EVOLUTION

EVOLUTION AS CYCLIC PROCESS

In the five successive extinctions of bio-history, the highest forms that evolved in each case disappeared, yet the bio-system does not return to square one. Each cycle of extinction/radiation leads to organisms of greater complexity, yet the genomes of the highest forms are not preserved. What then is preserved in the evolutionary process that is transmitted from cycle to cycle that enables evolution to reach new levels of complexity? What ingredients are enhanced at each cycle? What inhibitors are removed? Is it the power of self-organization that is enhanced? A power that allows more rapid development. Is it that greater variety exists and variety is the key to complexity? What characteristic, aside from complexity (which is not satisfactorily defined), increases from cycle to cycle? May we say that it is consciousness?

And turning to cultural evolution, what causes an extinction? What is lost and what is preserved? The great cultural extinction/radiation of c 500 B.C.E. (Jasper's Axial period) appears to have been caused, not by an asteroid, but largely by the introduction of writing. The effect of this was the liberation of the intellect from the necessity of memorization and oral transmission. The preservation of the culture and its records could be trusted to writing and human mental activity could turn from its focus on memory to focus on imagination resulting in enhancement of creativity and innovation. This has resulted in accelerated cultural change during the past 2500 years leading us now to a new cycle of extinction/radiation. The 20th century marks another axial period. We suspect that it is writing and the written record that is itself now being replaced. This time the "asteroid" of extinction is the computer. Such facilitating powers as hypertext and morphing extend (or possible replace) imagination. Hypertext allows the permuting of linkages and associations. Morphing allows the permuting of images and forms. If a world view is basically a set of mutually supportive associations and images, then instead of a single world view the computer can construct innumerable alternative sets of associations and images and create for us a smorgasbord of perspectives. The age of one solution, one answer, one ontology, one epistemology, one theology, one science, ...is ending. In the next radiant multiple approaches and paths will emerge. The human intellect will again change focus, this time not from memory to imagination, but from imagination to evaluation. We leave the mono-world of "this is how it is" and enter the multi-world of "if this, then this". Our human task, not ascribable to computers, will be how and which world do we select? the "which" world

What commonalities are perceived in all of this? The ever increase in variety seems to be one factor operating in both bio and cultural evolution. And variety provides the building blocks both for complexity and for more variety. And possibly an on going increase in consciousness, an entity that we may not view as "a thing out there" because we ourselves are part of it and it a part of us.

GENCODE.WPD January 31, 1999 #5

THE GENERAL GENOME

We postulate a "general genome", a coded representation defining anything that exists. A bio genome is a subset of a general genome which applies to only to life forms. This "general genome" or [gg] contains four major components:

1) The "E-set" This portion of the [gg] contains the "genes", or enes as we shall call them, specifying the species of existence of the phenotype which the particular [gg] describes or encodes. All things having material existence contain identical E-set codes. Any differences in the E-set from this material existence code is conventionally termed non-existence. However, there may be innumerable species of non-existence, or rather more properly termed, alternative species of existence. Each code within the E-set specifies an alternate reality. [1]

2) The "H-set" Those enes specifying form, structure, pattern (cf Plato's archetypes)

3) The "P-set" Those enes specifying position in space-time (inc a local/global switch)

4) The "L-set" Those enes specifying the bonds, links, and filters interrelating "things" and effecting communication and interaction between things

Our first postulate implies that [gg] exists. However, this existence is a meta-existence {on the Brahman or SAT level } not on the level covered by the E-set. Whereas we can locate the bio genome in chromosomes, there is no known physical location for the non-bio portions of the [gg].

With regard to the specific contents of the E,H,P,L sub-sets, we ask, must information be inscribed in a material matrix such as writing, sound, memory, electronic, magnetic, ... or may it exist independently in some immaterial form? (Here we recall the Plato's archetypes) Indeed what is the relation between information and physical forms of energy? [negentropy?]

Of special interest in the E-set is an ene that would specify whether an object is local or global. In P-Space (position space) an ene set to global would abolish space-time. For there to be particles or even matter P-Space must be set to local. In H-Space (form or pattern space) an ene set to global would abolish all forms, shapes, and patterns. Thus H-Space set to global would take on the attributes of the Sunyata– an empty container of all possible forms. For there to be diversity and uniqueness H-Space must be set to local.

