our own experience that the observation of such motion in Einstein's theory must theoretically be immediate in both cases. Why? Because:

> "We know that, with respect to a distant star, the orbital motion of the Earth round the Sun causes an alternation of approach and recession. The Doppler effect corresponding to this is observed to synchronize with the [Earth's] orbital motion in every case, so we know that, when the [terrestrial] observer moves, the effect is seen immediately…" (*Id.*)

This empirical fact contradicts Einstein's assertion that the unique velocity of the observer, when considered separately, has no meaning for the Doppler effect of light. Other empirical facts (such as blue shifts of supernovae and alternating blue and red light shifts of binary stars) also contradict the assertions of the relativists: that the unique velocity of the source body, when considered separately, has no meaning for the Doppler effect of light. (see Chapter 8C and Figure 8.4)

In addition, because our experience tells us that the solar orbital motion of the Earth results in immediate blueshifts and redshifts in the light received by a terrestrial observer from a distant star: "That means that [Einstein's relativistic Doppler] effect must also be seen immediately [symmetrically] when the star moves, otherwise there would be an observable [non-symmetrical] distinction between the two cases." (Dingle, 1972, p. 216) Therefore, also according to Einstein's Special Theory, "every Doppler effect observed is a result of a motion occurring at the time (instant) of observation, no matter how far away the source of light may be." (*Id.*, p. 217)

This fact presents two more extraordinarily serious contradictions for Einstein's relativistic Doppler theory. First, in Einstein's relativistic Special Theory, Maxwell's and

Römer's distance/time delay of the finite light signal at c must be irrelevant to Einstein's Special Theory, because the light shift caused by a distant motion of the source can be seen immediately (instantaneously) on Earth with no distance/time delay.[18] Secondly, this means that the transmission of information (vis. the blue shift velocity of fragments from a distant exploding star) is instantaneous for the terrestrial observer, and thus such transmission dramatically exceeds the finite velocity of light at *c*, which Special Relativity claims cannot happen.

The above empirical contradictions demonstrate *inter alia* that the classical Doppler effect of light is correct, and that Einstein's simplistic, symmetrical and relativistic Doppler theory is invalid. Rather than being an application and confirmation of Einstein's relativistic concepts, Einstein's relativistic Doppler effect of light is self contradictory, and it also contradicts the rest of his Special Theory.[19] On the other hand, if the relativistic Doppler effect is correct then information can be instantaneously transferred over great distances (much faster than the velocity of light) which contradicts Special Relativity which asserts that this result cannot happen. (Chapter 29) Either way, Einstein's Special Theory is contradicted.

C. The relativistic formula for stellar aberration.

After Einstein theoretically applied his Lorentz transformations to the light from a distant star in order to arrive at his formula for the relativistic Doppler effect of light in

[18] This fact, if true, would even contradict Special Relativity.

[19] For example, it contradicts the validity of the Lorentz transformations that produced Einstein's mathematical Doppler effect. (see Chapter 27) It contradicts Einstein's first postulate that Galileo's principle of relativity applies to light in all cases. (Chapters 20, 21 & 24) It contradicts Einstein's second postulate that 'light propagates with a definite velocity *c*' (Chapter 21), and his relativistic formula for the 'computation of velocities' (i.e. that nothing can exceed velocity *c*). (Chapter 29) Finally, it contradicts Einstein's 'aberration of light' concept, because both it and his relativistic Doppler effects are based on substantially the same algebraic equations. (Chapters 30C and 37)

Section 7, he conjectured that the relativistic formula for the aberration of starlight "in its most general form" is:[20]

$$\cos \phi = \frac{\cos \phi - \mathrm{v}/c}{1 - \cos \phi \bullet \mathrm{v}/c}$$

(Einstein, 1905d [Dover, 1952, p. 56]) The denominator was due to Einstein's concept of the Relativity of Simultaneity (Miller, p. 286), which we demonstrated in Chapters 26 and 28 is *ad hoc* and empirically invalid.

