PREPARING FOR
THE RECIPROCAL SYSTEM OF THEORY

A Primer to the Work of Dewey B Larson (1898-1990)

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Preface

Ever since the publication of *The Structure of the Physical Universe* (1959) and other volumes on physical theory by Dewey B. Larson, there has been a pressing need for the reader to adapt oneself to a different form of thinking to adequately assess the quality of his work. In spite of the fact that numerous calculations throughout the entire body of work strive to clarify the applicability of the theory to practical calculations, uneasiness with the basis on which the development of the theory proceeds is present all too often, preventing full clarity of the subject, resulting in extremes of reader opinions—that it is extremely logical or that it is completely mistaken. Unless the basis of any theory is adequately understood, following the further development becomes increasingly difficult, and if nothing else, the past decades have been living proof of that.

The purpose of this booklet is to take a look at the theory and its development by approaching the fundamental postulates in a slightly different manner than usually presented, for instance, as in Larson's careful descriptions of the *Outline of the Reciprocal System* and Lawrence Denslow's clarification of the *Fundamentals of Scalar Motion*. A basic familiarity is assumed with the ideas in the Reciprocal System of theory, to which the reader is referred to the books already published by various authors and available online. While efforts have so far been made to highlight the development of the theory from the postulates, it appears that a fresh effort, one that *leads* to the postulates by preparation, is necessary at this point of time. Larson's own research work, after all, began thirty years before he published the first book, comprising many stages of thinking, all of which are quite vital for a full understanding. This approach could, perhaps, not only give the new student a way through commonly encountered difficulties, but also provide a connection to existent scientific practices.

It must be emphasized that the intention is not to forcefully justify or prove any particular point of view, even Larson's, but to give a wider perspective and leave the sincere reader free to come to conclusions based on the facts.

Gopi Krishna
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CHAPTER ONE

INITIAL OBSTACLES

It is necessary, at first, to identify some common obstacles encountered in the study of Larson's works and the subsequent discussions of the Reciprocal System. Even though it starts the discussion with the unpleasant aspects and criticisms, it is much preferred to address these problems directly rather than to leave them unsaid in the background, in order to clear the way to judge the merits of the theory.

Picking up a book on the Reciprocal System of physical theory, one of the first things that come to the attention of most readers is the huge body of text—pages upon pages of text with few equations and fewer diagrams. In today's age of split-second decisions, this is sufficient excuse for the casual reader to assume that the so-called physical theory is little more than philosophical rambling that bears little similarity to physics books, or even scientific works of the past hundred years. Even the presentation of graphs or tables of calculations which are remarkably close to experimental values evokes little interest, as sophisticated calculations of remarkable accuracy are present even in the entire nanometer range of the physical world, such as the gyro-magnetic ratio of the electron or band structures of various compounds. What indeed, is new in another set of equations giving the same results, in an obscure way?

If this preliminary hurdle is passed, and one is still curious as to the nature of this theory, that brings one to the next stage: that of abstract terminology and postulates. One of the primary postulates of the theory, the nature of space and time, is stated in this way for example:[1]

> We thus arrive at the conclusion *that space and time are simply the two reciprocal aspects of motion and have no other significance*.

This sentence is a difficult one to work with, primarily as all sensory experience is removed, by definition. It is not clear how one is to visualize or represent motion to oneself if the definitions of space and time are altered in this fashion and how this definition was arrived at in the first place. Thus, after getting the rug yanked out from underneath, we are now led into the deductive development from the Fundamental Postulates.

At this point, it is still possible to pursue the studies on a purely mathematical basis, as most of the definitions of mathematics begin in an equally abstract fashion. Hence treating the postulates as fundamental, in developing the logical consequences of the theory, we can now examine the next task: understanding the variations in the logical consequences. Let us take the *Outline*,[2] for instance:

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1 D. B. Larson, *Nothing But Motion*, Portland, North Pacific Publishers, p. 30.

2 D. B. Larson, "Outline of the Deductive Development of the Theory of the Universe of Motion."

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 unit, 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.

Here, point 15 alternates between the opposing ideas of discreteness and uniformity, whereas point 16 has proved to be a stumbling block for decades.[3] That is the nature of the difficulty faced, even by mathematicians and philosophers who attempt to understand the theoretical system. In fact, a communication to Larson from a contemporary philosopher from the University of Guelph highlights these "jumps," and more recently, attempts to simulate the structure on a computer have highlighted the gaps that appear, at least at first glance, to exist in the logical development.

By this time, of course, the casual reader has little in the way of affinity with the subject, which started with physics, took a turn, deviated into philosophy, took another turn into mathematics, and has now mostly escaped the mind's grasp altogether. Understandably, little other than a deep interest or some intuitions appear to support a thorough investigation of the theory, at which point there is one final jump that is still present: the criticisms.

