Constraints vs. Controls

Scirus Sci-Topic Page

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"Constraints" are frequently confused with "Controls." The two are not synonymous. The concepts they describe have little in common. The two terms may not be used interchangeably.[1]

"Constraints" refer to the cause-and-effect deterministic orderliness of nature, to local initial conditions, and to the stochastic combinatorial boundaries that limit possible outcomes.[2-4] The only "options" offered by constraints are slight statistical variation (distribution curves). "Necessity" is the result of physicodynamic cause-and-effect determinism. The physical laws contribute to overall constraints. Constraints severely limit degrees of freedom. Empirical evidence is sorely lacking for unchosen forced physical constraints producing nontrivial formal function or organization of any kind.

"Controls," on the other hand, *steer* events toward the goal of formal utility and final function.[5-11] Controls first require the uncertainty that can only come from *freedom from constraint.* In addition, controls require the exercise of choice contingency. Mere freedom from constraint is not sufficient to generate bona fide controls. Deliberate purposeful selections must be made from among real options to produce formal and final function. At the moment of purposeful selection of one option over others, a true control is introduced. Whether the selection is a wise one is another question. But, good or bad, that purposeful choice introduces a third fundamental category of objective reality[9] in addition to Monod's "Chance and Necessity:[12] Choice Determinism (CD), as opposed to Physicodynamic

Determinism (PD) and randomness. In the history of human observation, PD has never once been observed to produce CD. Science is about repeated observation.

The only known source of CD is "agents." Agents can be less than human, but they invariably have the capacity to exercise some degree of freedom of choice over a strict physicodynamic determinism.

Constraints produce no integrative or organizational effects. Inanimacy is blind to and does not pursue organization or utility. Decision Theory and Systems Theory both require steering and control. Mere physicodynamic constraints cannot steer, control, regulate or manage.

Thus controls are choice-based and formal. They are fundamentally non-physical even though they may *use* physicality. Sophisticated physical processes must be steered toward functional goals and away from non-functional dead-ends. Without formal steering, a relentless tendency toward disorganization and dysfunction will ensue according to the Second Law. Formal steering is accomplished only by choice contingency, not by chance contingency or law.

Only the purposeful choice of constraints (e.g., an experimenter choosing the initial conditions of an experiment), not the constraints themselves, can generate bona fide controls. When constraints are deliberately chosen to steer physicodynamic causal chains towards pragmatic pursuits, those constraints then become legitimate controls at the moment of their purposeful selection.

The end result of utility tends to confuse many investigators into thinking that the constraints themselves caused the formal function. They forget the essential role that choice contingency played in choosing those constraints, and in steering events toward pragmatic success. Computational algorithms, for example, can be optimized only by purposeful choice contingency. Inanimate nature cannot program or process computations. The latter is a form of formal control, not constraint.

Classic examples of the prevailing confusion between constraints and controls are found in the faulty-inference conclusions drawn from many so-called "directed evolution," "evolutionary algorithm," and computer-programmed (steered) "computational evolutionary" experimentation. All

