

TOWARDS A SCIENCE OF *LIFE* AS CREATIVE ORGANISMS

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ABSTRACT: There is a paradigm shift occurring. The transition underway is from a rigid, mechanistic, and materialistic worldview to a process organismic worldview supporting a foundation of interconnectedness, cooperation, and the intersection of science and spirituality. A new paradigm must start with abductive hypotheses. I present the following as a presentation of abductive hypotheses. In semiotics abduction is a kind of reverse deduction to discover a law or some factor that would render some phenomenon intelligible. (Most of Sherlock Holmes's so-called deductions were abductions.) The importance of abduction is that it is creative; it escapes the confines of deduction and induction. In this paper we're not putting forth claims of truth or arguments for a position, but we are putting forth claims of usefulness; what do we need to be investigating to support this new paradigm?

KEYWORDS: Life-itself; beyond materialism; process metaphysics; not matter; structured energy; Dirac Sea; biofields, self-causing; non-deterministic; creative organisms; value driven; new formalisms; beyond math; self-creating, self-organizing

INTRODUCTION

Life is sui generis, that is, life is unique and in a class by itself. It cannot be compared to or explained by physics. What is coming out in today's research in biophysics labs around the world requires understanding how living organisms are free to act and combine in societal unities. Life is fundamental. Life is unpredictable and uncontrollable. To be alive is to be able to act. There is nothing in our history of ideas, whether philosophical or scientific, that deals with living self-acting entities. Everything in our philosophy and science is an attempt to imitate life with non-living entities not capable of *self-determining* and *self-initiating action*. We will talk about life as energies within the electronics nature of living organisms, and mysteries such as how bodies of so many parts can be holistic. The answer is the organizing processes within them are holistic. The living processes within them are "metastable" and constantly have to be maintained by energy. If the organizing processes cannot be maintained, all that's left is hardware.

Life means organisms. There seems to be more agreement to this than I would have expected. Actually, *organism* is a broader category than we knew. If it is an organism, it is alive. This draws a distinction between mechanisms, as in computers, and organisms that do not function by mechanisms. Organisms may include the cells in our bodies,

you and me, or you and me as cells in society, the ecosystem, the economy, or planet earth as a cell in the universe. Thus it is being said today that the cosmos is an organism; what used to seem an outrageous claim that the cosmos is living. We know that the Gaia hypothesis claims the earth is a living organism; the cells in our bodies are organisms, now, by high tech observation, the molecules in the cells are living organisms.

Life means structured energy in the Sea of Dirac (pre-space), a primordial matrix that creates the physical universe as a living entity/organism. Within this living entity (infinite because there is no other) are many hierarchal societies of organisms, all connected and interacting. Life is primordial activity, which Bohm called the implicate order.

...it is possible, not only for the manifest level of ordinary experience, but for the quantum level underlying it, to emerge from a deeper implicate level in which the classical Cartesian notions of form, order and structure have more or less dissolved ...this suggestion is close to one that has been under consideration recently by physicists, i.e., that of 'pre-space' ...¹

Life means the organizing principles that are creating all forms of life. I shall talk of the "laws of life" referring to the laws by which organisms function. There will be many differences of details but throughout there will be organizing principles that characterize life and life as organism. All forms of life are organisms and they obey universals. It is our hypotheses that on every hierarchal level in living entities, the same kind of processes will occur and can be recognized as universal living processes; organismic. These principles obey very different kinds of logic than that known in the scientific materialism of physics. The material world can be accounted for by induction and deduction, but in the world of life and organisms abduction is also required. Bear in mind as we go, the subject of this paper cannot be approached in the old style of simulation by computation.

To get through the mechanistic deadlock to further understanding requires a new foundation of philosophy with matching logic.

Towards that end I bring into question scientific materialism and advance considerations for the foundations of a new science for *life as organism*. The challenges will be based on new discoveries in physics and biophysics. Presenting them has a dual purpose. I think they decisively falsify scientific materialism and provide ideas that have to be incorporated in a new worldview to understand life.

Scientific materialism, in spite of its triumphs in creating technology, is such a limited and incomplete view that it is deadening and destructive when applied to living contexts.

Towards a science of *life as creative organisms*, we consider the following topics:

1. Life as fundamental and creative, not matter
2. The characteristics of life as organisms and organismic functioning
3. Foundations for a new organismic philosophy and formalism
4. Logic (Early Formalism) of Organisms

1. David Bohm & B.J. Hiley, *The Undivided Universe*, Routledge, London, New York, 1996, p.374.

BACKGROUND

Fifty years ago I became convinced that there was going to be an urgent need to understand values. At MIT I studied values with Robert Hartman, a visiting professor developing value theory as formal axiology for a *science* of value.² I thought I would find the logic of value in the mathematical and logical foundations of physics. Instead, I would discover through a lifetime of inquiry that physics and its foundations in substance metaphysics and accompanying logics is totally inappropriate for applications to understanding life. Way down deep human knowledge developed in a way that became committed to errors that destroy life.

I had studied physics gaining experience with an actual science. I studied the philosophy of science to help me understand science in general. I studied mathematics to understand the driving force behind scientific inquiry. I studied the theory of logic to understand the limitations of mathematics. I discovered the limitations of logic itself. I then studied the most modern theory of formalisms and discovered that logic, as we know it, is simply one amongst many possibilities for doing meaningful formalisms. What people today believe is rational is simply one choice. Believing that philosophy itself was a way of exploration I turned to it. Mainstream *substance* philosophy offered a worldview, a metaphysics that further entrapped us.

