GALILEAN ELECTRODYNAMICS

Volume 5
1994

PO Box 545
Storrs, CT 06268-0545
U.S.A.

GALILEAN ELECTRODYNAMICS

Experience, Reason, and Simplicity Above Authority

January/February 1994 (Vol. 5, no. 1) **P.O. Box 545, Storrs, CT 06268-0545**

Contents

EDITORIAL POLICY

Galilean Electrodynamics aims to publish high-quality scientific papers based on experimental evidence even if their interpretation of it runs counter to the conventional orthodoxy. In particular, it publishes papers supporting the position that Einstein's interpretation of the Relativity Principle is unnecessarily complicated, has been confirmed only in a narrow sector of physics, leads to logical contradictions, and is unable to derive results that must be postulated, though they are derivable by classical methods.

Though the main purpose of the journal will be publication of logically correct and experimentally supported theories contradicting the Einstein theory, it will, should the occasion arise, publish related, or even unrelated physical topics that rest on logically and experimentally firm ground in challenging other theories cherished by physics orthodoxy.

Where there is more than one theory contradicting accepted opinion and interpretation, but all of them meet the criteria of faultless logic, greater simplicity, and absence of experimental contradiction, none of them shall be favored, except when Ockham's razor yields an overwhelming verdict.

All papers are reviewed by qualified physicists, astronomers, mathematicians or engineers. Rejection on the sole grounds that a submitted paper contradicts accepted opinion and interpretation will be ignored. The papers in Galilean Electrodynamics are generally limited to challenging established orthodoxy or defending it against such direct or indirect challenges.

No paper contradicting experiment will be accepted; however, papers making a case why the current interpretation of observed effects may be erroneous will be considered for publication.

All papers are expected to be in the realm of physics, mathematics, astronomy or engineering; non-mathematical, philosophical considerations will generally not be accepted unless they are fairly short and have something new and outstanding to say. Papers reporting experimental results will be given preference over theoretical papers of equally high standard.

Shorter papers will be preferred over long papers of comparable quality; and papers easily grasped at the level of keen seniors and graduate students will be given emphatic preference over esoteric analyses accessible only to a limited number of specialists.

However, none of these restrictions (other than length and subject area) apply to book reviews, news items, and readers' letters; these are solicited and encouraged to be vividly interesting.

Authors do not have to pay any page charges; but once an author's paper has been accepted (after being submitted in 3 copies in any well readable form), it should be submitted on a diskette (see Instruction to Authors overleaf). Papers submitted in TeX are welcome, but not obligatory.

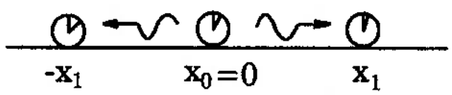
SPEED-SYNCHRONIZATION CIRCULARITY

by W. Vincent Coon
818 6th Avenue
Salt Lake City, UT 84103

We can neither measure instantaneous speed nor synchronize separated clocks with absolute assurance. The reason is that velocity determination and clock synchronization depend on each other. Hence the realization that Special Relativity's Principle of light speed invariance (PLSI) is circular and self-fulfilling. PLSI can only base itself upon presumed (not affirmed) velocity/synchronization. In other words, Einstein's Second Postulate can only be a fiat, not a true find of nature.

The Problem of Synchronization

We are faced with the task of synchronizing separated clocks. Consider a row of clocks stationed along the axis x as illustrated. A clock at $x_0 = 0$ is equipped with a wavicle source. All clocks including those at $\pm x_1$ have wavicle detectors. We wish to use the wavicle pulses originating at x_0 to synchronize clocks at $\pm x_1$ with the x_0 clock.



Let us accept that the laws of motion are valid in this scenario, and in particular, recognize that

$$\vec{F} = \dot{\vec{P}} = m\dot{\vec{V}} + \vec{V}\dot{m} \qquad (1)$$

expresses the second law.

Inspection of (1) informs us that, in general, net force acting upon something is relative because $\vec{V}$ is relative.

In the present scenario, we may consider that a brief force instigates the emission of wavicles from x_0 precisely as the attending clock registers time t_0. That the same magnitude of force acts upon wavicles in the $\pm x$ directions is given. This does not inform us as to the velocities of the departing wavicles because we cannot be certain of their inertia or rates of change of inertia, without actually measuring their velocities. The "known" force must itself be expressed in units of momentum per time which presupposes velocity/acceleration measurements of "known" masses.