Einstein's above conclusion has been explained by many of his followers, as follows. If we make the analogy that light from a distant star is like a rain of photons, then the direction of such rain will change relative to an astronomer/observer on Earth arbitrarily moving at v in its solar orbit relative to such rain. Therefore, the change in the relative direction of such rain of photons can be calculated to the first order of approximation from such relativistic formula. (French, pp. 132 – 134; Zhang, p. 153; Hoffmann, 1983, pp. 47 – 48) The implications from the above conjectures are that Einstein's relativistic aberration formula predicts and approximates Bradley's 1728 aberration of starlight experiment (which was determined empirically), and therefore Bradley's work was an experimental confirmation of Special Relativity. (Miller, p. 286)

On the contrary, Bradley's 1728 aberration of starlight had two components: 1) the telescope had to be tilted to a certain angle, vis. the constant angle of aberration, in order to keep the star in the center of the scope, and 2) as a result the direction of the starlight relative to the Sun appeared to constantly change during the Earth's annual solar

[20] Einstein went on to mathematically determine the "electric and magnetic force" of the light waves, and then conjectured: "It follows from these results that to an observer approaching a source of light with the velocity *c*, this source of light must appear of infinite intensity." (Einstein, 1905d [Dover, pp. 56 – 57]) Miller claimed that this conjecture was offered by Einstein as an example of the unphysical results that would occur when v = *c*. (Miller, pp. 285 – 286, 288)

orbit. (see Chapter 7D and Figure 7.6) Einstein's relativistic formula only described the latter. Einstein's relativistic formula cannot even be applied until the constant angle of aberration 'a' and the velocity v of the receiver (i.e. the Earth) have been empirically determined. Also, the mere mathematical approximation and description of an age-old empirical discovery is obviously not a prediction of what happened in the past.[21]

In any event, Bradley's work in 1728 is not an experimental confirmation of Special Relativity in general or of the empirical validity of the *ad hoc* Lorentz transformation in particular.[22] The only assertion of Special Relativity that Bradley's experiment did confirm was the second part of Einstein's second postulate: that the velocity of light is independent of the motion (velocity) of its source body.[23] However, as we have repeatedly pointed out, this assertion was never in doubt by 1905. For all of the above reasons, Einstein's *ad hoc* relativistic formula for stellar aberration is *ad hoc*, empirically invalid and above all meaningless.

D. Einstein's Relativistic Transverse Doppler Effect

In 1906, Johannes Stark (the publisher of Einstein's December 1907 *Jahrbuch* article) observed a shift in the periodic spectral lines of high velocity hydrogen canal rays (particles) emitted substantially perpendicular to the observer, which he interpreted to be a Doppler shift. The observed frequency of such spectral lines (v) was apparently less

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[21] In addition, there is no empirical way to test with any accuracy which approximation (Bradley's or Einstein's) is more accurate. Feynman conjectured that Bradley's empirical result was not as accurate as Einstein's formula because Bradley's ruler was contracted, but that Einstein's formula takes this length contraction into account. (Feynman, 1963, p. 34-10) On the other hand, we know that length contraction is an empirically invalid concept (see Chapters 26 and 28), so Feynman's conjecture is nonsense.

[22] On the contrary, because Einstein's relativistic aberration formula was obtained by application of the *ad hoc* Lorentz transformations, and because we know that such transformations are empirically invalid (see Chapters 16 and 27), Bradley's aberration formula must be more empirically correct.

[23] We know that this fact is true, because the angle of aberration is always the same for all light received from every possible star in the MW Galaxy.

than the emitted frequency (ν_0). (Zhang, p. 183; Einstein, 1907 [Collected Papers, Vol. 2, p. 263]) In early 1907, Einstein interpreted the canal ray ions that produced such periodic spectra to be "a fast moving clock." He also claimed that such theoretical transverse Doppler effect could be predicted from his concept of 'Time Dilation': "a uniformly moving clock runs at a slower rate as judged from a 'stationary' system…"[24] (*Id*., p. 232) Note that Einstein was using one *ad hoc* concept (Time Dilation) as the foundation and justification for another *ad hoc* concept (the transverse Doppler effect). Circular reasoning?

In his December 1907 *Jahrbuch* article, Einstein again referred to this "very interesting application" of his 'Time Dilation concept':

> "Since the oscillation process that corresponds to a spectral line is to be considered an intra-atomic process whose frequency is determined by the ion alone, we may consider such an ion as a clock of a certain frequency ν_0…
>
> "the effect of motion on the light frequency…reduces the (apparent) proper frequency of the emitting ions [particles] in accordance with the relation [$\nu = \nu_0\sqrt{1 - v^2/c^2}$]." (*Id*., p. 263)
>
> "If…the connecting line 'source of light-observer' forms an angle Ψ [so that the direction of the light is not perpendicular] relative to the observer, then the frequency ν of the source of the light perceived by the observer is given by the equation[25]
>
> $$\nu = \frac{\nu_0\sqrt{1 - \frac{v^2}{c^2}}}{1 - \cos\psi\,\frac{v}{c}}$$
>
> ." (*Id*., pp. 266 – 267)

Einstein's so-called transverse Doppler effect "is a purely relativistic effect with

[24] Assuming that Stark's measurements were reasonably accurate there has to be a physical reason for such frequency change, but it certainly is not Time Dilation. In Chapters 26 and 28 we demonstrated that Time Dilation is an empirically invalid concept, and that empirically it does not exist. It is just a myth.