Recent experiments of the past 20 years in physics and biophysics are producing results that cannot be explained with the traditional scientific materialism and substance philosophy. A new worldview is required. ***Not only is a new view of reality required, we also need to change protocols of inquiry to cope with it.***

SECTION I: LIFE AS FUNDAMENTAL AND CREATIVE, NOT MATTER

Life is fundamental and creative, and creativity is supported by abduction. Abduction is the logic of creativity. So why don't we say that? We don't say that because, given scientific materialism, we think matter is fundamental and everything has to be reduced to matter. Reinforcing that idea, normal logic only has the procedures of deduction and induction; that is all that is needed for thinking about matter. Unlike matter, with organisms being self-initiating, self-acting and creating, abduction is required.

It is not hard to *say* what life is. It is hard to *understand* what life is. It is as if trying to describe a new theater production by elaborating the facts. Begin by describing the stage scene and the physical movement of the actors around the stage. Something is missing. That something is meaning. That something is what theater critics will write about, and they might not even mention the fact details.

What makes "life is creative" hard to understand is the dominance of a materialistic worldview as described by Whitehead:

Thus in framing cosmological theory, the notion of continuous stuff with permanent attributes, enduring without differentiation, and retaining its self-

². Robert Hartman, *The Structure of Value: Foundations of Scientific Axiology*, Southern Illinois University Press, 1967.

identity through any stretch of time however small or large, has been fundamental. The stuff undergoes change in respect to accidental qualities and relations; but it is numerically self-identical in its character of one actual entity throughout its accidental adventures. The admission of this fundamental metaphysical concept has wrecked the various systems of pluralistic realism.³

This might be metaphysics for a world of rocks. Indeed, considering the efforts that have gone into discovering the origin of life, I believe we do think in terms of rocks. It has been claimed that life began by accident when lightening hit a pond of chemicals ultimately producing life on earth. This myth has perpetuated the search of space for signs that such accidents may have happened elsewhere. Could there be life on other planets? Hydrogen, oxygen, nitrogen, and carbon are fundamental constituents of life as we experience it. We look where these are available in the right combination. So much for life being fundamental!

Indeed, considering the efforts that have gone into discovering the origin of life I believe it hasn't occurred *because* life is fundamental. That pond of chemicals must have had some kind of predisposition toward life if they were to come alive by a lightening strike.

The question should be how does matter arise from life? Life is creative, but everything in flux would simply be chaos. As a ground for building order, life takes on habit, over-powering habit. The result is matter, entities that no longer are capable of self-acting. There is more to reality than we knew. Could there be living patterns of energy? Is there a biofield in pre-space creating matter?

LET US CONSIDER SOME EVIDENCE BEGINNING WITH THE ELECTRONIC ENVIRONMENT WITHIN LIVING ORGANISMS, AS WE KNOW THEM

Research in biophysics has discovered that living organisms are not simply matter. I do remember years ago when some computer folks, in pursuit of artificial intelligence, argued that machines could do anything people could do since people are just meat machines; now biophysics shows that is not true. In 1992 liquid crystalline living tissue was discovered in the laboratories of biophysicist, Mae Wan Ho.⁴ Our bodies consist of trillions of cells all connected through a living matrix of liquid crystalline tissue supporting proton jump conduction; a flow so fast that all cells are acting simultaneously. Thus our bodies, as with all living organisms, function holistically as a single unity. *Functioning as a single unity is a characteristic of organisms. If it functions as a collection of parts, it's not an organism. If it functions as a single holistic unity, it is an organism.*

Appearances to the contrary, there are no parts. The "parts" are so integral to the whole that they cannot exist - they cannot be the same thing - when separated from the

3. Alfred North Whitehead, *Process and Reality, An Essay in Cosmology*, The Free Press, New York, London, 1978, p.78.

4. Mae-Wan Ho, *The Rainbow and the Worm, The Physics of Organisms*, 2nd Edition, World Scientific Publishing Co. Pte. Ltd., 1998.

whole.

Before the discovery of the living matrix of liquid crystalline tissue, it was thought that the only signaling flow was the electron flow in the nervous system lending credence that the body is composed of organs as parts. The electron flow was too slow for everything to be functioning in a single unity. It is now said that the body is powered by electricity for electron flow *and* proticity for proton flow with all the cells functioning in simultaneity of unity.

To learn about life, it had been thought we should turn to biology. Biology should be to health care what physics is to engineering. Unfortunately, below is the condition of biology today as described by Robert Rosen.⁵

The question “What is life?” is not often asked in biology, precisely because the machines metaphor already answers it: “Life is a machine.” Indeed to suggest otherwise is regarded as unscientific and viewed with the greatest hostility as an attempt to take biology back to metaphysics.

This is the legacy of the machine metaphor. I hope to convince the reader in the course of the present work, that machine metaphor is not just a little bit wrong; it is entirely wrong and must be discarded.

Biophysicist and biochemist, Szent Gyorgi, points out that metabolism works only with reactions that are statistically improbable. **Since the reactions are improbable, it takes some form of catalyst to keep them going.** This is done by internal meta-stable energy flows. Their *stability* has to be maintained by oxygen. If their stability disintegrates, the reactions of the body will stop working. That is why we can only last several minutes without breathing. This may be stating what seems obvious; however, it shows the importance of maintaining internal energy flows in life.

For years I have said there is no similarity between computers and living organisms such as people. Now I see there is one. Computers are matter, hardware. They cannot do anything until a program is installed in memory. When the power is turned off, the program disappears. Once again the computer cannot do anything. What is a computer program anyway? It is called software. It is not matter. It is not a thing. We might think of it as a ghost in the machine. Actually a program is a well-ordered set of codes. In the computer they can be read in order to trigger an internal act by the computer.

When a computer is turned off, the hardware can be studied forever without ever revealing a clue as to how it does what it is known to be capable of. When a living organism is dead, the energy fields and flows inside disappear. The “hardware of the body” can be studied forever without revealing a clue as to what life is.