In attempting to perfectly synchronize clocks, we cannot take the relay's inertia for granted. Inertia cannot be assumed constant and laboratory standards peremptory. It is entirely possible, for instance, for lab frames to pass unaware through mass, meterstick and clock effecting fields, all in keeping with the laws of motion. A body's acting inertia may increase as a function of motion with respect to such fields [1], [2].

So force cannot, with certainty, provide us the signal velocities. Surely there must be some kinematic way? Let the wavicles be reflected back at a pre-determined distance from x_0 and divide double the distance by the delay. Unfortunately, this approach gives us only an average, round-trip speed, not the instantaneous speeds. We cannot be certain that the speed with which a wavicle is sent is the same with which it returns, because we cannot be absolutely sure that its inertia is the same when traveling in opposite directions relative to x_0. Neither can we synchronize a portable clock at x_0 and expect it to remain synchronized while it is carried to other locations. We are brought full circle to the fact that absolute synchronization of separated clocks requires absolute knowledge of the relay's relative velocity.

In a universe in which everything we think we know depends on experience and measurement we confront a dilemma. It seems that there's no getting started without making assumptions. So it is with the velocity-synchronization marriage.

In order to synchronize clocks at a distance, we must know the relay velocity, but in order to measure the relay velocity, we must have synchronized, separated clocks.

So Says the Second Postulate (the PLSI)

Special Relativity Theory (SRT) does not escape this circular dilemma. Two observers situated in inertial reference frames S and S' each determine that the speed of a particular electromagnetic (EM) wave front, in a vacuum, is isotropically invariant. Of course they do! Each presumes to know the speed of light in his or her reference frame and has synchronized S or S' clocks accordingly. It must be emphasized that the PLSI in concert with the principle of relativity, requires more than clock-rate retardation and Lorentz-Fitzgerald contraction. Time-position dependence or relative simultaneity (RS) is essential to the Einstein interpretation of the Lorentz transformation.

RS is the capricious consequence of S and S' clocks becoming synchronized in accordance with presumed, not proven, relay speed. The situation is somewhat analogous to synchronizing a row of clocks parallel to a wind by means of an acoustical signal. If one stubbornly maintains that the speed of sound is the same, relative to the clocks, with or against the wind, and synchronizes the clocks accordingly, the time pieces will uphold this perception and could be made to indicate the same speed of sound as that determined by a row of clocks in still air. Similarly, as long as S and S' observers presume to know the speed of light by axiom (fiat) and synchronize their clocks presumptuously, their standards will comply.

The strange symmetry which PLSI invokes exploits the flexibility (uncertainty) in interpreting synchronization. *An interpretation of synchronization effects one's evaluation of the lengths of moving meter sticks and the clock-rates of moving clocks.* So it is that each evaluates the other to be clock-rate retarded and motionward contracted because synchronization is interpreted in favor of PSLI which means that the accepted simultaneity of each inertial frame is made to differ from another.

If, however, observers are willing to admit their ignorance about relay speeds and synchronization, it will be understood that none are required by nature to accept the PLSI.

Let S clocks be synchronized on the presumption that light speed is isotropically constant in that frame. Let uniform motion exist between S and S' and let a particular EM wave front be the subject of attention. The S' observer is thoughtfully uncertain about any speed and synchronization, but, for the sake of compliance, opts to accept the S clocks as "truly" synchronized. In a whim, this destroys SRT's version of the relativity of simultaneity, but what becomes of meter stick and clock-rate comparisons?

If S' clock-rates seem adjusted, according to S, such that

$$\Delta t' = \Delta t / \gamma \Rightarrow dt'/dt = \gamma^{-1} \tag{2}$$

then S clock-rates seem modified by a factor $dt/dt' = \gamma$ according to measurements in S'.

Both S and S' observers reciprocally agree about which clocks seem to be running slower or faster.

Likewise if metersticks, parallel to the direction of motion, seem to be adjusted such that

$$\Delta x = \Delta x' \gamma^{-1} \tag{3}$$

then (3) is agreeable to both S and S' and $\Delta x' = \Delta x \gamma$ obviously follows.