An enormous amount of Larson's material focuses on the shortcomings of the current theories of physical sciences, ranging from the repeated failings of current theory in answering fundamental questions such as "What is mass?" or "What is electricity?" to the criticism of the introduction of *ad hoc* concepts and free inventions. While it is true that science does have the drawbacks mentioned, the learning is not made any easier due to the necessity of wading through entire sections of similar descriptions. One of the unfortunate side-effects of this is to alienate long-standing scientists from researching the theory, even if there is an initial interest. It is true that some new ideas might be difficult to accept, but deliberately pointing it out once every few paragraphs does not make it any easier.

All in all, these constitute a veritable thicket for the beginner to penetrate. The question now becomes: how does one know for sure whether or not there is merit in this approach? The claim occurring multiple times through the description of the theory is that it is a *general* theory of the physical universe, which can be derived from two postulates. How far does this claim hold? It is necessary, hence, to examine the process of arriving at the postulates and where that *process* stands in relation to the scientific method.

3 K. Nehru, "Birotation and the Doubts of Thomas," *Reciprocity*, Vol. XXI, No. 1, Spring 1992.

CHAPTER TWO

PATH TO THE POSTULATES

It has been an accepted part of scientific research for nearly two centuries that in order to formulate a theory about anything, one has to start somewhere with some basic set of axioms. Whether we quote Galileo's kinematics, Newton's dynamics or even Dirac's treatment of Quantum Mechanics for that matter, almost every single development of a scientific theory has started with a set of assumptions and it is taken as a matter of course that it is the way to go.

In order to take a more relevant and practical example, we shall examine a quote from Veblen Oswald,[4] who was a pioneer in the development of computers and a mentor of the prolific John von Neumann:

> The starting point of any strictly logical treatment of geometry (and indeed any branch of mathematics) must then be a set of undefined elements and relations, and a set of unproved propositions involving them; and from these all other propositions (theorems) are to be derived by the methods of formal logic.

And why is that? Because:

> Since any defined element or relation must be defined in terms of other terms and relations, it is necessary that one or more of the elements and one or more of the relations between them remain entirely *undefined*; otherwise a vicious circle is unavoidable.

This is the foundation of a deductive development of a theory. Albert Einstein[5] is of a similar opinion about the axioms:

> Now it has long been known that the… question of the truth of the axioms is not only unanswerable by the methods of geometry, but that it is in itself entirely without meaning.

However, on proceeding ahead a couple of chapters in his explanations, we find:

> In the first place, we must entirely shun the vague word "space," of which, we must honestly acknowledge, we cannot form the slightest conception, and we replace it by "motion relative to a practically rigid body of reference"

If that statement is re-read, it is seen that the statement opposes itself. Since we have given up *defining* "space," we cannot define something rigid, as "rigid" is itself defined by spatial behavior. Here we can see clearly the confusion caused by the "matter" view of the world overlapping the "space time background" view of the world. By defining "rigid body" while negating "space," one is negating one part of a definition by another

4 V. Oswald and J. W. Young, in *Projective Geometry*, Ginn and Company, 1910, p. 1.

5 A. Einstein, "Geometrical Propositions," in *Special Theory of Relativity*, New York, Crown Publishers Inc., 1916, pp. 2-3.

definition! Hence axioms can be mutually contradictory, and since it has previously been decided that the axioms are "meaningless," criticism of them is debarred, by definition.

It is indeed a peculiar situation that the foundation for a theory that aims at meaning something, resides in the meaninglessness of its axioms. Moreover, as previously identified, this path was chosen because of the vicious circle that results in trying to define something by means of itself, such as trying to learn English for the first time solely by using an English-to-English dictionary.

How did this situation arise? It arose in a direct line of thinking from Immanuel Kant in the 19th century, which had a far reaching effect on scientists of all branches, as his ideas emphasized the boundaries to human knowledge. Scientists following in the wake of Kantian thought were convinced that we can never truly know what is outside us in the world, but only the effect of the world on ourselves. Many in the experimental field took the attitude that James Jeans mentions,[6]

> The most we can aspire to is a model or picture which shall explain and account for some of the observed properties of matter; where this fails, we must supplement it with some other model or picture, which will in its turn fail with other properties of matter, and so on.

This is the standpoint of inductive science, which Larson identifies[7] as being a reaction to long years of frustration. Whether that is true or not, it is indeed the case that we have two completely opposing viewpoints here, one view that starts from an unquestionable set of assumptions and derives everything from that basis, and the other that aims to make models, which always keep getting replaced by new data. For instance, inductive science does not ask how the Law of Gravitation comes to have the form it does, it merely states it as a piece of knowledge and leaves it at that.

Both of these viewpoints have a portion that is supposed to be definitely beyond knowing, in the first deductive case, one cannot ask anything about the assumptions and in the second inductive case, one cannot obviously know *all* the facts in the world. It would be as impractical, in this Kantian way of thinking, to try to derive assumptions from something else or to put down a final model. In practical life, most of mathematics has taken the deductive path while physics and other natural sciences have predominantly taken the inductive path.

