

# The Origin and Foundational Development of Structural Logic

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## Abstract

*Structural logic is the manner in which the intrinsic qualities of something that exists determine the kinds of relations that that something can have with other things that exist. The kinds of relations that occur in a situation then determine the patterns organization of the structure and process of the situation. Because all the material objects and systems we see about us are foundationally composed of the same set of elementary particles, which combine into atoms, which combine into molecules, which in turn combine into all the objects and systems, those objects and systems are distinct from one another by way of the pattern of organization of their components. The structural logic intrinsic to reality, to that which exists, plays its roles from the spatial, temporal, and material foundations of that which exists all the way to the most intricate complexities of biological systems and to the immensity of galaxies. The intrinsic structural logic of components, relations, and patterns of organization can be used as a tool of analysis and understanding. That the factors that play foundational roles are still present and still playing their roles at advanced stages and higher levels of the development of reality is a nearly universal aspect of reality. These foundational factors provide insight into the nature of those advanced stages and higher levels. This paper presents an introduction to the origins of structural logic.*

## Keywords

cause, complexity, development, emergence, general systems theory, generalist, modern generalist, structural logic, systems, systems methodology, systems principles, systems thinking

## INTRODUCTION

To understand what it means to be a modern generalist, it is necessary to understand the logic of the generalist mode. Why does a modern generalist use structural logic? Why is this an accurate and reliable form of reasoning, and in what manner does it provide deep knowledge of the nature of reality?

Structural logic is the manner in which the intrinsic qualities of something that exists determine the kinds of relations that that something can have with other things that exist. When used as a tool of analysis, there occurs a development from existence to understanding. Existence is the foundation. Existence sets self-identity. Self-identity sets the types of relations that can occur. And relations are the primary subject matter of understanding.

Structural logic, as an intellectual tool, is a method of reasoning about the nature of reality that is derived from the intrinsic nature of its subject matter. This is the source of its accuracy. It is derived by way of the prime imperative of analysis. Look to reality itself. Let the intrinsic nature of reality dictate the nature of your understanding of reality. Let the intrinsic structural logic of that which exists dictate your use of that logic to understand that which exists.

This is a method that provides deep understanding in part because it originates at the foundations of reality. The intrinsic structural logic of reality, on which the method is based, originates with the factors that are required for there to be existence. For something to exist, certain existential factors must be-there playing their roles—there must be continuous voluminal existential quantity. That these particular factors are required for there to be existence *is structural logic*. Structural logic as a mode of analysis begins here.

Structural logic provides deep understanding beyond the foundations of reality because it develops with the development of reality, its utility thus staying concurrent with the developing complexity of that which exists. The mode of the tool mimics the mode of the subject matter, at whatever stage of development or level of organization. The structural logic intellectually applicable to any particular situation is the structural logic operating in that situation that determines the origin, nature, and consequences of the situation. An example of using structural logic for analysis and understanding can be found in *The Modern Generalist Universal Conceptual Model* (Vesterby 2007).

In the development of reality, some early stages establish what can and cannot exist at later stages. For example, some early stages provide existential contexts to which later stages must conform in order to exist. Prior stages and factors often continue to play roles in other ways in the existence and nature of later stages, as do atoms and molecules in more complex patterns of material organization such as animals and mountain ranges. Furthermore, later stages can be existentially dependent on developmentally prior factors which are no longer there in the situation as it currently exists, but whose roles were required to establish the conditions for the later stages. It is not possible, then, to fully understand developed stages and higher hierarchic levels without understanding the prior stages and the lower levels of hierarchic organization. Because structural logic as an intellectual tool mimics and develops with the structural logic intrinsic to reality, it is likewise not possible to understand and correctly use the tool at well developed stages without an understanding of its foundation and early development.

Reality develops, factors develop, and structural logic develops. At the foundation of reality there is a specific set of developments from the existence of space to the origin of cause. These developments set the stage for the existence, structure, and processes of all else that exists or that could possibly exist. For the most part, the factors that play roles at these early stages develop in step with that basic set, as does structural logic. The description of the foundations of structural logic must be presented within the context of the foundational development of reality.

## **STRUCTURAL LOGIC FROM EXISTENCE TO CAUSE**

Here are the foundational stages in the development of reality:

1. The existence of space.
2. The continuing-existence of space.
3. The existence of matter.
4. The continuing-existence of matter.
5. The existence of matter in relation to space.
6. The existence of a unit of matter in relation to another unit of matter.
7. The existence of two units of matter in adjacent relation.
8. The existence of motion.
9. The continuing-existence of motion.
10. The existence of motion in relation to space.
11. The existence of the motion of one unit of matter in relation to another unit, which is stationary.
12. The existence of a collision between a moving unit and a stationary unit.

And here is an abridged description of that development and its structural logic (Vesterby 2008).

### **The Existence of Space**

Space is the ultimate foundation of reality, the ultimate foundation of existence. Space is place, immaterial place, and because it is immaterial, it is the simplest form of existence, the simplest manner of being-there. Structural logic begins with the factors required for there to be existence, the existence of space. That these factors *are required* is a key aspect of the structural logic of the existence of space. They are the way of it. They are how existence is at its foundational level of being-there. The way it must be—for it to-be.