Mathematical biologist, Robert Rosen and biophysicist (discoverer of Vitamin C) Szent Gyorgi point out that biology of the past is more like physics. That biology has led to the study of ***structure where we wind up with nothing but misleading guesses as to what processes are going on.*** Now, **electronic biology** has been discovered. The living energy structure in our bodies is electronic and biophoton energy flows. To

⁵. Robert Rosen, *Life Itself, A comprehensive Inquiry Into the Nature, Origin, and Fabrication of Life*, Columbia University Press, 1991, p.23.

quote biophysicist and biochemist, Szent Gyorgi:

There is a basic difference between physics and biology. Physics is the science of probabilities. If a process goes 999 times one way, and only once another way, the physicist will not hesitate to call the first the way. Biology is the science of the improbable and I think it is on principle that the body works only with reactions that are statistically improbable. If metabolism were built of a series of probable and thermodynamically spontaneous reactions, then we would burn up and the machine would run down as a watch does if deprived of its regulators. The reactions are kept in hand by being statistically improbable and made possible by specific tricks that may then be used for regulation. So, for the living organism, reactions are possible which may seem impossible, or at least, improbable to the physicist.... If Nature wants to do something she will find a way to do it if there is no contradiction to basic rules of Nature. She has time to do so. (Living Nature also often works with more complex systems than the physicist uses for testing his theories.)⁶

The last paragraph in Szent Gyorgi's book on sub molecular biology states:

In an earlier chapter I emphasized the biological importance of "organization," by which I meant that if Nature puts two things together a new structure is born which can no more be described in terms of the qualities of its components. The same holds also for functions. In living systems the various functions, too, seem to integrate into higher units. We will really approach the understanding of life when all structure and functions, all levels, from the electronic to the supramolecular, will merge into one single unit. Until then our distinguishing between structure and function, classic chemical reactions and quantum mechanics, or the sub- and supramolecular, only shows the limited nature of our approach and understanding.⁷

It used to be that the only way biologists could study living organisms was to cut up dead ones and study the material structure. Then following what they thought was a proper scientific protocol, reductionism, process them down to the smallest particles. Biology as it has been known is a dead end.

Mae Wan Ho says:

I do not think quantum theory per se will lead us through the mechanistic deadlock to further understanding. Instead, we need a thoroughly organicist way of thinking that transcends both conventional thermodynamics and quantum theory.⁸

The scientific materialism worldview of "matter as a fundamental reality" does not work. The idea of "matter being fundamental" has led us astray. Matter doesn't do anything. It is non-active, but acted on. Matter is rearranged by cause and effect. It comes down to mechanisms. It is useful to distinguish between entities that are autonomic, obeying self-law and entities that are allonomic, obeying non-self law. We have been led astray by our experience of obedient things. In dealing with living autonomic self-acting entities it

6. Albert Szent-Gyorgi *Introduction to Submolecular Biology*, Academic Press, 1960, p.3.

7. Szent-Gyorgi *Introduction to Submolecular Biology*, p.135.

8. Ho, web article.

may come as a surprise that they do what they want with no thought of obedience.

In the case of quantum theory, I wonder if relational quantum theory isn't pointing to an organismic creative reality. If so, then quantum theory won't be separate from an organicist point of view, but it will be reinterpreted to be seamless with the organicist point of view. Similarly, conventional thermodynamics will be enlarged to account for the way living entities manage energy. And it will be seen that the second law of thermodynamics does not apply to living organisms.

What was *not* considered in physics is the contribution that organisms could initiate their own acts. In organisms, their acts can create new forms of order. Thus organisms do not approach reality in a machine-like fashion; always limited to the current context of order. Living entities must change and adapt constantly to evolving forms of order.

An organism is not calculating, and second of all, it is connected to the requirements of its environment. Living organisms must live in an organismic environment to function. **Organisms function to conform to coherence conditions imposed by their environment while co-creating coherent acts through internal processes that individuate and add their uniqueness to the whole. Thus organisms have a Janus character.** Janus was a Roman God with a double-faced head, each looking in opposite directions at the same time. An organism is looking both to its own unique experiences while sensing what also can be unique contextual conditions of the moment. Thus to develop their unique contributions, organisms must harmonize this reality and that is accomplished through the use of inherent value intelligence. I have found that this requires values as guiding force, as opposed to cause and effect. More on that in section III.

Now given the discoveries in physics, the Dirac Sea, and biophysics, and the electronic inner environment of living organisms, I don't think it would be outrageous to suggest that our being alive is due to energy flows. We can no longer assume that physics will help us understand life.

SECTION II: THE CHARACTERISTICS OF LIFE AS ORGANISMS AND ORGANISMIC FUNCTIONING

The following provides beginning subject matter to be addressed by new philosophy of organism; the characteristics and properties of organisms that must be accounted for in new organism philosophy and formalisms.

Life requires a science that deals with the improbable. In the observation of living processes, we see that *Life* does not function in any of the ways traditionally thought. I propose the development of such a philosophy, with accompanying logic based on process metaphysics. Process metaphysics will provide the organizing principles by which life works to manifest and maintain organisms.

Philosopher Nicholas Rescher provides contrasting descriptions of Substance Philosophy and Process Philosophy.⁹ As we examine organisms as life, consider how Process

9. Nicholas Rescher *Process Metaphysics*, State University of New York Press, 1996, p.35

Metaphysics is more characteristic of life than Substance Metaphysics (upon which physics as been founded).

