

The Philosophy of Cybernetics

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Abstract

This special edition of The Journal on Systemics, Cybernetics, and Informatics (JSCI), "Philosophy & Cybernetics", would not be complete without describing the link between the two words of the subtitle. "Interdisciplinary" is the heart of this journal and its embracing organization, the International Institute of Informatics and Systemics (IIS), one of the few, if not the only organization, devoted to the study of the concept. We find "cybernetics" within the context of "interdisciplinary", also carrying the same import of integration, interdependence, and organicity as "cybernetics".

To see why requires thinking about thinking, or philosophy, more precisely a philosophical system. Yet, all philosophical systems are beset by the insurmountable problem of attaining universal incontrovertible truths, that is, metaphysical certainty. A tentative solution exists.

I start with "discipline" having a generic meaning. Its academic meaning - rigor and specialization - are combined as intense focus, reducing scope ultimately to the smallest of the smallest, interacting Planck scale units, also in a unique manner characterizing the substratum, both process and object contained within the singularity and giving rise to what we have today. This substratum characterizes the most fundamental law, the unity of difference, the essence of "interdisciplinary". Bootstraps, an answer to the metaphysical problem, are starting points, the singularity with superposition and logic the descriptive language. Now, modern computing is moving towards supercomputers, the Q-bit, based on superposition as the computing unit. Ultimately, my discipline here is sociointelligence, the study of how we can transcend ourselves through cybernetics.

Integration and interdependence are dynamic, meaningless absent a framework, a special kind, a system, a dynamism explicitly operating inside and over a system with its descending subsets of objects and processes, designated logically as variables (like "a"s), those also ascending from Planck units to suprasystem, all mutually interacting. Contained within innately, thus implicitly, are deduction (descension of sets) and induction (ascension of sets).

Dynamism does not occur in isolation, it reflecting the same organic essence shared by humans, their environment, and between the two. "Cybernetics" describes that vital connection between dynamic systems and organisms, in founder Norbert Wiener's words, "the scientific study of control and communication in the animal and the machine". In the end, humans not only live "interdisciplinary" as well as study it but internalize it, ultimately being it.

Recursion, subsumed by cybernetics, occurs with virtually every dyadic relationship in the Universe, each's output forward-fed as inputs, ultimately reproducing the relationship. If logic is a language of innate order in the Universe, so recursion describes it, hence, cybernetic. In a true recursive manner, a cybernetic one, the IIS studies itself, hence, self-reflective.

The philosophical system, resting on the pillars of ontology and epistemology (with its substructure of rationalism and empiricism), describes the relationships between cybernetics, and "interdisciplinary", moreover how we arrive at the connection and why. The system, itself, stands on ontology and epistemology, recognizing the inefficacy of attempts at absolutist metaphysics,

deferring to bootstrapping. Such as the foregoing is a precis for my forthcoming book *Zero is Greater Than One* explaining in detail how and why this all occurs.

** I use a modified British punctuation style because the U.S. one is illogical.*

1. Introduction

Since its inception, the International Institute of Informatics and Systemics (IIS) has devoted major efforts to promoting "interdisciplinary", a main supporting pillar of cybernetics. This special edition of *The Journal on Systemics, Cybernetics, and Informatics (JSCI)*, subtitled "Philosophy & Cybernetics" is an opportune time to set forth what has been missing from academics promoting what they think is "interdisciplinary", mainly the philosophy that gives the word life.

Following is a thumbnail sketch of my larger project, also by invitation from the IIS, to present that philosophy in book form, *Zero is Greater Than One*. "Cybernetics" is an intermediate and critical step, as it contains not only a process but a link between ourselves and the attempted creation of ourselves, the motivations needing exposition.

"Interdisciplinary" is a university salespersons' "good draw". Perhaps more so is "Cybernetics", updated to the popular "artificial intelligence" and transhumanism, steps beyond the industrial roboticization ongoing in earnest for over 250 years. We presently seek not only to replace human slaves (unpaid and wage) with artificial devices but apply the process to ourselves. Indeed, searching for "transhumanism" shows the most recent versions emerging from its origins several thousand years ago with Egypt's artificial toe. These are the mechanics, the import of which is vacuous without insight about intent.



Figure 1: Towards transhumanism – prosthetic toe (circa 1550-1000 BC) found in Sheikh 'Abd el-Qurna (Prosthesis, 2021)

I intend to use this forum to distribute a larger message about the essence of "interdisciplinary" and "cybernetics". "Interdisciplinary" and cybernetics cannot simply be intellectual fodder for academicians living in caves away from their collapsing environment, especially when they are perhaps unbeknown to themselves holding the ticket to their very survival. Here will be presented the thumbnail sketch of my thesis, the book following with

substantiating details. You will notice my quoting "interdisciplinary", as I honestly do not think most persons think about the word's larger scope enveloping who uses it.

I plan to explain the:

- building blocks "cybernetics", "communication", "interdisciplinary", and supporting components "inter" and "discipline";
- philosophical backdrop - the most fundamental law;
- barriers to settling on a philosophical system;
- solution to the barriers problems;
- elements of the philosophical system - ontology and epistemology;
- transition of order to social organism;
- How "interdisciplinary" and its attendant cybernetics are realized.

Any discussion of philosophy and cybernetics must ultimately lead to centering on our identity, including core values. Otherwise, academicians will be churning cement and rocks together, clueless about the mixture's purpose.

"Isn't this rather far from "cybernetics?" you may ask. Whether you realize it or not, we already are inextricably caught in a cybernetic loop. Here is a spoiler. You may have a philosophy, but you need to justify it, but justifying it requires philosophy. You sever this circle, make it a line, and enlarge the circumference to encompass more of the Universe. First, we should agree about the language used, starting mainly with "cybernetics" and "philosophy".

Another objection may be raised that some - even much - is tutorial belaboring the obvious or non-essential to "interdisciplinary", signifying how we exist within ourselves and our environment. If interconnection, integration, and intercommunication were obvious, we probably would not be facing the Holocene Extinction (a.k.a. the Sixth Great Extinction) [Holocene Extinction, 2021; Bradshaw et al., 2021]. Philosophy tells how we regard ourselves, and if we fail to reflect on core values propelling cybernetics, extinction will occur.

Be aware also this article has a companion, "The rigor of 'interdisciplinary'", appearing in another special JSCI edition, "Rigor and Interdisciplinary Communication". Together, these shamelessly help promote *Zero is Greater Than One*.

2. Scope of Inquiry

Justifying the scope of my presentation relies on some axial words revolving around "philosophy" and "cybernetics", the very core of this special issue.

André-Marie Ampère (1838, p. 140) first used "cybernetics" in 1838.

Cybernétique. Les relations de peuple a peuple, étudiées dans les deux sciences precedentes [Ethnodicée, Diplomatie], ne sont que moindre parties de objets sur lesquels doit veiller un bon gouvernement; le maintien de l'ordre public, l'executions des lois, la juste repartition des impôts, le choix des hommes qu'il doit employer, et tout ce qui peut contribuer a l'amelioration de l'etat social, reclament a chaque instant son attention. Sans cesse il a a choisir entre diverses mesures celle qui es la plus propre a atteindre le but; et ce n'est que par l'etude approfondie et comparée de divers elements que lui fournit, pour ce choix, la connaissance de tout ce qui es relative a la nation qu'il regit, a son caractere, ses mœurs, ses opinions, son histoire, sa religion, ses moyens d'existence et propsperite, son organisation et ses lois, qu'il peut se faire des regles generales de condite, qui le guident dans chaque cas particulier. Ce n'est donc que'apres toutes les sciences qui s'occupent de ces divers objets qu'on doit placer celle dont il est ici question et que je nomme Cybernétique, du mot κυβερνητική, qui, pris d'abord, dans un acception restreinte, pour l'arte de gouverner un vaisseau, recut de l'usage, chez les Grecs meme, la signification, tout autrement entendue, de *l'arte de gouverner en general*.