Space is the continuous voluminal extension of immaterial place. Mentally picture a volume of space that has height, width, and depth. Now imagine it compressed, completely, from top to bottom such that there is no longer any height remaining. When the extension of height is eliminated there is no longer anything existing there to have extension in width or depth. To not be voluminal is to not be-there. Voluminality is a factor required for there to be existence, a *primal existential factor*. Nothing exists without there being some voluminal aspect of its being.

For something to be voluminal, there must be some quantity of it, some existential quantity of whatever form of existence it is, for instance spatial place or a unit of matter. If there is no existential quantity of it, it is not there, it does not exist. As existential quantity is a factor required for there to be existence, existential quantity is another primal existential factor.

The existential quantity of space occurs as the extension of immaterial place. As in the cases of the two previous factors, if there is no extension, there is no existence. Voluminal existential quantity cannot exist,

cannot be-there, without the role of extension. Foundationally, for there to be existence, extension is a required primal existential factor.

To be what they are, existential quantity, extension, and voluminality must have a continuous aspect or quality to their mode-of-being. It matters not how large, or how small, is the extent of existential quantity, as with the infinity of space or an infinitesimal mote of matter. For there to be existence there must be some *continuous* extension of voluminal existential quantity. Space, as the ultimate foundation of existence, is-there as the continuous extension of the voluminal existential quantity of immaterial place—*existentially continuous* immaterial place—a continuum of pure place. Continuance is a required primal existential factor.

Continuance...extension...voluminality...existential quantity—primal existential factors—factors required for there to be existence—any and all existence. Structural logic originates with the necessity of the roles of these factors. Structural logic is the manner in which the intrinsic qualities of something that exists determine the kinds of relations that that something can have with other things that exist. This is the general descriptive definition of structural logic as it is encountered in virtually all situations. But *virtually* means not quite entirely. Structural logic develops, and there are two stages of that development, deep-structure stages, prior to the form of structural logic which is evident all around in the universe. The *necessity of the roles of the primal existential factors for there to be existence* is the first of these deep-structure stages. That *existence sets self-identity* is the second. The first involves what must be-there for there to be existence. The second involves the character of the primal existential factors, what qualities they have due to what they are.

Self-identity is what something is intrinsically, what it is in and of itself, exclusive of its relations to other things. Existence sets self-identity because existence is complete. There is no in-between condition or state of being between existence and nonexistence. Either a factor exists, or it does not. What exists is what is-there—whatever it might be, whatever form it might have. That which exists is what it is, it is itself. Self-identity is based on what is-there.

Anything that has existential quantity, anything that has extension, anything that has voluminality—anything that has a continuous aspect to its existence—has parts. For example, there is the part that is one half of the existential quantity, and there is another part that is the other half. To exist as existential quantity, to exist as extension, or voluminality, is to have parts.

The voluminal existential quantity of space has parts—spatial places—such as the part that is the infinity of space to your right and the other part that is the infinity of space to your left. Because space is immaterial, it is static, unmoving, unchanging in any way whatsoever. With immateriality there is nothing there to move, nothing there with the intrinsic capacity for change of any kind. Thus, any particular spatial place has the intrinsic quality that it is where it is, it has a unique, permanent, eternal location—it is that location, that is its self-identity by way of its existence. This is not location by way of relation to other places. It is location by way of being—existence sets self-identity.

The parts of space are coexistent. If there is coexistence, there is relation. The foundational relations between spatial places are adjacent, direction, and distance relations. The specific relations, as those between two locationally distinct spatial places, are set by the intrinsic nature of those places, what they are, that is, their self-identity of where they are. Here then, is the foundation of the general descriptive definition of structural logic—the manner in which the intrinsic qualities of something that exists determine the kinds of relations that that something can have with other things that exist—*self-identity sets relation*.

To exist is to have parts, relations between those parts, and organization. If there are parts there are relations, and if there are relations there is organization. *Relation sets organization*. The direction and distance relations between spatial places constitutes a pattern of organization between those places.

Relations between coexistent components, such as spatial places, are in addition to and existentially dependent on the existence of the primary components of the coexistence. That relations are in addition to coexistent components is why the whole is greater than the sum of the parts. A simple numerical summation of the components of a group does not include the relations between those components. Even with just spatial relations, distance and direction relations, the sum of the relations increases faster with additional components than does the sum of the components. Relations are an enhancement of a coexistence situation. Whenever components are coexistently combined there occurs relational enhancement. This is combinatorial enhancement, a structural logic factor that has a major role in the origin of complexity.

The development—existence sets self-identity, self-identity sets relation, and relation sets organization—is the foundation of the determinate aspect of reality. These are the existential stages of determinate-reality, and in their roles with spatial place there is no role for change. Further along there will be the development-of-origin of change, and with it the first of the change stages of determinate-reality.

Any particular spatial place has another place adjacent to it, and beyond that place is another, and another, and so on infinitely. This type of sequential organization is universal throughout space. It is a pattern of sequential difference from spatial place to spatial place. As all spatial places are coexistent, this is a pattern of *coexistent-sequential-difference*. There is no role for change here, only that of sequential difference from locationally distinct place to locationally distinct place.

Extensional development is the progressive difference, additional place and the additional relations between spatial places, that is-there with continuous increase of quantity of space from place to place. Extensional development is based on coexistent-sequential-difference, and occurs as the sequential enhancement, basically more of something, that goes with additional quantity of spatial extension, additional quantity of coexistent-sequential-difference.