Substance Philosophy

discrete individuality
 separateness
 condition (fixity of nature)
 uniformity of nature
 unity of being
 (individualized specificity)
 descriptive fixity
 classificatory stability
 passivity (being acted upon)

Process Philosophy

interactive relatedness
 wholeness (totality)
 activity (self-development)
 innovation/novelty
 unity of law
 (functional typology)
 productive energy, drive, etc.
 fluidity and evanescence
 activity (agency)²²

Characteristics of Organisms

- Self-creating
- Self-referencing
- Self-motivated, acting
- Self-knowing
- Autonomous
- Connected
- Cooperative, must form societies
- Invariant identity
- Comes into existence in its totality, it has no separate parts
- Originates acts
- Choices are made from value intelligence
- Able to act in unrestricted, unknown environments

Requirements of Organisms

- Instant communication
- Variety
- Energy management
- Holism
- Vibratory - between categorical contrasts/oscillation.
- Cooperation
- Living at edge/Avoidance of equilibrium
- Improbable/Non-predictable

Recent Empirical Philosophy about Organisms

- **Organisms are self-creating**, i.e., autopoietic -autopoiesis requires self-creation, self-correction & self-reference. Autopoiesis requires autonomy. It

rejects allonomy leading to informational closure.

- **Living entities exhibit invariant organization and structural plasticity. Self-making requires self-knowing and self-reference.** These requirements destroy the applicability of logic as we have known it. Also life is dipolar requiring the assertion of both poles of categorical contrasts, a paradox resolved by time and oscillation. Do not think of anything living as being logical. There is a rationale to be discovered. Meanwhile, give up consistency and shine light on Jung's dark side. See good days and bad days as being in the normal flow.
- **Living organisms are holistic. There are no parts and no states.** Organisms are created as a single whole. It seems as if there are parts. We have hearts, brains, kidneys, livers, etc. But they are not truly parts as in machines.
- **Life works by creating new realities, novelties, variety.** It is life itself that produces evolution, not random processes or survival of the fittest. Living processes are vibratory, oscillating between both poles of categorical contrasts to find effective acts in its creation process. This is why, for thinking about life, I reject consistency and truth valued inference.
- **Organisms are autonomous. Autonomous means self-law.** Everything they know and can do is developed within by processes only now being discovered. They are not like any processes a machine view would imagine. There are no computations. There are societies of living entities, cells in humans, societies of molecules in the cells and so on down to particles. At each level the societies permit maximum freedom subject only to coherence conditions some of which are values and value processes. And we, as human beings are cells in a higher order society. The role of values and the valuation process that Hartman put forth now becomes incredibly important. Strictly speaking I believe it is valuation processes that are important to living entities. The necessary autonomy of living entities prevents their having any informational inputs. Yet they do need to discover what works in their living context. They do that by acting, to find effective acts. Acts that produce the organism's intentions are effective acts.
- **Organisms are "informationally" closed systems.** This seems to conflict with Prigogine's thinking for whom organisms are open to their environment taking in energy and creating islands of order within the universe moving towards disorder. Here, I am only asserting that organisms are closed to what we think of as information. Otherwise they are open to taking in energy, for example.
- In the case of possible conflicts with Prigogine, the primary conflict would be the idea that *the universe is moving toward disorder*. As a living organism, the universe is not moving toward disorder, but it certainly may appear to be as old orders are destroyed to be replaced by new orders. Life is creative.

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- **Informare.** Living entities are autonomous, i.e., only responsive to self-law based on informare. Informare means formed within. That is, the “information” available is not gathered by senses from the outside; it is formed within. They are autonomous, so they can differentiate subject only to coherence. Autonomy implies they are closed to information. Information is not a commodity. Informare, formed within, replaces information.
 - **Organism can only know and do what its own living history,** and that includes inherited history, has provided.
 - **The only thing the organism really knows is its inner experience.** By inference and by abduction, it makes hypotheses. The hypotheses are often called “abductive hypotheses”. Abductive hypotheses are advanced for their possible usefulness and are subject to tests to determine their value. There are no in-puts in living organisms. By body field awareness, intuitions are developed from experience formed in the body/mind directly through fields of energy. It’s a kind of “feel-think process we call “felt sense.” Free will plays a key role in the functioning of an organism.
 - **Organisms are capable of acting and initiating their own acts.** They are free to act and choose their acts based on values. In living processes there is no cause and effect or determinism. Life evolves based on values. At all the levels mentioned above, living entities are choosing acts based on values characteristic of their level, i.e., molecules, cells, societies, etc.
 - **Living entities are manifest with an invariant identity.** Identity refers to the process specifications by which their autopoiesis occurs. A living entity cannot violate its identity. Yet a living organism can be in process and change over time. Thus the identity allows for structural plasticity. The process specifications cannot be changed or violated, but they do allow freedom in their fulfillment. In the development of structural plasticity the organism can maintain its identity. Now we begin to see many consequences such as a person cannot be controlled, may not be able to fulfill arbitrary expectations, there is no possibility of literal language and we all live in different realities.
 - **Holistic means the entire organism functions as a single unity.** Appearances to the contrary notwithstanding they have no parts.
 - **Organisms are meta-stable, living on the edge.** When something appears to be trying to push it over the edge, it can suddenly mobilize massive energy. The organism is a “meta-stable energy structure” within the physical structure of a living organism. Being meta-stable, it requires energy to maintain it. Turn the energy source off and it is gone. This is also true for living organisms such as us. For us the energy source is the oxygen we breathe. Without oxygen the meta-stable energy structure dissipates. There is nothing left but non-functioning “hardware.”
 - **Organisms avoid equilibrium.** For example in energy management thermal equilibrium would mean death. Thus non-thermal energy is stored

in many nested fractal space-time regions. If the energy in our bodies were thermalized it would produce thousands of degrees Kelvin. In nature biodiversity is essential for energy management; without sufficient biodiversity our life support system will not function