It is crucial to examine this junction, the *lack* of knowledge, a bit more carefully. What does it truly mean to state that one cannot know one thing or the other? It is here we find that the very statement cancels itself completely. How can one state definitely that something will remain unknown, while the statement itself is a claim to knowledge? That would be tantamount to saying "I know what I cannot know," a complete removal of all meaning or logic in the sentence. One might as well state something like "This is not a sentence." Both the offshoots of this Kantian system of thinking are hence compromised.

This nitpicking in meaning is necessary to untangle two massively influential trains of thought, the inductive and deductive sciences, (the experimental and the theoretical

6 S. J. Jeans, in *The Universe Around Us*, Cambridge University Press, 1947, p. 113.
7 D. B. Larson, *Nothing But Motion*, Portland, North Pacific Publishers, p. 19.

sciences as they have developed today) and show their origin in a common point. It is at this common point that we see Larson's work as a first attempt in bridging the gap.

The written works of the Reciprocal System appear to rely almost entirely on deductive logic, however in the background of this work is the actual fact of many decades' worth of experience as a chemical researcher at the Northwest Natural Gas Company. There is a considerable amount of inductive work that has occurred behind the scenes in addressing the problem, a fact that is of great importance for us to identify the actual method of understanding the results of the Reciprocal System. The postulates of the Reciprocal System are arrived at very differently from the *ad hoc* foundation of the mathematical method or the numerous *ad hoc* fixes of the inductive method.

It is worth noting a few situations from Larson's life at this point. Towards the end of his life, Larson wished to make it very clear that starting from a different set of postulates cannot be allowed within the work of the International Society of Unified Science (ISUS). This fact turned up repeatedly in personal communications and also created a lot of confusion as one or the other researcher, over the years, naturally suggested alterations to the postulates. This is a direct result of restricting research to the deductive development of the theory alone, as the postulates of the theory would then by definition become meaningless, and as a result dogmatic. Dogmatism is entrenched in both a strictly deductive and a strictly inductive approach by definition, and cannot be avoided.

There is however, a way that was actually taken by Larson, perhaps even unknowingly, while bridging his vast experience as an engineer with the dedicated research into theoretical foundations. While pursuing the inductive path of identifying the correct formulae, the continuing attempt was made to *refrain* from *ad hoc* assumptions. Conversely, while formulating his deductive system of development, much iteration of the Fundamental Postulates was carried out.[8] This shows that in its formulation, the process was neither inductive nor deductive, but a distinct combination of the two.

Getting back to the issue with the form of Kantian thought, we can also identify the precise juncture at which a misidentification was made, and dogma created. Consider inductive science, where one has a large collection of sensory facts and strives to create a theory by arranging those facts with formulae, filling up the gaps with fundamental constants. What is here seen as knowledge are the sensory facts, as the theory is relatively unknown and full of assumptions. Now consider deductive science, where the unknown resides in the postulates. The "known" laws of logical development are given the major emphasis.

Hence, we can see that *the boundary of knowledge has been misidentified*. In one case, sensory facts are said to be true knowledge, in the other, a logical theory is said to be the correct one. In reality, the sensory *perceptions* form the "postulates" and the logical *conceptions* form the development, and *both together* constitute knowledge. The mistake has been to assign sensory facts (fundamental constants) themselves as part of the theory and conversely to assign the fundamental postulates the part of "given facts" like perceptions. In the altered approach, one has neither fundamental constants nor

8 B. Peret, "RS2-102 Fundamental Postulates," online at http://reciprocalsystem.org/

fundamental postulates in the traditional sense.

This way of thinking, called “archetypal thinking” by its developer Goethe (a contemporary and opponent of Newton) has received little serious emphasis in the sciences today. Larson came very close to realizing it in his writing about gravitation:[9]

> If we pursue our quest for an explanation long enough we should ultimately be able to account for the law in terms of some basic *property* or properties of the universe.

The “property” mentioned here is pointing precisely to the connection with a sense-perception, via a sense organ. Since it was only lightly touched upon, the seriousness of this idea has not been understood. It is in this sense that it is now possible to go beyond Newton and examine the postulates of the Reciprocal System from a fresh viewpoint.

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9 D. B. Larson, “The Problem, Section III” in *Beyond Newton*, Portland, North Pacific Publishers

CHAPTER THREE

ARCHETYPAL CONCEPTS

Having encountered the possibility of going beyond the notions of inductive and deductive approaches, it is necessary now to identify and clarify the features of this new, what we may call, *archetypal approach*. This is the capacity to identify a *key sense perception* with a *key conception*, such that the two in combination then allow us to explain an entire range of phenomena. It is in this field of archetypal thinking that the Reciprocal System generates a major stride: *motion*.

Part of the key perception is the fact that all measurable quantities are expressed in terms of speeds, and therefore, so are space and time. For example, let us take something different from speeds, such as heat. As long as we are *measuring* heat, with a thermometer for example, we still read a length. The different instruments of measurement involve a physical conversion of the process into either a length or a period. The perception, that we ultimately measure space or time even when not dealing directly with velocities is a vital perceptual fact that stands on its own. Hence, it has the nature of an archetype—something that expresses the entirety of the experience in a unique process.