Translation:

Cybernetics. People-to-people relations, studied in the two preceding sciences [Ethnicity, Diplomacy], are only the smallest parts of the objects over which good government must watch; the maintenance of public order, the execution of laws, the fair distribution of taxes, the choice of the men to be employed, and all that can contribute to the improvement of the social state, demand at every moment His attention. He constantly has to choose, among various measures, the one which is best suited to attaining the goal; and it is only by the in-depth and compared study of various elements that provides him, for this choice, the knowledge of all that relates to the nation which he governs, to its character, its moorings, its opinions, its history, its religion, its means of existence and prosperity, its organization and its laws, that it can form general rules of conduct, which guide it in each particular case. It is only after all the sciences which deal with these various objects that we must place that which is in question here and which I call *Cybernetics*, from the word, κυβερνητική, which, taken first, in a restricted sense, for the art of governing a vessel, received from use, among the Greeks even, the meaning, quite differently understood, of the *art of governing in general*. [emphasis included]

Ampère represented the 19th century tradition of organically-thinking scientists and philosophers, departing from the pre-to-mid-18th century of mechanistic thinking characterizing the Enlightenment, sparked in part by Descartes regarding animals as souless machines.

Norbert Wiener [1948] is the modern founder of "cybernetics", saying "Dr. Rosenblueth and myself (sic) had already become aware of the essential unity of the set of problems

centering about communication, control, and statistical mechanics, whether in the machine or in living tissue [Ibid., p. 11]". However, there was no unifying literature or terminology, let alone a separate field of study embracing the problems. Accordingly, they

... have decided to call the entire field of control and communication theory, whether in the machine or in the animal, by the name of *Cybernetics*, which we form from the Greek. *ἡ κυβερνητική*, or *steersman* ', taken after the way a steamship is driven, deviations of its tiller fed back into valve control mechanisms, that is, feedback, the results of an action used to initiate the next action. [Ibid., p. 19]

[Ibid., p. 11].

Wiener does not acknowledge Ampère.

Yet, we really need to go back further to ancient times. A brief search for the history of automatons yields [King Mu of Zhou](#) (1023-957 BCE) and the Hellenistic period with Ctesibius, Ktesibios, or Tesibius (285–222 BC) and his water organs and clocks.

Wiener was just one among numerous others in the growing academic community researching "control and communication theory, whether in the machine or in the animal". Aside from the mechanization of human labor highlighted by the Industrial Revolution, W. Ross Ashby already was researching adaptation coming after learning. Ludwig von Bertalanffy, Alan Turing, and John von Neumann were some of the luminaries advancing cybernetics work in the 1930s and 1940s. Ours is not the task to review this interesting history but to show cybernetics the crucial link between the interdisciplinary inherent both in mechanical systems and organic ones.

Because Wiener does I give special attention to "interdisciplinary", noting in his introduction, "...increasingly the task of specialists, in which show a tendency to grow progressively narrower." [Wiener, 1948, p. 2], upset about jargon, where

...every single notion receives a separate name from each group; and in which important work has been triplicated or quadruplicated; while still other important work is delayed by the unavailability in one field of results that may have already become classical in the next field.

We [Wiener's program working group] had dreamed for years of an institution of independent scientists, working together in one of the backwoods of science, not as subordinates of some great executive officer, but joined by the desire, indeed by the spiritual necessity, to understand the region as a whole, and to lend one another the strength of that understanding"

[Wiener, pp 2-3].

Wiener saw the nascent computer research in 1940 "...as we shall see in the body of the bookof interest in connection with the study of the nervous system" [Ibid., p 4]. It was clear to him that technological development had brought with it many interdependencies, as

in calculating velocities of varying objects with respect to each other or in electro-mechanical systems designed to replicate human functions, all "interdisciplinary". Oxford says about "interdisciplinary", "Relating to more than one branch of knowledge" [Interdisciplinary-Oxford, 2021].

UNESCO's International Bureau of Education (IBE) refers to "interdisciplinary" as:

An approach to curriculum integration that generates an understanding of themes and ideas that cut across disciplines and of the connections between different disciplines and their relationship to the real world. It normally emphasizes process and meaning rather than product and content by combining contents, theories, methodologies and perspectives from two or more disciplines.

[Interdisciplinary-UNESCO, 2021]

The U.S. National Science Foundation (NSF) says:

Interdisciplinary research is a mode of research by teams or individuals that integrates information, data, techniques, tools, perspectives, concepts, and/or theories from two or more disciplines or bodies of specialized knowledge to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline or area of research practice.

*Committee on Facilitating Interdisciplinary Research, Committee on Science, Engineering, and Public Policy (2004). *Facilitating interdisciplinary research*. National Academies. Washington: National Academy Press, p. 2.

[Interdisciplinary-NSF, 2021]

Other dictionaries follow the same definition pattern set by Oxford:

- involving two or more different subjects or areas of knowledge: [Interdisciplinary-Cambridge, 2021]
- involving more than one academic subject. [Interdisciplinary-Collins, 2021]

... all carrying the same import of integration, interdependence, and organicity as "cybernetics". Here, the magic number is "two", but quite sufficient for the argument I will make for this work's philosophical foundations.

From "interdisciplinary" come subsidiary words, like "inter-disciplinary", content with material common to more than one discipline; "intra-disciplinary", communication among researchers from a specific discipline researching with diverse methods and communicating their results in each presenter's own specialized language; and "cross-disciplinary", explaining aspects of one discipline in terms of another.

All these have in common interconnectedness, integration, and interdependence, "common to more than one discipline ... communication among researchers ... one discipline in terms of another", just like Wiener wants to see. We will learn fortuitously these characterizing our world in general and permeating the individuals in it.

Dictionary definitions are not sufficient nor are reading a plethora of articles on its reputed implementation. A generic view is through the lens of a thesaurus [Interdisciplinary-Thesaurus, 2021], our finding, "integrative", "multidisciplinary", "associative", "incorporative", "multifaceted", "synthesizing", versatile", and so forth, each with its distinct and subtle meaning sufficient to differentiate it from other terms. Such is one reason why so many articles have appeared on the word. Too, context involves etymology, how a word came to be, including the motivating ideas stemming from how we know and interact with the world in general.

That is, the academics' "interdisciplinary" is an artifact of a more substantial layer of our being requiring philosophy. Yet, all philosophical systems are beset by the insurmountable problem of attaining universal incontrovertible truths, that is, metaphysical certainty. A tentative solution exists.

3. Elements of a philosophical system

In the following, I am leaving out a lot because of space limitations, hence, *Zero is Greater Than One*. "Philosophical system" means an organized way of thinking about thinking. Any decent exposition of a philosophy stands on two pillars - determining criteria for existence, ontology, and how we justify, epistemology.

Descartes wrote the famous words, "*Cogito, ergo sum*", "I think, therefore I am", the first statement of a person's existence (at least her/his mind) existence. But how did Descartes know? "Existence is derived immediately from the clear and distinct idea of a supremely perfect being.", a view very much in dispute [Nolan, 2021]. "God" says so, and I believe in "God", his justification. Of course, this is circular, neither an answer universally satisfactory for all time, unless faith is your epistemology. Much literature has been generated by scholars over these interpretations, the *Stanford Encyclopedia of Philosophy* an excellent starting point, but such does not detract from his subdividing required to know anything.

Arguably, the most difficult question is "what exists?", many thinking it sophomoric, preferring to move on toward more "practical" affairs. I disagree, thinking avoidance is code for avoiding philosophy altogether. Legitimate problems exist, my solution to which bespeaks a whole methodology and content of exploring our universe. We are confronted with ultimate explanations – existence and our knowledge of it. What is reality, and how do we know? Equally wearying is "how do you know?" Notice here the problem of justifying the justification, similar to the ancient myth of stacking tortoises on top of each other to explain how the Earth is supported.

- Our seeming inability to arrive at absolute answers is expressed by (among others):

- the boundary problem - we set the limits, as in calculus and the Copenhagen interpretation in double-slit experiments;
- problems like wave-particle, material-immaterial, and so forth;
- inability to identify an absolute reference frame (general and special theory of relativity);
- explaining mentation (ideas, consciousness, thinking, etc.) – except through the effects;
- escaping human bias - questing for neutrality;
- inability to identify the substratum giving rise to everything currently (not the singularity).