- **Organisms are a pure democracy** with each entity making choices for itself autonomously and at the same time for the benefit of the whole organism. It functions like a jazz band. In a jazz band each musician autonomously decides what to play, yet his or her decisions work to the benefit of the whole. In a press release, from The Institute for Science in Society, Dr. Ho says: Quantum Jazz is the music of the organism dancing life into being. We are all quantum jazz players, in the very substance of our being. Organisms are thick with spontaneous activities at every level, right down to the molecules, and the molecules are dancing, even when the organisms sit still. The images obtained give direct evidence of the remarkable coherence (oneness) of living organisms. Even if we could know the complete state of an organism we could not predict its next state
- **Organisms have maximum freedom of action subject only to coherence conditions within its living context.** Coherence from coheres – to stick together. Coherence means compatible habits of acting. Coherence can be quantum coherence to axiological coherence.
- **Organisms are autonomic and come into being as a whole entity** and grow into maturity as a whole entity unlike machines that are assembled piece by piece by some other. There is a distinction between being autonomic, obeying self-law, and allonomic, obeying some other's law. Machines are allonomic; they obey the laws built in by external agencies. There is no way for any other to build in the internal laws of a living entity.
- **Organisms are complex systems** versus simple systems (autonomic). Complex (living) does not mean the same as complicated.
 1. No simulation possible
 2. Many living entities acting uniquely
 3. No largest model
 4. Always becoming
 5. Cannot be predicted
 6. Ordered by valuation and meaning
- Organisms are Not simple systems (Allonomic)
 1. Mechanistic
 2. Ordered by cause and effect
 3. Finite in nature, allonomic, built by external agencies
- **Nature's way of management or solving problems is to create societies of living entities.** Thus in this world of overwhelming variety there are uncountable societies. Not just international societies but all kinds of sub societies; social, business, professional, the societies of cells within

our bodies, etc. Also super societies from Gaia to the living cosmos. **Now, harmonize does not mean homogenize but harmonize presents logical difficulties that go beyond current thinking. But it is not beyond jazz. I am told that the theory of music enables jazz musicians to bring very diverse music into harmony. They may have learned the theory at Julliard or simply in their experience playing. I wonder if the theory of life will be more like music theory than like physics.**

- **For dealing with life itself we must recognize that life is creative.** Truth preservation is irrelevant. The necessity of consistency is, in my opinion, the most crippling error in history.
- **For living process space is fractal.** Space/time as we have known it does not apply.
- **Living entities are born into unknown environments to which they must learn and adapt.** To permit learning and adaptation, the identity processes allow for structural plasticity. Survival depends on learning effective acts not representations of external world. An act is effective if the results are what were intended by the actor. To avoid chaos and confusion a living entity must distinguish itself from its environment. See the logic of distinction in Brown's "Laws of Form".¹⁰ Brown's calculus is not expressed in sentence-like forms. It is expressed in *symbols for acts* of distinction. Thus it begins to present logic as a *theory of acts* as we will require for the logic of life. Another paper is required to explain this.
- **Organisms require cooperation.** Life creates change and novelty. It creates evolution. We don't need random processes and survival of the fittest. I wonder if survival of the fittest hasn't led to our belief in the law of the jungle; nature red in tooth and claw. I wonder if such beliefs made competition seem attractive. It is now known that life in nature is primarily cooperative. Yes people insist on calling predator-prey relationships competitive. That's our interpretation without fully realizing the living processes involved. Trying to interpret activity that we see based on materialism leads to false interpretation because it doesn't recognize the over-all cooperative nature of Life-itself. Cooperation between interspecies and intra-species is dominant. Without cooperation there would be no life.
- Competition is only appropriate in activities that are "autotelic," such as football. That is, games have their own built-in goals that should not be relevant to anything but the game. In normal life, competition is destructive!
- **Living process is social, i.e., carried out by democratic societies of cells.** At all levels from atoms to the universe life forms societies. The society is called a nexus. Values conflicts are resolved by a "Regnant nexus"

10. G. Spencer Brown, *Laws of Form*, The Julian Press, Inc. New York, 1972

replacing the notion of controllers. Regnant nexus are transient as required.

SECTION III: FOUNDATIONS FOR NEW ORGANISMIC PHILOSOPHY AND FORMALISMS

All fact and thing-oriented formalisms are not appropriate for life. That includes both mathematics and logics as we've known them. **For this new paradigm, new metaphysics, recent advances in empirical philosophy (see Section II) and new formalisms are required.**

There is a complementary role between philosophy and science/organismic logic. I suggest that metaphysics and logic should be a matched pair to create the new science. I am tempted to call them the analytics and synthetics of the most fundamental notions; but I think the current use of those terms is a confused mess. I would define them as:

- Analytic: derived from analysis of **experience**
- **Synthetics: postulated**

In western philosophy there are two traditions. Logic as we know it traditionally has been developed to be compatible with substance metaphysics. Now I believe process is moving into dominance.

The best-known process views today are those of Alfred North Whitehead's philosophy of organisms. Though Whitehead is thoroughly incompatible with materialism, I am amazed to find many interpreters claim he is a materialist and wreak havoc on his views as pointed out by Florence Bradford.¹¹ **What thinking really is: Fact** Logic has been considered laws of thought. It is not. To find out what logic is really all about, we begin by looking at Peirce's semiotics. **As we recognize that life is fundamental, it will no longer work to look to a material world for understanding.** We need to examine our own *internal living processes*. For this I add my insights from Peircian semiotics. With many experts to choose from, however, my choice is Floyd Merrell.¹² Awareness begins with fleeting impressions. This domain is called Firstness. It progresses by analysis to conceptual understanding called Secondness. Finally it reaches by postulates relational understanding called Thirdness.

Seeing this from my Whiteheadian perspective the concepts are not about things; they are about *acts*.