With coinciding origins at $t = t' = 0$, the coordinate transformation between reference frames is

$$\begin{aligned} x' &= (x - vt)\gamma = x\gamma - v't\gamma^{-1} \\ y' &= y \\ z' &= z \end{aligned} \tag{4}$$

$$t' = t\gamma^{-1} \tag{5}$$

or alternately

$$\begin{aligned} x &= (x' + v't')\gamma^{-1} = x'\gamma^{-1} + vt'\gamma \\ y &= y' \\ z &= z' \end{aligned} \tag{6}$$

$$t = t'\gamma \tag{7}$$

Where v is speed in S units and v' describes the same motion, but measured according to S' standards.

It follows that the parallel velocity transformation is quasi-galilei relativistic:

$$d\vec{x}'/dt' = d(\vec{x} - \vec{V}t)\gamma / \gamma^{-1}dt = \gamma^2[(d\vec{x}/dt) - \vec{V}] \tag{8}$$

$\|\vec{V}'\| = v' = \gamma^2 v$ merely represents a conversion of units. If $dx/dt = c$ then the speed of light in the positive x, x' direction, according to S', is $\gamma^2(c - v)$.

Lorentz-like effects can be ascribed to motion with respect to fields or substrata which need not be considered at absolute rest. PLSI and RS are not of necessity implicated.

For whatever reason, the S' frame may seem Lorentz contracted and clock-rate retarded relative to S. This does not automatically mean that S' symmetrically determines the same of S. Whether or not S seems motionward compressed with slower running clocks relative to S' depends on the selected "synchronization" of S' clocks. If S' clocks are synchronized in order to give the EM wavefront the same constant speed in S' as perceived in S, then this alleged synchronization will permit the S' observer to determine that S clocks run slow and S lengths are contracted.

If, however, all S' clocks are made to read the same as adjacent S clocks (for instance when an adjacent S clock reads $t = 0$), this will augment S' evaluation of S standards thereafter. S' will nevertheless seem Lorentz contracted with slower running clocks, relative to S, but all S' clocks will now seem to run in phase.

Of course relative to S', S will now seem stretched in the direction of motion and S clocks will seem to run hyperactively in phase with each other. Most importantly, the speed of the EM signal will be revised relativistically.

Appropriate readjustments of S and S' clocks can cause the inertial frames to trade perceptions. For instance, S' clocks can be re-synchronized back to the belief that the EM signal moves with constant speed everywhere in S'. S clocks can then be reset to go along with S''s asserted synchronization. S' would then no longer seem Lorentz contracted and clock-rate retarded relative to S. On the contrary, S would seem Lorentz contracted, etc., according to S'. The situation would be the converse of that previously described.

Concluding Remarks

A particular light speed is so rapid as to appear instantaneous to ordinary sense. This fact affords us the perception of simultaneity among events in our local space. We are able to make, what we believe, are good measurements of many rates of change in the world around us.

But, in order to be absolutely certain of the magnitude of any relative velocity, it must be measured over intervals of known distance and time. This requires the empirical synchronization of separated clocks. Here we are frustrated because we have no other way of certifying that two clocks are indeed synchronized except that separation and relay velocity are certain to begin with.

Unlike "heuristic" SRT, the exact means or media of signal propagation must be sought. This, it seems, would bolster the belief in universal or absolute time, but it is doubtful that all equivocation can be eliminated.

It may be argued that in order to be certain that two clocks are synchronized, we need a reliable instantaneous relay. Infinite speed, if it can be called a speed, is the natural speed limit in a Galilei relativistic universe. The Galilean transformation can be expressed in the form of the Lorentz transformation by letting $c=\infty$, and subscribing to the rules of extended real numbers such that $V/c=0$ for $0 \le V < \infty$; but what becomes of space, time and synchronization at transfinite speed is undefined.

REFERENCES

1. Beckmann, Petr. "Einstein Plus Two." Golem Press (Box 1342), Boulder, Colorado 80306, pp. 53-56, 128-139.
2. Sokolow, Leonid. "A Dual Ether Universe." Exposition Press, Inc. 900 So. Oyster Bay Rd., Hicksville, New York 11801, pp. 61-65.

GALILEAN ELECTRODYNAMICS

Volume 7
1996

PO Box 545
Storrs, CT 06268-0545
U.S.A.