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[1] We may, for illustration purposes, say that the E-set consists of six enes each of which may assume two values, 0 and 1. Say the code corresponding to our familiar physical reality is given by 101011. Any other code, such as 110001,... specifies a different reality or species of existence. In our present Aristotelean dichotomic view all codes other than 101011 are lumped together into a single class termed non-existence. However, in this example there would be 64 realities or species of existence. (Or we could compromise and say, one reality and 63 species of non-existence.)

EVOLUTOI.WPC

96/08/23

EVOLUTION: THE LARGER PATTERN

For Darwin to have entitled his book, "The Origin of Species" was a great misnomer. While his form of evolution can nicely account for gradual adaptive changes that take place in a species due to contextual changes, it says little that is substantive regarding origin itself. Innovation is not accounted for. [We are here distinguishing between innovation and modification.] Whether origins are built into the life structure and process through some self-organizing principle--auto poesis; or come from some external source is presently not known. Fossil patterns seem to show that origins occur only at singular moments in time, usually after great extinctions. This would indicate that potential, seeds so to speak, ~~is~~ are always present, but can only develop when inhibiting forces are removed. A great extinction removes the inhibitors allowing the seeds to sprout, as when the mammalian seeds sprouted after the termination of the dinosaurs.

The steam roll is ever present

cf Gunderf evolution = removal of limits

But there are other anomalies. In the Darwinian model success leads to survival, failure to extinction. This is hardly what is observed in cultural and societal evolution. Success leads to stagnation, not evolution. Success is a trap resulting in stasis and an all out effort to preserve the status quo and prevent further change. Only an extinction can allow evolution to resume, as with the cretaceous-tertiary dinosaur extinction. Failure, on the other hand, may lead to self extinction, but may also lead to change. So it is those species that are not successful, but are teachable, able to change, that are the ultimate survivors.

cf 60's booklet on books

We conclude that success is a trap, but that failure does not entrap us for failure can bring the challenge to learn and change. The cutting edge of evolution is not with the successful, but with the failures and only with those failures who are able to change. In the long run it is not the well adapted, the successful, who survive, it is the readily adaptable.

We look about and see many institutions that have stagnated. The fact that they are here and have stagnated implies, however, that at some earlier time they must have been a success. For example, up to our time Science has been successful, but it has become a trap. And if to continue, the future vehicle of human knowledge cannot be science, but some new epistemology more inclusive and more adaptive. As has been said, the human spirit will always escape from the traps that the human intellect creates for it. The essence of this human spirit contains something paradoxical: It is capable of a kind of success that is able to transcend success. It has discovered evolution's greater pattern.

also in military, some religions and maybe the law as practiced

WHITEHEAD QUOTE

I Could note how the subsequent highest species are new descendants of a previous highest species.

SOUZA.WPD November 9, 2009

From: A. Wilson
To: Robert Porter

A reply to your request for comments on Dinesh D'Souza's
THE MESSAGE OF EVOLUTION

I would like to suggest several questions:

First is the nature of evolution itself.
D' points out that Stephen J. Gould holds that evolution is a random process. But even so. Gould states there is a direction (or plan) to evolution: viz. the increase of complexity. This raises the question: What is the relation between complexity and consciousness. Both are evolving and increasing. An M1 metaphysics would hold that consciousness is a byproduct of complexity. i.e. Complexity increases consciousness. An M2 worldview would hold that there is an interplay between complexity and consciousness effecting mutual growth. An M3 view would be that there is a fundamental contextual consciousness that guides evolution. So, is consciousness created by evolution or is evolution guided by consciousness, or both?

Next is the question of the role of the elements that participate in evolution, be these elements molecules, cells, tissues, organs or humans. Some elements are apoptic. Certain cells self-sacrifice in order to preserve tissue. The lower order sustaining the higher order. Indeed, death of participants may be essential for evolution toward higher complexity or consciousness.
But what are the details of apoptosis? It is known that apoptic cells recycle portions of themselves. So cascade wise, something in many elements participating in evolution is immortal being recycled for repeated or iterated use. This does not infer the immortality of an element itself, but that each element contains that which is used over and over and thus may be considered as immortal.* Death of the parts to sustain life of the whole is the nature of evolution.