The primary criterion to say that we can measure something has to do naturally with assigning a number to it. So far, all assignments of numbers have been arbitrary, as there is no specific reason why one meter is precisely that long, and so on. Tradition and convenience, rather than any specified observation, have guided the assignment of numbers to physical quantities. Even previous investigators who had recognized the primacy of motion among all visible phenomena had failed to make the consequent connection: that of *measuring* that motion.

Measuring motion requires a discrete standard, and a standard is that which remains unchanged. Take length as an example. If our yardstick shrinks or expands a lot according to the geography of a location, there is no sense in measuring with it, as it is neither discrete nor standard. Hence, with the identification of motion as a primary, key physical quantity, there has to be a motion that remains a "standard," and perception gives the data that light-speed remains the same. Hence, the unit of motion is defined as "c" and this constitutes the number "1" in a coherent new system of units. The value of "c" has been determined historically based on the arbitrariness of the measurement of length, but now, the speed of light or light-speed is set as the basis on logical grounds. The "fundamental constant" is now no longer arbitrary; there is a reason behind it.

The third aspect was the observed fact that *measurement* of space and time was reciprocal in nature. One can say that a speed is 2 meters per second and equally well say that it is 1 meter per half-a-second. The fact that an increase in the numerator is equivalent to a decrease in the denominator is a fact known even to children, however the significance of placing this concept alongside the measurement of space and time via speed constitutes a fully different approach, as the measurement properties of space are now transferable to the measurable properties of time. We normally regard space, by itself, as having three dimensions. However, space is always entwined with time as a matter of observation, e.g. even glancing at the two ends of a slide rule to determine a length takes a jiffy! Hence, the three dimensions that one would attribute to space alone, can alternatively be assigned to time as well. As far as measurements go, both involve juggling three numbers, either in the numerator OR the denominator.

This full complex of observations, associated into a single whole, constitutes the first Fundamental Postulate of the Reciprocal System of theory:

> The physical universe is composed of one component, motion, existing in three dimensions, in discrete units, and with two reciprocal aspects, space and time.

It is in this sense that we can make sense of the first Postulate. The observation of speeds is associated with the right numbers (i.e. $c = 1$), and in order to develop the theoretical principle, a key perceptible fact is included within the Postulate. It is important to note that this choice of perception is not arbitrary and will stand as long as the measurement process of speeds and physical quantities remains the same; i.e. via lengths and time counts (clocks).

It has long been felt that the motion of light is very different from the motion of other objects, and with the understanding of this postulate, one can see why this is so. Light has always resisted all definitions of matter (hence even the origin of the word lighter as opposed to heavier) and, to date, the photon itself is regarded as massless. This has proved confusing to many, and old ideas still persist:[10]

> "… a ray of light plays the part of a man walking along relative to a carriage"

Without mass, there is no possibility of calling it an "object" in the traditional sense, and therefore even the phrase "movement of a photon" is not logical, since we cannot express that in the same way as saying "movement of a bus." Even the description of photon as "energy" merely transfers the burden from one perceptible scalar to a non-perceptible one: energy. We can at least sense a mass, but how does one directly sense an energy?

Here one understands the notion that light is not an object in motion, but that light IS motion, and hence it forms the *content* of measurable physical relationships. A clear formulation of both the logic and the physical reality is necessary to understand this fact.

To summarize, the identification of the perceptions associated with measurement is directly extended to a revised idea of space and time, with the connection made between the number *unity*, its threefold expression and the physical reality of motion at light speed.

Since we already noticed that the appropriate division point of the physical theory is in between sense observations and the corresponding concepts, we can now identify the entire complex of observations under one name, that of a sense *organ*: the eye. If the first

10 A. Einstein, Chapter VII, in *Relativity*, New York, Crown Publishers, p. 18.

Postulate is seen not as a collection of *ad hoc* rules, but as a direct expression of what is perceived by the eye, then one can see that it matches very well. The first Postulate is *the postulate of the eye*.

Now, once we have the unit defined, the next question is the relationship between the units as numbers, and also the relationships of motions. For this it is necessary to understand the background of Larson's work as a chemical engineer, where the fact that chemical relationships occur in definite proportions to one another, is indispensable. Hence, the mathematics of reality, in the field he was in, corresponded to that of ordinary commutative mathematics.

A second point that turns up in measuring with the eye alone, is the fact that the eye gives only relative measurements. For example, we can state one object is twice as tall as the other, but how can one determine the accuracy of the measurement itself? Thus, we find that intuitively, the primacy of what we call "measurement" rests predominantly *away* from the sense of sight. This concept was missed by many, leading to the theory of Relativity by outlawing absolute measurements.