The explanatory purpose of philosophy is often misunderstood. Its business is to explain the emergence of the more abstract things from the more concrete things. It is a complete mistake to ask how concrete particular fact can be built up out of universals. The answer is, 'in no way.' The true philosophic question is how can concrete fact exhibit entities abstract from itself and yet participated in by its own nature? ¹³

11. F. Bradford Wallack, *The Epochal Nature of Process in Whitehead's Metaphysics*, State University Press at Albany, 1980.

12. Floyd Merrell, *Peirce, Signs, and Meaning*, University of Toronto Press Inc., 1997.

13. Alfred North Whitehead, *Process and Reality, An Essay in Cosmology*, The Free Press, New York, London, 1978, p.20.

The organizing principles of this whole business of organisms will explain how abstract entities arise out of the reality of experience, and are used to guide actions of living entities.

A new logic required

Logic, as known today, is thoroughly extensional. It is shocking to realize extensional means form, syntax, but without meaning. Likewise, mathematics is extensional. Life requires logic with meaning, i.e., a new formalism.

In a materialistic worldview all attempts to develop a logic with meaning have been defeated. Materialism has been a seemingly insurmountable block. Of course, a logic of things would not require meaning. Further, a logic of meaningful acts can create new realities. Life itself evolves and produces the long and circuitous history we call “evolution.” Materialism might permit truth preservation in logic, but creation of new realities, as in evolution, it does not. This implies that reconsideration of implication is needed.

For a logic of truth-values, i.e., an implication based on truth values, a contradictory statement such as ‘A and not A’ collapses the entire system. Thus it is thought that consistency is necessary. Since Aristotle, a statement such as ‘A and not A’ has been forbidden by the Laws of Non Contradiction (LNC). Today I am pleased to see challenges to the LNC in a movement called *dialetheism*.

For understanding the dynamics of life I believe consistency is a tragic fundamental blunder. Life requires self-knowing by self-reference. Self-reference introduces what has been called vicious self-reference often illustrated by the sentence “this sentence is false”. If so, it is true. This sentence is now called a dialetheia. A dialetheia is a true contradiction, a statement, A, such that both it and its negation, are true. I have read that Wittgenstein called this a Janus headed figure facing both truth and falsity. Janus has also been applied to organisms.

Is there really a problem with a true contradiction? There is if inference is based on modus ponens. There are other forms of inference, as we will find in functional logics, for which a true contradiction presents no difficulty.

If truth is not conserved, what replaces truth? I suggest *coherence*. Living entities are capable of self-determining, self-originating, acting. They choose their acts based on value perceptions and the coherence conditions of the newly discovered laws of value.

The laws of value were discovered in the 1950s by philosopher, Robert Hartman who specialized in axiology.¹⁴ He found three distinct value dimensions: intrinsic, extrinsic and systemic. These dimensions seem to correspond to the levels of semiotics, i.e.

- Intrinsic with Firstness: presentational awareness
- Extrinsic with Secondness: conceptual awareness
- Systemic with Thirdness: relational awareness

¹⁴. Robert S.Hartman, *The Knowledge of Good, Critique of Axiological Reason*, Rodopi, Amsterdam – New York, NY, 2002.

These dimensions form a hierarchical order. Intrinsic is the highest and systemic is the lowest.

Firstness/intrinsic corresponds to what psychologist, Eleanor Rosch calls “primary knowing.”

... 'primary knowing' arises by means of interconnected wholes, rather than isolated contingent parts and by means of time-less, direct, presentation rather than through stored re-presentation. Such knowing is open rather than determinate, and a sense of unconditional value, rather than conditional usefulness, is an inherent part of the act of knowing itself,... Acting from such awareness is spontaneous, rather than the result of decision-making, and it is compassionate...since it is based on wholes larger than the self.¹⁵

The next form of knowledge, **Extrinsic/Secondness**, is conceptual learned in and abstracted from experience. Concepts are the basis for judging good and bad. Through experience we learn the full meaning of a concept; its intension. For any thing belonging to a concept, we judge good to bad based on how well it fulfills the intension, i.e., our expectations. Finally it all has to be put together by relations, **Systemic/Thirdness**. With appropriate modifications of terminology, I believe more exact treatment of values as coherence conditions will be discovered. In selecting terms we have to be careful that we don't confuse mere abstractions with reality. Remembering that Whitehead wrote *Principia Mathematica*, it is quite a surprise in that he first embraced and was expert about formal logic and then in the last thing he ever wrote in his festschrift volume, he says it's a fake.

The conclusion is that Logic, conceived as an adequate analysis of the advance of thought, is a fake...The exactness is a fake.¹⁶

I concur there is no exactness in the meaning of words in philosophy, in science, story telling or conversation or even this paper. With respect to life, boundaries are blurred, copies are not exact replicas, reproduction is imperfect, quantities of life forms change their quality – unlike numbers that can be added to infinity – and so on.

The propositional components in logic are abstractions; to think they are real, commits the fallacy of misplaced concreteness. Fitting life forms into logical concepts is trying to fit square pegs into round holes. In organisms everything is connected. Also, abstract terms point to a reality and a context. The reality cannot be pulled out of context and stand-alone. **In an organismic reality there are no stand-alone facts.** When we use mathematics we think we're talking about something real, real facts. *But in an organism, real facts are in contexts that modify the meaning.*

In a living domain, it is not meaningful to talk about facts. **Instead we can talk about organizing principles, processes and intelligence.** We need not look for

15. Eleanor Roach, in Peter Senge, Otto C. Scharmer, Joseph Jaworski, Betty Sue Flowers, *Presence, An Exploration of Profound Change in People, Organizations, and Society*, Doubleday, New York, 2005, p.98f.

