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Conceptual Fundamentals

The Reciprocal System Theory introduces two new concepts into physical science: the concept of physical location, and the concept of scalar motion.

The nature of these new concepts can be illustrated by a consideration of the "expansion of the universe" that is postulated in the astronomers' latest theory of the recession of the distance galaxies. As explained by Paul Davies, "the expanding universe is not the motion of the galaxies through space... but is the steady expansion of space." Since the galaxies, on this basis, are not moving through space, each galaxy remains in what we will call a physical location in space. This physical location is moving outward in the context of the stationary spatial reference system, carrying the galaxy with it. While only the galactic motion can be observed, all physical locations necessarily participate in the outward motion, irrespective of whether or not they are occupied by galaxies.

Inasmuch as all galaxies, and the physical locations that they occupy, are moving uniformly outward from all others, each is moving in all directions. A motion distributed uniformly over all directions has no specific, or inherent, direction; that is, it is scalar. Thus the expansion can be described as a positive scalar motion of the all physical locations (represented as outward in the spatial reference system). Out new theory defines a universe of motion in which scalar motion of physical locations is not a unique phenomenon confined to the expansion recognized by the astronomers, but is the basic form of the motion from which all physical phenomena are derived.

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Physics Outline of the Reciprocal System

(For centuries the profession of natural philosophers and/or physicists knew beyond any reasonable doubt that the physical world is and must be continuous, not quantized, not finitely divisible. The atomic theory of Leucippus and Democritus was remembered only in the writings of those correct physicists who, like Aristotle, dismissed it. Their followers, such as Epicurus and Lucretius, were put down as mere poets and 'metaphysicists'. Even to-day the scientific profession has still to learn how it is that the physical world is entirely quantized; that light, electricity, magnetism, matter and 'antimatter' are quantized, because motion, time and space are quantized. Conventional science with its logical positivism and pragmatism has not progressed further in its quantum mechanics and electrodynamics investigation by neglecting to unite theory with practise and experiment. Dewey Larson's Reciprocal System of revalued and unified science has stepped into and over this breach. *Editor's note.*)

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How The Physical World is Quantized

Dewey B. Larson and ISUS,Inc.

Basic Premises

The basic premises of the Reciprocal System theory consist of certain preliminary assumptions, a postulate and a definition.

A. In order to make science possible, some preliminary assumptions of a philosophical nature must be made. We 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.
B. We assume that the generally accepted principles of mathematics, to the extent that they will be used in this development, are valid.
C. We postulate that the universe is composed entirely of one component, motion, existing in three dimensions and in discrete units.
D. We define motion as the relation between two uniformly progressing reciprocal quantities, space and time.

Deductive Development

Each of the following statements is a deduction from the postulate and the preceding statements.The objective of this deductive development is to determine what can exist in the theoretical universe defined by the premises of the theory. In most cases it will be evident that the entity or phenomenon that theoretically *can* exist is identical with one that *does* exist in the actual physical universe, and there are no definite conflicts in any case. To the extent that the outline has been carried, the theoretical universe is thus a correct representation of the observed physical universe.

1. Motion, as defined, is measured in terms of speed, the scalar magnitude of the relation between space and time.
2. By 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.
3. We define the *primary motions* as those which can exist independently of the existence of motions of other types.
4. According to our definition, motion involves a 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.

5. Inasmuch as we postulate that the universe is three-dimensional, we may represent the scalar progression of space by a line in a stationary three-dimensional spatial reference system, measuring the corresponding progression of time by means of a scalar device,a *clock*. In this reference system, a positive motion is represented as *outward* from a reference point, and a negative motion as *inward*.. The terms "outward" and "inward" will be used in preference to "positive" and "negative" to avoid possible confusion with another use of the latter set of terms.
6. The initial point of the progression of the 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 the distance relative to the initial points.
7. The progression is scalar. It is simply outward without any inherent direction. Motion outward from the initial point of the progression is therefore outward in all directions.
8. From the foregoing,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.
9. We define the *natural system of reference* as that system in which the primary motions do not cause any change in the positions of physical locations.
10. From (8), it follows that the natural system of reference is progressing outward at unit speed relative to the spatial system of reference.
11. We identify unit speed as the speed of light.

    (The various features of the theoretical universe emerge from the deductive development without labels. It is therefore necessary to identify the physical phenomena to which they correspond. The correlation is usually quite evident, as in this instance. In any event, it is self-verifying, as any error would quickly show up as a discrepancy in the subsequent development.)
12. Since the postulate 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. The natural system of reference, as defined, is therefore the physical zero, or datum level, from which all physical activity extends.
13. We identify the outward progression of the natural reference system relative to the stationary system of reference as the "***expansion of the universe*** " reported by the astronomers.

At this point we have arrived,by deduction from our basic premises, at an explanation of the general background of the physical universe that is essentially in agreement with the astronomers' ***assumption.*** (Our derivation leads to a uniform outward speed, rather than a speed that varies with the distance, as produced by the kind of an expansion assumed by the astronomers, but this difference 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 advantage of deriving this explanation of the universal background from a set of general premises, rather than merely assuming its existence, lies in the fact that further deductions can be made from these same premises. Instead of a single process involving the universe as a whole, the explanation that we have just derived from the premises of the theory of the universe of motion identifies the ***expansion*** as the result of outward scalar motions of individual physical locations. This opens the way for the existence of other scalar motions of the same physical locations, ***independent motions*** , as we will call them.

