

# Absolute Magnitudes of Physics

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## 1 Abstract: Absolute Magnitudes of Physics

A universe of motion composes the physical universe, in which motion is a reciprocal relation between space and time. All motion consists of discrete units. Each individual unit of motion is a relation between one unit of space and one unit of time, a motion at unit speed. This unit speed and its constituents, clock time and clock space, are absolute magnitudes. Unit speed is identified with the speed of the physical locations of photons. Absolute magnitudes do not exclude relative magnitudes, such as material speed, coordinate space and coordinate time. Mass, invariant with speed, as reported by I. Newton, L. Oken and D. B. Larson, is another fundamental absolute physical magnitude. The contention of some teachers of the theories of relativity that mass near unit speed is a relative magnitude, not an absolute magnitude, results from the misinterpretation of the equation,  $E=mc^2$ .  $E$  does not denote the total energy of a moving mass, but rather only the rest energy of the mass.

## 2 Introduction

Many of us know what time and space are, when we do not think about them. When we start thinking about them, we are not so sure. Most of us believe that time passes, time progresses, time does not stand still, time has no stop, time does not stop.

Does anyone know the finite speed of time, say with relation to space; when is this speed uniform, when non-uniform; when absolute, when relative; when both absolute *and* relative?

Newton<sup>1</sup> believed that absolute space is immovable. This implies that, if we further suppose with Newton that absolute space remains always the same, the speed of space with relation to time is and remains zero.

When, like Aristotle, Newton, Einstein and/or Larson, we spend a life time wondering and learning about these fundamentals of physics, space and time, we are likely to find that we learn more about them only by making and repeating old mistakes, correcting old mistakes and making and repeating new mistakes. We are reminded to appreciate Will Roger's sage observation: "We all are ignorant except about different things." Truth is by no means manifest, is hard to come by, but what science is about.

## 3 Absolute Motion of the Expanding Universe

Nothing has shaken established view about space and time more than the Hubble discovery that the physical universe includes an expanding universe of galaxies. "The expanding universe is not motion

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<sup>1</sup> Newton, Isaac: *Principia*, Vol. I; "The Motion of Bodies," page 6, Translated by Andrew Motte in 1729; Revision prepared by Florian Cajori, Univ. of California Press, Berkeley, 1962.

of the galaxies through space, ...but is the steady expansion of space.”<sup>2</sup> Expansion clearly implies that the well known three dimensional scalar gravitational motion, which is *always INWARD* toward absolute unit speed, is opposed by the less-known three-dimensional disembodied space-time scalar motion at unit speed. Space-time progressions are the *primary* motion, which is *always OUTWARD* from unit speed (unity, the true physical ZERO).

Unit speed, including an absolute unit of space and an absolute unit of time, is an absolute magnitude, equal in measured value to the speed of light in vacuo. The purpose of this talk is to submit data and evidence for the existence of these magnitudes as *absolute* throughout the physical universe.

## 4 Absolute and Relative Motion in the Reciprocal System

In the *Reciprocal System* of physics absolute motion (unit speed), absolute space (clock space) and absolute time (clock time) refer only to the *primary motions*, defined as those motions which can exist independently of the existence of motions of other types. Relative motions (the motion of matter, electricity, light, etc.), relative space (coordinate space), relative time (coordinate time) refer to independent motions, other scalar motions of physical locations that the primary motions open the way for.

In Newtonian mechanics and in Einsteinian physics absolute motion and relative motion are distinguished, but Einstein and Newton agreed neither about their distinction nor their relation.

Newton guessed space to be absolute, because he believed space to be permanently immovable. He was aware that absolutely immovable space can not be sensibly verified. Therefore, he had to introduce a relative space, that is, a stationary spatial reference frame. Such a frame of reference is not any physical entity and is always relative to the human mind that conjures it. Newton correctly guessed that absolute time progresses uniformly (“flow equably”), but was unaware of relative time (coordinate time). Einstein identified relative time with all of time and incorrectly defined time operationally as what you measure with a clock. A clock is useful in physics only to measure absolute time, not relative time (coordinate time) and also to measure absolute space (clock space).