16. Alfred North Whitehead, *The Philosophy of Alfred North Whitehead*, 2nd Edition, Tutor Publishing Co., New York, 1951, p.700.

facts, but organizing principles. For example, in Whitehead's philosophy of organism, the first principle is, "the many become one and are increased by one". True, the meaning of that doesn't just leap into ones mind. It is all explained in "Process and Reality" by:

- Eight categories of existence
- Twenty seven categories of explanation
- Nine categoreal obligations.

All of which describe the basic principles for organismic process.

An example of process: An *actual occasion* is a living event composed of many living entities with their own identity in which every entity in the composition is making judgments for itself; what do I want based on prehensions (felt sense facts of togetherness or the awareness of one another) guided by mental pole of eternal objects. Eternal objects are perfect because they are outside space and time like Plato's *Ideals* in mathematics. Eternal objects (these are the organizing principles of life) are organizing principles around which space/ time organizes itself within perfections. Each entity is going to be invoking some aspect of some eternal object(s). This could be the same as laws of coherence. Eternal objects are like objectives (intensional attractors). A living entity in an actual occasion has prehensions giving it what it's got to work with. All of this said is what is presented to us at the beginning of the *actual occasion*. An actual occasion reaches satisfaction in the concrescence of its being positively prehended by another actual occasion and becomes a superject. ***Each individual will decide on the basis of the eternal objects (superject) and the prehensions.***

For life, where freedom of choice in acting exists, control and prediction is impossible, attempts to control are destructive of life and lead to chaos. Most of the problems of the world today are resulting from attempts to control and predict the nature of organisms. If we examine the causes of our failing institutions, it is easy to show that attempts to control them, violating normal processes of life, makes them fail. Nowhere is this more obvious than the immoral idiocy of war.

SECTION IV: LOGIC (EARLY FORMALISM) OF ORGANISMS

For a logic of organismic function, we should be mindful, based on experience, that it should lead to the following results:

- New Realities
- Novelty
- Variety
- Paradox
- Cooperation
- Avoidance of equilibrium, is meta-stable
- Energy, energy stores
- Improbability
- Effective Acts
- Functioning as a unity

- Evolution, not random processes or survival of the fittest
- Oscillation and vibratory processes between both poles of categorical contrasts to find effective acts in its creation process
- Final cause

In contrast to...

Results of *materialism*:

- Deterministic
- Materialistic
- Cause and effect, there is no way of seeing process or how something becomes other than cause and effect
- Passive things/a thing world
- Parts/things/machine-like
- No final cause
- Only way to cause action is with force
- It's predictable
- Has need for consistency/ truth preservation
- Discrete separate things
- Deals only with facts

Rosch characterized perception based on *materialism* worldview of knowledge as follows:

In the analytic picture offered by the cognitive sciences, the world consists of separate objects and states of affairs, the human mind is a determinate machine which, in order to know, isolates and identifies those objects and events, finds the simplest possible predictive contingencies between them, stores the results through time in memory, relates the items in memory to each other such that they form a coherent but indirect representation of the world and oneself, and retrieves those representations in order to fulfill the only originating value, which is to survive and reproduce in an evolutionarily successful manner.¹⁷

In the context of primary knowing, analytic knowledge *can* be beneficial. However, without primary knowing, analytic knowing can be fatally flawed. Today all social institutions are failing. Without knowledge of life, analytic knowing produces “work-arounds” that are ill adapted and exacerbate the catalogue of existing problems.

CONSIDERATIONS FOR ORGANISMIC FORMALISMS

I do have problems with the word logic. Logic is a collection of formal systems originating in the need for sound arguments. Needed now is a class of formal systems with different properties for different purposes.

¹⁷. Eleanor Roach, in Peter Senge, Otto C. Scharmer, Joseph Jaworski, Betty Sue Flowers, *Presence, An Exploration of Profound Change in People, Organizations, and Society*, Doubleday, New York, 2005, p.98.

The logic of physical matter (discrete things or objects) is much concerned with truth preservation, consistency, mono-polar, and cause-and-effect. For 2000 years it was believed that paradox was fatal. We now know that it need not be, but it does require a different kind of logic.

The logic of life is creative, rich in variety and even paradoxical as it embraces both poles of contrasts (strong/weak). Instead of cause and effect, life logic supports willful intentional acts.

Philosophy is a talking discipline. We exchange ideas by describing what we have in mind by talking. In science we exchange ideas by thought recipes or formalisms. This has two advantages. First, we can exchange ideas that cannot be meaningfully said, and second there is no ambiguity. Using logic whose structure is derived from natural language, we see propositions. These are a form of sentences expressing *what we want to say*. If we begin with true sentences, and follow the rules of logic we will not inadvertently wind up defending false statements. In contrast looking at mathematical formalism expressions, we are not likely to want to say anything. Mathematical expressions or formalisms are *commands to do something*.

There is something I want to illustrate here. In high school I learned that Newton's law of motion was $F = ma$. That is easy. F is a number equal to two numbers, m and a , multiplied. Simple, I know how to multiply. But that is not Newton's Law. It is nothing scientifically useful. Newton's law is $F = d(mV)/dt$. Except for the fact that I learned calculus I would have no idea what to do with it.

F and V are vectors. In n -dimensions vectors are sets of n -numbers called n -tuples indicating a magnitude and direction. The only simple number here is m for mass. The expression $d(mV)/dt$ means the derivative of mV with respect to time, i.e., how fast it is changing. Now we encounter a whole set of rules for doing this.

It is the job of empirical philosophy to discover and describe what there is in the world. Empirical philosophy is a precursor to science leading to thought recipes. As an existing science creates serious difficulties scientists will often say, "Let's be philosophical". Much of the work being done today by biophysicists, for example, is empirical philosophy. They are discovering what we need to know to develop a science of life.