Space as universal immaterial place is the foundation of reality, and constitutes an *existential context* for all else that exists, a place-to-be for matter and all its dynamics and all its diverse patterns of organization. As infinite voluminal place, space is all the place there is. There is nowhere else to-be. To exist is to exist in space. This has significant consequences for structural logic.

The intrinsic extensional factors of something other than space, such as matter, its dynamics, and its patterns of organization, must conform to the extensional factors of the existential context provided by space. The patterns of material organization, the motion of matter, and the force relations of matter can be accurately understood only within the context of the extensional factors of static immaterial spatial place. For example, as will be explained further along, the sequential change of motion occurs in existentially conforming relation to the nonchanging sequential difference of spatial place. All else that exists other than space has an existential-dependency relation with spatial place, and conforms in relevant ways to the qualities of space.

In summary, the factors and stages of structural logic that occur with the first stage of the development of reality, the existence of space, are (a) primal existential factors: existential quantity, extension, continuance, voluminality, (b) existence sets self-identity, (c) self-identity sets relation, (d) relation sets organization, (e) extensional pattern of organization, (f) combinatorial enhancement, (g) determinate-reality, (h) existential stages of determinate-reality, (i) coexistent-sequential-difference, (j) extensional development, (k) sequential enhancement, and (l) extensional existential context.

### **The Continuing-Existence of Space**

For something to exist there must be some continuance of that existence. There must be some existential quantity of continuing-existence, for to have no continuance-of-being is to not be-there at all. Just as there must be continuous existential quantity of voluminal spatial extension for there to be existence, there must also be continuous existential quantity of continuing-existence. As factors, continuance and existential quantity play roles in both the first and the second major stages of the development of reality, the existence of space and the continuing-existence of space. In the continuing-existence case, similar to the extensional case, if there is existential quantity and if there is continuance, there are parts.

If a person looks up at the nighttime sky and observes the continuing-existence of the star strewn space above, and while doing so holds a hand in a closed position, and then, while still observing the ongoing continuing-existence of that part of space, holds the hand in an open position, it becomes immediately evident that the two parts of the continuing-existence of space were distinct. During the part of the continuing-existence of space in which the hand was closed, the part of the spatial continuing-existence in which the hand was open did not then exist. Then, during the part of the spatial continuing existence in which the hand was open, the prior part during which the hand was closed was no longer there, it had ceased to exist. These two parts of spatial continuing-existence were not coexistent, but occurred sequentially one after the other. These parts occurred in a relational pattern of noncoexistent-sequential-difference. If there are parts, there is relation, and if there is relation, there is organization.

The continuing-existence of space has intrinsic organization. Each part of continuing-existence has after relations with all the parts that have gone before and before relations with all the parts that will follow. Because the parts are noncoexistent, only the current part exists, the prior parts having ceased to exist and the following parts not yet having occurred. Each part as it comes into existence is new, having never been-there before. The noncoexistent-sequential-difference of spatial continuing-existence is the development-of-origin of change and newness. It is possible to understand the nature of change by understanding what it is and why it exists, by understanding the structural logic of the basis and origin of change. The intrinsic organization of continuing-existence is that of change.

The initiation of new part of continuing-existence is a form of adding factors to the situation. Adding new factors creates new relations, for example the after and before relations between the parts of continuing-existence. Adding factors is a common form of the structural logic of change development. In this case the

added factor is intrinsic because it is new part of continuing-existence. Adding factors is a form of enhancement of a situation, and since new part of spatial continuing-existence occurs sequentially, this is another case of development by way of sequential enhancement. The first case was extensional development with additional quantity of coexistent-sequential-difference, where change plays no role. With this second case, it is change development with additional quantity of noncoexistent-sequential-difference.

Space exists, and it continues to exist. It continues to exist because it exists. The continuance is a consequence of the existence. The existence of the new part is a consequence of the existence of the prior part. This is *consequent-existence*, the existence of something as a consequence of the existence of something else.

Space is-there, and continues to be-there. It continues to be-there because it is there. The existence of space initiates the continuing-existence of space. Existence initiates ongoing existence. Existence initiates existence. The existence of what goes before initiates the existence of what follows, in this case simply by way of the *consequent-existence of new part aspect* of continuing-existence.

The initiation of the continuing-existence of space is the development-of-origin of self-organization. The initiation of new part of spatial continuing-existence establishes after and before relations between the parts of spatial continuing-existence. There is a sequential organization to the ongoing existence of space which is created by way of factors intrinsic to the existence of space, without any role whatsoever for any factor extrinsic to the existence of space. The noncoexistent-sequential-difference is self-generated, self-organized.

Existence comes from prior existence. It does not come from nothing. It cannot come from nothing. Nothingness has no intrinsic qualities or factors from which something could come. Nothingness lacks the wherewithal to produce or create anything.

The nature of what goes before determines the nature of what follows. Existence determines existence. It does so at this foundational stage, and at all developed stages and levels, by way of the continuing-existence of intrinsic self-identity. Being immaterial, the voluminal extension of spatial place is incapable of changing in any way whatsoever, and thus, with the ongoing continuance of its self-identity, it is simply a case of space continuing to be space, space continuing to be itself, with no change occurring in the situation other than the continuous change of what part of its continuing-existence is currently there. What goes before is space, the voluminal extension of immaterial place, and what follows, in the absence of any change in the intrinsic nature of these factors, is space with its voluminal extension of immaterial place. While continuing-existence, with its continuance of self-identity during the change of ongoing existence, always plays its role in every case of change, the more highly developed forms of change such as motion, emergence, cause, the dissipation of energy, and growth all require for their existence the roles of many other factors.