GALILEAN ELECTRODYNAMICS

Experience, Reason, and Simplicity Above Authority

Nov./Dec. 1996 (Vol. 7, no. 6) **P.O. Box 545, Storrs, CT 06268-0545**

Contents

EDITORIAL POLICY

Galilean Electrodynamics aims to publish high-quality scientific papers based on experimental evidence even if their interpretation of it runs counter to the conventional orthodoxy. In particular, it publishes papers supporting the position that Einstein's interpretation of the Relativity Principle is unnecessarily complicated, has been confirmed only in a narrow sector of physics, leads to logical contradictions, and is unable to derive results that must be postulated, though they are derivable by classical methods.

Though the main purpose of the journal will be publication of logically correct and experimentally supported theories contradicting the Einstein theory, it will, should the occasion arise, publish related, or even unrelated physical topics that rest on logically and experimentally firm ground in challenging other theories cherished by physics orthodoxy.

Where there is more than one theory contradicting accepted opinion and interpretation, but all of them meet the criteria of faultless logic, greater simplicity, and absence of experimental contradiction, none of them shall be favored, except when Ockham's razor yields an overwhelming verdict.

All papers are reviewed by qualified physicists, astronomers, mathematicians or engineers. Rejection on the sole grounds that a submitted paper contradicts accepted opinion and interpretation will be ignored. The papers in Galilean Electrodynamics are generally limited to challenging established orthodoxy or defending it against such direct or indirect challenges.

No paper contradicting experiment will be accepted; however, papers making a case why the current interpretation of observed effects may be erroneous will be considered for publication.

All papers are expected to be in the realm of physics, mathematics, astronomy or engineering; non-mathematical, philosophical considerations will generally not be accepted unless they are fairly short and have something new and outstanding to say. Papers reporting experimental results will be given preference over theoretical papers of equally high standard.

Shorter papers will be preferred over long papers of comparable quality; and papers easily grasped at the level of keen seniors and graduate students will be given emphatic preference over esoteric analyses accessible only to a limited number of specialists.

However, none of these restrictions (other than length and subject area) apply to book reviews, news items, and readers' letters; these are solicited and encouraged to be vividly interesting.

Authors do not have to pay any page charges; but once an author's paper has been accepted (after being submitted in 3 copies in any well readable form), it should be submitted on a diskette (see Instruction to Authors overleaf). Papers submitted in TeX , Word for Windows, or Word Perfect are welcome, but not obligatory.

GALILEAN ELECTRODYNAMICS
Box 545
Storrs, CT 06268-0545
ISSN 1047-4811

Send all correspondence to address above.

FREQUENCY : bimonthly.

SUBSCRIPTION FEES:

Galilean Electrodynamics does not ask for taxpayers' money and will refuse any government subsidies if offered. This is based on the belief that a journal unable to pay for itself by its quality and resulting reader appeal has no moral right to existence; and it may even lack the incentive to publish good science. Subscription fees are therefore equally unorthodox and heavily favor individual subscribers.

Individuals: paying by personal check or cash: $35 for 6 issues, corporations double ($70), taxpayer-subsidized organizations (such as universities and government agencies) quadruple ($140). All orders must be prepaid (foreign orders in US dollars drawn on a US bank). The category is identified by address and method of payment: an individual by his name (at any address) and personal check, money order or cash, the others by their checks. Higher priced categories should note that there is no objection whatsoever to corporations or tax-subsidized organizations using, with or without the journal's knowledge, surrogate individuals whom they reimburse for paying the individual rate if their bureaucracies permit them to do so. Subscriptions by complete volume only. Firm, prepaid orders only; no refunds for canceled subscriptions.

INSTRUCTIONS TO AUTHORS:

The International System (SI), should be used in all papers. For all other points, authors should use past issues as a guide to the form of their papers. In particular, they should try to avoid footnotes (which can only be printed as notes at the end of the paper). References should include the full title, not just the author, of the quoted paper. Unsolicited manuscripts are returned only if a self-addressed, stamped envelope is supplied. Authors should submit three copies of their manuscript in any readable form. If accepted, the paper should be supplied on an MS-DOS 5 1/4" or 3.5" disk, preferably in Word for Windows, TeX, Word Perfect, or otherwise as an ASCII file without word processor control codes. We have recently become able to handle Word for Macintosh files on ***high-density*** 3-1/2 inch diskettes. In all cases a hard copy should be supplied. Exceptions may be made where this would involve excessive hardship.