A third most interesting idea suggested by D' is that evolution itself is evolving. That is the process governing change is itself changing. The present evolutionary process is a catalyst for higher order change processes. Does Gould's evolution become an apoptic part in some "Meta-evolution"?

* THE DOING PART IS MORTAL
THE BEING PART IS IMMORTAL

Apoptosis

).
Herbert Spencer coined the phrase, "survival of the fittest."

"Survival of the fittest" is a phrase which is commonly used in contexts other than intended by its first two proponents: British polymath philosopher Herbert Spencer (who coined the term) and Charles Darwin.

Herbert Spencer first used the phrase - after reading Charles Darwin's On the Origin of Species - in his Principles of Biology (1864), in which he drew parallels between his own economic theories and Darwin's biological ones, writing "This survival of the fittest, which I have here sought to express in mechanical terms, is that which Mr. Darwin has called 'natural selection', or the preservation of favoured races in the struggle for life."[1]

Darwin first used Spencer's new phrase "survival of the fittest" as a synonym for "natural selection" in the fifth edition of On the Origin of Species, published in 1869.[2][3] Darwin meant it is a metaphor for "better adapted for immediate, local environment", not the common inference of "in the best physical shape" [4]. Hence, it is not a scientific description,[5] and is both incomplete and misleading.

The phrase "survival of the fittest" is not generally used by modern biologists as it does not convey the complex nature of natural selection, so they prefer and almost exclusively use the latter term (natural selection). Survival is only one component of selection. For example, where a number of males survive to reproductive age, yet only a few ever mate, the difference in reproductive success would stem from factors other than the ability to survive, such as an ability to successfully attract mates. In an evolutionary reproductive sense, fitness is the average reproductive output of a class of genetic variants in a gene pool, and should not be confused with meaning physically fit - biggest, fastest or strongest - and which does not necessarily lead to reproductive success [6].

An interpretation of the phrase "survival of the fittest" to mean "only the fittest organisms will prevail" (a view sometimes derided as "Social Darwinism") is not consistent with the actual theory of evolution. Any individual organism which succeeds in reproducing itself is "fit" and will contribute to survival of its species, not just the "physically fittest" ones, though some of the population will be better adapted to the circumstances than others. A more accurate characterization of evolution would be "survival of the fit enough".[7]

Moreover, to misunderstand or misapply the phrase to simply mean "survival of those who are better equipped for surviving" is rhetorical tautology. What Darwin meant was "better adapted for immediate, local environment" by differential preservation of organisms that are better adapted to live in changing environments. The concept is not tautological as it contains an independent criterion of fitness.[4]

[edit] History of the phrase

Herbert Spencer first used the phrase - after reading Charles Darwin's On the Origin of Species- in his Principles of Biology of 1864 (vol. 1, p. 444) in which he drew parallels between his economic theories and Darwin's biological, evolutionary ones, writing, "This survival of the fittest, which I have here sought to express in mechanical terms, is that which Mr. Darwin has called 'natural selection', or the preservation of favoured races in the struggle for life." [1]

In the first four editions of On the Origin of Species, Darwin used the phrase "natural selection".[8] Darwin wrote on page 6 of The Variation of Animals and Plants under Domestication published in 1868, "This preservation, during the battle for life, of varieties which possess any advantage in structure, constitution, or instinct, I have called Natural Selection; and Mr. Herbert Spencer has well expressed the same idea by the Survival of the Fittest. The term "natural selection" is in some respects a bad one, as it seems to imply conscious choice; but this will be disregarded after a little familiarity". Darwin agreed with Alfred Russel Wallace that this new phrase - "survival of the fittest" - avoided the troublesome anthropomorphism of "selecting", though it "lost the analogy between nature's selection and the fanciers'". In Chapter 4 of the 5th edition of The Origin published in 1869,[2] Darwin implies again the synonym: "Natural Selection, or the Survival of the Fittest"[3]. By the word "fittest" Darwin meant "better adapted for immediate, local environment", not the common modern meaning of "in the best physical shape"[4]. In the introduction he gave full credit to Spencer, writing "I have called this principle, by which each slight variation, if useful, is preserved, by the term Natural Selection, in order to mark its relation to man's power of selection. But the expression often used by Mr. Herbert Spencer of the Survival of the Fittest is more accurate, and is sometimes equally convenient."[9]

In The Man Versus The State, Spencer used the phrase in a postscript to justify a plausible explanation for why his theories would not be adopted by "societies of militant type". He uses the term in the context of societies at war, and the form of his reference suggests that he is applying a general principle[10].