The continuing-existence of space is a case of noncoexistent-sequential-difference, it is change, and the foundational stage of change development. Change is the result of initiation and consequent-existence, and is determinate in that what goes before determines what follows. The determinate aspect of spatial continuing-existence—what goes before determines what follows—is a stage in the development of the determinate aspect of reality. Prior stages are (a) existence sets self-identity, (b) self-identity sets relation, and (c) relation sets organization. These are the foundational existential stages of determinate-reality. The continuing-existence of space is the first stage in the development of determinate-reality based on change, based on noncoexistent-sequential-difference, based on what goes before determining what follows. Spatial continuing-existence is determinate because of what it is. It is intrinsically determinate. It is the first of the change stages of determinate-reality.

Due to the nature of the roles of initiation and consequent-existence, the change of continuing-existence is unidirectional. And because the existence is continuous, the initiation of new part is continuous. The initiation of the change is continuous, without a role for dimensionality. The current part has no dimension, no length. It is just the current part of the continuous change. Continuing-existence is intrinsically nondimensional.

To exist is to exist in space. To continue to exist is to do so with the continuing-existence of space. The extensional aspects of space provide an existential context for the extensional aspects of all else that exists. Likewise, the continuing-existence of space provides an existential context for the continuing-existence of everything else. The self-organization of spatial continuing-existence plays a deep-structure existential context role in all developed forms of self-organization from simple cases like crystallization to complex cases like biological evolution, with all developed cases deeply based on and conforming to the organizational aspects of the case of spatial continuing-existence. The continuing-existence of space provides the temporal aspect of reality. (Vesterby 2008, p. 69)

In summary, the factors and stages of structural logic that occur with the second stage of the development of reality, the continuing-existence of space, are (a) initiation, (b) consequent-existence, (c) existence initiates existence, (d) newness, (e) noncoexistent-sequential-difference, (f) change, (g) change pattern of organization, (h) change development, (i) development by way of additional intrinsic factors, (j) new part of spatial

continuing-existence—a second stage of sequential enhancement, (*k*) self-organization, (*l*) existence determines existence, (*m*) change stages of determinate-reality, (*n*) continuing-existence is unidirectional, (*o*) continuing-existence is nondimensional, and (*p*) continuing-existence existential context.

### **The Existence of Matter**

What matter is and why it exists is not known. What the intrinsic nature of substantiality is, and why it is-there, are the deepest, most profound of mysteries. Therefore, the observational study of matter must begin at stages and levels of its development where there is physical access, currently at the level of the internal structure of elementary particles like protons.

There are, however, certain deeper points about the nature of matter that can be achieved through structural logic. First there are the primal existential factors. They play their roles with matter just as they do with space. For matter to exist at all, it must have continuous voluminal existential quantity. Further, that there is something that is-there that is not immaterial is the first stage of the development of the roles of substantiality.

Because space is immaterial place, its continuous existential quantity is infinite. The material case is different. Substantiality can, and does, occur in discontinuous units—elementary particles, atoms, molecules, rocks, people, planets. Because existence requires continuous existential quantity, at the primal level of the existence of matter this discontinuous aspect must have a limit, with substantiality occurring at that level in the form of primal units of matter.

Also, like space, because a primal unit of matter has continuous extension of existential quantity, it has parts, coexistent parts with relations, extensional relations—adjacent, direction, distance—and these relations constitute intrinsic material extensional pattern of organization.

In summary, the factors and stages of structural logic that occur with the third stage of the development of reality, the existence of matter, are (*a*) existence that is not immaterial—first role of substantiality, (*b*) discontinuous existential quantity, (*c*) units of matter, and (*d*) extensional pattern of organization of a primal unit of matter.

### **The Continuing-Existence of Matter**

Matter exists, and it continues to do so. Similar to the case with space, the existence of matter initiates the continuing-existence of matter, with the consequent-existence of new part of material continuing-existence and of noncoexistent-sequential-difference, the change of material continuing-existence. With initiation of material continuing-existence, existence initiates existence, ongoing existence, with change development occurring by way of additional intrinsic factors. And again, existence determines existence by way of the ongoing continuance of intrinsic self-identity. The sequential initiation of new part of material continuing-existence is another case of sequential enhancement occurring with noncoexistent-sequential-difference, and is the third stage of sequential enhancement as listed in this abridged discussion of structural logic. The continuing-existence of matter is a change stage of determinate-reality. Because it is simply the continuance-of-being of matter, it is unidirectional. Because it is continuous change, it is nondimensional.

In summary, the factors and stages of structural logic that occur with this stage of the development of reality, the continuing-existence of matter, are (*a*) the factors of continuing-existence as they occur with the existential quantity of an extensionally limited primal unit of matter, and (*b*) new part of material continuing-existence—a third stage of sequential enhancement.

### **The Existence of Matter in Relation to Space**

The existence of space does not require the existence of matter. Space is entirely independent of matter. Matter is-there in addition to space. This is a different form of adding a factor. Since the existence of matter is not intrinsic to the existence of space, this is the addition of a factor, a single stationary primal unit of matter, which is existentially extrinsic to space, although not locationally so.

Because space and matter are coexistent, there is relation between them. The substantiality of matter occupies the immaterial place that is space. The occupation of space by a unit of matter is the second of a series of roles played by matter that are existentially-dependent on the nature of substantiality. Wherever a unit of matter is, it occupies a specific part of space, and shares with that place all the extensional relations that place has with the rest of spatial place.