To understand the nature of the second postulate, try to imagine the reality of the world with your eyes closed. In particular, try to carry out the measurement of an object with your hands alone, and the situation is that the hands perceive only a direct "push." This push is scalar—a direct pressure felt—and measurements, say, corresponding to a foot, cannot have any notion of direction attached to them. One can still feel compression from the three sides, vertically, horizontally and forward-backward, but as there is no way for the hands to determine which one of them is which, there is little to go on with other than three-dimensionality and *absolute magnitude*. Sure enough, the only geometry one can utilize for the world without sight is Euclidean. Primary, solid, three dimensional entities can be touched, and parallel lines remain parallel no matter where you touch them. Imaginary numbers cannot be perceived either. This leads to the second postulate, *the postulate of the sense of touch*:

> "The physical universe conforms to the relations of ordinary commutative mathematics, its primary magnitudes are absolute, and its geometry is Euclidean."

Thus, the two Fundamental Postulates have been arrived at by discovering the essential observations of two different sense organs, and thereby used as a starting point. It is here also that we notice why such a theory HAS to be a general theory, as the theory must hold as long as the sense organs sense the way they do, and hence admits no exception. There is no confusion of looking at the world filled with "objects" (sense of touch) inside a "world of space" (sense of sight). The description of motion by the eye and the description of measurement by the hand, these simple yet truly archetypal concepts, have been combined to derive the concept of "scalar motion." We also here come to an understanding of why there is a persistent lack of imagery in the descriptions, since all the calculations proceed on a scalar/touch perspective and the sense of touch is distinct from the sense of sight. The best one can draw is a few lines here and there to delineate calculations towards and away from unity, and the like.

This also answers a fundamental discrepancy between linear motion and rotational motion that has been puzzling researchers for a long time:[11]

> Before rotational motion can take place, however, there must exist some physical object (independent motion) that can rotate. This is purely a matter of geometry… While motion is possible without anything moving, rotation is not possible unless some physical object is available to be rotated.

This idea can now be understood very clearly when looking at the observation of the sense of touch—that touch perceives a rotation as a *force* or a *pressure*. If, with the rotation of the Earth, each one of us is thrown away slightly from the surface, we will not perceive it as a rotation and only as a decrease in weight. And this fact was held to be true for *centuries*, in the geocentric point of view where only the rotation of heavenly objects was seen and that of the Earth not felt by touch. This shows the necessity, with postulates whose basis for calculation resides in the sense of touch, of the rotation to follow only after linear motion. On a side note, it also clarifies why Larson repeatedly used the word "push" in describing forces and did not express them as a complex of linear or rotational motion. He was taking the basis of a completely different sense organ and could hence describe it in no other way.

11 D. B. Larson, "Gravitation," in *Nothing But Motion*, Portland, North Pacific Publishers, p. 57.

CHAPTER FOUR

THE PATH FROM THE POSTULATES

Identification of the true nature of the Postulates opens up a field of research with the Reciprocal System that helps one to extend it in its true sense. Many misunderstandings have been attributed to the abstract nature of the development of the theory, which has mainly been the result of not giving the perceptive nature of the Postulates the right importance. If this linkage is missing it comes as no surprise that as one thought follows another, one is unable *to think with* the author, leading to a quick loss of the train of thought, which the author himself, due to his abilities and the vast experience in his life, does not have to overcome. Now, it is not necessary for each one to actually work in a chemical company for many decades in order to verify the results of the Reciprocal System, but merely to be able to grasp the nature of the senses in a healthy fashion. While this is in stark contrast to the various postulates, assumptions, variables, constants, functions, geometries and "spaces" employed in current science, it does offer a much better chance of verification.

How about the development of the Reciprocal System itself over the years? There have been various developments of the theory since its inception by Dewey Larson, with researchers extending the consequences of the second postulate alone,[12] extending the calculations of the basic properties of matter and corroboration with modern developments,[13] identifying the primacy of rotation as a uniform motion and the extension of the geometry of motion to the non-Euclidean regime.[14] Hence the directions taken by the lines of research are now understandable.

Identifying the nature of the postulates now helps us make further identifications. The development of rotation as a primary motion is seen as a further step taken in the mathematics of the *eye*, which perceives the rotation and a translation equally as uniform motions. Further development of the mathematics leads to the fact that the geometry associated with the eye is that of projective geometry, as distinct from the Euclidean geometry of the sense of touch. This shows that the postulates are not necessarily being replaced or even extended, but different archetypal perceptions are being taken as starting points. However, even though the sense organs are quite distinct, they do not occur separately or singly, they are all united by the same human organization, hence there is an inherent interrelationship among the various senses. That is what points towards further tasks of the Reciprocal System of theory, which takes its starting point from the various combinations of these ideas. Larson has solved one important question, and that is "How does what we see relate to what we touch?" The systematic answer to that question has led to the entire theory of physics that he developed, which can indeed be developed

12 D. Bundy, [Online] Available: http://www.lrcphysics.com/

13 R. Satz, [Online] Available: http://transpower.wordpress.com/

14 KVK Nehru, B. Peret [Online] Available: http://rs2theory.org/

indefinitely. This opens the door to ask even further questions, and with different starting points with the same or different senses, one can arrive at a slightly different picture of the reality around us and the various specialized researchers, within the developers of the Reciprocal System, can then compare their developments and mutually correct them.