Short, succinct papers stand a better chance of being accepted, and sometimes even of getting published earlier.

Galilean Electrodynamics (ISSN 1047-4811) is published bimonthly at 15 Timber Drive, Storrs, CT 06268. First class postage paid at Storrs, CT. One-year subscription for individuals is $35. This issue is Vol. 7, No. 6. **POSTMASTER:** send changes to Galilean Electrodynamics, Box 545, Storrs, CT 06268-0545.

From the Publisher

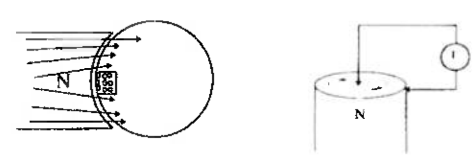
Generalities

It is impossible to remember every experimental fact, and it is just as impossible to remember every useful equation. It is the habit of scientists to "figure things out," rather than memorizing everything. Unfortunately, students often go too far, preferring to memorize nothing, for fear of appearing not to be able to "think." These students usually apply linear formulas to everything: if a dropped ball travels 25 meters during a certain second, it will travel 25 meters during the next; if the potential energy is 50 joules for a spring that is compressed 10 centimeters, it will be 100 joules if the spring is compressed 20 cm. Such thinking, *given the assumptions*, is often correct; unfortunately for the student, the assumptions are wrong, and the conclusions are wrong.

The minimalist compromise for a student wishing to learn physics is to memorize the *definitions* and the *basic laws*, along with a very few conclusions ($v = v_0 + at$, $s = v_0 t + (1/2)at^2$, $\mathbf{a}_c = -\left(v^2/r\right)\hat{\mathbf{r}}$, $\omega = \sqrt{k/m}$) that are used so frequently as to demand being committed to memory. The student who knows the laws and definitions of physics has done the very least possible amount of memory work, and can solve any number of problems, limited only by his creativity.

We presume, however, that the basic laws are known. Perhaps somebody will discover a totally unknown basic law next week, and perhaps nobody will do so for the next millennium; nobody can say until the job is done. But work remains to be done in our basic understanding. For example, Faraday's law of induction is often described in terms of a wire of length L crossing a magnetic field of induction B with velocity v; the *emf* ε is given by Blv (we take everything at right angles, herein). By what is supposedly rigorous mathematics, Faraday's Law becomes generalized to $\varepsilon = -d(\mathbf{B}\cdot\mathbf{A})/dt$, where $\mathbf{A}$ is the area (represented by a perpendicular vector) enclosed by the loop encircled by a wire. Currents and magnetic field lines obey the same rule here: there are no sources, hence they must close upon themselves.

However rigorous the mathematics may be, the result is not a very good description of what happens. For example, the magnetic flux in a transformer remains in the iron core, and the magnetic field in the windings is nil. For another example, the wires of the armature of a motor are always in a region effectively free of any magnetic field. As shown in the figure below, the magnetic field shown crudely by straight arrows mostly remains in the iron, dodging the large gaps where wires reside.



On the other hand, there is the infamous Faraday generator, in which wires connected to the center and periphery of a rotating magnet experience an *emf*, although the magnetic flux through anything going by the name of *loop* is always zero.

If the particular law fails to describe one case, and the general law fails to describe the other, are we possibly missing something?

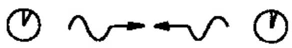
Howard Hayden

Simultaneity Interpretations

by W. Vincent Coon
2706 Dearborn Street
Salt Lake City, UT 84106

It is shown that in inertial frame scenarios, the Einstein interpretation of the Lorentz Transformation (LT) competes with other transformations which do not support light speed invariance. These rival transformations can be obtained by re-evaluating LT simultaneity which is susceptible to overhauling.

Introduction



Isotropy postulates of space and the speed of light are the basis for defining simultaneity in Special Relativity Theory (SRT). The illustration above depicts a typical text book scenario in which two identical clock-transmitters send signals toward each other precisely as each clock registers an agreed time. If the signals meet at a point exactly mid-distant between the clocks, the clocks are said to be synchronized. Supposedly the signals have the same speed relative to the clocks. This is an assumption that should not be taken for granted. In order to confirm that the signal speeds are the same, they must be verified empirically. But unambiguous measurements of one-way speed are impossible because of *speed-synchronization circularity* [1, 2, 3, 4]. You see, *in order to measure a signal's one-way speed we depend on synchronized, separated clocks, but in order to synchronize separated clocks we must know a signal's one-way speed to begin with.* Defending light speed invariance by SRT's clock settings is therefore tautological. In short, the isotropy assertions of SRT remain postulates because they cannot be proven. Because these assertions cannot be proven, the synchronism required by light speed invariance is vulnerable to reassessment. Revisions of "synchronization" are accomplished by resetting clocks according to other standards of alleged simultaneity which are no less provable. The following exercise shows how to go about this algebraically.