Matter is developmentally secondary to space. To exist in any manner whatsoever, matter must do so in space, within the extensional existential context provided by space. The extensional factors of matter must conform to the extensional factors of space. Further, the continuing-existence of matter must occur with the continuing-existence of space, with the continuing-existence existential context provided by spatial continuing-existence,

and conform thereto with new part of material continuing-existence occurring in concert with new part of spatial continuing-existence. Matter has an existential-dependency relation with space.

Due to the coexistence of space and matter, combinatorial enhancement plays roles in the form of relations between these immaterial and material components, (a) the existential context relation, (b) the occupation relation, (c) the extensional relations, (d) the pattern of relations differentiated both materially and immaterially, and (e) the concurrent initiation of new part of spatial continuing-existence with new part of material continuing existence. This is a second stage in the development of combinatorial enhancement.

In summary, the factors and stages of structural logic that occur with this stage of the development of reality, the existence of matter in relation to space, are (a) development by way of an additional extrinsic factor, (b) occupation relation—second role of substantiality, (c) extensional relations of matter with spatial place, (d) existential dependency, and (e) combinatorial enhancement—a second stage.

### **The Existence of a Unit of Matter in Relation to Another Unit of Matter**

This is again development through the addition of an extrinsic factor, the second unit (which is also not moving). Because a unit of matter shares the extensional relations of the place it occupies, the distance and direction relations between the two units are those of the occupied places. The extensional relations between the units are those of the spatial existential context in which the units exist. Space sets extensional relations, and the extensional relations of all else conform.

The location, direction, and distance relations between spatial places constitute a pattern of organization. Any particular spatial place has these relations with all other spatial places, and because space is infinite, this is an infinite pattern. The extensional relations between the units of matter is also a pattern of organization, in this case quite limited. Pattern of material organization is differentiated by the substantiality of matter.

Materially differentiated extensional relations are the combinatorial enhancements that go with the coexistence of the two units. This is a third stage of combinatorial enhancement.

In summary, the factors and stages of structural logic that occur with this stage of the development of reality, the existence of a unit of matter in relation to another unit of matter, are (a) the differentiation of material pattern of organization, which is the third role of substantiality, and (b) combinatorial enhancement—a third stage.

### **The Existence of Two Units of Matter in Adjacent Relation**

The next stage is not due to the addition of another extrinsic factor, but rather to a particular type of pattern of material organization, that in which there is directional relation between the units but no distance relation. This pattern is the adjacent relation, and when it occurs with units of matter a quality of matter, its substantiality, plays a new role. The roles of substantiality develop, and there is an associated development of structural logic. Matter is not immaterial, and the substantiality of matter occupies immaterial spatial place. Coexistent units of matter, of substantiality, constitute pattern of material organization. And the substantiality of units of matter in adjacent relation is in contact one part with another. When the units are there together without any distance between them, without any spatial place between them, the substantial existential quantity of the one is in contact with the substantial existential quantity of the other.

Combinatorial enhancement develops significantly with the coexistence of two units in adjacent relation. Substantiality plays a fourth role, with contact as the enhancement, in this fourth stage of combinatorial enhancement.

In summary, the factors and stages of structural logic that occur with this stage of the development of reality, the existence of two units of matter in adjacent relation, are (a) adjacent relation, (b) contact—a fourth role of substantiality and (c) combinatorial enhancement—a fourth stage.

### **The Existence of Motion**

Motion is matter passing through space. As space is static, any motion relative to space is real motion, an actually existing aspect of reality.

The structural logic of continuing-existence can be used to understand the structural logic of motion. With continuing-existence, and all else that exists, for there to be existence there must be some existential quantity of that which exists. For motion to be-there, there must be some existential quantity of motion. There is no in between state between complete rest relative to static space and motion relative to space. Either a particular unit of material existential quantity is at rest or it is in motion. Both continuing-existence and motion are forms of change, and motion occurs with and conforms to the change existential context provided by spatial

continuing-existence. New part of the change that is motion occurs in concert with both the new part of spatial continuing-existence and new part of material continuing-existence.

If a person looks up at the nighttime sky and observes the continuous flight of a satellite passing by overhead, and while doing so holds a hand in a closed position, and then, while still observing the ongoing motion of that satellite, holds the hand in an open position, it becomes immediately evident that the two parts of the continuing motion were distinct, sequentially ordered, and noncoexistent—noncoexistent-sequential-difference. During the part of the motion in which the hand was closed, the part of the motion in which the hand was open did not then exist. But then that second part of the flight came into existence. New part of the motion came into existence.

This adding of new part has the consequence of creating new relations, after and before relations within an overall pattern of organization of noncoexistent-sequential-difference. And as in the previous stage involving consequent-existence, the initiation of new part results in change development based on that noncoexistent-sequential-difference. The sequential enhancement that occurs as new part of motion and the associated before and after relations is a fourth stage of this form of enhancement.

In a part of space devoid of factors that significantly influence motion, the motion of an object will be ongoing. Existence initiates existence. It does so by way of continuing-existence of intrinsic self-identity. The self-identity of motion is a form of change, thus, motion initiates ongoing motion, new part of ongoing change, simply by way of continuing to be itself.

