

RS2-201: One Dimensional Rotation

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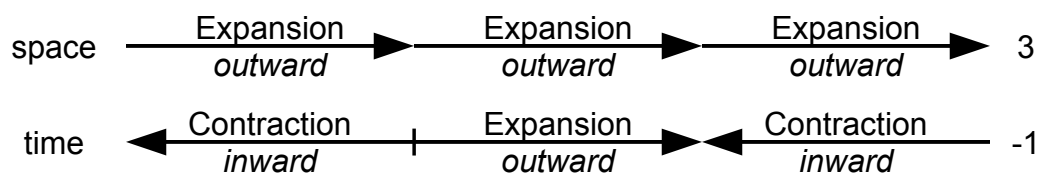
Behind the Scenes of 1D Rotation

Dewey Larson's *Reciprocal System of physical theory* is defined by a universe based on the concept of *motion*, a simple ratio between space and time, s/t , as a multiplicative inverse of *aspects*. In the Reciprocal System, "space" and "time" have no other meaning other than *aspects of motion*, no different from the "heads" and "tails" of a coin. Because it is a multiplicative inverse, the *natural datum* (the origin of measurement) of such a universe of motion is *unity*, $1/1$, which Larson identifies as the *speed of light*.¹ This infers that the "default condition" of the universe is that everything wants to fly apart, in a straight line and scalar fashion (as the galaxies move) at the speed of light.² Larson refers to this as the *progression of the natural reference system*. Because of the unity datum, any motion that equates to unity is the equivalent of "nothing" (how far is the beginning of the tape measure, from the beginning of the tape measure?)

In order for something to exist in this universe of motion, something had to *oppose* this universal expansion in one aspect of motion (space or time), which Larson refers to as a *direction reversal*,³ a quantum change from *expansion* (outward motion) to *contraction* (inward motion) in *one dimension*.⁴ This quantum contraction exists for one natural unit of space or time, running concurrent with the outward progression.

"Since the outward progression [expansion] always exists, independent continuous negative motion [contraction] is not possible by itself, but can exist in combination with the ever-present outward progression."⁵

For example, if the *aspect of space* expands and the *aspect of time* undergoes a direction reversal, the result is a speed of $3s/-1t$; space expands 3 units and time contracts 1 unit.⁶ This difference in speeds and direction create a shear strain, like a bow on a violin string, resulting in simple, harmonic motion:



Larson identifies this series of "direction reversals" as the vibratory motion of a *photon* and the resulting rate of change as its *frequency*.

1 The speed of light is fixed at 299,792,458 m/s, or in natural units of space (s) and time (t), $1 s/t$.

2 Identified in astronomy as the *Hubble expansion* or *recessional velocity*. However, in the Reciprocal System, this expansion is not limited to galaxies flying apart but is also effective at atomic and molecular distances, having been misidentified in conventional science as "dark energy."

3 Identified in the *Law of One* series as "free will."

4 Larson never postulated what causes this "reversal," only that it must exist because the Universe is not empty.

5 Larson, Dewey B., *Nothing But Motion*, North Pacific Publishers, Portland, OR, 1979, page 46.

6 Which Larson calls a "negative displacement" since the net motion is in space. He considers "space" to be negative and "time" to be positive.

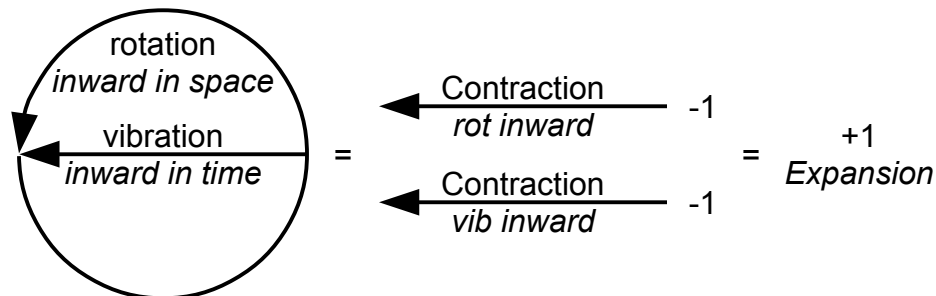
Larson's goal was to define a scalar relationship that would flip the outward expansion to an inward contraction, a process that would pull everything in the universe together. His 1D direction reversal failed to do this, as it would only cancel the outward progression and bring the expansion to a halt—no change—so if the universe were constructed solely of “direction reversals,” it would just freeze in place.