14. Once the primary units of motion are in existence, units of inward scalar motion can be superimposed on the outward units. The net magnitude of two such motions is zero, and the combination has no physical properties in a spatial reference system, but it constitutes a base upon which other combinations can be formed.
15. As stated in our definition, motion is a progression. Thus it is not a succession of jumps, even though it exists only in discrete units. There is progression within the units, as well as unit by unit, simply because the unit is a unit of motion(progression). The significance of the discrete unit postulate is that discontinuity can occur only *between* units, *not within* a unit. But the various stages of the progression within a unit can be *identified*.

16. The continuity of the progression within the units enables the existence of another type of scalar motion of physical locations. This is a motion in which there is a continuous and uniform change from outward to inward and vice versa; that is, a ***simple harmonic motion***.. At this stage of the development only continuous processes are possible, but a continuous change from outward to inward and the inverse is just as permanent as a continuous outward or inward motion.
17. In the two-unit complete cycle of the simple harmonic motion the net change of the spatial position is zero. As represented in the spatial reference system, the two-unit combination remains stationary in the universe of motion.
18. From (10), it follows that the physical location occupied by that motion combination(17) moves outward at the speed of light in a second dimension.
19. The path of the combined progressions then takes the *form of a sine curve*.
20. We identify such scalar motion combinations as *photons*.. A system of photons is *electromagnetic radiation*..

    (This derivation shows why radiation has the properties of a wave as well as those of particles. It is composed of particles (discrete units), but the motion(progression) of these particles is wave-like.)
21. The outward movement of physical locations due to the motion of the natural reference system relative to the stationary spatial system carries with it **not only** the photons **but also** any other physical entities that occupy such locations.

    (In addition to the photons, there are certain other massless particles that have no known motion-producing mechanism, and must therefore remain stationary in the natural system of reference, unless acted by some outside agency. There are **also** objects---**very distant galaxies**----that do have a motion-producing mechanism(gravitation), but are so far away that the gravitational motion toward our location has been reduced to negligible levels. All of these objects behave exactly as required by the theory; that is, they move outward relative to the spatial reference system at the speed of light.)
22. There is no inherent relation between the time magnitudes involved in the two different dimensions of the photon motion. One is the time of the progression of the natural reference system. The other is independent of the progression. Thus the *frequency* of the radiation, the number of cycles per unit of the linear progression, can take any value, subject only to the capability of the process whereby the radiation is produced.
23. The postulate that the universe is three-dimensional means that three independent magnitudes are required for a complete definition of each of its basic quantities. Thus three dimensions of scalar motion are possible. In order to distinguish these purely mathematical dimensions of motion from the dimensions of *space*, which are geometrical, as well as mathematical, in the context of a spatial reference system, we will refer to them as *scalar dimensions*.
24. Only one dimension of *motion* can be represented in a three-dimensional spatial system of reference. Each motion shown in such a system is represented by a vector, a one-dimensional quantity having both magnitude and direction, and any combination of such motions can be represented by the vector sum, which is likewise one-dimensional.
25. A scalar motion has magnitude only, and no inherent spatial direction. It therefore has to be given a direction in order to be represented in a spatial reference system.
26. To give directions to the members of a system of scalar motions, it is necessary to couple some one of the moving locations to the stationary reference system in such a way that it is represented as motionless. The directions imputed to the other motions of the system are then determined by their relation to this assumed motionless *reference point*.

    (For example, if we designate out galaxy as A, the direction of the motion of distant galaxy X, as we see it, is AX. But observers in galaxy B see galaxy X as moving in a very different direction BX because they use a different reference point. This contrasts sharply with the directions of the motions of our ordinary experience--vectorial motions--which are the same regardless of the location from which they are being observed. In this vectorial case the direction is the property of the motion.)
27. From (25) and (26), it follows that the factors which determine the direction of a scalar motion are independent of those which determine the magnitude. The direction is a result ofthe nature and location of the coupling of the motion to the reference system. It may be a *constant* direction, as in the outward travel of the photons of radiation, or it may be a *rotationally distributed* direction, one that is continually changing.