of this research is a form of artificial selection, not natural selection. Choice *FOR (IN PURSUIT OF)* potential function at decision nodes, prior to the realization of that function, is always artificial, never natural (See Figure 1). Inanimate physicodynamics possesses no ability to pursue pragmatism over non pragmatism. Inanimate nature is blind to function and utility.
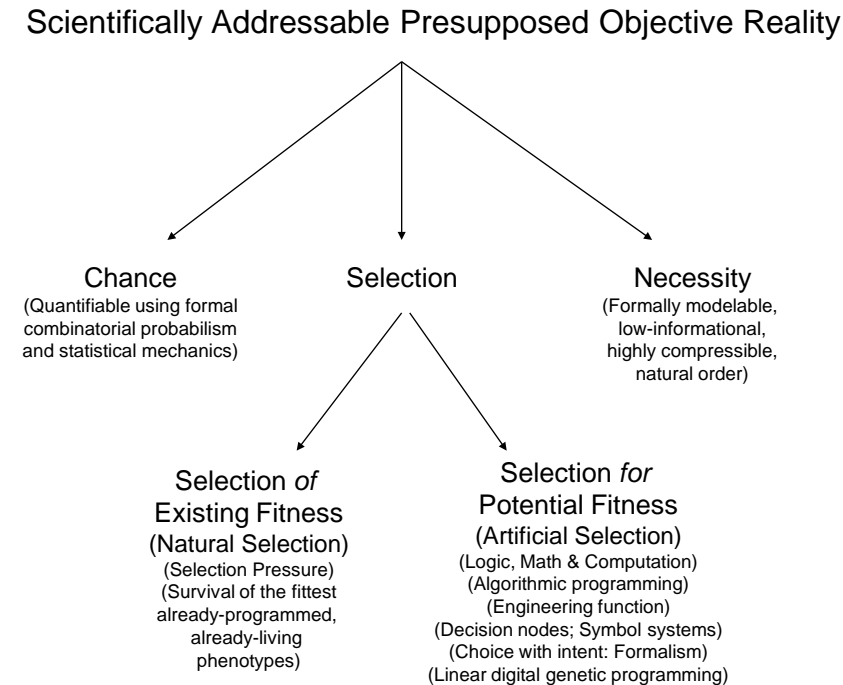
Scientifically Addressable Presupposed Objective Reality

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        Scientifically Addressable Presupposed Objective Reality

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              ▼               ▼               ▼
           Chance         Selection        Necessity
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Chance
(Quantifiable using formal
combinatorial probabilism
and statistical mechanics)

Selection

Necessity
(Formally modelable,
low-informational,
highly compressible,
natural order)

Selection *of*
Existing Fitness
(Natural Selection)
(Selection Pressure)
(Survival of the fittest
already-programmed,
already-living
phenotypes)

Selection *for*
Potential Fitness
(Artificial Selection)
(Logic, Math & Computation)
(Algorithmic programming)
(Engineering function)
(Decision nodes; Symbol systems)
(Choice with intent: Formalism)
(Linear digital genetic programming)

Figure 3. The scientific method itself presupposes the reality and reliability of choice-contingent language, formal rationality, mathematics, cybernetic programming, and predictive computations. In addition, biological science presupposes natural *selection* as its most fundamental paradigm. Science, therefore, must acknowledge the validity of Selection as a fundamental category of reality along with Chance and Necessity.

(Modified from: Abel DL: The Biosemiosis of Prescriptive Information (PI). *Semiotica* 2009, **2009:**1-19)

Bits, bifurcation points and nodes represent "choice opportunities," not choices. Configurable switch-settings allow the instantiation of formal choice contingency into physicality. While configurable switches are themselves physical, *the setting* of these switches to achieve formal function is physicodynamically indeterminate—decoupled from and incoherent with physicodynamic causation. In other words, *the setting of these logic gates is*

free from constraint—free from the determinism of the law-like regularities of nature.

The mental choice of tokens (physical symbol vehicles) in a material symbol system[13-16] is also free from constraints. No law of physics forces us to spell certain words when playing Scrabble. The laws of physics work equally on all Scrabble blocks of wood. The choice of certain physical symbol vehicles (tokens; Scrabble pieces) is another way of instantiating nonphysical formal controls (programming choices) into physicality.