"Thus by survival of the fittest, the militant type of society becomes characterized by profound confidence in the governing power, joined with a loyalty causing submission to it in all matters whatever" [11].

Herbert Spencer is credited with starting the concept of Social Darwinism.

The phrase "survival of the fittest" has become widely used in popular literature as a catchphrase for any topic related or analogous to evolution and natural selection. It has thus been applied to principles of unrestrained competition, and it has been used extensively by both proponents and opponents of Social Darwinism. Its shortcomings as a description of Darwinian evolution have also become more apparent (see below).

Evolutionary biologists criticize how the term is used by non-scientists and the connotations that have grown around the term in popular culture. The phrase also does not help in conveying the complex nature of natural selection, so modern biologists prefer and almost exclusively use the term natural selection. Indeed, in modern biology, the term fitness mostly refers to reproductive success, and is not explicit about the specific ways in which organisms can be "fit" as in "having phenotypic characteristics which enhance survival and reproduction" (which was the meaning that Spencer had in mind).

Also, see the section Conflation of "survival of the fittest" and morality below.
[edit] Is "survival of the fittest" a tautology?
Question book-new.svg

This section needs additional citations for verification.
Please help improve this article by adding reliable references. Unsourced material may be challenged and removed. (October 2009)

This article may contain original research. Please improve it by verifying the claims made and adding references. Statements consisting only of original research may be removed. More details may be available on the talk page. (December 2008)

"Survival of the fittest" is sometimes claimed to be a tautology.[12] The reasoning is that if one takes the term "fit" to mean "endowed with phenotypic characteristics which improve chances of survival and reproduction" (which is roughly how Spencer understood it), then "survival of the fittest" can simply be rewritten as "survival of those who are better equipped for surviving". While this is not exactly a tautology (we might imagine a benevolent deity or experimenter that would consistently favour the poorly adapted, and destroy well-adapted creatures, so that "survival of the fittest" might actually not occur), this is not a very informative statement: it simply reduces to a statement that the game of Life is not rigged in favour of the poorly adapted, which is not controversial. Furthermore, the expression does become a tautology if one uses the most widely accepted definition of "fitness" in modern biology, namely reproductive success itself (rather than any set of characters conducive to this reproductive success). This reasoning is sometimes used to claim that Darwin's entire theory of evolution by natural selection is fundamentally tautological, and therefore devoid of any explanatory power.

However, the expression "survival of the fittest" (taken on its own and out of context) gives a very incomplete account of the mechanism of natural selection. The reason is that it does not mention a key requirement for natural selection, namely the requirement of heritability. It is true that the phrase "survival of the fittest", in and by itself, is a tautology if fitness is defined by survival and reproduction. However, natural selection is not just survival of the fittest. Natural selection is the portion of variation in reproductive success, that is caused by heritable characters (see the article on natural selection).

If certain heritable characters increase or decrease the chances of survival and reproduction of their bearers, then it follows mechanically (by definition of "heritable") that those characters that improve survival and reproduction will increase in frequency over generations. This is precisely

what is called "evolution by natural selection." On the other hand, if the characters which lead to differential reproductive success are not heritable, then no meaningful evolution will occur, "survival of the fittest" or not: if improvement in reproductive success is caused by traits that are not heritable, then there is no reason why these traits should increase in frequency over generations. In other words, natural selection does not simply state that "survivors survive" or "reproducers reproduce"; rather, it states that "survivors survive, reproduce and therefore propagate any heritable characters which have affected their survival and reproductive success". This statement is not tautological: it hinges on the testable hypothesis that such fitness-impacting heritable variations actually exist (a hypothesis that has been amply confirmed.)