[25] French conjectured that any deviation from the transverse would cause the normal linear Doppler effect "to swamp the" transverse Doppler effect so that it cannot be observed. (French, p. 144) How convenient!

no classical counterpart."[26] (Resnick, 1992, p. 897) Generally, it is only an unobservable 'second order effect' and theoretically it only occurs when "the relative motion of the source and the observer is at right angles to the direction of propagation of the wave fronts…[T]he observed frequency v is always lower than the frequency v_0 emitted by the source."[27] (*Id.*) Resnick tells us what he thinks this means in his 1968 book:

> "we see a given number of oscillations in a time that is longer than the proper time. Or, equivalently, we see a smaller number of oscillations in our unit time than is seen in the unit time of the proper frame. Therefore, we observe a lower frequency than the proper frequency." (Resnick, 1968, p. 91)

In other words, the distant stationary observer S theoretically measures a longer (dilated) time period between less frequently received longer light waves than the observer S' moving with the particle properly measures during a proper time interval. (see Resnick, 1992, p. 898) "Thus any confirmation of the transverse Doppler effect can therefore be taken as another confirmation of relativistic time dilation." (*Id.*; Bohm, p. 80) Again, we have one unobservable *ad hoc* relativistic effect confirming another unobservable *ad hoc* relativistic effect, but we know that Time Dilation does not empirically exist. (Chapters 26 and 28)

In 1937, Ives and Stillwell conducted a canal ray (accelerated positive ions) experiment based on the existence of ether which the relativists claimed confirmed Einstein's transverse Doppler effect; whereas, Ives himself claimed that the results instead verified a different theory.[28] (Miller, p. 212) Here we have the relativists

[26] It is also pure conjecture. The reason why the transverse Doppler effect "does not vanish in the relativistic theory is basically that the period of light [between waves] can be regarded as a kind of 'clock'…so that in the change from one reference frame to another moving at a speed v, relative to the first, there remains an increase of this period in the ratio $1/\sqrt{1-(v^2/c^2)}$." (Bohm, p. 80) More conjecture.
[27] Miller conjectured that: "Stark's 1906 experiment lacked sufficient accuracy for detecting the transverse Doppler shift [to the second order] in the spectral lines emitted by the moving canal rays (hydrogen ions)." (Miller, p. 250; Einstein 1907 [Collected Papers, Vol. 2, p. 232])
[28] "Ives remained a vigorous anti-relativist to the end of his life." (Miller, p. 250)

claiming that an experiment confirms one of their concepts, and the person who devised and conducted the experiment denying such confirmation. Gill concluded that: "Evidence for the correctness of the [Doppler] formulae to the second order in *v/c* [the transverse Doppler effect] depends on specially designed experiments which are few in number and not high in precision." [29] (see Gill, p. 140)

Miller concluded that, with his theoretical transverse Doppler effect, Einstein went far beyond his intent in 1905, and in 1907 he defined a clock as "any periodic process—for example, an atomic oscillator emitting a frequency…" (*Id*.) Miller was correct. Einstein's interpretations and applications that accompanied his transverse Doppler effect opened a Pandora's Box of similar *ad hoc* interpretations and applications for his relativistic concepts.

For example, if any periodic process (in nature or otherwise) could be interpreted to be a clock, and if any such moving clock could be interpreted to be slowing down, then the concepts of Time Dilation in particular, and Special Relativity in general, could be expanded to other phenomena without any restraints or limitations. This is exactly what happened with the quantum mechanics explanation of why fast moving theoretical atomic particles (pions and muons) are believed to decay slower than expected on their way toward Earth. It was, of course, because of Time Dilation. (see Chapter 37) Einstein also felt free to use such expanded interpretations and *ad hoc* applications of Special Relativity to help concoct his General Theory of Relativity (see Einstein, *Relativity*, pp. 88 – 91), even though General Relativity contradicts Special Relativity. (Chapter 40)

[29] Nevertheless, Gill supported the transverse Doppler effect, not so much because of the imprecise Ives-Stillwell experiment, but mainly because of "the general success of the Special Theory of Relativity, and the failure of rival theories." (Gill, pp. 140 – 141) This type of unscientific deference to Special Relativity is not uncommon. We shall discuss the Ives-Stillwell experiment in greater detail in Chapter 37.