Where is When?

Let S and S' represent standard inertial reference frames and let us arbitrarily choose a Galilean Transformation (GT) to describe the coordinate systems in relative motion.

$$x' = x - vt \tag{1}$$
$$t' = t \tag{2}$$

An observer in S' questions the synchronization of S' clocks and resets the clocks so that

$$\tau' = t - R'x' \tag{3}$$

τ' is the new clock reading at x'. t is the previous clock reading at x' and R' is an arbitrary real constant in units of inverse speed. $-R'x'$ is the temporal or clock adjustment made at x'. Having accepted a new standard of simultaneity, S' evaluations of many S standards change. It was pointed out in [1] that *an interpretation of synchronization affects one's evaluation of the lengths of moving meter sticks and the clock-rates of moving clocks.* Kinematics depends on simultaneity dogma and kinetics will follow the lead of kinematics.

Substituting (1) in (3) we obtain

$$\tau' = t(1 + R'v) - R'x \tag{4}$$

Also from (1) and (3) we obtain

$$x = x' + v(\tau' + R'x') = (x' + V'\tau')(1 + R'v) \tag{5}$$

in which $V' = v/(1 + R'v)$ is the new evaluation of the motion between reference frames according to S'. For convenience let $k' = 1 + R'v$.

Now consider that an observer in S restandardizes all S clocks and then declares them to be truly synchronized. That is

$$\tau = t + Rx \tag{6}$$

Note that the clock resetting procedure followed by an observer in the S frame is similar to the procedure followed by the observer in the S' frame. In other words, R is to S frame re-synchronization what R′ is to S' re-synchronization, though R and R' needn't have the same value. R like R' is an arbitrary real constant with units of inverse speed. This R business may seem a little abstract. The important thing to conceptualize is that Rx represents the adjustment made to a clock at x in the S frame, so that the new clock setting at this point is given by equation (6) in which t is the old clock reading at x.

Rearranging (6) and substituting it in (1) we obtain

$$x' = x - v(\tau - Rx) = (x - V\tau)k \tag{7}$$

V is the new reference frame speed evaluated in S after all S clocks are reset. Relative speed itself has not changed, but the clock standard by which speed is evaluated in S has been adjusted. $V = v/k$ and $k = 1 + Rv$. Solving for $\tau(\tau', x')$ and $\tau'(\tau, x)$ using previous equations, we obtain

$$\tau = \tau'V'V^{-1}k' + x'V^{-1}(k' - k^{-1}) \tag{8}$$

and

$$\tau' = \tau V V'^{-1} k - x V'^{-1} (k - k'^{-1}) \qquad (9)$$

Equations (7) and (9) (or (5) and (8) alternately) are general enough to represent a wide range of transformations. Gathered together and re-presented the pertinent equations of this ultra-generic transformation are:

$$x = (x' + V'\tau')k' \qquad (5)$$

$$\tau = \tau' V' V^{-1} k' + x' V^{-1} (k' - k^{-1}) \qquad (8)$$

or inversely

$$x' = (x - V\tau)k \qquad (7)$$

$$\tau' = \tau V V'^{-1} k - x V'^{-1} (k - k'^{-1}) \qquad (9)$$

where $k' = (1 + R'v)$, $k = (1 + Rv)$ and the old and new evaluations of reference frame speed are (depending on the frame) related by $V' = vk'^{-1}$ and $V = vk^{-1}$. All that has been done is to systematically reset clocks in *S* and *S'* and to declare them synchronized and yet this operation is sufficient to affect (even dramatically) *S* and *S'* evaluations of each other. Observers in *S* and *S'* have the right to re-evaluate simultaneity because, after all, *S* or S' clocks may have been mis-synchronized to begin with. Who is to say that *S* or S' clocks are not now correctly synchronized?