Wiener describes Heisenberg's inability to measure position and momentum of a particle at the same time, more technically stated by one of my colleagues, not "... just have to do with instruments, but also with the non-commutativity of the multiplication of matrices representing the observation of position and momentum.". Locating something precisely is impossible, just by its constant movement and resolution. He says locating something requires an instrument with the same resolving power [Wiener, p. 83], high frequency and short wavelength, but higher frequency means higher momentum, and conversely. Hence, measuring something with a frequency requires the instrument with the same or higher frequency. The particle escapes precise measurement, like an animal chasing its tail. Such says nothing about larger problems, like Gödel's incompleteness theorem (undecidability of consistency in any system giving rise to mathematics, including arithmetic).

I refer to the "Abbot problem", after Edwin A. Abbott and his 1884 "*Flatland: A Romance of Many Dimensions*", a novelette about a two-dimensional world. A raindrop falling in Flatland would appear to its inhabitants first as a dark spot on the horizon, a line as the drop passes through the plane, and last a dot again, experiencing solely by pressure atop of the head. One-dimensional persons in their linear world see only ahead or behind. Modeling four dimensions (spacetime) is not empirically equal to beyond three dimensions. We are unsure of time's existence.

In lieu of absolutist metaphysics is personal ontology, a special type of bootstrap. Think how calculus solves the boundary problem – our setting the limit, and because of the Copenhagen and Heisenberg problems. Human bias is unavoidable, hence internal ontology. Each person is her/his reference frame, no different than mathematics and logic with axioms, definitions, premises, and so forth.

My epistemology is:

- *Reason/rationalism* – All knowledge comes from how we arrange things in our minds according to certain rules, precepts, etc.
- *Empiricism* – We know things through observation, the senses, and experience.

Tradition is repetition, history is a recording of past events, and science combines all the other epistemologies in special and organized ways. In essence, we sense and experience the environment (empiricism) and figure it out (mentally process it, or reason it), extrapolating from past events and projecting to the future. If you notice closely, these are pairs, neither capable of existing without the other.

4. The philosophical system itself

Overall, I develop from the simplest elements how "interdisciplinary" describes a living being, cybernetics exploding the prejudice of it having to be humans. First, we require a law, just as Feynman described for the Universe in his 1964 *The Character of Physical Law*.

4.1 The most fundamental law

In a dark room, you should see nothing. With the lights on everything becomes apparent. You see each object because it is different from the rest. In more abstract terms, you realize it because of what it is not. It is the most fundamental law of all: the unity of difference, others calling it "the unity of opposites" or "dialectics". Apprehending by difference applies to all of our senses: sight, touch, taste, sound, and smell - empiricism. You also have to use the epistemology of logic, the inability to think of anything just by itself. If you did, everything would be that. Eastern philosophers "evacuate" the mind of all externals in deep meditation. History, tradition, and science follow the same dialectical trajectory. There are many differences, some of which are contradictions - opposites like:

- up – down
- left – right
- ugly – beautiful
- white – black
- fast – slow
- construction – destruction
- particle - wave
- theory – practice
- in - out.

Another name for these pairs is "duals". Two distinct parts are necessary for each to exist. Logicians, for example, say the existential quantifier exists because of the universal, and vice versa, individuals for sake of their property. Yes, "interdisciplinary" operates to effect these duals.

Aristotle said:

Pairs of opposites which fall under the category of relation are explained by reference of the one to the other, the reference being indicated by the preposition "of" or by some other preposition. Thus, 'double' is a relative term, for that which is double is explained as the 'double of something'"

[Aristotle, 1984, *Categories* 10 – 11b22-33; 192a25-192a34, p. 455/18].

Descartes followed with: " ... to divide each of the difficulties under examination into as many parts as possible, and as might be necessary for its adequate solution. ... by showing that we cannot conceive body unless as divisible" [Descartes, 1641, p. 122].

Recall Abbott and dimensions in locating these duals, the simplest, a line, one point before the other or the reverse, the nascence of order, or arrangement.

From the unity of differences - the substratum - comes existents. Aristotle said the source of expansion and contraction is that "substratum" (Aristotle, 1984, 192a25-192a34), "...that there must be something underlying the contraries, and that the contraries must be two" [Ibid., 191a9-191a12], "...before and after in motion identical in substratum" [Ibid., 219a15-219a21, p. 508/70]. This is to say that it is neither this (as in position A before the movement) or that (position B after the movement), but something underneath, the process discerning which is position A and which is position B. Two items are critical here. First, expansion - contraction is a dual, the extremes infinitesimal and infinity, the first reducing to Planck scale and ultimate disappearance, the second expanding to the heat death of the Universe, or entropy; the first creation, the second destruction; the first no entropy, the second entropy. Second is "dual" is two, hence binary, the most elemental spawning order.

Said Aristotle,

The 'now' in one sense is the same, in another it is not the same. In so far as it is in succession, it is different (which is just what its being now was supposed to mean), but its substratum is the same; for motion, as was said, goes with magnitude, and time, as we maintain, with motion.

[Ibid., 219b13-219b34]

So, time "goes with" motion, and motion with magnitude. That is, one is associated with the other. So, time goes with magnitude. "Magnitude" strictly implies space. "Goes with" is taken to mean "being coupled with", a compound word, a single entity with two characteristics, like "crosswalk", "railroad", or "grasshopper". The first word "goes with" or is coupled with the second. Hence, it is no less valid to conclude that "magnitude" (space) can "go with" time as "spacetime", exactly what Einstein said. Further, "Not only do we measure the movement by the time, but also the time by the movement, because they define each other. The time marks the movement, since it is its number, and the movement the time" [Ibid., 220b15-220b32].

Mind you, each half of a dual cannot be apprehended alone, it requiring the other, existing because of what it is not. How can both exist, then apart from ourselves? Quantum physicists refer to "superposition", two different states of something existing simultaneously, illustrated by the Schroedinger thought experiment of a cat both alive and dead at the same time. Kant [1787/1929] in his discussion of appearance and reality in his *Critique of Pure Reason* states:

All our representations are, it is true, referred by the understanding to some object; and since appearances are nothing but representations, the understanding refers them to a something, as the object of sensible intuition. But this something, thus conceived, is only the transcendental object; and by that is meant a something = X, of which we know, and with the present constitution of our understanding can know, nothing whatsoever, but which, as a correlate of the unity of apperception, can serve only for the unity of the manifold in sensible intuition. By means of this unity the understanding combines the manifold into the concept of an object. This transcendental object cannot be separated from the sense data, for nothing is then left through which it might be thought. Consequently it is not in itself an object of knowledge, but only the representation of appearances under the concept of an object in general a concept which is determinable through the manifold of these appearances.

[Ibid., A250, A 251 p. 268]

We experience an object in one moment after another (appearing, or appearance), but the reality is the persisting object peeking through these appearances.

When, therefore, we say that the senses represent objects as they appear, and the understanding objects as they are, the latter statement is to be taken, not in the transcendental, but in the merely empirical meaning of the terms, namely as meaning that the objects must be represented as objects of experience, that is, as appearances in thoroughgoing interconnection with one another, and not as they may be apart from their relation to possible experience (and consequently to any senses), as objects of the pure understanding.

[Ibid., A258 p. 274]

The instance (appearance) exists, given the totality of instances (reality) and vice versa, but we are no closer to understanding why we cannot perceive each by itself.

Now we are approaching the birthplace of "interdisciplinary", the core dynamic exhibiting the most fundamental law.

4.2. From order to system

4.2.1. Binary, itself

We have the foundations of the bootstrap - the most fundamental law - and the origin of order, something arranged with respect to what it is not in the simplest dimension.

Wiener, himself, gives me liberty to develop my philosophical system.

He writes:

Mr. Pitts had the good fortune to fall under McCulloch's influence, and the two began to work quite early on problems concerning the union of nerve fibres by synapses into systems with given over-all properties. Independently of Shannon, they had used the techniques of mathematical logic for the discussion of what were after all switching problems."

[Wiener, p. 13]...

... The all-or-none character of the discharge of the neurons is precisely analogous to the single choice made in determining a digit on the binary scale, which more than one of us had already contemplated as the most satisfactory basis of computing machine design. The synapse is nothing but a mechanism for determining whether a certain combination of output from other selected elements will or will not act as an adequate stimulus for the discharge of the next element and must have its precise analogue in the computing machine.