By way of consequent-existence, the existence and intrinsic nature of what goes before determines the existence and nature of what follows. The qualities of what goes before determine the qualities of what follows. Thus, the speed and direction of the current part of an existing motion determine the speed and direction of the ongoing motion.

It is matter that moves. It is the substantiality of matter that provides the something-not-immaterial to be-there that can do the moving. This is a fifth role for substantiality in the development of reality. Substantiality is a nonimmaterial form of existence, occupies space, forms material pattern of organization, can have contact relation, and moves.

In summary, new factors and stages of structural logic that occur with this stage of the development of reality, the existence of motion, are (a) the noncoexistent-sequential-difference of motion, (b) new part of motion—a fourth stage of sequential enhancement, and (c) motion as a fifth role of substantiality. Other factors that play roles with the existence of motion are developments of factors that play roles in previous stages of the development of reality, for example existential quantity, initiation, continuance, and so on.

### **The Continuing-Existence of Motion**

Motion exists, and it continues to exist. Motion has two forms of continuous change, the motion itself and the continuing-existence of that motion. The change that is motion itself takes place in relation to spatial place, in relation to spatial extension. The change that is motion continuing-existence takes place in relation to spatial continuing-existence.

Just as with space and with matter, something exists and continues to exist, with that existence initiating continuing-existence. With existence initiating ongoing existence, there is consequent-existence of new part of motion continuing-existence and the associated noncoexistent-sequential-difference, change pattern of organization, and change development by way of additional intrinsic factors. As with all cases of continuing-existence, motion continuing existence is unidirectional, nondimensional, and a change stage of determinate-reality. And as with material continuing-existence, motion continuing-existence occurs with, and conforms to, the existential context provided by spatial continuing-existence. New part of motion continuing-existence occurs in concert with new part of spatial continuing-existence. At this stage of the development of reality there are three cases of continuing-existence occurring together. The sequential initiation of new part of motion continuing-existence is a case of sequential enhancement occurring with noncoexistent-sequential-difference, and is a fifth stage of sequential enhancement.

In summary, the factors and stages of structural logic that occur with this stage of the development of reality, the continuing-existence of motion, are (a) the factors of continuing-existence as they occur with an ongoing motion and (b) new part of motion continuing-existence—a fifth stage of sequential enhancement.

### **The Existence of Motion in Relation to Space**

With the existence of motion there are three distinct forms of change. There is the noncoexistent-sequential-difference of the ongoing motion itself. There is the noncoexistent-sequential-difference of the continuing-



existence of the motion. And there is the noncoexistent-sequential-difference of the consequent changing extensional relations of the moving unit of matter with spatial place.

Understanding the extensional relations of matter, such as those of moving objects, must be founded on an accurate understanding of the intrinsic nature of the extensional relations of space. Because each part of space is existentially and locationally unique, each part has a unique set of extensional relations with all the rest of spatial place. A material object occupying a particular spatial place shares with that place all those extensional relations with other spatial places. Motion is matter passing through space, matter continuously passing through spatial place. By passing through spatial place, motion initiates change in extensional relations. As a unit of matter occupies a continuously changing series of spatial places, it temporarily shares the extensional relations of those places with the rest of space. With the continuously changing occupation relation there occurs continuously changing adjacent, direction, and distance relations. The set of extensional relations a place has with the rest of spatial places constitutes a pattern of relations, and an occupying object shares that pattern of relations. As the object moves, there is a continuous change in the pattern of extensional relations the object has with spatial place.

There are four more stages of sequential enhancement that occur here, one each for the sequentially occurring new occupation, direction, and distance relations, and one for the sequentially occurring new pattern of extensional relations.

There are two stages of the development of combinatorial enhancement that occur with the existence of motion in relation to space, with the occurrence of a unit of matter moving through space. The one is due to the combining of *a motion* with a sequence of spatial location, and the combinatorial enhancement is new location relation of the motion to spatial place. The occurrence of the enhancement in this case is a consequence of the roles of both sequential enhancement and combinatorial enhancement together. The second stage of combinatorial enhancement here is due to the new combining of *a unit of matter* with spatial location as a consequence of motion. The combinatorial enhancement is new occupation relation. Again the enhancement is a consequence of the roles of both sequential and combinatorial enhancement together.

Because motion is something matter does in the context of spatial place, nearly every previous stage of structural logic plays a role at this stage. There are two fundamental forms of development, extensional development and change development. Each has its own types of structural logic, and when motion is playing a role, change development always occurs in the context of extensional development—the structural logic of change development then occurring in the context of the structural logic of extensional development.

In summary, new factors and stages of structural logic that occur with this stage of the development of reality, the existence of motion in relation to space, are (a) the changing occupation, adjacent, direction, and distance relations of a moving unit of matter with spatial place, (b) changing overall pattern of extensional relations of a moving object with spatial place, (c) four stages of changing extensional relations—four stages of sequential enhancement, and (d) combinatorial enhancement—a fifth and a sixth stage.

### **The Existence of the Motion of One Unit of Matter in Relation to Another Unit, Which is Stationary**

At this stage the motion of the one unit initiates changes in extensional relations between the units. When there are changes in the direction and distance relations between units, there occurs a change in the pattern of extensional relations between those units. A new pattern of material organization comes into existence, it emerges.

This is the development-of-origin for emergence. Change of extensional relations between units of matter with the consequent change in the pattern of those relations is the foundational structural logic of emergence. All cases and stages of emergence, from this stage to the emergence of thoughts or the emergence of galaxies are based on this fundamental set of components and relations. Each further stage gets its character from the additional factors—components and relations—that play roles there.