One of the basic principles of the Reciprocal System is that you cannot do the same thing twice in succession. So you cannot put *two* direction reversals together to get a contraction (inward motion). You have to do something else, but he used up his “straight line” functions and resorted to the concept of *scalar rotation*—now that he had a vibrating “line” of a photon to rotate.⁷

Since his vibration is already contracting in time, the rotation must be applied to the *inverse* aspect, space. Because the vibration is a single unit (-1t), the “radius” of rotation could only be a single unit as well, splitting off a single unit vibration from a photon, regardless of frequency:

“Because of the lack of any connection between the vibrational units there is no force resisting separation. When the one unit starts moving inward by reason of the rotation it therefore moves away from the remainder of the photon, which continues to be carried outward by the progression of the natural reference system. Irrespective of the number of vibrational units in the photon to which the rotational displacement was added, the compound motion produced by this addition thus contains only the vibrational units that are being rotated. The remaining vibrational units of the original photon continue as a photon of lower displacement.”⁸

The consequence is that an expansion/contraction pair of progression and direction reversal is extracted from the photon vibration as the “unit” to be rotated. The rotation is also contractive/inward, so a rather unusual situation develops—two negatives make a positive, so the two, contractive/inward motions result in a net, expansive/outward motion at unit speed. Since unit speed is our datum, the RS version of “nothing,” this structure becomes a “rotational equivalent of nothing” and what Larson calls a *rotational base*.



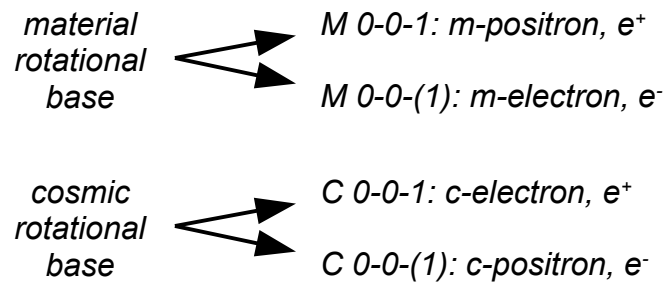
The two concepts involved with Larson's model are:

1. *Direction reversal*, to bring the linear, outward expansion of the Universe to a halt within one dimension and provide a mechanism of “something to rotate” to compound motion.
2. *Scalar rotation*, to cancel the magnitude of the contraction, but keeping its direction in one of the aspects of space or time, resulting in the rotational base—Larson's “physical object” to rotate.

⁷ “Thus, while motion is possible without anything moving, rotation is not possible unless some physical object is available to be rotated.” *Ibid*, p. 57. This conclusion was based on the concept that motion required *two* dimensions, so it could not be applied in a 1-dimensional system.

⁸ *Ibid*, p. 123.

With a rotating physical object at unit speed, Larson then compounds a unit of scalar rotation to either the space or time aspect, resulting in four possible 1D rotational systems (subatomic particles):



Larson’s “displacement” notation is how much a magnitude has *changed* from unit speed, 1/1. A value of 0 indicates no change (a speed of 1/1). A number in parenthesis (1) indicates a change of in the spatial aspect (a displacement of (1) is a speed of 2/1; the numerator increased by “1” from 1/1) and a number without parenthesis is a change in the temporal aspect (a displacement of 1 is a speed of 1/2). The M or C prefix indicates the rotational base he is starting with and the three values (the A-B-C notation) express the speeds in the three possible dimensions of motion, A and B being a 2-dimensional, “magnetic” rotation (2 values, 2 dimensions) and C being a 1-dimensional “electric” rotation. In the above diagram, the m-positron can also be expressed as having “speeds” of 1/1, 1/1, 1/2.

As can be seen, the m-positron/c-electron and m-electron/c-positron particles have virtually identical characteristics from a “displacement” perspective, the former being a 1D temporal rotation and the latter, a 1D spatial rotation. The only difference is the rotational base on which they were constructed, which is basically “equivalent to nothing,” so there is no real difference in their behavior. So why have two of each? Because Larson “put the cart before the horse”⁹ by not recognizing *angular* velocity.