[Ibid., p. 14]

Apart from the obvious foundation of modern computation, the base-2 system, few realize a deep philosophy underpins bivalency. Wiener keenly points to "... an element which occurs repeatedly in the history of cybernetics - the influence of mathematical logic." the "patron saint of cybernetics being Leibniz" [Ibid., p. 20]. Gottfried Leibniz (1703) set forth binary counting in his *Explication de l'Arithmétique Binaire* over three hundred years ago, saying, "... seroit un des plus importants moyens d'aider lesprit humain" (... it would be one of the best means of helping the human spirit.) [Ibid., p. 89].

The binary did not die with Leibniz, as Jean Piaget said in the middle of the last century:

There exist outline structures which are precursors of logical structures,... It is not inconceivable that a general theory of structures will...be worked out, which will permit the comparative analysis of structures characterizing the outline structures to the logical structures characteristic of the higher stages of development. The use of the logical calculus in the description of neural networks on the one hand, and in cybernetic models on the other, shows that such a programme is not out of the question. (emphasis included).

[Piaget 1958, p. 48]

World renown physicist John Archibald Wheeler said the arrangement in the universe is according to a "pregeometry as the calculus of propositions," such that "...a machinery for

the combination of yes-no or true-false elements does not have to be invented. It already exists [Misner, Thorne, and Wheeler, 1973, p. 1208 et seq.]. Wheeler said further, "...it is not unreasonable to imagine that information sits at the core of physics, just as it sits at the core of a computer [Wheeler, 1998, p. 340]". His "It from bit" specifies,

every 'it'—every particle, every field of force, even the space-time continuum itself—derives its function, its meaning, its very existence entirely—even if in some contexts indirectly—from the apparatus-elicited answers to yes-or-no questions, binary choices, bits. 'It from bit' symbolizes the idea that every item of the physical world has at bottom—a very deep bottom, in most instances—an immaterial source and explanation; that which we call reality arises in the last analysis from the posing of yes-no questions and the registering of equipment-evoked responses; in short, that all things physical are information-theoretic in origin and that this is a participatory universe.

[Wheeler, 1990]

We have a history extending to ancient times, as in "The Creation hymn" in the *Rig Veda* saying, "Whence all creation had its origin, he, whether he fashioned it or whether he did not, he, who surveys it all from highest heaven, he knows--or maybe even he does not know [Rig Veda, 2017 CXXIX – Creation – Pp 1073. Book the Tenth]", and the *I-Ching* (Book of Changes) to which Leibniz refers as a means to display binary relations with 64 hexagrams.

4.2.2 Semantics and meaning

We cannot be limited to Wiener's "all-or-none character of the discharge of the neurons". Logic is the language of innate order in the Universe. It is the language of the philosophy, starting with the "letters" zero and one, bytes the words, conceptually capturing the essence of the most fundamental law. Interesting is the Christian Bible's, "In the beginning was the word." [John 1:1], with "logos" extending from the Greek for "word" and the etymology of "logic" [Logic, 2021].

Repeated (recursive) Cartesian subdivision yields the smallest of the smallest, entities physicists call "particles" in Planck scale($1.616255(18) \times 10^{-35}$ m) (indistinct from each other, all having quarks, etc., the only difference between them their spacetime. How do we know? By seeing them in terms of what they are not, vacuum space, these "particles" disappear and emerge from an unknown. We now have the "table of relational completeness".

Table 1: Table of relational completeness

p	q	Relationship
0	0	existent as is related to or contained within itself.
0	1	existent as is related to or containing its other
1	0	existent's other as is related to or containing the existent; yet, this is the "other" of 0-1.
1	1	existent's other as is related to or containing itself.

Zero precedes, the absence of order, the singularity, superposition, chaos, - point (as the geometers say, "dimensionless", and, arguably most notable), "cannot be defined in terms of previously defined objects" [Point, 2021].

It is not a far stretch to see the symbols zero and one - bits - describing orderings or arrangements in spacetime. Indeed all of our world is discrete [Zizzi, 2000, 2004].

4.2.3 Structure

The four rows of existent relationships of the preceding single-dimension Table of Relational Completeness table produce a two-dimensional complete 16-column logical space, the Table of Functional Completeness (ToFC). That is, zeros and ones can be arranged in four placeholders 16 different ways.

Table 2: Table of functional completeness

p	q	f₀	f₁	f₂	f₃	f₄	f₅	f₆	f₇	f₈	f₉	f₁₀	f₁₁	f₁₂	f₁₃	f₁₄	f₁₅
0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
0	1	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1
1	0	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
1	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
		~f₁₅	~f₁₄	~f₁₃	~f₁₂	~f₁₁	~f₁₀	~f	~f	~f	~f	~f	~f	~f	~f	~f	~f₀
								9	8	7	6	5	4	3	2	1	

For all 16 functions, if we forward-feed the outputs of a function as inputs to it, ultimately, the function, itself will re-appear, i.e., recursion [Horne2017]. Notice the turquoise highlighting of the relational completeness table.

For function 13 it is:

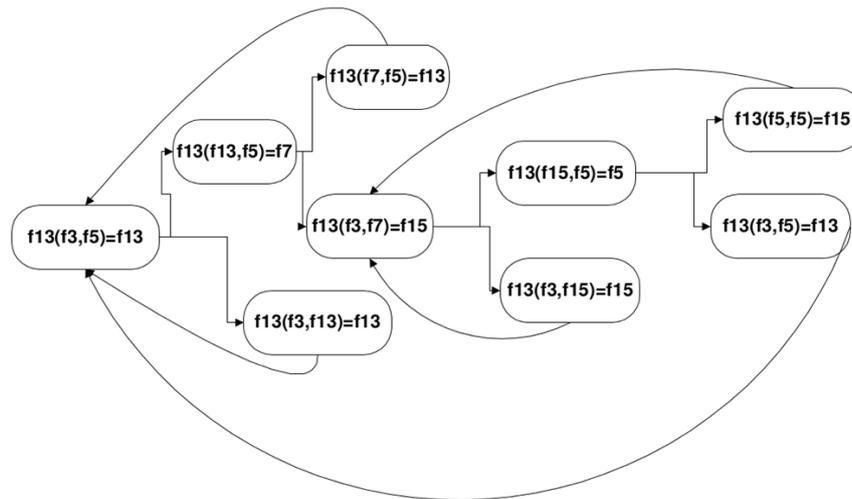


Figure 2: Recursion of function 7, "material implication"

In three dimensions is the three-dimensional hypercube with 16 plates, my full explanation appearing in a separately-published paper:

The hypercube represents the 4,096 permutations of dyadic (two place) computations of the sixteen functions in the Table of Functional Completeness (TFC), i.e. $f_n(f_x, f_y)$, where the subscripts "n", "x", and "y" stand for "a selected function" as an operator, the first element in an ordered pair as operands, and the second element of the ordered pair, respectively. There are 16 plates, each corresponding to one of the 16 functions. Each plate displays a Cartesian coordinate form of a particular function operating over the 16 functions, including itself. That is, the plate shows the complete permutation of computations for a function. There are 162 computations, in each plate or 256 results. In reading the hypercube one starts from the top left, reads downward and then across the top to arrive at an answer. Thus, in Plate f6, for $f_6(f_9, f_{12})$ to get f5, read down the left-hand most column to f9 and then across to the column headed by f12 in the manner of a distance chart on a highway map to get the f5. The same plate shows $f_6(f_8, f_{11}) = f_3$. Always read across and then down to get the result of the computation; a number of function pairs are not commutable, i.e., yield the same result if the functions are switched. We can see that 16 plates times the 256 results for each plate yields the 4,096 as the total number of dyadic computations possible in binary space. This is the complete expression of computational completeness for all 16 functions in a dyadic relationship. The hypercube is to computational completeness for dyadic relationships as the TFC [Table of Functional Completeness] is to the permutations of 0s and 1s in a four place number. The first is three-dimensional, the second two-dimensional. [Horne, 2011]

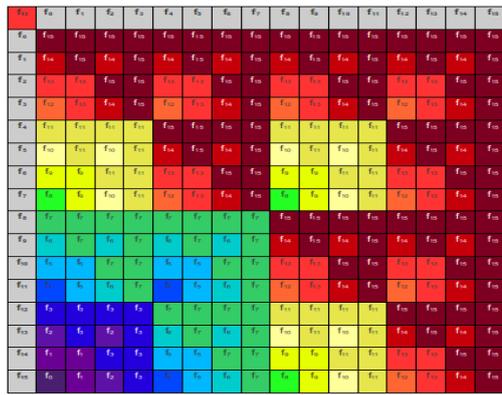


Figure 3: Three-dimensional hypercube.