Two broad classifications of transformations are contained in the ultra-generic transformation. These are symmetric and asymmetric transformations. Asymmetric transformations are cases in which $k \neq k'$. Furthermore, it is useful to group those transformations which are synchronistically like the Galilean Transformation. Simultaneity interpretations in which $k^{-1} = k'$ render quasi-Galilean transformations. In these cases, clocks assigned to an observed reference frame are ostensibly in phase with each other regardless of the difference between *S* and S' clock-rates. There is no "relative simultaneity" (broadly defined) in quasi-Galilean cases. Both *S* and *S'* observers agree about their differences when comparing clock-rates and motionward lengths.

Symmetric transformations (including the LT) are contrived by setting $R = R' \Rightarrow V = V'$ and $k = k'$. Thus

$$x' = (x - V\tau)k \qquad (10)$$

$$\tau' = \tau k + x V^{-1} (k^{-1} - k) \qquad (11)$$

or inversely

$$x = (x' + V\tau)k \qquad (12)$$

$$\tau = \tau' k - x' V^{-1} (k^{-1} - k) \qquad (13)$$

The GT ($R = R' = 0 \Rightarrow k = k' = 1$) is unique in satisfying both $k^{-1} = k'$ and $k = k'$. The GT may be regarded as the formal link between quasi-Galilean and symmetric transformations. The LT is clearly not the only transformation with a dubious, yet self-consistent symmetry.

Setting

$$R = R' = -v^{-1} + (v^{-2} + c^{-2})^{-1/2} \Rightarrow k = (1 - V^2 / c^2)^{-1/2}$$

gives a generic LT.

$c \neq 0$ in this case can be regarded as an arbitrary constant. Light speed invariance isn't necessarily implied. Nothing has been stated thus far about light speed isotropy in *S* or S'. The above exercise demonstrates that a Lorentz Transformation can be obtained from a Galilean Transformation and vice versa. More generally, by resetting clocks in a prescribed manner and declaring them synchronized, infinitely many variations from the LT and GT are possible.

Now, if the speed of light were isotropic in either *S* or S' under the Galilean Transformation, the speed of light would not evaluate to be isotropic in *S* and S' after assuming a Lorentz Transformation (by clock readjustment). Conversely, light speed isotropy under a Lorentz Transformation guarantees light speed anisotropy under other symmetric transformations. Light speed anisotropy in all inertial frames is no more strange than ubiquitous light speed isotropy. It is capricious to choose light speed isotropy as the grounds for accepting one synchronization standard over another.

Light speed isotropy is a separate issue from that of producing a transformation with the form of the LT. Just because a Lorentz Transformation describes the coordinates of *S* and S' where once a GT described them, does not necessitate light speed invariance. If the speed of light happens to be isotropic in *S* under a Lorentz Transformation, it will also evaluate to be isotropic in S' granted that c is the appropriate value.

It is possible for speeds to figure faster than c after reassessing synchronization. Even the LT does not strictly forbid "super luminal" speeds (Tachyon speeds if you like), despite bazaar consequences such as "backwards time travel." Common sense seems to favor some simultaneity interpretations over others, especially in instances in which a thing arrives at a clock that reads earlier than the clock it left. But even in these instances, we must be careful not to assert our prejudices too strongly.

Despite more outrageous simultaneity interpretations, there remain countless subtle transformations which are no less acceptable than the LT. In these alternatives, the speed of light *"in vacuo"* does not evaluate as a universal constant. These rivaling transformations are possible because the isotropy of an environment is uncertain. The instantaneous speed of light is as Winnie, Ungar, and this writer have attested, unverifiable.

As for the Einstein versus Lorentz interpretation of the LT, it should be clear that an unverifiable absolute speed is not more desirable than an undetectable transforming aether. Velocity dependent clock-rates and inferred length contractions do not guarantee light speed invariance. The synchronization scheme of SRT must be verified independently, if light speed invariance is to stand on empirical ground. The trouble is that in a universe of uninterrupted inertial reference frames, SRT synchronism cannot be confirmed. In such a universe, SRT clock settings are not privileged over other interpretations of simultaneity.