Genetics depends upon the formal selection of certain nucleotide tokens in a certain sequence. The sequencing of these tokens determines [by Choice Determinism (CD), not Physicodynamic Determinism (PD], what will be the sequencing of amino acids into each protein.[13,17-21] The overlapping linguistic choice of sextet sequences of nucleotides determines translational pausing (TP) and the folding of those proteins into three-dimensional machines.[22,23]

The reality of controls, the Cybernetic Cut [6,10,18] and the one-way-only traffic across the CS (Configurable Switch) Bridge [6,10] first becomes evident at Maxwell's trap door that separates thermodynamic compartments of inert gas molecules.[24] The only hope of creating an energy potential and eventual heat engine is through *control choices*, not mere constraints, of when to open and close the trap door. The only reason a ridiculous cartoon caricature in the form of Maxwell's Demon was introduced into physics and thermodynamics texts was that "agency" is the only known source of such trap-door *control*. The second we disallow agency from our models (due to our naturalistic metaphysical presuppositions), we lose all ability to move far from equilibrium in a sustained fashion.

The Second Law describes a relentless tendency toward disorganization, not disorder.[2,4,11,18,19,25-29] Probably at least 90% of the scientific community still currently believes, erroneously, that entropy and disorder are synonymous. Order and entropy can simultaneously increase with the self-ordering of crystallization, for example. High degrees of self-ordering (e.g., tornadoes, hurricanes) can increase in the dissipative structures described by Prigogine's Chaos Theory while chaos races toward maximum entropy and eventual heat death. Highly self-ordered tornadoes produce only disorganization, never formal organization. The reason is that

chaos cannot possibly generate Choice Determinism (CD) and Choice-Contingent Causation and Control (CCCC).

CCCC alone can temporarily and locally reverse the relentless tendency toward disorganization. This CD "force" is fundamentally nonphysical, not physical (mass/energy). Physicodynamic Determinism (PD) generates mindless physical constraints. Choice Determinism (CD) alone generates formal controls.

Further evidence of formal control is found in the simplest categories of sequence complexity[19]. Random Sequence Complexity (RSC) and Ordered Sequence Complexity (OSC) can both arise out of purely physicodynamic environmental contexts. But Functional Sequence Complexity (FSC) (e.g., genes, micro RNAs, and proteins) must be formally sequenced at the level of nucleotide selection. This selection must be made *FOR (IN PURSUIT OF), not just selection FROM AMONG,* in order to generate genetic prescription and processing[18].

Even 3-D movies can be reduced to linear digital feeds. The same is true of three-dimensional molecular machines prescribed using sequencing of digital physical symbol vehicles (tokens). Nucleotide sequencing determines polyamino acid primary structure. This in turn largely determines minimum Gibbs-free energy folding, along with TP and chaperone influences.[30,31]

So called "genetic algorithms,"[27,32-36] and all other algorithmic processes, require "optimization." Pools of "candidate solutions" first have to exist that supposedly arise spontaneously. But no explanation is provided as to how inanimate physical nature could even identify a formal "solution," let alone prefer any one ideal solution over lesser or non-solutions. What does an inanimate environment care about problem solving? Optimization is clearly goal-oriented. Inanimate nature, natural selection included, has no goal. A logically consistent philosophical physicalist cannot participate in genetic algorithm theory and process. His purely metaphysical commitment to materialism causes him to shoot himself in the foot. No mechanism for optimization exists in a purely mass/energy, chance and necessity world.

"Neither chance nor necessity problem-solves. Physicodynamics cannot generate "chromosomes" of abstract representations known as "candidate solutions." "Solution space" does not exist in a logically

consistent metaphysical materialism that excludes formalism as a fundamental category of reality. The illusion of wonderfully pragmatic Markov chains and spontaneous rugged-landscape-climbs up mountain peaks of optimization can be shown in every case to have behind-the-scenes hidden investigator involvement. The iterations are steered toward formal pragmatic success artificially by agents. A critical review of Materials and Methods in all of these so-called "evolutionary algorithm" papers exposes the hidden experimental design. The investigator pursues a goal, and artificially selects for it. Evolution has no goal."[37]

Conclusion: Peer review should immediately reject any paper that attributes sophisticated control capabilities to pragmatically blind, forced, redundant, low-informational constraints.[18] To attribute programming and organizing capabilities to mere physicodynamic constraints is the ultimate "category error" of fallacious inference.

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