Skeptic Society founder and Skeptic magazine publisher Dr. Michael Shermer addresses this argument in his 1997 book, Why People Believe Weird Things, in which he points out that although tautologies are sometimes the beginning of science, they are never the end, and that scientific principles like natural selection are testable and falsifiable by virtue of their predictive power. Shermer points out, as an example, that population genetics accurately demonstrate when natural selection will and will not effect change on a population. Shermer hypothesizes that if hominid fossils were found in the same geological strata as trilobites, it would be evidence against natural selection.[13]

[edit] Conflation of "Survival of the fittest" and morality

Critics of evolution have argued that "survival of the fittest" provides a justification for behaviour that undermines moral standards by letting the strong set standards of justice to the detriment of the weak.[14] However, any use of evolutionary descriptions to set moral standards would be a naturalistic fallacy (or more specifically the is-ought problem), as prescriptive moral statements cannot be derived from purely descriptive premises. Describing how things are does not imply that things ought to be that way. It is also simplistic to suggest that "survival of the fittest" implies treating the weak badly, as good social behaviour - cooperating with others and treating them well - improves evolutionary fitness.[15][16]

It has also been claimed that "the survival of the fittest" theory in biology was interpreted by late 1800s capitalists as "an ethical precept that sanctioned cut-throat economic competition" and led to "social Darwinism" which allegedly glorified laissez-faire economics, war and racism[17]. However these ideas predate and commonly contradict Darwin's ideas, and indeed their proponents rarely invoked Darwin in support, while commonly claiming justification from religion and Horatio Alger mythology. The term "social Darwinism" referring to capitalist ideologies was introduced as a term of abuse by Richard Hofstadter's Social Darwinism in American Thought published in 1944.[16][18]

Using the phrase "survival of the fittest" as a criticism of Darwin's theory of evolution is an example of the appeal to consequences fallacy: use of the concept of survival of the fittest as a justification for violence in human society has no effect on the truth of 'the theory of evolution by natural selection' in the natural biological world.

[edit] "Survival of the fittest" and anarchism

Russian anarchist Peter Kropotkin viewed the concept of "survival of the fittest" as supporting co-operation rather than competition. In his book Mutual Aid: A Factor of Evolution he set out his analysis leading to the conclusion that the fittest was not necessarily the best at competing individually, but often the community made up of those best at working together. He concluded that

In the animal world we have seen that the vast majority of species live in societies, and that they find in association the best arms for the struggle for life: understood, of course, in its wide Darwinian sense – not as a struggle for the sheer means of existence, but as a struggle against all natural conditions unfavourable to the species. The animal species, in which individual struggle has been reduced to its narrowest limits, and the practice of mutual aid has attained the greatest development, are invariably the most numerous, the most prosperous, and the most open to further progress.

Applying this concept to human society, Kropotkin presented mutual aid as one of the dominant factors of evolution, the other being self assertion, and concluded that

In the practice of mutual aid, which we can retrace to the earliest beginnings of evolution, we thus find the positive and undoubted origin of our ethical conceptions; and we can affirm that in the ethical progress of man, mutual support not mutual struggle – has had the leading part. In its wide extension, even at the present time, we also see the best guarantee of a still loftier evolution of our race.

CHANGE

See Puzpred.WPD

Jan 7, 1999

SOCIETAL EVOLUTION

"4 FACES"