The other subject that this development has to address is the far more important relation of the researchers of the Reciprocal System to the researchers of what is called "conventional" or even the "unconventional" science. It is of vital importance to understand thoroughly the methods of both inductive and deductive development of a theory, as the vast number of discoveries of the past century have been predominantly inductive. This would help one to understand why looking at a set of data with a particular set of assumptions leads to the results claimed, and therefore a real understanding can take place of the progress in the physical sciences. The obvious byproduct of adhering to inductive methods is a massive proliferation of sensory data, which now requires using the help of computers to manage them. It is necessary to develop our own capacities of thinking and understanding to build a bridge to the huge body of current work.

CHAPTER FIVE

IDENTIFICATIONS

Based on the identification of the postulates with the two sense organs, one can see that the development of those postulates involve terms for concepts that are derived from both the organs simultaneously. Hence, to identify a major portion of the terms used by Larson, it is important to clarify which attribute belongs to which sense, and how they are combined and related to measurement—a path that substitutes the conventional method of *ad-hoc* "definitions." Let us take up the examination of a few terms that turn up in the analysis.

1. Scalar Motion

   As brought out earlier, the absolute scalar magnitudes perceived by touch are combined with the observation of motion, giving motion with "no inherent direction" as the real basis for calculations. Having no direction, this motion could represent all directions equally. The experience can be exemplified by squeezing a small rubber ball in one's hand, where the motion perceived is distributed across all directions.

2. Space and time as Reciprocal quantities

   As already discussed with respect to the first Postulate, the primary observation is the fact that both space and time are determined with respect to motion and not the other way around, as is commonly assumed. For example, when we say that an object is moving at 1 m/s, the "1 meter" and "1 second" that we are using as units are *themselves* traditionally defined based on motion. Meter outsources its definition to the second: "the length of the path traveled by light in vacuum during a time interval of 1/299,792,458 of a second."[15] And "second" is defined by "the duration of 9,192,631,770 periods of the radiation corresponding to the transition between the two hyperfine levels of the ground state of the caesium 133 atom."[16] In other words, the radiation transition is primary, as is the speed of light, so both space and time are defined in terms of light or radiation. In the Reciprocal System, this identification is the foundation, hence "1 unit speed" occurs prior to "1 meter" or "1 second." This is the part that takes getting used to, as we are used to thinking in chunks of space divided by chunks of time, but speed does not come in a chunk. It *determines* the chunks.

   The meaning of "reciprocal" is also worth emphasizing again. Firstly, an increase in space is mathematically equivalent to a decrease in time. Perceiving a "quick" or a "fast" movement can be attributed to a huge length or a short time duration,

15 http://physics.nist.gov/cuu/Units/meter.html

16 http://physics.nist.gov/cuu/Units/second.html

hence this is the first meaning of "reciprocal." In addition, since absolute measurement is scalar such that it has to be verified by touch, every measured quantity of space or time *has* to be scalar. We perceive orientations with the eye, but the actual measurement still requires a projection onto three independent axes, which is a way of generating three scalar quantities from one vector quantity. Therefore, motion can be assigned three scalar quantities and whether we assign these numbers to space (numerator) or time (denominator) depends on the situation. This is the direct result of reciprocity.

3. Dimensions of Motion

   Carrying forward from the previous identifications, the dimensions as observed show a threefold distinctness. The true origin of the dimensions actually leads to the inner ear as the proper sense organ, but that would lead too far from the aims of this little treatise. It will suffice to note that both with the eye, and with the sense of touch, one can sense a threefold nature whichever way one chooses to describe it. This overlap of both senses is three-dimensional, and scalar motion as a combination, is also three-dimensional as a result.

4. Extension Space

   Directional information, something that is specific to the eye is referred to as "extension space" or even the "time-space" region. This is the traditional space one works with in geometry, ignoring the element of time for convenience. In the Reciprocal System however, this mode of description forms one special case, as space is seen to be a derived quantity.

5. Three Dimensions of Time

   Probably no other concept stretches the imagination as much as this idea, mainly due to the our notion of the "flow of time." However, imagination is not the basis for this identification because time as *measurement* is always linked with space. For instance, even the observation of a clock or a pendulum only shows a repetitive confined movement, and measurement involves counting the motion occupying the same region of space. *Just as we noted that observing the length of a slide rule takes some time, determining the time also takes some confined space*. It is in this sense, that when we restrict space to a single quantity, all other variability *has* to be attributed to time. We do it all the time, but since any "count" is taken as a pure number, the fact is commonly missed that the count is related to time. 5 oscillations implies 5 units of time.

   Thus, the three dimensions of time have no correlation with past, present and future, or any other threefoldness of time usually recognized. It is plainly a consequence of recognizing two facts, and putting them together in this way: space is seen as three dimensional and space measurements always occur in conjunction with time measurements, hence time can also be three dimensional.