Each function in the hypercube has been color keyed to a frequency on the light spectrum to reflect a discussion in August Stern's [1992] work purporting the ability of binary spaces to reveal quantum mechanical relationships. Be it the case or not, it makes the cube colorful, and it helps the reader track functional relationships. :-)

There is nothing to say the same cannot be done for dimensions above three.

4.2.4. Automata and communication

Each bit interacting with its neighbors according to rules produces other bits, the assemblage being a cellular automaton, each cell a placeholder for a bit. There may be apparently predictable (ordered) or non-predictable (random) outcomes.

Here is where Wiener and communication dovetail with the above. We need to place those zeros and ones in proper context. That is, does the bivalent system satisfy communications requirements set forth by Wiener? After all, cybernetics is about "communication in the animal and machine".

Communication requires both a sender and receiver and a signal with something being communicated, not simply as content but meaning, telling the recipient the purpose of the communication so s/he act accordingly. This gets tricky because an artificial entity can communicate. Shannon, who says:

The fundamental problem of communication is that of reproducing at one point either exactly or approximately a message selected at another point. Frequently the messages have meaning; that is they refer to or are correlated according to some system with certain physical or conceptual entities. These semantic aspects of communication are irrelevant to the engineering problem. [Shannon, p. 379]

Minimally, "meaning" enables a receiver to act on the sent content, just a signal or the absence of one triggering a switch. The scope of communications is:

Communication (from Latin *communicare*, meaning "to share") is the act of conveying meanings from one entity or group to another through the use of mutually understood signs, symbols, and semiotic rules.

... Interpretation and making sense of the presumed original message.

[Communication, 2021]

... begging the question of what it takes - human or otherwise - to "understand" or "interpret". There is a vast difference between the switch and the content conveyed by a painting.

We come to the content, information.

What is this information, and how is it measured? One of the simplest, most unitary forms of information is the recording of a choice between two equally probable simple alternatives, one or the other of which is bound to happen - a choice, for example, between heads and tails in the tossing of a coin. We shall call the single choice of this sort a *decision*. ... if we put $A = 0$ and $B = 1$, and represent the quantity in the binary scale by the infinite binary number ... then the number of choices made and the consequent amount of information is infinite.(italics included) [Wiener, p. 61]

Information is the recording of a choice.

Wiener - "The message is a discrete or continuous sequence of measurable events distributed in time - precisely what is called a time series by the statisticians." [Ibid., pp. 8-9]. So, binary qualifies. Logic is that language used in communication, bits the letters, bytes the words. Not every string of bits contains "information" – at least insofar as we can determine. It has been pointed out to me, "that the number of infinite binary strings is uncountable, but the number of comprehensible messages (via any of a number of arguments) is countable. Thus it cannot be true that all sequences correspond to messages." Hypothetically, we simply may not have been able to interpret meaning or comprehend all strings of bits, raising the randomness issue, i.e., there even being randomness.

An aside is in order here for those looking to Wiener's extensive discussion of information transmission efficiency [eg: p. 66]. Mine is not the purpose to worry about such matters, only that binary is information.

Functions interact to produce functions. What of their contents, bits? They interact too as cellular automata. Wiener says:

In short, the newer study of automata, whether in the metal or in the flesh, is a branch of communication engineering, and its cardinal notions are those of the message, amount of disturbance or "noise" - a term taken over from the telephone engineer - quantity of information, coding technique, and so on.

[Ibid., p. 42]

Representative work in cellular automata by Andrew Wuensche [<http://www.ddlab.com/>] and Stephen Wolfram [<https://www.wolframscience.com/nks/>] describes both what they say is randomness stemming from order and conversely. A whole separate discussion occurs

about organization stemming from the dual, emergent phenomena, autopoiesis, and entropy, all of which Wiener covers and I discuss in my book.

As we have seen, cybernetics subsumes feedback and recursion. A feedback example by Wiener is:

The central nervous system no longer appears as a self-contained organ, receiving inputs from the senses and discharging into the muscles. On the contrary, some of its most characteristic activities are explicable only as circular processes, emerging from the nervous system into the muscles, and re-entering the nervous system through the sense organs, whether they be proprioceptors or organs of the special senses. This seemed to us to mark a new step in the study of that part of neurophysiology which concerns not solely the elementary processes of nerves and synapses but the performance of the nervous system as an integrated whole. [Ibid., p. 15]

(NB: Wiener in *Cybernetics* writes "feed-back", "feed back", and "feedback" several ways, an interesting variation that could be interpreted as emphasizing the verb "feed" - backward in time, as in an effect preceding its cause.)

Then, "Between the receptor or sense organ and the effect or stands an intermediate set of elements, whose function is to recombine the incoming impressions into such form as to produce a desired type of response in the effectors" [Ibid. Wiener, p. 42].

Thus the modern automaton exists in the same sort of Bergsonian time as the living organism; and hence there is no reason in Bergson's considerations why the essential mode of functioning of the living organism should not be the same as that of the automaton of this type.

[Ibid. p. 44]

While space does not permit me to elaborate, worthy of exploration is Tononi's "update" of Wiener showing how he digitizes neural transmissions, demonstrating that subtleties of consciousness can be expressed in binary form [Tononi, 2008].

If you think such is farfetched, research The Intelligence Advanced Research Projects Activity (IARPA), Blue Brain, the US National Institute of Mental Health Research Across Domains (RDoC), Human Brain Project, Riken Brain Science Institute, and SyNAPSE, massive work to replicate human consciousness. Explore also Towards a Science of Consciousness (<https://consciousness.arizona.edu/>), a conference I helped start in 1981, now the largest one in the world.

4.3. From system to social organism

I won't say much on systems analysis, in particular social systems, merely referencing well-known works by Bertalanffy, Easton, Buckley, etc. Elsewhere, I have developed the foundations of an organic society [Horne, 2018]. Here, I want to focus - in keeping with Wiener - how its cybernetic nature not only fosters but is "interdisciplinary *en vivo*."

Wiener says:

It is certainly true that the social system is an organization like the individual, that it is bound together by a system of communication, and that it has a dynamics in which circular processes of a feedback nature play an important part. This is true, both in the general fields of anthropology and of sociology and in the more specific field of economics; and in the very important work, which we have already mentioned, of von Neumann and Morgenstern on the theory of games enters this range of ideas. [Wiener, p. 24]

His is not the first suggestion that societies are organic, as the following examples illustrate:

Table 3: Representative philosophers arguing societies have organic character

Writer	Writing
Plato (circa 428/427 BCE - circa 348/347)	<i>Republic</i>
Aristotle (circa 384 – circa 322 B.C.E.)	<i>Politics</i>
Thomas Hobbes (5 April 1588 – 4 December 1679) - artificial but acting as organism	<i>Leviathan</i>
Jean Jacques Rousseau (28 June 1712 - 2 July 1778)	<i>The Social Contract and Discourses</i>
Henri Saint-Simon (17 October 1760 – 19 May 1825)	<i>Du Systeme Industriel, The Political Thought of Saint-Simon</i>
Georg Wilhelm Friedrich Hegel (27 August 1770 – 14 November 1831)	<i>Philosophy of History, Philosophy of Right</i>
Johann Caspar (also Kaspar) Bluntschli (7 March 1808 – 21 October 1881)	<i>The Theory of the State</i>
Auguste Comte 19 January 1798 – 5 September 1857)	<i>Cours de Philosophie Positive, The Positive Philosophy of Auguste</i>
Emile Durkheim (15 April 1858 – 15 November 1917)	<i>The Division of Labor in Society</i>
Oswald Spengler (29 May 1880 – 8 May 1936)	<i>Decline of the West</i>

... all of which I write about in *Zero is Greater Than One*. Oh yes, add Ampère, too.

When Wiener refers to the social system bound together through a system of communication, we can go back to Durkheim and read about the social brain, coordinator of

social communication through government [Durkheim, 1893]. That brain reaches out through philosophy, motivated by the social core value - ethos - valuing the search for truth above all else. It is intriguing to think how the *Journal of Sociocybernetics* might regard it [<https://papiro.unizar.es/ojs/index.php/rc51-jos/index>]. How do we study this?