- PROPHET } DETERMINISTIC
  PREDICTOR
  PAST ⇒ FUTURE
  PRECEDENCE

CLOSED

- FORECASTER
  STATISTICAL

OPEN

- PLANNER TELEOLOGICAL
  INTENTIONAL

CONVERGING

SELECTION ⇒ CONTRARY PLANS – WAR

- VIRGIN BIRTH
  ~~FAT~~ CONTEXTUAL
  CREATION – INNOVATION
  DISCOVERY

OPEN

BIO EVOLUTION

- NATURAL LAW
  ~~SEX~~ MULTIPLICITY
  APOPTOSIS
- SEX, DIVERSITY ↑
- NATURAL SELECTION
  CRITERIA
- MUTATIONS

TECHNOLOGICAL EVOLUTION

Tools – extensions
Engines – Metabolism
Robots – Reproducing
Evolving Robots

COGNITIVE EVOLUTION

Old ideas never die, only their carriers

Cogito ergo sum

M_1, M_2, M_3

Im all 3 the tipping point

when the creation replaces the creator

LIFE

LIMITS

LOGICS AND LXM

MEANING

METAPHOR

MYTH MATH METAPHOR

MONUN

MULTIPLEXING

MUSIC

MUTUALITY

MYSTERY

ONTIC EPISTEMIC

ORTHOGONAL

PARADIGMS

PATTERNS

PLENITUDE

POLYTOPES

POWER of

PRODSUM NUMBERS

PROTO PLANETS

PURPOSE

QUESTIONS

RANDOM

RECURSION

REGRESSION

REPETITION

REPORT TO GALAXY

RITUAL

RULES META RULES

SEARCH

SEMIOTICS

SETS

SOCIETAL POLITICAL

SPACES

SPIN

SURVIVAL

SYNCHRONIC QUESTS

SYMMETRIES

SYNTHESIS

SYSTEMATICS GST

TECHNOLOGY

TEMPLATES

THEOLOGY

TIME

TOPOLOGIES

TYPOLOGIES

UNITS

UNITY | DIVERSITY U|D

UNIVERSALS

UNLEARNING

WIDTH OF HERE

WIDTH OF NOW

WIDTH OF IDENTITY

WIDTH OF VALIDITY

ZOOM

There are two strategies for survival. The first is that of the principle of plenitude, viz, through proliferation of numbers and environmental manipulation. This is the approach from the species level point of view. The second strategy is to find and fill some indispensable niche in the ecology. This approach is from the ecological level point of view, in which the species thinks of itself, not as a competitor, but as an essential organ in the ecological organism.

There are examples of both approaches in human history. Most civilizations and cultures, and frequently religions, have approached survival per the principle of plenitude, counting on numbers and environmental control (e.g. of certain resources) for survival. The Jews are an exception to this, having through their doctrine of "the Chosen" a prescribed niche to fill. The Jews could not have survived as a culture had they relied on the principle of plenitude. The captivity and diaspora would have obliterated them. It is in the filling of a niche that their survival has been assured. However, this niche has not always been the same. The original commission for the Jewish people was for them to be the custodians of God's communications with earth. They were to be the priests for all mankind, since they alone were in communication with the true God. With the spread of Christianity, this role was challenged. Though it was not abandoned, it was supplemented. Later the Jews became the money lenders and the bankers since other religionists eschewed interest giving and taking. This niche led to another, since creditors (of all sorts) as well as self-proclaimed elites are generally disliked, the Jews began to fill the niche of 'scapegoats'. This is an important global niche. There must always be someone to blame for what is wrong in the world, and the Jews accepted the charge since it gave them the cohesiveness and endurability which derive from persecution. Antisemitism has proved a great force for their survival. In addition, the niche of scapegoat is secure, not a niche for which others are likely to compete. The Jews have thus found a key for indefinite survival. Perhaps the realization of this by certain frustrated antisemitic groups led to the idea that the 'ultimate solution' was only to be found in genocide, hence the holocaust.

But there is great wisdom here. Whatever the niche, the Jews may have been the first to approach the cultural world on the non-competitive higher organic level of niche filling. (The natural world, in distinction, is filled with examples of symbiosis and niche filling.) It is paradoxical, however, that the Jews among themselves are voraciously competitive. A second cultural example may be found in the Swiss, who have found for themselves an economic niche though living in a region largely devoid of natural resources. The key to the future is in organism. Become an essential organ in the ecological organism. Abandon the principle of plenitude.

EVOLUTION

(1) Horizontal
- Survive by the Principle of Plenitude
- Numbers Control
- by competition in organism Society
- Horizontal

(2) Vertical
- Survival by unique function, role in larger higher organism
- Apoptosis
- Sacrifice
- A form of adaptation

(3) Parallelism, alternate organism, shelter
Per mutation?