Regardless of dubious interpretations and claimed experimental confirmations, we know that Stark's 1906 observations and Ives' 1937 results were not the result of relativistic Time Dilation or any relativistic transverse Doppler effect. Why? Because in Chapters 26 and 28 we demonstrated that the Relativity of Simultaneity and Time Dilation were *ad hoc* and empirically invalid. Also, in Chapter 27 we demonstrated that the Lorentz transformations (which mathematically produced the theoretical consequence of Time Dilation) were also *ad hoc*, empirically invalid and meaningless. Without these foundational concepts to support it, or as its premise, no transverse Doppler effect can even theoretically exist. The conclusion is clear: Einstein's unobservable relativistic transverse Doppler effect is just another mathematical fantasy.

E. The energy and pressure of light on an inertially moving mirror.

In early 1904, Abraham published a widely read paper entitled: "On the Theory of Radiation and of the Pressure of Radiation." In it Abraham "deduced equations…for the characteristics of radiation reflected from a perfectly reflecting surface in inertial motion relative to the <u>ether</u>, and for the <u>light pressure</u> on this surface…"[30] (Miller, p. 298) In his 40-page paper, "Abraham discussed all of his results in great detail." (*Id*., pp. 291, 300) Very importantly, in order "To obtain exact results… he used only one reference system, <u>fixed in the ether</u>." (*Id*., p. 298)

Then, in 1905, in Section 8 of his Special theory, Einstein decided to take a shot at these problems and conjectures. Einstein first deduced "the energy of light per unit of volume" in the stationary system K. (Einstein, 1905d [Dover, 1952, p. 57]) Because of "the relativity of time and length observers in K and k do not measure the same volumes

[30] Abraham must have falsely assumed that light had a magnitude of mass which caused such pressure or force. (see infra)

of the light complex." (Miller, p. 292) Therefore, Einstein deduced that "the energy…of a light complex [will] vary with the state of motion of the observer in accordance with the…law: [31]

$$\frac{E'}{E} = \frac{1 - \cos \Phi \,.\, v/c}{\sqrt{(1 - v^2/c^2)}} \;.$$

(Einstein, 1905d [Dover, 1952, p. 58])

Einstein then conjectured:

> "It is remarkable that the energy and the frequency of a light complex vary with the state of motion of the observer in accordance with the same law."[32] (*Id.*)

On the contrary, the energy and the frequency of a propagating light ray generally do not vary in accordance with the same law. The energy of an emitted light wave normally does not vary as it propagates through the vacuum of empty space from a star to Earth. However, if it encounters particles of matter during its journey it could convert a fraction of its energy to heat during the process of absorption and re-emission. After a great number of such encounters the diminished energy level of the light ray may be manifested by a redshift observed on Earth.[33]

On the other hand, the observed frequency of a propagating light wave *a priori* can vary depending upon the linear motion of the observer. If the observer moves toward the linearly propagating light ray, *a priori* the frequency of its waves will appear to increase, and this will be manifested by an observed blueshift. Conversely, if the

[31] Einstein did not deduce a specific variation for the energy of any light ray. All that such equation asserted was that if the energy of the light ray varied, then the magnitude of such variance would depend upon the angle of the light ray relative to the observer, and that such magnitude would be different at the source than when received by the observer depending upon the relative velocity.
[32] The reason for this conjecture was that Einstein's formula for the relativistic energy of a light complex was exactly the same as his relativistic formula for the Doppler effect of light. Was the connection between light wave frequency and energy not already common knowledge in 1905? See Chapter 7.
[33] This theoretical phenomenon has been given the unfortunate name 'tired light' by Eddington and other cosmologists.

observer moves away from the linearly propagating light ray, *a priori* the frequency of its waves will appear to decrease, and this will be manifested by an observed redshift (the Doppler effect of light).[34] In these situations, the energy of the light wave which is received by the linearly moving observer may increase or decrease,[35] but the energy possessed by the light wave itself does not physically change; the energy possessed by the light wave (whatever it may be) remains constant as it propagates, regardless of any relative motion by the observer (its potential recipient). Thus, the law that governs the change in energy of a light ray is very different than the law that governs its observed frequency.[36]