In the previous case there were sequentially changing extensional relations between a moving unit and spatial places. Here there are sequentially changing extensional changes between the moving unit and a stationary unit, changes in direction and distance relations, and in the pattern of extensional relations. Emergence originates as a stage in the development of sequential enhancement.

In summary, new factors and stages of structural logic that occur with the existence of the motion of one unit of matter in relation to another unit, which is stationary, are (a) changing extensional relations between units, (b) changing pattern of material extensional relations, (c) origin of emergence, (d) three stages of changing extensional relations—three stages of sequential enhancement.

## **The Existence of a Collision between a Moving Unit and a Stationary Unit**

When there is a stationary unit of matter directly in the path of an equivalent moving unit, and that moving unit arrives at the adjacent location with the emergence of contact between the units, the motion cannot be ongoing because of the blocking role of the stationary unit. Blocking is a sixth role of substantiality. Because motion is ongoing, the substantiality of the moving unit presses against the substantiality of the stationary unit. In the development of the roles of substantiality, push is a seventh stage. Because there is nothing in the situation preventing it, under the influence of the push the stationary unit begins to move.

The motion of the one unit cannot continue on with out change. It slows down, and it does so as the other unit begins to move. The moving unit loses motion while the stationary unit acquires motion. Motion is transferred from the one unit to the other by way of the push. The moving unit causes the stationary unit to move. This is a foundational development-of-origin for cause, a structural logic relation that plays a role in all developed stages of cause, giving them their intrinsic nature as cases of cause. Cause is push.

Because what goes before determines what follows, and because the consequent-existence relation is a unidirectional relation, cause is unidirectional. The cause in the collision situation goes from the moving unit to the stationary unit. The moving unit causes the stationary unit to move by pushing on it. The stationary unit does not cause the moving unit to slow down because the stationary unit, having no intrinsic motion, does not, cannot, push against the moving unit. The role of the stationary unit is passive, just blocking. The flow of cause through a situation goes with the flow of motion-originated initiation through that situation.

Contact, blocking, and cause are enhancements of the collision situation. They are consequences of the sequentiality of the continuing-existence of the components of the situation, space, matter, and motion, and they are consequences of the sequentiality of motion. They are also consequences of the combining of the two units of matter. There were two previous cases of combined roles for the two forms of enhancement, that of the new combining of motion with different spatial location and that of the new combining of a unit of matter with different spatial locations with the consequent new occupation relations. The cases of contact, blocking, and cause as enhancements are developments of the combined roles of sequential and combinatorial enhancement. Such combined roles are extremely common in the development of reality.

Another case of combined roles and consequent significant enhancement occurs with the various forms of change. It begins with the nature of spatial continuing-existence, that its parts are each newly and sequentially initiated, that those parts are noncoexistent, and that it occurs as noncoexistent-sequential-difference. Spatial continuing-existence is also an ultimate foundational aspect of reality, providing an existential context for all other forms of noncoexistent-sequential-difference.

Matter exists, and continues to exist with the same factors of newly and sequentially initiated parts of its continuing-existence, noncoexistent parts of that continuance, and a consequent overall pattern of noncoexistent-sequential-difference. Because there is nowhere else to exist but in space, the continuing-existence of matter conforms to the existential context of continuing-existence provided by space. Newly occurring part of material continuing-existence occurs concurrently with newly occurring part of spatial continuing-existence, the noncoexistent-sequential-difference of material continuing-existence matching the noncoexistent-sequential-difference of spatial continuing-existence. These aspects of concurrent new part and matching noncoexistent-sequential-difference are foundational to and necessary for the existence of more developed forms of change.

Next there is motion and the factors of its continuing-existence. Motion, like continuing-existence is a form of change. For motion to exist, there must be some existential quantity of its continuing-existence and equally some existential quantity of the motion itself. Now, with space, its immaterial place just remains immaterial place, with no role for change during spatial continuing-existence. And with matter the situation is essentially the same, with the substantiality remaining material substantiality, with no evident change in its basic nature during material continuing-existence. But motion is a form of change, and its two forms of noncoexistent-sequential-difference occur concurrently, with new part of each occurring together. For there to be new part of motion itself there must be new part of motion continuing-existence. For there to be the change of motion noncoexistent-sequential-difference, there must be the change of motion continuing-existence noncoexistent-sequential-difference. For the different parts of the motion to exist, they must do so during the different parts of the motion's continuing-existence. That the motion has the change that is continuing-existence allows for the change that occurs as the motion itself.

It is matter that moves, and new part of motion and motion continuing-existence occur in concert with new part of material continuing-existence. New part of material continuing-existence allows for there to-be new part of motion and motion continuing-existence. And ultimately it is the change of spatial continuing-existence that allows for the existence of the other forms and cases of change. The situation, then, is the three cases of continuing-existence change together in combination with the change that is motion. The change that is

continuing-existence, the occurrence of sequential noncoexistent part in each of the three cases, makes it possible for there to be the change that is motion, the occurrence of its sequential noncoexistent parts.

The change that occurs in the three cases of continuing-existence is intrinsic to each case. Likewise, the change that is motion is intrinsic. In this situation the noncoexistent-sequential-difference of continuing-existence makes it possible for there to be an intrinsic case of noncoexistent-sequential-difference that is of a form different from that of continuing-existence.