It is not surprising that the consummation of centuries of white man's creativity takes the form of the digital computer. The white man's way of viewing himself and the world is reflected in his creations, and the computer like its creator, is formatted in dyads or binaries. Everything must be reducible either to zeros and ones, the white man's binary arithmetic; to true or false, the white man's binary logic; right or wrong, the white man's binary ethics; innocent or guilty, the white man's binary justice; inside or outside, the white man's binary dwellings; private or public, the white man's binary space; etc. Is the world really digital? or have we let something important fall between the cracks by negating the transition values between zero and one; between true and false, between inside and outside?

In our houses we go directly through one door from the outside to the inside. Sometimes there is a bit of a transition provided by an overhanging eve or in increasingly rare instances there may be a porch, anachronisms from a pre-digital age. Lin Yutang in his book, The 'Importance of Living', describes a particular manifestation of the many transition steps that may exist between outside and inside:

> First, there is a gate and the gate must have a roof. Inside the gate there is a footpath and the footpath must be winding. At the turning of the footpath there is a screen and the screen must be woven of bamboo. Behind the screen there is a pine tree and the pine must be gnarled and old. At the foot of the pine there are rocks and the rocks must be quaint. Beyond the rocks there is a spring and the spring must gurgle. Above the spring there is a pavilion and the pavilion must overlook a pond. Across the pond is a bridge and the bridge must be tantalizing to cross. At the end of the bridge is a grove of trees and the trees must be tall. And in the grove is a house and the house must be secluded.

X4METAPH.WPD June 12, 2002 June 13, 2002
Sciesis See also DILFOCUS.WPD and 2002 # 21

Science vs Intelligent Design, ID

Philosophically, we have

1) Determinism,, Necessity,,Causalism	past —> future
2) Chance,, Random,,Probabilism	Juxtaposed combinations , permutations
3) Design,,Purpose,, Finalism	past <— future
4) Mutualism	past <—>future
5) Contextualism,,Inovation,,Mutation	↑ ↓ ↕

Science tests itself on predictability. But science focuses on the repeatable, which is in large part why it is successful in prediction. The other feature leading to th success of science in prediction is mathematics. Mathematics is the closest to a universal key to linkages as we yet have.

creates a future,, selects a future,, self fulfilling prophecy ???

20 questions Traditional and Wheeler version

Advice to ID If you are trying to affirm a pattern, eg a Biblical one [rather than seek a picture] then look for archetypes, they are patterns that repeat on an abstract level. [don't confuse a repeating archetype with a prophecy.]

Science claims to be seeking a picture, or rather the picture. But it is really looking for familiar patterns. So long as your epistemology is confined to the repeatable and reproducible, your set of patterns will repeat and you tell yourself you have the picture.

If the universe is complex, [non-equilibrium state], and science views the only the frequently repeated, that is the low energy end of the power law, it misses the infrequent high energy events. Science does recognize one such event. The Big Bang. But there may be many others in the high energy- infrequent portion of the power law. Such events may arguably be termed "creation events" So the charge that ID makes no predictions is explained. It operates on the low frequency end of the power law.

DILFOCUS
p2

We connect the points to display a pattern, i.e. something familiar. And familiar because of frequent repetitions. We recognize a pattern because it has happened often before and is in our memories and records. [a discrimination here is important between memory and record]

But how do we recognize a picture? [in contrast to a pattern]
We here postulate a human capability which we shall call, recognizabilty . Even if never seen or perceived before we have stored in us either a set of pictures or the ability to recognize a certain genre of pictures. [this gets into deja vu and how we recognize things we have not experienced, that are not in our memories. One hypothesis is reincarnation, memory from a previous life] **But at the root of all human knowledge, at root of empiricism, deductive systems, inductive systems, logic, even mathematics is *RECOGNITION.*** Our ultimate validator and filter.

We have many other filters such as, consistency, predictability, reproducibility,,, but all lead only to one or at best a subset of pictures. And even human recognition is probably limited to but a subset, but it is our largest accessible subset.

Initially we experience frequent repetition. This gives us our "foundation" patterns on which we build all subsequent knowledge. One tool would be to morph the familiar patterns. But this is what the manifestations of archetypes are, morphed settings of a single plot.