Einstein then deduced the necessary relativistic transformation equations for the energy of a light complex and transformed the light waves from K to the surface of a perfectly reflecting mirror on inertial system k moving at v relative to K, and then back to K. (see Figure 31.4) The theoretical result was that the energy of the light waves incident upon the moving mirror was greater than the energy of the reflected light.[37] Einstein concluded that the difference was due to the work done by the pressure of the light on the mirror.[38] (Einstein, 1905d [Dover, 1952, p. 59]) Einstein ended Section 8 with the following conjecture:

"What is essential is, that the electric and magnetic force of the light which is

[34] *A priori* the length of the light waves emitted by the source may be physically lengthened or shortened by the relative linear motion of the source, which would produce the same effect for an observer on Earth, albeit a delayed effect depending upon the relative distance between the two bodies.
[35] In Chapter 7 we suggested a reason for this theoretical phenomenon. The more frequently a light wave containing the same quantity of photons (or quanta) is received (in other words, the shorter the wavelength), the more EM energy will be received at a certain point.
[36] Einstein was always striving for simplicity and fewer hypotheses in physics. However, too often simplicity is achieved at the cost of correctness.
[37] If this was true, it was probably due to Einstein's relativistic transformations.
[38] It is probable that at this time Einstein also assumed that light had a magnitude of mass. (see Chapter 32) Another question: Why did Einstein not attempt to transform the pressure of the light? Why is the physical phenomenon of pressure not also velocity dependent? What is the reason for this relativistic inconsistency?

> influenced by a moving body,[39] be transformed into a system of co-ordinates at rest relatively to the body. By this means all problems in the optics of moving bodies will be reduced to a series of problems in the optics of stationary bodies."[40] (*Id*.)

Miller asserted that Einstein's results in Section 8 were equivalent to Abraham's results in his early 1904 paper. (Miller, p. 298) But how could this be? Abraham theoretically measured his light rays relative to the stationary ether, whereas Einstein applied relativistic equations to his light rays and denied the existence of ether.

It turns out that both Abraham and Einstein applied their light rays to a system theoretically at rest. Abraham's system at rest was the hypothetical ether that does not exist. Einstein's system at rest was his axiomatic velocity of light at exactly *c* in every inertial system regardless of its linear motion. Thus, light propagated at *c* from K is theoretically received at the mirror in k at *c* 'as if the surface were at rest.' (see Miller, p. 300) And Einstein's relativistic transformation equations make this virtual result mathematically so.

Actually, and empirically, as we learned in Chapter 21, the light propagating from K at velocity *c* relative to the medium of the intervening space also propagates toward the mirror at k (moving away from K) at $c - v$. (see Figure 30.4A) Therefore, neither Abraham's impossible ether solution nor Einstein's impossible absolutely constant velocity of light at *c* explanation is correct or equivalent. Most likely, both were completely *ad hoc*, arbitrary and meaningless.[41]

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[39] Einstein never told us the theoretical process by which such forces are "influenced by a moving body."

[40] Except that the relativistic transformation process changes and distorts the problems that need to be solved.

[41] Einstein's explanation was also meaningless because *inter alia* it includes and requires the empirically invalid relativistic concepts of the Relativity of Time, the Relativity of Length (Chapter 26), the Lorentz transformations (Chapter 27), Einstein's relativistic kinematics (Chapter 28), and Einstein's relativistic composition of velocities (Chapter 29).

F. The invariance of an electrical charge.

In Section 9 of his Special Theory, Einstein first attempted to demonstrate the invariance of the Maxwell-Hertz equations in the presence of an electric charge. (see Einstein, 1905d [Dover, 1952, pp. 59 – 60]) Einstein assumed that electric charges are coupled to electrons, and therefore that the Maxwell-Hertz equations "are the electromagnetic basis of the Lorentzian electrodynamics and optics [theory] of moving bodies." (*Id*., p. 60) He also assumed that the Maxwell-Hertz equations were valid in the stationary system K. (*Id*.)

Einstein then transformed the Maxwell-Hertz equations to system k with the Lorentz transformations (with the assistance of the electromagnetic field transformation equations that he used in Section 6), but this was still insufficient to achieve his desired covariance. Einstein found that this time he also had to use an additional transformation equation for the charge density in order to achieve covariance.[42] (Miller, p. 306) After this convoluted transformation process, Einstein concluded that "the electrodynamic foundation of Lorentz's theory of the electrodynamics of moving bodies is in agreement with the principle of relativity."[43] (Einstein, 1905d, [Dover, 1952, p. 60])

Einstein then easily deduced the constancy and invariance of any electrical charge from such covariant equations. He stated:

> "If an electrically charged body is in motion anywhere in space without altering its charge when regarded from a system of co-ordinates moving with the body, its charge also remains—when regarded from the 'stationary' system K—constant."