"New" Kinetics

As demonstrated, "new" interpretations of simultaneity beget "new" kinematics. In symmetric cases

$$u_x = dx/d\tau = (dx'/d\tau' + V)k\left[k - (k^{-1} - k)V^{-1}dx'/d\tau'\right]^{-1} \quad (14)$$

and

$$u_y = dy/d\tau = dy'/d\tau'\left[k - (k^{-1} - k)V^{-1}dx'/d\tau'\right]^{-1} \quad (15)$$

"New" kinematics bring "new" evaluations of momentum and inertia, thus

$$m' = m\left[k - (k^{-1} - k)V^{-1}dx'/d\tau'\right]^{-1} \quad (16)$$

where m represents an object's inertia in S and where m' is the object's inertia according to S'. The work equation

$$E = \int Mudu + \int u^2 dM \quad (17)$$

may then be invoked. In Einsteinian kinetics, (17) produces $E = \Delta MC^2$. The celebrated expression is also obtained in quasi-Galilean kinetics.

Clearly kinetics cannot be used to prove 'synchronization' because kinetics conforms to simultaneity interpretation.

We shouldn't be too impressed with the fact that the SRT interpretation of the LT, like other symmetric transformations, demonstrates a certain consistency which leads to a consistency in kinetics. Consistency of the sort demonstrated by symmetric transformations is not enough to elect any of these to represent the natural world. The relevance of a transformation to the real world must depend on how it behaves in a universe of inertial interruptions (starts, stops, and changes of direction).

Arguing that a transformation is only fully applicable in inertial frames raises the suspicion that the transformation may only qualify for a universe of uninterrupted, rectilinear velocities. The uniform motion loop-hole that is often resorted to to rescue SRT from dilemmas of non-inertial situations does as much to damn the theory. SRT *must function in a universe of inertial interruptions if it is to be physically relevant at all.*

The heart of the problem with SRT is Relative Simultaneity. Einstein's LT is only one of a class of transformations ($k^{-1} \neq k'$) that can be interpreted to involve some kind of relative simultaneity. In the real world "relativity of simultaneity" is confounded [5].

REFERENCES

[1] Coon, W. Vincent, "Speed-Synchronization Circularity." *Galilean Electrodynamics*, vol. 5, No. 1, pp. 10-12 (1994.)

[2] Ungar, Abraham. "Ether and the One-Way Speed of Light." *Am. J. Phys.* **59** (9), p. 814 (1988).

[3] Ungar, Abraham. "The Lorentz Transformation Group of the Special Theory of Relativity Without Einstein's Isotropy Convention." *Philosophy of Science* **53**, pp. 395-402 (1986).

[4] Winnie, John A. "Special Relativity Without One-Way Velocity Assumptions." *Philosophy of Science* **37**, pp. 81-99, 223-238 (1970).

[51 Hill, Charles M. "On the Synchronization of Clocks." *Galilean Electrodynamics*, Vol. **5**, No. 3, p. 54 (1994).

Correspondence

"The Definition of Simultaneity."

Ah, if nature were just so simple! The citing of Marinov and Silvertooth experiments is a strong hint that Dring has not been particularly thorough. The evidence is that both of these experiments were hoaxes or particularly poorly executed. No one, other than Marinov, has every reported seeing his experimental apparatus — even when they asked to see it. If one analyzes the Silvertooth experiment one finds that even if the postulated explanation of the experiment were correct, it would still not give rise to the observed data. Silvertooth apparently does not understand how electromagnetic waves interfere.

More than 50 years ago Ives showed how length contraction would cause the Marinov apparatus to twist such that a null result would be observed. Before Dring tries some new variation of the Marinov experiment, I would strongly suggest that: (1) he carefully analyze the effects of length contraction on the straightness of his rod; (2) that he analyze the effect of mass increase with velocity on its (variation) in rotation rate; and (3) that he consider the effect of a finite beam width on the direction at which light will reflect from a moving mirror. I have analyzed a lot of variations of mechanical experiments. I have yet to find any variation which can provide a common spatially extended clock..

Ronald R. Hatch
1142 Lakme Avenue
Wilmington, CA 90744

Author's Response

I am responding to Hatch's comments on my Simultaneity paper. Hatch claims that there can be no spatially extended clock since a rotating rod placed in motion would undergo a twist, making the rod useless as a clocking device. To support this claim he refers to a paper by Ives [1], which derives the twist using the Fitzgerald contraction. I disagree with the twist hypothesis for three reasons. (Continued, page 115)