Needless to say, it does not take Dr. Sheldon Cooper¹⁰ to realize that there are a lot of problems with this model of a photon and rotational base, which has been pointed out by researchers into Larson’s theories over the last 50 years in numerous papers¹¹ published in *Reciprocity*.¹²

Rather than go into them, let’s proceed forward with the RS2 reevaluation of this system.

The RS2 Reevaluation

RS2 recognizes that an *angular velocity*, a type of “rotation,” is a 1-dimensional quantity requiring only a single magnitude to express it, such as RPM (rotations per minute). As such, it shares the same character as a *linear velocity*—in other words, you *can* have “rotation, without anything to rotate” as long as it is expressed in the ratio of a *speed* of rotation.

The logic is simple; put on your space suit and get dropped off in the void of space with two baseballs. Throw one—it will continue to fly away in a straight line at a constant, linear velocity. Take the other and give it a spin—it will continue to spin about its axis at a constant, angular velocity. Both of these types of motion are *primary*, in that they are self-sustaining. These motions correspond to the Eastern

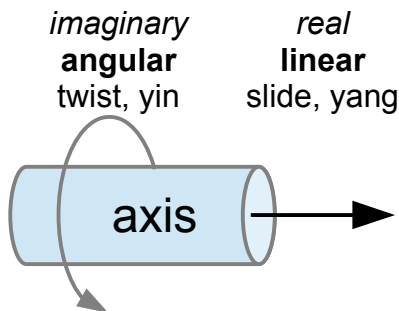
⁹ An old saying that means, “reverse the accepted or logical order of things.”

¹⁰ The theoretical physics genius of the television series, *Big Bang Theory*.

¹¹ See: “[The Law of Conservation of Direction](#),” “[The Photon as Birotation](#),” “Dissecting the Birotating Photon,” “[Birotation and the Doubts of Thomas](#),” “[The Photon: Displacement in a Second Scalar Dimension](#)” and others, available on <http://reciprocalsystem.org/papers>

¹² *Reciprocity* is the journal of the *International Society of Unified Science*, now the *Reciprocal System Research Society*.

philosophical concept of yin-yang (feminine-masculine) and can be represented in a mathematical context as a *complex quantity*, one that contains a “real” or linear magnitude, coupled to another that contains an “imaginary” or angular magnitude.

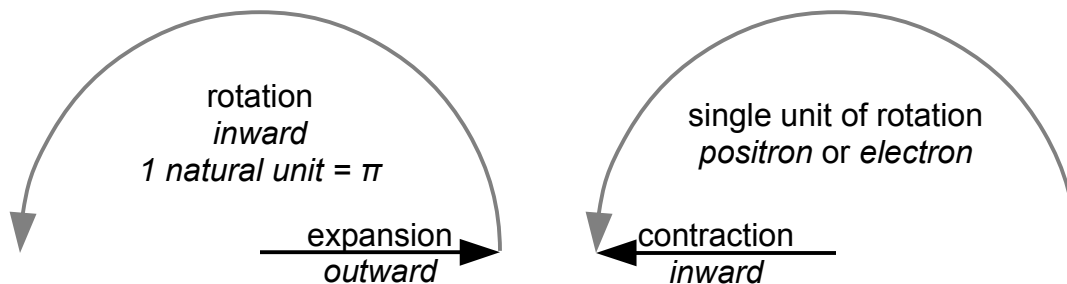


Imaginary quantities can appear confusing at first, because conventional thought tries to treat them as *linear* vectors. A better name for an “imaginary number” is a *rotational operator*, because that is *exactly* what it does—it is a *rotation* or *twisting* of an axis, not a translation or sliding of it.

The mathematical form of a complex quantity is: $a+bi$, where a and b are magnitudes, a being the “real” part and b being the “imaginary” one. The “ i ” notation *should be* an indicator that you are twisting the axis, but conventional mathematics treats it as an *axis designator*, so

they can slide along it in a linear fashion and continue to treat rotation as offsets on two axes. In RS2 application, $a+bi$ is treated as $a+e^{bi}$ in order to retain the rotational behavior of the imaginary quantity.

With the incorporation of 1-dimensional, angular velocity (as “scalar rotation”) to the Reciprocal System, there is no need for the linear *direction reversals* (to create something to rotate) or *rotational bases*. One can proceed directly from the outward expansion (progression of the natural reference system) to inward contraction (gravitation) with a single, *angular* “direction reversal” of a *natural unit of rotation*, an arc length of π radians, because $e^{\pi i} = -1$:



Drawing 1: RS2 version of a rotational “direction reversal”

This is a clean solution, because it conforms to the policy of “not doing the same thing twice,” uses only a single unit of rotation and is indicative of the reciprocal, geometric duality between translation and rotation.