WILL MATHEMATICS SERVE?

Mathematics creates the required thought recipe for physics. Can it create the thought recipes for a science of life? I think not. I believe that applying mathematics to living contexts is itself a disaster. Life is a domain of organisms. It would help if we had a fully developed theory of organisms. For now consider the following:

Organisms are born to create and maintain their own life. They are self-creating, i.e., autopoietic; they are not just self-organizing. They maintain their own life by constantly recreating it. Their purpose is not to become machines fulfilling some external task. Thus they are autonomic, i.e., obeying self-law. They are autonomous. An organism's purpose is to develop its own life. Thus maintaining its life does not mean homeostasis. Since its

purpose is not something external, no organism is an input/output machine. They have no information inputs or outputs as the theory of autopoiesis claims.¹⁸(Varela)

Mae Wan Ho, a prominent biophysicist, has used advanced technology to observe living organisms as they live. After 27 years of laboratory observation she describes a human as a society of 75 trillion cells functioning with no controllers or set points, unlike computers. A living society might be described as a super jazz band including instruments as small as 10^{-9} meters to as large as 1 meter and performing our personal theme with endless variations in 72 octaves without a pause. Our bodies are not doing computations, or logic as we know it, nor anything our technology-oriented world is prepared to understand.

In a press release, from The Institute for Science in Society, Ho says:

Quantum Jazz is the music of the organism dancing life into being. We are all quantum jazz players, in the very substance of our being.

Like the little fruit-fly larva, the Daphnia, and any other small creature, we too, would be resplendent in all the colors of the rainbow when observed under the polarizing microscope at a special setting that lets you see right through to the tissues and cells and especially the molecules, as they are busy being alive, and keeping the organism alive.

Organisms are thick with spontaneous activities at every level, right down to the molecules, and the molecules are dancing, even when the organisms sit still. The images obtained give direct evidence of the remarkable coherence (oneness) of living organisms.¹⁹

Even if we could know the *complete* state of an organism we could not predict its next state.

During my computer days I learned a lesson about variety proliferation; I learned the power set law. The total variety in a set of things is 2^n where n is the number of things. For example for three things the variety is 2^3 or 8. I can write them out: 000, 001, 010, 011, 100, 101, 110, 111. The variety in eight things is 2^8 or 256. I can write them out, but I would rather not. Now the variety in 256 things is 2^{256} or 1.15×10^{77} . This means add enough zeros to move the decimal point 77 digits to the right. If I could do one a second and I had started when the universe began I would still be far from done.

Organisms have to select what they want to pay attention to. To accommodate this the theory of autopoiesis reverses the theory of perception. The standard theory begins with inputs. In autopoiesis the theory of perception begins with acts. I call them acts of inquiry. The organism acts and then sends reafference messages to the senses asking, "What changed?" The organism seeks effective acts, i.e., acts that produced the change

18. Francisco J. Varela, *Principles of Biological Autonomy*, Elsevier North Holland, Inc., New York, New York, 1979.

19. Mae-Wan Ho, *Quantum Coherence and Conscious Experience*, www.i-sis.org.uk/SO.papers.php (Science in Society).

intended. *The organism's life depends on learning effective acts for survival in its ecological niche.*

Organisms function internally as jazz bands playing their themes without interruption. They do not pause for input or instructions. I think of the acts of inquiry as analogous to a trumpeter's solo. It may add to expression of the organism's theme upon successful closure or begin abductive processes to find new possibilities.

In short, mathematics won't serve because its rigidity does not allow the flexibility required by living processes.

I make the following distinctions between traditional logics and organismic formalisms:

Characteristics of Traditional Logics:

- Truth preserving
- Thing oriented (extensional)
- Consistency that denies process
- Static
- Excludes self-reference (self-knowing)
- Excludes values

Characteristics of Organismic Formalisms:

- Abductive/Creative
- Meaning oriented (intensional)
- Allows oscillation
- Dynamic
- Requires self-reference (self-knowing)
- Value-driven

The primitives of the Organismic Formalisms:

- Will not be things
- There will be acts and inner relations (Inner relations are relations that change the related)
- The rules will not be inference rules but transformations
- They will not have truth-values
- Truth values will be replaced by coherence, coherence will be conserved
- They will not have subject-predicate forms of propositions.
- Categories will not be object categories but function categories
- The questions we will ask of organismic formalisms will not be "is it true"?
- We will ask, "Can one get there from here"?

One might ask, "What will it be?" I can give some clues. A basic frame will be inspired by the logic of combinators used to develop variable free mathematics. This provides for what is called applicative logics, i.e., applying functions to functions. Here the functions will be acts, transformations.

Finally, for a world of organisms I suspect the formalism will not feature the inference/induction pair of processes. Rather, it will feature transformations/abductions. Organisms have to be what might be called self-programming. Also, they have to be self-connecting to their organismic environment. This requires abductions. I suspect

that abductions will depend on primary knowing.

CONCLUSION:

What is life? Life is more like a verb and an adjective than a noun in that verbs are often processual, and adjectives have to do with value, while nouns are usually a matter of thingness, and of substance.

Life as organisms is process. Life is not a thing.

It must be stressed that life, being creative organisms, is basically free. However, when and where it gets bogged down and develops habitual patterns, it is *not* free; and only then when freedom is lost, can it be understood by logical concepts, theoretical physics, mathematics, and the hard sciences. But the ultimate goal of life is to increase value. What values and how they'll be manifested is a free expression of organisms. Purposes (final cause) do not lend themselves to prediction by the hard sciences. Being creative organism, life comes with value intelligence: its creativity has direction and purpose that becomes its own free gift to the universe.

From the organizing principles of life we can learn better choices for acting, both individually and for social policy.

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