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[42] If Einstein has to keep inventing new *ad hoc* transformation equations for every different situation in order to achieve covariance (as he also did in Section 6), then covariance begins to take on the character of arbitrary algebraic manipulation

[43] This was an elaborate indirect way to demonstrate the invariance of Lorentz's relativistic concepts contained in his April 1904 treatise, without having to refer directly to them.

(Einstein, 1905d [Dover, 1952, p. 61])

But how could such electric charge remain the same if it was contracted and its time was dilated by all of such relativistic transformations?[44]

It turns out that Poincaré had developed an identical mathematical proof of the invariance of an electrical charge in early 1905, but it assumed a stationary ether.[45] (Miller, p. 307) Intuition, logic and classical physics would also produce the same result without any transformations. If all inertial frames are <u>equivalent</u> states of motion, why should an electric charge vary from one inertial frame to another? There is no viable physical reason. This conclusion should also apply to all other physical phenomena (including length, time, mass, etc.) as it did in classical physics. The conclusion is clear: No physical phenomenon is velocity dependent, with the possible exception that the constant velocity of light at c relative to the vacuum of empty space is also $c \pm$ v relative to linearly moving bodies.

Why did Einstein want to demonstrate the mathematical invariance of an electric charge? One reason probably was because Kaufmann <u>assumed</u> the invariance of electric charge for his experiments about electromagnetic mass in 1901 – 1902, and Einstein used Kaufmann's experiments and his concept of electromagnetic mass as the foundation for his own concept of Relativistic Mass in Section 10 of his Special Theory. It would be natural for Einstein to want to bolster Kaufmann's critical assumption which Einstein needed to adopt for his Special Theory. (see Chapter 31A)

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[44] See Guilini's *ad hoc* claim in Chapter 30A that spherical point charges (when Lorentz transformed) become ellipsoids.

[45] Once the concept of ether is eliminated, it becomes the same concept as Einstein's. Was Poincaré's proof of the invariance of electric charge Einstein's source; and if so, why did he not give Poincaré credit?