In the end Einstein supposed both space and time and all motion except the speed of light to be relative space, relative time and relative motion.

I think that the reason Einstein and modern physics came to conclude that all motion is necessarily relative has not been sufficiently examined and understood. The reason I suggest: Einstein was less interested in the intrinsic nature and objective reality of physical space, physical-time and physical motion than in their appearance to and through the imagination and inventive skill of the human species to represent them.

A story perhaps best illustrates what then Einstein means when representing time as relative: A graduate student of the Woodrow Wilson School of Political Science wandered over to the Institute of Advanced Study, when Einstein was taking a coffee break. The student approached Einstein and requested the physicist to brief him about the theory of relativity. Einstein responded jokingly and truthfully, “Young man, it’s like this: When you sit with a nice girl for two hours, you think it is only a minute, but when you sit on a red hot stove for a minute, you think it is two hours. That’s relativity.”

In the *Reciprocal System* the two hours of interlude with the nice girl is clock time, which is a moment of absolute uniform time progression, while the seeming one minute is a moment of relative time,

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<sup>2</sup> Davies, Paul, *Edge of Infinity*, page 137, Simon and Shuster, 1981.

related to the savor of the young man's joy. Another name for relative time in the R.S. is coordinate time since its estimation requires setting up a reference frame in the young man's mind. Another moment of absolute time, as measured by a clock, or clock time, is the one minute of his encounter with a red hot stove. Another moment of coordinate time or relative time is the seeming two hours, related to the apprehension of his pain.

Relative time dilation during the coward's fear of death also is aptly expressed by Shakespeare: "Cowards die many times before their death; the valiant never taste death but once."

In the new Reciprocal System of physics, absolute motion, absolute space, and absolute time refer only to the *primary motions*, defined as those which can exist independently of the existence of motions of other types. Primary motions are absolutely uniform motions at unit speed. Relative motion, relative space and relative time in the R.S. are not relative only in the relativistic sense of Einstein, but also refers in the R.S. to independent non-uniform (accelerated motions), which the primary motions open the way for.

## 5 Primary Motion and Independent Motions in the Reciprocal System of Physics

Members of ISUS, Inc. and other supporters of the *Reciprocal System* of physical science assume that the universe is rational, that the same physical laws apply throughout the universe, that the results of experiment are reproducible, etc. These assumptions are accepted by scientists as a condition of becoming scientists, and are not usually mentioned in purely scientific discourse.

We assume that the generally accepted principles of mathematics, to the extent that they will be used in this development are valid.

"*Reciprocal System*" is the name D. B. Larson<sup>3</sup> has given to his revaluation and unification of theoretical physics and engineering practice. The name derives from the mathematical relation Larson has discovered exists universally between time and space. Entities that are *multiplicatively inverse* in their physical relation to each other are referred to as each other's *reciprocal*. D. B. Larson has discovered that there is NO way in which the physical entities, space and time, can be distinguished other than that AS MOTION they are reciprocally related to each other.

Larson rejects as inadequate and grossly misleading the current definition of motion prevailing in physics as "change of spatial relations among bodies." The obvious inadequacy: this definition makes no mention of time. However, motion is as impossible without time as without space. At best this definition is grossly misleading, because it pertains at all only to one of the two reciprocally related sectors of the physical universe—the material sector. It is only in this sector, the material sector, that physical entities, i.e. material objects, move in *space*. This kind of motion is properly referred to a three-dimensional spatial coordinate and scalar clock time reference system. The only speeds involved here are less than unit speed. This scheme leaves entirely out of the account, however, representation of those inverse material objects, physical entities of the cosmic sector, the reciprocal of the material sector, that move in *time*. Since these entities move in time with finite inverse speeds in excess of unit speed, their investigation is not properly referred to a stationary spatial reference frame, but must instead be referred to a three-dimensional temporal coordinate and scalar clock space reference system

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<sup>3</sup> Larson, Dewey B., *The Structure of the Physical Universe* updated: Vol. I: *Nothing But Motion* (1979); Vol. II: *Basic Properties of Matter* (1988); Vol. III: *Universe of Motion* (1984); *New Light on Space and Time* (1965).