The continuing-existence of matter and of motion occur in relation to the continuing-existence of space and are of that same form, while the change that is motion is of a form that occurs in relation to spatial place. With the occurrence of motion there are continuous changes in extensional relations between the motion and spatial place, such as where the motion is taking place, the sequence of occupation relations of the moving unit of matter, and the continuous change in the direction and distance relations with other spatial places. These relations with space are extrinsic to the motion and the unit of matter. The combination of these cases and forms of *noncoexistent*-sequential-difference in the context of the extension of spatial place, in the context of the *coexistent*-sequential-difference of spatial place, makes it possible for there to be changes in extrinsic relations, changes in relations between components of a situation.

When the components are space and a moving unit of matter, the changes are those of extensional relations. When the components are two units of matter, the changes are still those of extensional relations, but now there is the development-of-origin of emergence. New patterns of material organization come into existence. The combination of the four cases of noncoexistent-sequential-difference, the coexistent-sequential-difference of space, and two units of matter, makes it possible for there to be the form of change that is emergence. And finally, when the various organizational factors of the collision situation are combined with those other factors, the combination makes possible the form of change that is the emergence of contact, blocking, and, that emergent form of change, cause. The two basic forms of change, continuing-existence and motion, in combination with other factors make it possible for there to be a development of change.

In a collision situation there is a significant development of emergence. Foundationally, emergence occurs with change in extensional relations between units of matter and the occurrence of a newly existing pattern of material organization. Emergence, at its development-of-origin, is an organizational situation—new organization comes into existence. At the development-of-origin of emergence, there is no new role for substantiality. There are only its developmentally prior stages, (*a*) existence that is not immaterial, (*b*) occupation of space, (*c*) differentiation of material pattern, and (*d*) that which moves. In a collision situation the development of emergence occurs in association with the development of the roles of substantiality.

In a collision situation substantiality has three emergent roles, contact, blocking, and push. All three require the adjacent relation, an organizational factor. Nonetheless, the relation between substantiality and this form of organizational relation results not in another organizational emergent, but rather in these supra-organizational emergents. Contact, blocking, and push are relations based on the nature of substantiality that have aspects to their natures that go beyond the merely organizational. They are aspects that go beyond the prior roles of existence that is not immaterial, occupation of space, differentiation of material pattern, and that which moves. Each is a new emergent role for substantiality. The significant development of emergence is the emergence of supra-organizational factors.

In summary, new factors and stages of structural logic that occur with this stage of the development of reality, the existence of a collision between a moving unit and a stationary unit, are (*a*) blocking—a sixth role of substantiality, (*b*) push—a seventh role of substantiality, (*c*) cause is unidirectional, and (*d*) supra-organizational emergents.

## **FACTORS OF STRUCTURAL LOGIC AS FACTORS OF SYSTEMS**

Following is a partial list of the factors of structural logic presented in this paper. Self-organization and emergence are in the list. These two factors are widely known as general systems principle, factors of system process, or isomorphies. All these factors of structural logic are also factors of the origins, structure, and processes of systems.

When a general system factor plays a role in a system, the intrinsic nature of that factor and the role it plays determine, in association with the other factors of the system, the nature of the system, its structure and its process. These factors, and the others in the paper, generally play universal deep-structure roles to which all systems conform.

1. existence sets self-identity
2. self-identity sets relation
3. relation sets organization

4. parts
5. coexistent-sequential-difference
6. extensional sequential enhancement
7. extensional development
8. extensional pattern of organization
9. spatial adjacent, direction, and distance relations
10. spatial extension existential context
11. consequent-existence—The existence of one factor as a consequence of the existence of another factor.
12. spatial continuing-existence—Time
13. newness
14. existence initiates existence
15. self-organization
16. existence determines existence
17. determinate-reality—The existence and intrinsic nature of what goes before determines the existence and intrinsic nature of what follows.
18. noncoexistent-sequential-difference—Change
19. continuing-existence is unidirectional
20. continuing-existence is nondimensional
21. change development
22. spatial continuing-existence existential context
23. existence that is not immaterial—First role of substantiality
24. occupation relation—Second role of substantiality
25. existential dependency
26. extensional relations of matter with spatial place
27. combinatorial enhancement—If there is coexistence of units of matter, there is relation between those units.
28. differentiation of material pattern of organization—Third role of substantiality
29. contact—Fourth role of substantiality
30. motion—Fifth role of substantiality
31. noncoexistent-sequential-difference of motion
32. changing adjacent, direction, and distance relations between units of matter
33. changing pattern of extensional relations between units of matter—Changing pattern of material organization.
34. new pattern of material organization—Emergence
35. blocking—Sixth role of substantiality
36. push—Seventh role of substantiality—Cause is push.
37. cause is unidirectional
38. supra-organizational factor

## **CONCLUSION:**

Emergence is the consequence of the intrinsic structural logic of reality. If emergence can develop from its origins of creating newly occurring pattern of material organization to a stage where it is creating emergent supra-organizational factors, just what is this process of creation capable of producing—life, evolution, sentience, consciousness, love, knowledge and understanding? Yes, because it has. Yes, because of the structural logic at the foundation of reality. Yes, because of the structural logic throughout the development of reality. Yes because of the structural logic that can be used by the modern generalist as a tool of universal

understanding. The questions, then, are, what else can structural logic, development, and emergence create, and what further can we learn about the intrinsic nature of reality?

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