

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 in 1959, 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, 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, and 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:

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.

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 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, that of 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, 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, and 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 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. 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.

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. In the center we must place the capacity to identify a *key sense perception* with a *key conception*, and it is in that field that the Reciprocal System generates the first major stride: *motion*.

Part of the key perception is the fact that all measurable quantities are expressed in terms of speeds, and therefore, 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 still measure space or time even when not dealing directly with velocities is a vital perceptual fact that stands on its own.

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. Taking 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. 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. Thereby, the observed three-dimensional nature of space can no longer be restricted to space itself, but passes over into time as well, creating three dimensions of motion.

This full complex of observations, associated into a single whole, constitutes the first 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, 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 [9]:

“... 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 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 hence 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.

Now, 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 as the sense of touch is distinct from the sense of sight, the best one can draw is a few lines here and there, to de-lineate 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 [10]:

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 geo-centric 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 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.

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? (Apologies for the reader who is not aware of the various paths of research here being referred to, one can conveniently skip to the next paragraph without losing the thread of the topic). There have been various developments of the theory since its inception by Dewey Larson, with researchers extending the consequences of the second postulate alone (Doug Bundy), extending the calculations of the basic properties of matter and corroboration with modern developments (Ronald Satz), identifying the primacy of rotation as a uniform motion (KVK Nehru), and the extension of the geometry of motion to the non-Euclidean regime (Bruce Peret). In most cases, all the extensions of the theory itself have met a lot of inner opposition, an opposition mostly caused due to the rigid nature of the fundamental postulates. If it is indeed true that the Reciprocal System stands upon the foundation of the postulates, then all questioning of the postulates, or even the blind acceptance of them, becomes a meaningless exercise, and opening the door for irrationality.

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 indefinitely. Thus, 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.

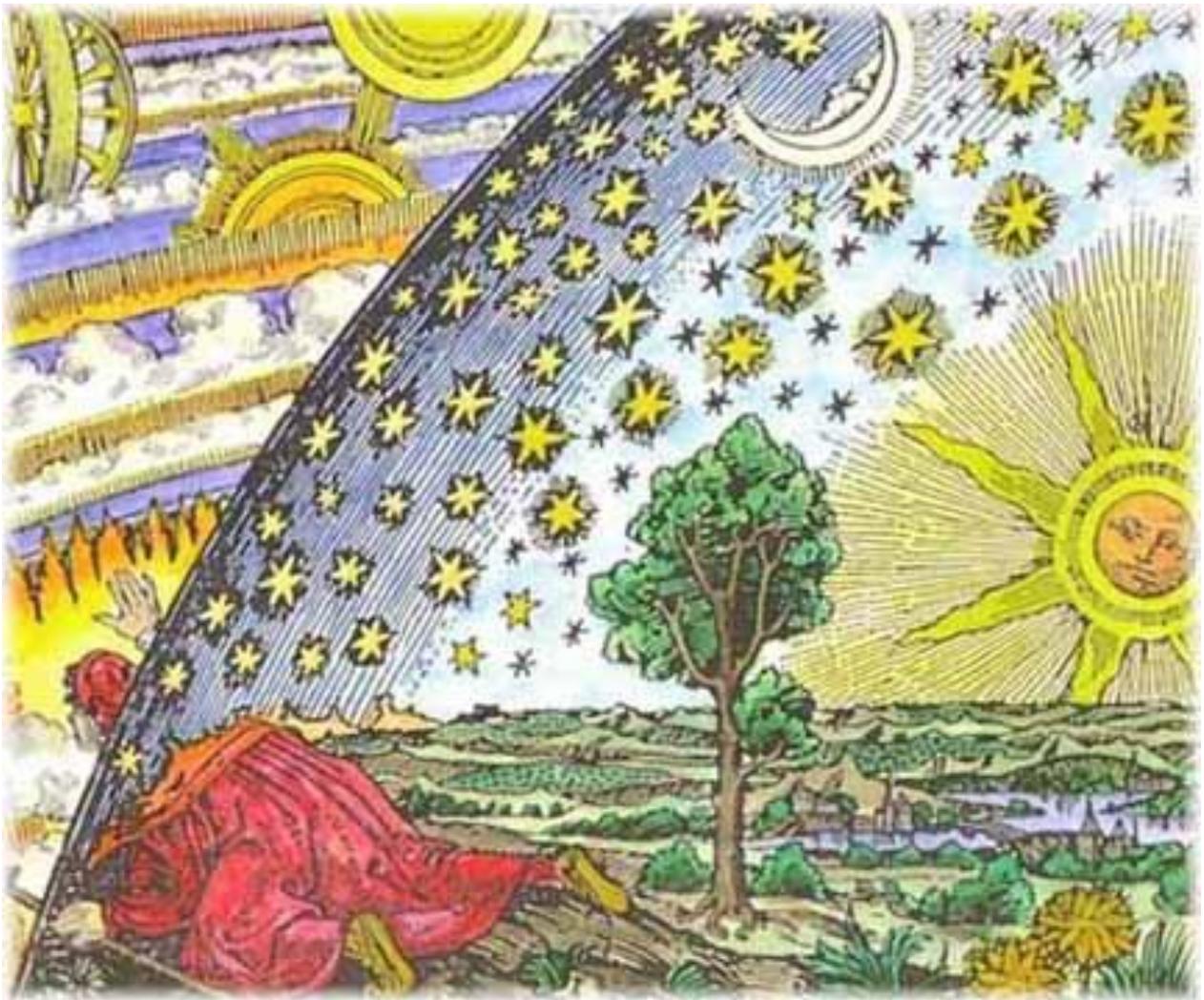
The other subject that this development has to address is the far more important relation of the researchers of the Reciprocal System to the researchers of what is called “conventional” or even the “unconventional” science. It is of vital importance to understand thoroughly the methods of both inductive 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 thus a real understanding can take place of the progress in the physical sciences. The obvious by-product 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.

CONCLUSIONS

This little 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. It is dedicated to the line of philosophers from Aristotle to Rudolf Steiner, and the physicists from Michael Faraday to Albert Einstein.

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

-JW Goethe