6. Natural System of Reference

With speed being the datum, the origin of measurement gets shifted. It is easily observed that, as far as the eye goes, one can never determine a single point as the "true" origin, as any point can be chosen as a reference. This is what is observed for both space AND time. We can choose any moment as a start for time measurement and any position as a reference. This observation lies at the basis of ideas of relativity.

However, in the current approach, including the sense of touch changes everything. While it may be true that we cannot sense if the train is moving or we are, it does matter whether we push on a resistance or if we are pushed by it. Kinematically there is no difference, but as an observation of the sensation process, there is a *distinct* difference e.g. if we stand up, that does not mean the Earth has moved down. This makes a scalar reference possible, one which is absolute. Combining this with the observed fact that light speed is independent of any system, we now get a scalar "unit speed" datum as the absolute or "natural" reference system. Speed of light is fixed absolutely at "1," justifying this reference system. All in all, a speed forms the "origin," rather than space or time.

7. Discrete Units and Uniform Progression

Once more, with the notion of discreteness, we must recognize the image we generally have of the concept: a yardstick, or a little ball of definite size. Taken at face value, if space or time is quantized, one would take that to mean that, say, only lengths of 1 cm, 2 cm and so on are physically observable or relevant. However, with a speed being our datum, that means something different, that speeds are expressed as 1, 2, 3, ½, ⅓ and so on. Hence, "1m/2s," as well as "π m/2π s" are both allowed and expressed as 1. This allows uniform changes with either component of a speed, but the net result is expressed discretely.

If one needs to further support the presence of discrete units as a reality, one only has to take a glance at the period table relations. Two volumes of hydrogen rightly combined with one volume of oxygen gives water, but the volumes can literally be any size. This signature, that of discreteness, has conventionally been attributed to "chunks" in space: those of atomic constituents imagined as small balls. Reciprocal System takes a different approach, by *observing* that speed is primary and that all "chunking" has its meaning only as a ratio. Hence, the *discrete* unit of speed is as absolute as a *uniform* change in space and time.

8. Direction Reversals

Following close behind the idea of uniform changes, there are ways in which uniform scalar motion is observed by the eye. This process is generally attributed to "choosing a reference point", which is actually our own eye. Firstly, since we are observing something intrinsically scalar, lacking direction, what we see with the eye must have no net resultant direction. This process is seen when we distinguish between a combination of inward and outward motion.

"Inward" is hence compressive, and "outward" expansive, both of which occur simultaneously. Even in the Universe, concomitant with gravity that appears to act inward, there is galactic recession which acts outwards, simultaneously.

Another way in which the direction can be conserved is in pure rotation, however, since we earlier observed (in Ch. 3, last para) that rotation always occurs *together with* the sense of touch, hence as far as the eye is concerned, only a *projection* of this circular rotation onto linear motion is possible: generating a simple harmonic motion (SHM). This is the origin of Larson's identification of light with vibration, of expressing it as a combination of inward and outward motion. The intrinsic magnitude is unchanged, but its expression in space takes the form of a sinusoidal curve, hence forming another expression of uniform motion.

Thus, we have a few terms that can be used to wade through the material of the Reciprocal System, without losing our bearings. It serves well to refresh the connection with the senses as one follows the development of the theory, helping to iron out confusions or mistakes and also to take it further. The important point is the method of doing it, where the key sense observation is connected to the key concept, which is then followed through consistently.

It is now possible to examine the subject using different approaches. One is the experimental approach, where the reader can identify the actual calculations made in this theory and their accuracy, as soon as possible, which can be called the Inductive or Experimental approach. Other readers might prefer to develop the concepts adequately before getting down to data analysis, which is the Deductive or Theoretical approach. An overview of the type of thinking possible in the development itself might be more interesting to some others. Based on that, suggested reading for various approaches to the Reciprocal System is given below.