We finally come to "discipline",

c. 1200, "penitential chastisement; punishment for the sake of correction," from Old French *descepline* "discipline, physical punishment; teaching; suffering; martyrdom" (11c., Modern French *discipline*) and directly from Latin *disciplina* "instruction given, teaching, learning, knowledge," also "object of instruction, knowledge, science, military discipline," from *discipulus* "pupil, student, follower" (see *disciple* (n.)).

The Latin word is glossed in Old English by *þeodscipe*. The meaning "treatment that corrects or punishes" is from the notion of "order necessary for instruction."

[Discipline, 2021]

Pay attention to instruction's function – to correct or redirect by punishment, teaching, or suffering from something deemed not right to correct. "Correct?" By pulling this word apart, we see the root "rect", or straight - not too different than truth.

To have a "discipline" you need an area of study, but the larger question is what "study" is and why we do it. I propose sociointelligence, the following image capturing the idea and about which I elaborate in the book.



Figure 4: Welcome to sociointelligence!

We discover the social brain with a central set of courses in philosophy (political logical, epistemology, and ontology), sociology, neuropsychology, and, among others, the study of a society's becoming a living being and its role in the Universe. These are the cybernetic tools for interdisciplinary study.

Now come larger questions of philosophy, as in reasons for our existence, two starkly contrasting ones the search for truth (Plato, *The Republic*, Book 7) and hedonism (Jeremy Bentham).

4.4 Social implications

Societies can be described as systems, those systems stemming from arrangement, or order, discussed previously. But, what kind of society are we looking for?

Wiener calls for:

... a society based on human values other than buying or selling. To arrive at this society we need a good deal of planning and a good deal of struggle -- which, if the best comes to the best, may be on the plane of ideas, and otherwise - who knows?
[Wiener, p. 28]

Although somewhat lengthy, his eloquence conveys substantial meaning relevant to us in social upheaval and radical income stratification:

a belief, current in many countries, which has been elevated to the rank of an official article of faith in the United States, that free competition is itself a homeostatic process: that in a free market the individual selfishness ... will redound to the greatest common good. This is associated with the very comforting view that the individual entrepreneur, in seeking to forward his own interest is in some manner a public benefactor and has thus earned the great rewards with which society has showered him. Unfortunately, the evidence is against this simple-minded theory. ... There is no homeostasis whatever. ... We are involved in the business cycles of boom and failure, in the successions of dictatorship and revolution, in the wars in which everyone loses, which are so real a feature in modern times.

Where the knaves assemble, there will always be fools; and where the fools are present in sufficient numbers, they will offer a more profitable object of exploitation for the knaves. ...

[Ibid., pp. 158-160]

It is only in the large community, where the Lords of Things as They Are protect themselves from hunger by wealth, from public opinion by privacy and anonymity, from private criticism by the laws of libel and the possession of the means of communication, that the ruthlessness can reach its most sublime levels. Of all these anti-homeostatic factors in society, the control of the means of communication is the most effective and most important.

[Ibid. p. 160]

One of the lessons of the present book is that any organism is held together in this action by the possession of means for the acquisition, use, retention, and transmission of information. [pp. 161]

How fitting in 2021, given contemporary poor knowledge quality in schools, public media, and peer-review. How is it we have Google, Facebook, Twitter, and other social media platforms upon which so many foolishly have become dependent? And, look at the billionaires who own them.

Plato argued in Book Seven of the *Republic* that the main focus of government (run by philosopher-kings-queens) was the pursuit of truth guiding leaders towards good government in educating future leaders (analogizing to a ship's pilot). Hegel's *Philosophy of Right* and Durkheim's *The Division of Labor in Society* provide excellent foundations for Wiener's vision of a good society.

What can we distill from feedback and recursion "powering" cybernetics, with logic as the language describing it? Logic (the language - communication), feedback, and cybernetics are interrelated - interdisciplinary. All of the above is meaningless in isolation; we need to look at our goal of realizing an entity internalizing, or living "interdisciplinary", the full embodiment (literally) of the word, an organic social system. A cybernetic approach to systems theory borrows from biology to talk about an organism (system) having a behavior, a condition requiring consciousness, mind, and psychology. For sure, the expression "body politic" alludes to this. Yes, individuals as a supraorganism make societies organic. First, though, we look at "animal" and "machine" and think where one begins and the other ends in an artificially intelligent device. This begs the question, "what is 'living', or 'organic'?" "Organic" or "life" is not sufficient, but requires "think", "conscious", and similar words. Consider "Can a machine think?", asked and answered by Alan Turing, but a tape replete with bits only communicates the content of binary and is not the content itself. Cybernetics allows us to transcend ourselves, like transhumanism), the quality of which comes about by our introspection about values.

5. Summary and conclusions

I traced from the most basic building blocks the development of cybernetics within the context of "interdisciplinary", expressed bivalently through systems. Then, from systems, it was on to giving them life, imbuing them with intelligence and wisdom. Perforce, the wise being is interdisciplinary, internalizing it by living it, giving it the very essence ordinary scholars may fail to apprehend. Yet, humans are not alone, systems analysts knowing they are in an environment having the same laws governing everything since the singularity unfolded as our universe. Academicians read all of this but how they can realize it I will explain at the end.

Now, I am going to shake all of this up in a glass and see what various interrelationships of the pieces look like, the whole panorama recursive, the repetitions colliding with each other synthesizing an emergence of which you may or may not impose a limit.

It starts with "discipline" having a generic meaning but particularly in sociointelligence, how societies as living beings with social brains can become wise enough to transcend themselves in searching for truth as their ethos. Discipline's academic meaning - rigor and specialization - are combined as intense focus, reducing scope ultimately to the smallest of the smallest, interacting Planck scale units, also in a unique manner characterizing the

substratum, both process and object contained within the singularity and giving rise to what we have today. This substratum characterizes the most fundamental law, the unity of difference, its essence of "interdisciplinary". Bootstraps, an answer to the metaphysical problem, are starting points, the singularity with its superposition and the language of logic describing it. Interesting it is as a sidebar how modern computing is moving towards supercomputers, the Q-bit, based on superposition as the computing unit, again the substratum.

Integration and interdependence are dynamic, meaningless absent a framework, a special kind, a system, a dynamism explicitly operating inside and over a system with its descending subsets of objects and processes, designated logically as variables (like "a"s), those also ascending from Planck units to suprasystem, all mutually interacting, all with an organic character. Contained within innately, thus implicitly, are deduction (descension of sets) and induction (ascension of sets).

Integration and **interdependence** now find their own organically in **internalization**, all together as a **system**, a living one. What a fitting acronym **IIS** to capture the essence of "interdisciplinary"!

Dynamism does not occur in isolation, it reflecting the same organic essence shared by humans, their environment, and between the two. "Cybernetics" describes that vital connection between dynamic systems and organisms, in founder Norbert Wiener's words, "the scientific study of control and communication in the animal and the machine". In the end, humans not only live "interdisciplinary" as well as study it but internalize it, ultimately being it. Beyond, cybernetic points the way to transcending human frailties, transhumanism.

Recursion, subsumed by cybernetics, occurs with virtually every dyadic relationship in the Universe, each's output forward-fed as inputs, ultimately reproducing the relationship. If logic is a language of innate order in the Universe, so recursion describes it, hence, cybernetic. In a true recursive manner, a cybernetic one, the IIS studies itself, hence, self-reflective, second-order cybernetics.

"Cybernetics" is an incorporative word - the one *Thesaurus* uses as a synonym for "interdisciplinary", and to apprehend "incorporative" requires thinking incorporating thinking, that is, philosophy, a particular instance of which is "interdisciplinary", integrative, and interdependent.

Immediately, we are in the grasp of the substantive recursion. Within philosophy are ontology (establishing what exists) and epistemology (how we know, or justified belief, with its substructure of rationalism and empiricism). A close look at the relationship between these two reveals a seemingly endless recursion on its own, justifying the

justification, each caught in an ontological web. Breaking the circle can occur by using the mathematical and logic epistemology of bootstrapping, starting arbitrarily with ideas upon which we have reflected, the most fundamental law, the unity of difference.