A single, rotational operator such as i is fine for a *one* dimension of rotation (angular velocity), but we live in a 3-dimensional universe, so *three* rotational operators are needed to express 3-dimensional rotation, such as *roll*, *pitch* and *yaw*. The mathematical convention for this is to use the letters: i , j and k to represent the three, rotational axes. When these three rotations are coupled with a single, linear (real) magnitude, the result is a quaternion: $a + bi + cj + dk$.

In RS2, we express these combinations of linear and rotational operators as a *tuple*¹³ where the first element is the real/linear magnitude (a scalar), and the remainder are rotations (a vector). The number of possible dimensions for these tuples is defined by the “real, closed” dimensions of Division Algebra¹⁴, with possible dimensions of 1, 2, 4 or 8:

¹³ A computer term for a finite, ordered list of elements.

¹⁴ In the field of mathematics called abstract algebra, a division algebra is, roughly speaking, an algebra over a field in which division is possible.

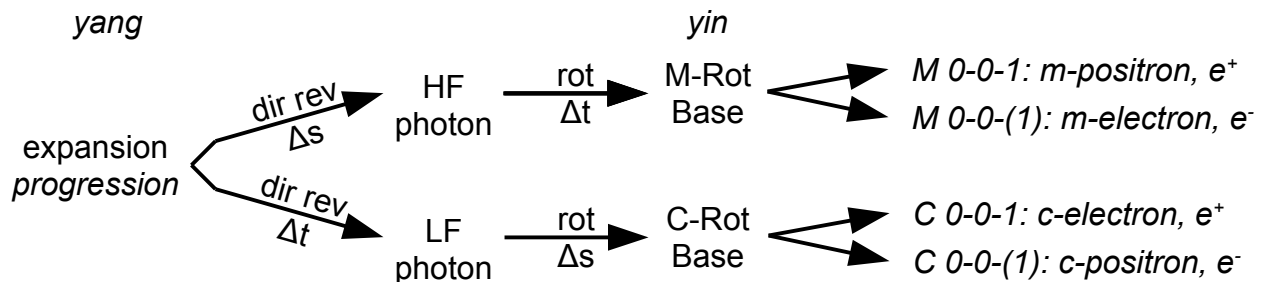
Dimensions	Expression	Concept
1	(1)	The progression of the natural reference system.
2	(w,<i>)	A complex quantity representing 1-dimensional (electric) rotation as an angular speed.
4	(w,<i,j,k>)	A quaternion that represents a 2-dimensional (magnetic) solid rotation, as an angular speed.
8	(w,<i,j,k,l,m,n,p>)	A octonian that represents the structure of a <i>life unit</i> . ¹⁵

In the tuple notation, we can omit the vector (angle brackets) by assuming that the first element is always the scalar and however many elements follow it comprise the vector portion. In the case of the 1-dimensional rotations above, the aspect in which the rotation takes place determines the resultant particle:

Aspect of Rotation	Particle	Displacements	space:time tuple
Space	Electron	0-0-(1)	(1,1):(1)
Time	Positron	0-0-1	(1):(1,1)

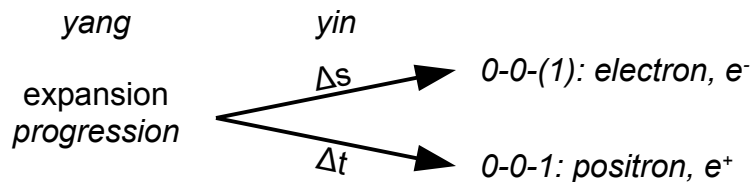
The tuple representation of (1) expresses the outward expansion at unit speed, the progression of the natural reference system. The inverse aspect of (1,1) is a complex quantity mathematically expressing the outward expansion as the “real” or linear component, and the unit rotation as the “imaginary” or angular component. (Note that the sign of the rotation is irrelevant, as a rotation of $e^{+\pi i}$ and $e^{-\pi i}$ both result at the same location of -1 on the real axis.)