We postulate that the universe is composed entirely of one component, only MOTION, existing in three dimensions and in discrete units.

Larson redefines motion as “the relation between two uniformly progressing reciprocal quantities, space and time.”

Motion, as defined, is *measured* IN TERMS OF SPEED, the scalar magnitude of the relation between space and time. By the reason of the postulated reciprocal relation between space and time, each individual unit of motion is a relation between one unit of space and one unit of time, a motion at unit speed. This speed is the unvarying absolute speed of all the equal discrete units of motion composing the primary motions of the three dimensional universe of motion.

According to our definition, motion involves the uniform *progression* of both space and time. We define a point, or segment of the line of the space progression *at a given time* as a physical location in space. (We define a point or line of the time progression a given space as a physical location in time.)

The initial point of the progression of an individual unit of motion is zero. As the distance between two points cannot be less than zero, it follows that the primary motions are necessarily OUTWARD, increasing their distances relative to the initial points.

Any two physical locations are progressing *outward* from each other at unit speed, that is, their separation is increasing at the rate of one unit of space per unit of time.

The *natural system of reference* FOR THE *Reciprocal System*, by definition, is that system in which the primary motions do not cause any change in the positions of physical locations.

The natural system of reference evidently is progressing outward at unit speed relative to the stationary spatial system of reference.

The R.S. identifies unit speed as the speed of light. Thus, the speed of light is not the speed of photons through space, but is the speed of their physical locations, whether or not occupied by photons (or galaxies). A corollary is that each photon remains in the physical location in which it originates.

Since the postulate of the R.S specifies that nothing exists other than discrete units of motion and the natural reference system is a direct consequence of the existence of the primary units, this reference system is the *framework*, or *background* OF THE UNIVERSE OF MOTION, and does NOT represent ANY activity IN that universe. This is why the natural reference system, as defined, is the *physical* zero, or datum level, from which all physical activity extends.

The outward progression of the natural reference system relative to the stationary system of reference CAUSES the “expansion of the universe”, reported by the astronomers.

The *Reciprocal System* explanation of the general background of the physical universe is essentially in agreement with the astronomer’s assumption. The R.S. account leads to an absolute uniform unit speed, rather than a speed that varies with the distance, as produced by the kind of an expansion assumed by the astronomers. This difference, however, is easily accounted for, because there is a known force, gravitation, that acts against the outward motion, with a magnitude varying as an inverse function of the distance.

The R.S. explanation of the *universal background*, it is well to notice, is developed from a set of general premises. The advantage of deducing the background rather than assuming its existence lies in the fact that further deductions can be made from the same premises. Instead of a single process involving the universe as a whole, this explanation identifies the expansion as the result of outward

scalar motion of individual physical locations. This opens the way for the existence of other scalar motions of the same physical locations. These other motions Larson calls *independent motions*.

## 6 Different Roles of Primary Motions and Independent Motions

The distinction in the R.S between primary motions and independent motions is essentially a difference between absolute motions and relative motions.

Independent motions are manifested by all observable physical phenomena, including photons (light), electrons and positrons (electricity), positive and negative magnetrons (magnetism), material and cosmic atoms (matter).

Independent motions are relative motions. Independent motions are NOT, however, relative to a state of absolute rest. They are relative to the state of absolute motion at unit speed.

Do not use mathematical zero, therefore, to express the origin of your spatial coordinate system, unless you can find more evidence that a state of absolute rest exists in practice, as Newton does.

Use rather the space-time ratio of unity to express the datum from which all physical phenomena extend, the initial level of all physical activity, as Larson does. Think of unity as the true physical zero.

Absolute motions and relative motions ensue as diverse expressions of one and the same fundamental CAUSE: that space and time are reciprocally related as motion. This same cause also results in space & time being completely and/or perfectly SYMMETRICAL and beautiful, leading Benjamin Franklin to comment that, if you love life, then don't squander time, for it is the STUFF life is made of.

The reciprocal character of the relation between space and time leads to each individual unit of space being EQUIVALENT to an individual unit of time. This equivalence, this one to one correspondence, leads to the absolute unit speed of space time progression.