Each of a dual - something in terms of what it is not - is an element of arrangement. One can precede the other, or vice versa. So it goes with the dual, order and disorder. Our bootstrap starts with order, From order comes complexity and system. Systems are dynamic or not. Dynamic systems either maintain themselves, go out of existence, or adapt. Humans are dynamic systems with the added quality of organicity, an essential attribute in describing ourselves. All the while we observe the recursion in our adaptation. Adaptation perforce is directed, in our case focusing on philosophy. Such comes as a matter of course, or necessity, given second-order cybernetics, the same form of reasoning about our establishing limits (calculus) and physical laws observed by Heisenberg in not being able to measure position and momentum at the same time. Humans inevitably are a part of the observation process, imparting their biases and values.

Recursion is within ourselves - integrity of existence. But so it is in terms of system analysis with our environment, our feeding into it, and vice versa. Ashby wrote of homeostasis, minimal survival of a system, but given the Holocene Extinction, we are not doing so well. We seemed to come to the proverbial fork in the road: self-extinction or further development. For the former, I offer Nirvikalpa Samadhi, the eighth limb of yoga, the Bodhisattva preparing to die by going deep within, canceling out all external physical impingements and disappearing into nothingness, violating the most fundamental law. Alternatively, transhumanism echoes Frank Tipler's 1994 fanciful *Physics of Immortality*, our transcending digitally our hydrocarbon confines and even the projected end of the Universe, itself.

Our method for escaping disastrous outcomes is second-order cybernetics. We have stood afar looking at society as if it were something apart from ourselves. Wiener says,

It is the social sciences that the coupling between the observed phenomenon and the observer is hardest to minimize. On the one hand, the observer is able to exert a considerable influence on the phenomena that come to his attention. With all respect to the intelligence, skill, and honesty of purpose of my anthropologist friends, I cannot think that any community which they have investigated will ever be quite the same afterward.

[Ibid., p. 163]

In other words, in the social sciences we have to deal with short statistical runs, nor can we be sure that a considerable part of what we observe is not an artefact of our own creation.

[Wiener, p. 164]

... not so far removed from Peter Berger's *Social Construction of Reality*.

For humanity's fate, you decide before that occurs



Figure 5: What are your core values?

Response of Peers

As always, I welcome responses to my work. The required peer review and time intervening between it and publication has given me an opportunity to reply, thus clarifying contention and amplifying the original contents. This section is somewhat lengthy, but if these very competent reviewers had questions, most likely the general audience will ask these and similar ones. Let's get the "techie" issues resolved before taking up substantive problems.

Because I am a horrible proofreader with failing eyes, I surely have been remiss in catching all the errors. Thanks to the kindness of one reviewer and his astounding abilities, many of the original mistakes were corrected. I have seen folks like these before, and they are nothing short of gods in my book. They rank up there with the Hubble telescope. Then, there are those obsessed (not merely wanting to correct errors) with spacing, the occasional typo, and formatting problems not affecting the content are welcomed to produce their own copy and/or consult professional help for obsessive-compulsive disorders. Freud had a word for them. It is one of those not seeing forest because of the tree things. So, to all afflicted with the disorder, either follow my recommendations or lobby for more helping for independent scholars, such as editing and proofreading services enjoyed by regular university and college faculty through their graduate assistants.

At the outset, a reviewer requested I place my remarks about non-standard punctuation presently at the end of the Abstract somewhere else or omit it. Non-standard presentation often deters readership. I am perfectly aware of conventions but often reject them, the reasoning bundled together with my overall philosophy, reflected by RT's (Russia Today - <https://www.rt.com/>) banner call "Question More". Accordingly, I want to let the reader

know at the outset to assuage her/him I know perfectly well what I am doing. Hence, the end-of-Abstract note remains.

Should it be “cybernetic loop” or “cybernetics loop” ? "Cybernetic loop" is correct, as an internet search will show [e.g.:: <https://www.oxfordlearnersdictionaries.com/us/definition/english/cybernetic>]..

Shouldn't all the paragraphs in the Abstract be merged into a single one? No. Granted, the abstract may be too long, but it kowtows to the original 600 word limit specification. First, main thoughts have to be separated by paragraphs. That is their main purpose. Second, the *Journal on Systemics, Cybernetics and Informatics* (JSCI) allows it, given its past issues [<http://www.iiisci.org/Journal/SCI/Past.asp>]. Click on any link and then sample the abstracts, and while most are one paragraphs enough are multiple ones, hence justifying keeping the present style.

One reviewer objected mine was not "technical material" and "relate[d] to the author's general considerations on the relationship between philosophy and cybernetics or vice versa.". Techne is everywhere, philosophy barely noticed. The Queen of the sciences" has been knocked aside like an old Wild West saloon whore by cattle killers craving their red meat. These comments also illustrate the widening gulf between episteme (theory, science, abstract, etc.) and techne (application, technology, material, etc.), helping to explain why more siloing has been occurring, giving force to IIIs' focus on "interdisciplinary". Requiring philosophy in all college-level programmes would help alleviate the problem. My article is appearing in "Cybernetics and Philosophy", not something like "Cybernetics and Techne", although philosophy (a branch of which is logic) can be very technical, the summary of logical space case in point. Pick up Rosser's *Logic for Mathematicians*, and I defy your reading it entirely during one session in the bathroom. Hence, I fail to see why the reviewer whines.

I also find the assertion, "... too lengthy and therefore hardly understandable. ..." particularly strange, the reviewer, a scientist in his own right implying anything "lengthy" would on its own be difficult to grasp. Rubbish! Read a patent, some of which can be dozens of pages long, especially one in this reviewer's field. One gets a patent because - aside from being novel - s/he has submitted a document anyone in the field can use to reconstruct the device or process. I gainsay a number of articles in this reviewer's field are figuratively book-length. The comments remind me of my student moaning I "use too big words". Rather, I think my previous two sentences are more apropos. The statement, "cybernetics can be a computational tool for philosophical issues" needs elaboration and examples. Yes, I am aware logic has been used to sort out ethical dilemmas, although this is not strictly cybernetics. Again, my focus is on the philosophy underpinning cybernetics, not a simple discourse on "issues", a parallel coming to mind: the political "issue" of providing

more health care centers and the philosophy of why health care should be universally-accessible.

Heisenberg would be chortling in his grave about the reviewer saying I should make the conclusions less ambiguous, especially for technicians.". Ha! It is ALL ambiguous, philosophers already having internalized the problem. If you don't think so, join the staff at *Conseil européen pour la recherche nucléaire* (CERN) and tell them how to do a Cartesian cut on a gluon. When you find the unambiguous smallest of the smallest let me know, and I'll upgrade this document. Otherwise, you need to go back to Heisenberg, Abbot, and Gödel – unless you are the metaphysician holding the philosopher's stone. So, for the technician and the philosopher, there is something everyone here – contrary to Hoover's lies, a chicken in every pot, a car in every garage [https://iowaculture.gov/history/education/educator-resources/primary-source-sets/great-depression-and-herbert-hoover/chicken].

For the historians among you:

A Chicken for Every Pot

THE Republican Party isn't a "Poor Man's Party." Republican prosperity has erased that degrading phrase from our political vocabulary. The Republican Party is equality's party—opportunity's party—democracy's party, the party of national development, not sectional interests—the impartial servant of every State and condition in the Union.

Under higher tariff and lower taxation, America has stabilized output, employment and dividend rates.

Republican efficiency has filled the workingman's dinner pail—and his gasoline tank besides—made telephone, radio and sanitary plumbing standard household equipment. And placed the whole nation in the silk stocking class.

During eight years of Republican management, we have built more and better homes, erected more skyscrapers, passed more beneficiary laws, and more laws to regulate and purify immigration, inaugurated more conservation measures, more measures to standardize and increase production, expand export markets, and reduce industrial and human junk piles, than in any previous quarter century.

Republican prosperity is written on fuller wage envelopes, written in factory chimney smoke, written on the walls of new construction, written in savings bank books, written in mercantile balances, and written in the peak value of stocks and bonds.

Republican prosperity has reduced hours and increased earning capacity, silenced discontent, put the proverbial "chicken in every pot." And a car in every backyard, to boot.

It has raised living standards and lowered living costs. It has restored financial confidence and enthusiasm, changed credit from a rich man's privilege to a common utility, generalized the use of time-saving devices and released women from the thrall of domestic drudgery.