28. From (27), the translation motion of a photon, instead of being unidirectional, as in (18) may be rotationally distributed in the reference system. The motion thus distributed, which we will call a *scalar rotation*, is a linear progression with a constant magnitude but a continually changing direction.
29. From (23), scalar rotation can take place coincidentally in three dimensions. From (25), however, it can be represented in a spatial reference system only on a one-dimensinoal basis. The magnitudes of the motions in the three dimensions are additive, and can be represented as a total, but the directions of the different distributions cannot be combined. The representation in the reference system therefore indicates the correct magnitude (speed) of the three-dimensional motion, but shows only the directions applicable to the one dimension of the motion that is parallel to the dimension of the reference system.
30. In the absence of any specific restrictive factor, rotationally distributed scalar motions are distributed over all spatial directions. The magnitude of such a motion toward a point in any given direction is therefore inversely proportional to the second power of the intervening distance. (This is the origin of the "inverse square law.")
31. Inasmuch as the natural reference system progresses outward at unit speed relative to the spatial reference system, no further increment of outward speed is possible, because of the discrete unit postulate. The net total magnitude of a rotationally distributed motion must therefore be inward.
32. If the scalar rotation is less than three-dimensional, the basic photon will move outward as radiation in a vacant dimension, and the motion combination will disintegrate. In order to be stable, the rotationally distributed motion must therefore be three-dimensional.
33. The three-dimensional combination of vibrational and rotationally distributed motions appears in the reference system as an identifiable object moving inward in all directions. We identify such an object as an *atom*, or a *sub-atomic particle*. Collectively, the atoms and particles constitude *matter*.
34. We identify *mass* as a measure of the net magnitude of the rotationally distributed scalar motions of matter. We identify the observable inward-directed effects of this motion as *gravitation*. The magnitude of the gravitational effect is therefore directly proportional to the mass.
35. The inward gravitational motion of the atoms results in the formation of material aggregates of various sizes. In these aggregates the atomic motions (and masses) are independent and additive.
36. 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 involbed (8). 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.
37. 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 reach equality at some greater distance, which we 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 received from the distant galaxies.)

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Albert Einstein on How the Physical Universe is Quantized

"From the quantum phenomena it appears to follow with certainty that a finite system of finite energy can be completely described by a finite set of numbers (quantum numbers). This does not seem to be in accordance with a continuum theory, and must lead to an attempt to find a purely algebraic theory for the description of reality. But nobody knows how to obtain the basis of such a theory."

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Clock Space, Coordinate Space; Clock Time, Coordinate Time;
What is the difference?

by
Ronald W. Satz

At last year's ISUS convention, a number of individuals expressed difficulty in comprehending the difference between clock space and coordinate space and the difference between clock time and coordinate time. This note will review these concepts to aid the understanding of these individuals.

Larson states [1]: "We begin with one-dimensional space s and one-dimensional time t....Dividing space by time we obtain velocity s/t...." Space and time do not exist separately; they exist *only* as aspects of motion. Motion in the most general sense is thus a relation of space to time, and in the Reciprocal System space and time have no properties other than what they have as aspects of motion. In defining motion, we can start with units of space and time, as Larson did in the quotation, or with units of motion and define space and time as the two aspects of that motion; the definitions are equivalent.

The basic space-time unit is thus one-dimensional and is a progression. We reject the Relativity doctrine that space and time are joined in four-dimensional continuum and that space and time magnitudes are purely relative. From the postulates of the Reciprocal System we compute the absolute natural unit of space to be $4.558816\text{x}10^{-6}$ cm and the absolute natural unit of time to be $1.520655\text{x}10^{-16}$ sec. Their ration is $2.997930\text{x}10^{10}$ cm/sec, the speed of light. The progression originates everywhere and is thus omnipresent. Larson stats [2]: "Unit velocity is a ... true physical datum with a finite magnitude." Thus we *begin* with clock space-time, rather than with coordinate space or coordinate time (or a combination of coordinate space with clock time). Conventional physicists (and individuals new to the Reciprocal System) keep trying to start with some type of 3-D or higher metric; we reject this approach entirely.

Coordinate space and coordinate time *result* from clock space and clock time. Larson explicitly states [3]: "There is a general framework of the universe, an extension space, generated by translational motion...."; likewise, there is an "extension" time, generated by translational motion, the progression. This motion is scalarly outward in all directions and thus the overall *distribution* of the 1-dimensional progressing units is 3-dimensional. In *The Unmysterious Universe* [4], I wrote "...with respect to any particular progressing unit, coordinate space and coordinate time include all other progressing units.... The progression of a single unit of space is one-dimensional, but the progression of all space units is distributed in three-dimensions." Stationary coordinate space (or stationary coordinate time) can arise only in the context of a gravitationally-bound material system (or cosmic system), in which the atoms of matter (or c-matter) have neutralized the space progression (or time progression).

When Larson states [5] that "undisplaced space-time is the physical equivalent of nothing" he means that a unit of space-time is *not* a photon, a subatom, an atom, or an electric or magnetic charge. These other entities are interchangeable, either directly or indirectly, but a unit of space-time is not. It cannot be changed into something else, and it cannot be used as an energy source. But this does not mean that space-time is "nothing"; it is unit motion, not zero motion, and is every bit as much an *existent* as anything physical. Larson says [6] "In terms of [a] building analogy, [space and time] correspond to the bricks of which the building [*i.e.*, the universe is to be constructed."

REFERENCES:

1. D. Larson, *New Light on Space and Time* (Portland Oregon: North Pacific Publishers, 1965), p. 226.
2. *Ibid*, p. 83.
3. *Ibid*, p. 242.
4. R. Satz, *The Unmysterious Universe* (Troy, NY: Troy Printers, 1971), p.24, 27.
5. D. Larson, *op. cit*, p. 242.
6. D. Larson, *op. cit*, p. 240.