Until now physicists have found only one absolute finite speed in the physical universe. This is called the speed of light. It is the translational speed of the physical location of each photon in vacuo. It is also the translational speed of physical locations, whether or not occupied by photon or other massless particle.

What constitutes this absolute finite speed? The speed consists of two absolute finitely divisible quantities, the smallest length of space, which Larson has shown is measurable by the reciprocal of the Rydberg wave number constant, and the shortest duration of time unit that is measurable by the value ratio of unit speed to the length of the natural unit of space. The length of the natural unit of space amounts to  $4.55 \times 10^{-6}$  cm, while the natural unit of time is  $1.52 \times 10^{-16}$  sec.

But reciprocal means much more than equivalence of these two units. Physical phenomena, as we know them, and we ourselves would not exist here and now or at all, if the only reciprocal relation between space and time were this relation of equivalence. Although reciprocal implies equivalence, equivalence is not identical with reciprocal.

Physical phenomena, independent motions, come in to existence from a quite different implication of the reciprocity between space and time. Larson's reciprocal postulate requires that in addition to the one to one correspondence or equivalence between space and time, under certain conditions association of  $n$  units of space must exist and under these conditions the  $n$  units of space are equivalent to  $1/n$  units of time and/or under certain other conditions associations of  $n$  units of time must exist and under these conditions the  $n$  units of time are equivalent to  $1/n$  units of space.

## 7 Expanding Universe of Outward Progression and Inward Gravitational Motion

The outward motion due to the progression of the natural reference system always takes place at unit speed, regardless of the size of the aggregate or the distance that is involved. The *net* relative motion of any two gravitating objects with no additional motions is the algebraic sum of the unit outward motion and the inward gravitational motion.

At relatively short distances gravitation predominates and the net motion is inward. Since the gravitational motion decreases with distance, while the outward progression remains constant, the opposing motions will eventually reach equality at some greater distance, which we will call the *gravitational limit*. Beyond this distance the net motion is outward, increasing with distance and approaching unity (the speed of light) at extreme distances.

This theoretical pattern of net speeds is verified observationally by measurements of the Doppler shift in the radiation from the distant galaxies.

## 8 Is Absolute Speed Meaningless and Relative Mass Meaningful?

Some physicists assert that absolute speed is a meaningless motion and that mass is a relative magnitude.

In the light of the R.S. they are wrong on both counts.

Even the relativists maintain that light speed in vacuo is an absolute speed. Is light speed then not an absolute speed? Einstein<sup>4</sup> was unable to explain the absolute motion of electromagnetic waves (light) in vacuo, but he assumed that the event exists:

“Our only way out ... seems to be to take for granted the fact that space has the physical property of transmitting electromagnetic waves, and not to bother too much about the meaning of this statement.”

Space does not do this job by itself; space requires the aid of time. Light speed is the scalar motion of physical locations at unit speed, whether or not occupied by photons or galaxies. Physical locations translate; they are not at absolute rest, the traditional stationary reference frame from which absolute motion and speed are estimated.

I. Newton, who introduced *mass* into physics, discovered it to be another absolute magnitude of motion, gravitational motion. The notion of relative mass is a modern mistake, reported 31 years ago by D.B. Larson<sup>5</sup> and more recently by L. Oken.<sup>6</sup> The mistake stems from a prevalent current misinterpretation of a true result of the theory of special relativity. This is Einstein's mass-energy equivalence equation,  $E=mc^2$ . The error consists of misinterpreting  $E$  to be the total energy of a mass,  $m$ , moving with velocity,  $v = \text{non-zero magnitude}$ .  $E =$  instead only the rest energy of  $m$ , when  $v = 0$ .

4 Einstein, Albert and Leopold Infeld, *The Evolution of Physics*, page 159, Simon and Shuster, New York, 1938.

5 Larson, Dewey B., *The Structure of the Physical Universe*, pp. 22-23, North Pacific Publishers, Portland, Oregon, 1959.

6 Oken, Lev, *Physics Today*, June, 1989, pages 31-36, American Institute of Physics.