1. Experimental Approach:

   Case Against the Nuclear Atom

   Basic Properties of Matter

   The Liquid State

   Quasars and Pulsars

2. Theoretical Approach:

   Neglected Facts of Science

   Nothing But Motion

   Structure of the Physical Universe

   Universe of Motion

3. General Developments:

   Beyond Newton

   Beyond Space and Time

CHAPTER SIX

CONCLUSIONS

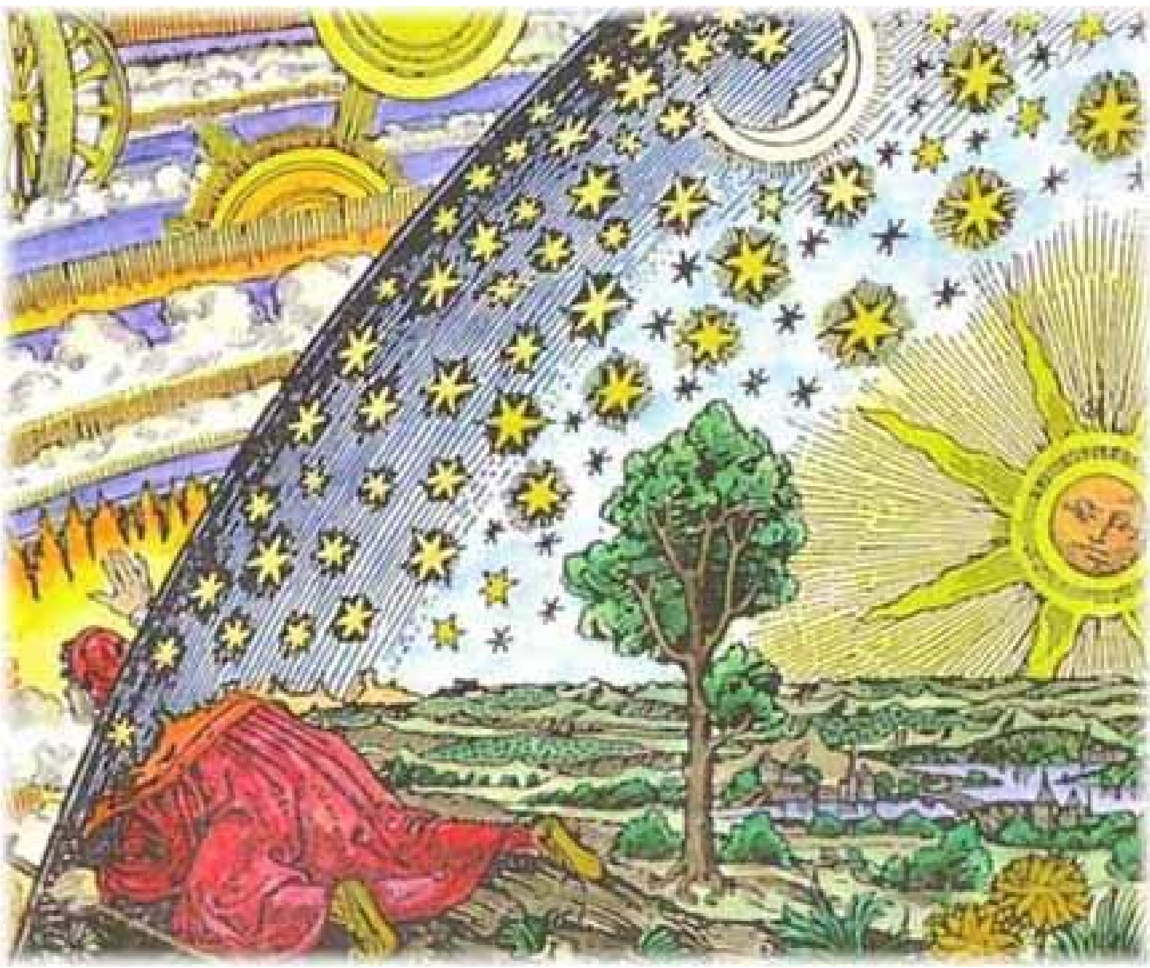
Firstly, it was identified that there are numerous pitfalls in beginning the study of the Reciprocal System developed by Dewey Larson and his associates, with the terminology, the concepts, their validity and the critical approach. This was then followed by an examination of the background behind the postulates, noting that the method was not deductive or inductive alone, but a peculiar combination of the two. The peculiarity was seen to reside in *choosing* a key perception and *connecting* a key conception to it, rather than treating perceptions as theoretical explanations or concepts as perceivable objects. This mode of thinking, which considers *the archetype of speed*, was seen to develop the postulates and create a general system of theory. The role of the senses being clarified, it is now possible to identify many of the terms used in the theory and to connect them with their physical counterparts.

A final consequence of this approach to Larson's work also helps us answer some fundamental questions: Is this a unified theory of everything? Can all the relationships of the physical universe be adequately explained by two postulates? The answer must recognize that the two postulates came about based only on what one could see and touch. If one had identified a different sense or a different combination of key observations, a different general unified theory could then be developed on its own basis. Hence, the Reciprocal System is not in itself a theory of everything, rather, it shows the approach to be taken if we desire to develop a *general* understanding as opposed to short term explanations. In other words, it is not a unified theory in the sense that it is the only possible one, but rather that it shows how *unification* itself works. Thus, we cannot be lulled into a sense of complacency that *everything* has been explained, nor can we take refuge in the idea that *nothing* can be explained. Rather, it shows the work that is possible —if Larson could develop this large volume of work based on two senses, how much more can be revealed by studying the entirety of life!

Epilogue

This booklet was intended to outline the process of development of the Reciprocal System and give the reader a few thoughts about postulates and key ideas which can be used to work not only with this particular theory, but also with *any* theory of the world that is possible. It is hoped that it goes at least a step in that direction.

Many thanks are due to *every* researcher of the Reciprocal System over the years, as all lines of research, even the smallest references or questions, throw a lot of light on each other that helps one to understand the theory better.



Every new object, clearly seen, *opens up a new organ* of perception in us.

-JW Goethe