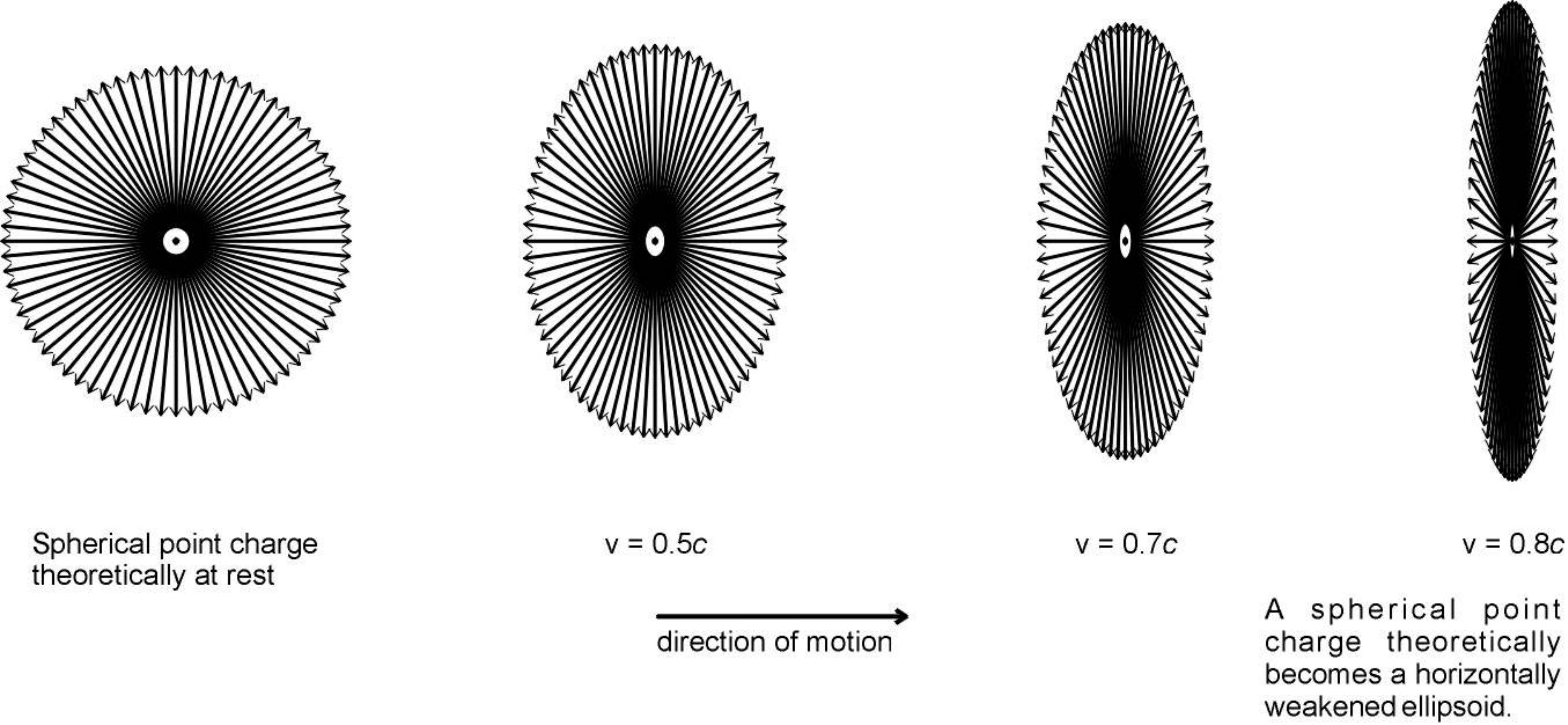
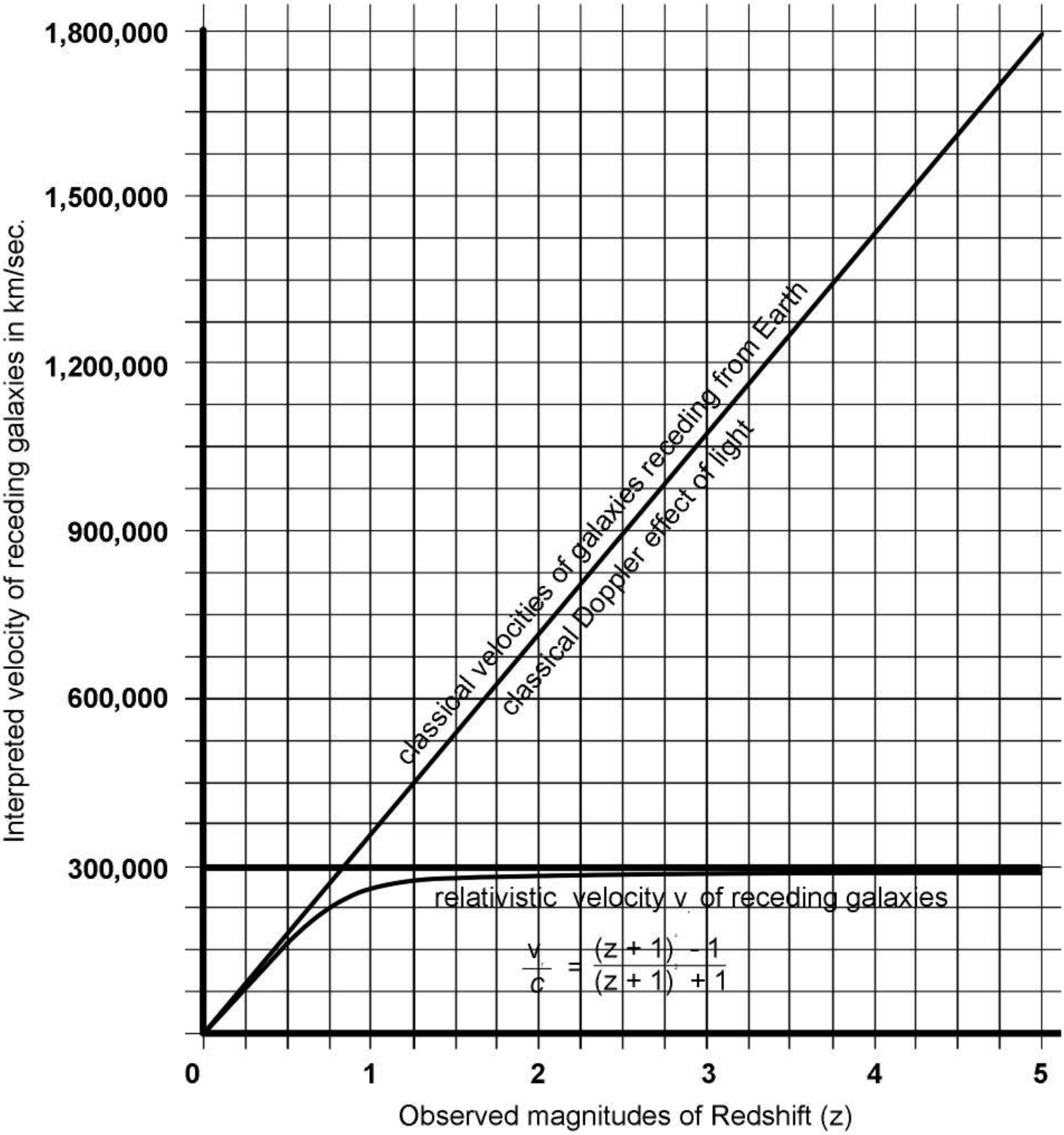