It has provided every county in the country with its concrete road and knitted the highways of the nation into a unified traffic system.

Thanks to Republican administration, farmer, dairyman and merchant can make deliveries in less time and at less expense, can borrow cheap money to refund exorbitant mortgages, and stock their pastures, ranges and shelves.

Democratic management impoverished and demoralized the railroads, led packing plants and tire factories into receivership, squandered billions on impractical programs.

Democratic maladministration issued further billions on mere "scraps of paper," then encouraged foreign debtors to believe that their loans would never be called, and bequeathed to the Republican Party the job of mopping up the mess.

Republican administration has restored to the railroads solvency, efficiency and par securities.

It has brought rubber trades through panic and chaos, brought down the prices of crude rubber by smashing monopolistic rings, put the tanner's books in the black and secured from the European powers formal acknowledgment of their obligations.

The Republican Party rests its case on a record of stewardship and performance.

Its Presidential and Congressional candidates stand for election on a platform of sound practice, Federal vigilance, high tariff, Constitutional integrity, the conservation of natural resources, honest and constructive measures for agricultural relief, sincere enforcement of the laws, and the right of all citizens, regardless of faith or origin, to share the benefits of opportunity and justice.

**Wages, dividends, progress and prosperity say,
"Vote for Hoover"**

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Figure 7: How about pot for every chicken?

Oh, don't you just love French's idea of understanding?

[https://iowaculture.gov/history/education/educator-resources/primary-source-sets/great-depression-and-herbert-hoover/chicken]

Now, I turn more to the real substance, philosophy.

One astute reviewer said,

Many scholars of Descartes would interpret "*Cogito, ergo sum*" as "Whenever there is a thought of my existence, something has to be thinking, and that something therefore has to exist, which I consider to be a self". They surely would maintain that God does not enter into his philosophy there.

For Descartes' "*Cogito ergo sum*" requiring a belief in a deity, Descartes, himself surely did, and the scholars I cited seemed to think such was a vital part of his arguments. Others surely would disagree. However, the debate does not detract from: A) His was a metaphysically irresolvable "bootstrap" position, my paragraph admittedly gratuitous not affecting the overall theme and arguments of this paper; B) Subdivision to understand arguably is one of, if not the most axial ideas of modern/early-modern philosophy.

"I find Table 1 difficult to understand. Some additional explication is needed.". I heartily agree, and such partially motivated this paper, as well as its sequel book, *Zero is Greater Than One*. "Table 1 displaying relational completeness" sets forth the minimal two existents in the minimal one dimension. What exists (ontology)? How do you know (epistemology)? How are they related (the most fundamental law, containment, deduction/induction, etc.). One of the reasons for *Zero is Greater Than One* is elaborating on "existent", "relation", and the environment in which they are situated, and the justification for it all.

This reviewer also observed, "... the number of infinite binary strings is uncountable, but the number of comprehensible messages (via any of a number of arguments) is countable. Thus it cannot be true that all sequences correspond to messages.". Oh, how true this is, and it leads directly to the larger metaphysical problems of our knowledge (countable) and what is to be known. There is another "wrinkle" (which s/he characterized my original section). Is the heat death a discrete event, when energy is distributed equally? Herein, we ponder, "Within what entity?". I see the questions just as mysterious as those about the singularity. Do any sequences not contain messages? It is a relativity problem, cryptographers knowing all too well. Is there some "cryptographer "out there" knowing perfectly well the content of a sequence that to us is "random"? His surely is a legitimate question that sets bootstrapping against the content of what really is.

Another reviewer asked, "Does this constructivist system reduce experience to bits of "information" leaving the will as the *de facto* source of their unity?". "Will" I take to mean "consciousness", and we only see the effects of something we call "consciousness". Chalmers' "hard problem" has not been resolved. Whether it is a constructivist system or not of course depends upon order being innate, ours a discovery of it. This is one of the Abbot problems. In one sense, we create our "reality". In another sense, "reality" may be something different. "Experience", itself, often is used so loosely to strip the word of all

content. James Edwin Creighton's excellent and comprehensive article, "The Standpoint of Experience" sets for my views. It is worthwhile to quote at length his writing:

we have approached our facts with conceptions and presuppositions which have determined in large measure our selection and reading of the facts

We must give up once for all the notion of experience as a mere lump or matter, upon which thought works ab extra, as upon something foreign and external to itself. There is no experience in itself, and there is no thought in itself standing as a merely subjective principle in independence of its content. Experience at every stage contains within itself, as an integral part, the moving principle of thought as its dynamic and integrating factor.

It is our reason itself which, as a thinking will or a willing thought, goes on to define and determine more adequately its own meanings and purposes. And it does this by selecting through active attention the objects it wants, those which stand in the required relation to its own ends and ideas. Facts, then, gain their significance in the development of experience only insofar as they become ideas; that is, only insofar as they are selected by our thinking-will as fulfilling and defining its own meanings and purposes.

We do not get a true totality by simply adding together the two sides. [Modern systems theorists refer to "emergence".]

... life is not a thing but a relation. Carrying out this analogy, it may be further urged, we consequently cannot impute to experience any principle of unity over and above the functional interplay of parts that are actually found there. To do so would be to hypostatize a system of relations. [Herein pinpoints the fallacy of trying to impart concreteness to ideas, as, for example, anthropomorphizing.]

Self-consciousness, in other words, is unique and all-important. It transforms the whole process by reducing all the objective relations into terms of its own life. By becoming conscious of the objective relations, and of its own life in connection with these relations, it thus raises itself above the mere process of experience. [I think this is a foundational basis for "consciousness". I wish this were presented at the Towards a Science of Consciousness Conference.]

... the fact of functional relationship implies the existence of an inner pervading identity running through the parts.

Creighton, J. E. "The Standpoint of Experience." *The Philosophical Review* 12, no.6 (1903): 593. <https://doi.org/10.2307/2176979>

Another question - "Is our "transhumanist" will for "transcendence" and "adaptation" the "substratum" of all the "duals"?" The substratum is what makes up the singularity, the "what" our ultimate question. We carry the essence of it within us. The will is not the substratum; it comes from it.

Then, "Is the "substratum" of "duals" a constantly constructed dialectical unity?". The substratum strictly speaking is not the unity, itself but the "what" of the singularity. From the substratum emerge the duals.

The reviewer asks, "Could the absolutizing of social construction by cyberneticists be utilized to support the justification of totalitarian social controls by "experts"?. I am not sure of your term "absolutizing", but if you mean cyberneticists advocating social control by "experts" – as you refer to knowledgeable persons, their arguing perhaps their field the highest development and systemization of human social organization, then, yes, you can make such an argument coherent. The word "totalitarian" has been politicized by liberal-democratic ideologues, ipso facto carrying the meaning of "oppression". "Total" means accounting for everything in social programmes, responses, organizations, systems, and so forth. For example, to have quality schooling, you need students to be healthy and have good family support, etc. Everything is interconnected and interdependent. This is why we have the Head Start Programme. Too many social responses are disjointed and a-contextual, having neither a social framework or interdisciplinary thinking underpinning them.

Hegel's *Philosophy of Right* and Durkheim's *The Division of Labor in Society* appeared in the "Romantic Period", a reaction to the mechanistic thinking of the Industrial Revolution and the way humans were treated as cogs in the proverbial machine (and still are). The thinkers breathed life back into social philosophy, realizing a person's life is a total experience and social programmes had to be vetting with similar thinking. More will appear in *Zero is Greater Than One*.

"How can the field of cybernetics respond to the irreducible freedom of the existing beings that precede it, rather than trying to encompass and "direct" them through control?" Because "cybernetics" concerns "control", there is no "freedom". "Freedom" is a very often mis-understood word, most persons confusing it with "liberty". Be mindful that most, if not all, Western-oriented social systems are predicated upon social contract theory, so well explicated in John Locke's *Second Treatise on Civil Government*, "On property". We live with liberty, and are not "free". We are "controlled", albeit, as the ideology goes, by ourselves, the reputed "sovereign" (rule over ourselves). Of course, the reality is quite another matter. With Hegel, though, a new more comprehensive meaning was imparted to "freedom", the unrestrained pursuit of truth.

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