To summarize Larson’s logic, in order to go from expansion to a 1-dimensional rotation:



Drawing 2: Larson’s system to create 1-dimensional rotation

Compare that to the RS2 use of rotation as a primary motion:



Drawing 3: RS2 system to create 1-dimensional rotation

¹⁵ Larson, Dewey B., *Beyond Space and Time*, Tucek & Tucek publishers, 1996. Discussion of life units is beyond the scope of this paper and only mentioned to fill in the dimensionality of the tuple table.

By positing that rotation is primary, the system becomes much simpler—but also replaces some of Larson’s natural consequences of an all-linear Universe with new ones:

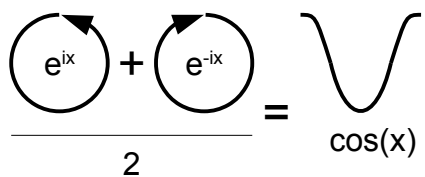
1. Without a direction reversal, the simplest, basic motion of the universe is *not* the photon, but 1-dimensional rotation, an angular velocity. This corrects a long-standing concern that the vibratory motion of the photon is an *accelerated* motion, therefore unable to exist on its own. (There is no way for our spaceman to throw or spin a baseball and have it follow a sine curve.)
2. Without a rotational base, there are only *two possibilities* (not four) for 1-dimensional rotation, a *rotating unit of space*, the *electron*, and a *rotation unit of time*, the *positron*, that can exist in *both* the material and cosmic sectors as they have no internal bias.¹⁶
3. A new concept must be introduced to parallel the “quantum” or “discrete unit” structure of a linear unit of motion, that of a discrete, rotational unit of motion, where one unit is equivalent to a rotation of π radians or 180° .

1-Dimensional Rotational Combinations

Obvious by its absence in the RS2 approach is the photon, the *linear vibration* that Larson uses as the building block of his atomic theory. Originally, the photon was thought to exist as a wave-particle duality and Larson attempts to explain that by showing it is a “particle moving as a wave”:

The photon acts as a particle in emission and absorption because it has the distinctive feature of a particle: it is a discrete unit. In transmission it behaves as a wave because the combination of its own inherent vibratory motion with the translatory motion of the progression of the natural reference system causes it to follow a wavelike path.¹⁷

Recent research has shown the photon to be a more complex particle, exhibiting both electric and magnetic “modes” and polarization that cannot be explained with Larson’s simple, linear vibration. In the paper, “The Photon as Birotation,”¹⁸ Prof. KVK Nehru defines a different model based on a concept he termed *birotation*, that of two, opposing angular velocities that combine to form a simple, harmonic motion that can be expressed with the relations that Leonhard Euler developed in the 18th century:

$$\frac{\text{Clockwise rotation } e^{ix} + \text{Anticlockwise rotation } e^{-ix}}{2} = \cos(x)$$


Due to the fact that the system is quantized moving in steps of π radians, we find that clockwise and anticlockwise rotation are indistinguishable. The only way we can obtain an opposite rotation is to change to the inverse aspect of motion, since “outward” in one aspect is analogous to “inward” in the other; if

the first rotation is in space, the other must be in time and vice versa.

The birotation is therefore constructed of the only two, opposite rotations that we have available: the positron and electron. If we consider this birotation structure to be the simplest form of a photon, then it explains electron-positron annihilation, where an electron and positron collide (creating a birotation) expressed as a *gamma ray*. The reverse situation is also well known, where a gamma ray, a birotation, decays into an electron/positron pair.

¹⁶ Material atomic systems are rotating units of time, so the electron, being spatial, passes through them because the relation of space-to-time constitutes motion. Positrons, also being temporal, cannot move through atoms and are captured by them, adding to atomic displacement. This is why the positron is so rare in the environment, whereas the electron is plentiful.

¹⁷ *Nothing But Motion, Ibid*, p. 54.

¹⁸ KVK Nehru, “The Photon as Birotation,” *Reciprocity* Volume XXV № 3 page 11.

This process of dimensional reduction, going from two rotating systems to a single wave structure also has an interesting consequence: rotation has *area*, and therefore can exhibit the concept of *resistance*, the decrease in momentum over a distance. (Or inversely, *conductance*, the increase in momentum over a distance.) However, the vibratory motion of a birotation *has no area*, therefore not exhibiting either of these properties. These will be discussed in detail later on, but the origin of the concept is here.