Figure 30.1

Guilini's *Ad Hoc* Theory That A Spherical Point Charge Physically Contracts In A Coulomb Field In The Direction Of Relative Velocity

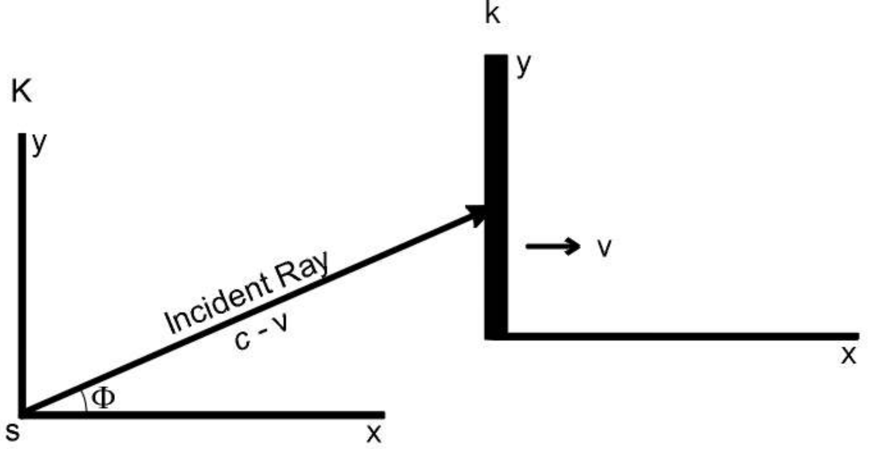
Source: Guilini, p. 83



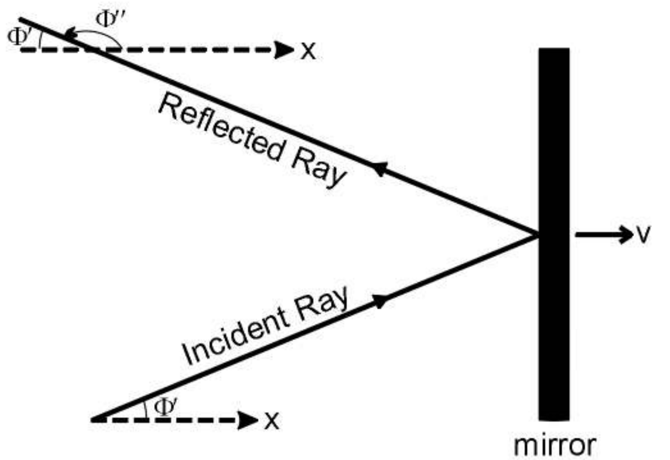
When the velocity of a galaxy is interpreted by reason of an observed galactical redshift to be receding from the Earth at an appreciable fraction of the velocity of light or greater, the relativists use the relativistic redshift equation (shown above) instead of the classical magnitudes of velocity, because no matter how large the observed magnitudes of redshifts become "the velocity can never quite equal the speed of light." (Seeds, p. 365) Does such *ad hoc* relativistic redshift equation eliminate the theoretical conflict? Of course not.

Figure 30.3 Einstein's Relativistic Redshift Equation

Source: Seeds, p. 365



A. A source S in K emits a light ray that is incident on the moving mirror at an angle Φ relative to the x-axis on K.



B. The angle that the incident ray makes with the x-axis is Φ′. The angle that the reflected ray makes with the x-axis is Φ″.

Figure 30.4

Source: Miller, pp. 295, 296