LINYUTNG.WP6

ON TRANSITIONS

Inside the gate there is a footpath and the footpath must be winding. At the turning of the footpath there is an outdoor screen and the screen must be small, Behind the screen there is a terrace and the terrace must be level. On the banks of the terrace there are flowers and the flowers must be fresh. Beyond the flowers is a wall and the wall must be low. By the side of the wall, there is a pine tree and the pine must be old. At the foot of the pine tree there are rocks and the rocks must be quaint. Over the rocks there is a pavilion and the pavilion must be simple. Behind the pavilion are bamboos and the bamboos must be thin and sparse. At the end of the bamboos there is a house and the house must be secluded. By the side of the house there is a road and the road must branch off. At the point where several roads come together, there is a bridge and the bridge must be tantalizing to cross. At the end of the bridge there are trees and the trees must be tall. In the shade of the trees there is grass and the grass must be green. Above the grass plot there is a ditch and the ditch must be slender. At the top of the ditch there is a spring and the spring must gurgle. Above the spring there is a hill and the hill must be deep. Below the hill there is a hall and the hall must be square. At the corner of the hall there is a vegetable garden and the vegetable garden must be big. In the vegetable garden there is a stork and the stork must dance. The stork announces that there is a guest and the guest must not be vulgar. When the guest arrives there is wine and the wine must not be declined. During the service of the wine, there is drunkenness and the drunken guest must not want to go home.

from Lin Yutang's, The Importance of Living p267-8

A MATH METAPHOR FOR EVOLUTION

Mutations
- Normal - norm
- Retarding
- Punctuating
- Extinction
- Stability

(4) species of mutations

F

	1	1	2	3	5	8	13	**21**	34	55	89	144	233	...
								Normal						
punct −								**27**	40	67	107	174	281	
retard −									15	28	43	71	114	185
EXTINCTION −									−15	−2	−17	−19	−36	−55

If $F_{n+1} - F_n = 0$ STABILITY

	−13	0	−13	−13	
→	0	13	13	13	13
		0			

The most general recursion formula:

$$F_{n+a} = A F_{n+b} + B F_n \qquad a > b$$

Evolution of Evolution change recursion formula

$$X^{n+a} - A X^{n+b} - B X^n = 0$$

$$X^n [\, X^a - A X^b - B \,] = 0$$

Most general with a quadratic characteristic equation

Special case $a = 2,\ b = 1$

$$X^2 - AX - B = 0$$

Sub-case $A = B = 1$

$$F_{n+2} = F_{n+1} + F_n$$

$$X^2 - X - 1$$

$$p = \frac{+1 + \sqrt{5}}{2}$$

$$q = \frac{+1 - \sqrt{5}}{2}$$

resonances between sequences ⇒ ? evolutional eigen values for stability?

BID-SEMIOTICS

For the recursion equation

$A_n = j A_{n-1} + k A_{n-2}$ (and unequal roots)

with $A_0 = \alpha$ and $A_1 = \beta$ Initial conditions $A_{n+2} = J A_{n+1} + K A_n$

The explicit equation is

$$A_n = \frac{[(\beta - \alpha q)p^n - (\beta - \alpha p)q^n]}{(p-q)}$$

$x^2 - Jx - k = 0$

$p: \frac{J + \sqrt{J^2+4K}}{2}$

$q: \frac{J - \sqrt{J^2+4K}}{2}$

$$p = \frac{j + \sqrt{j^2+4k}}{2} \qquad q = \frac{j - \sqrt{j^2+4k}}{2}$$

$p - q = V$

Eg. Fibonacci: $j=1,\ k=1$

$p = \frac{1+\sqrt{5}}{2}$ Φ $\qquad q = \frac{1-\sqrt{5}}{2}$ φ $\qquad p, q: -V^2$

$\alpha = \beta = 1$

$$A_n = \frac{(1-q)p^n - (1-p)q^n}{p-q} = \frac{(p^n - q^n) - pq(p^{n-1} - q^{n-1})}{p-q}$$

Fib $A_n = \frac{p^{n+1} - q^{n+1}}{p-q} = \frac{\Phi^{n+1} - \varphi^{n+1}}{\sqrt{5}}$

$A_{n+1} = \frac{p^{n+2} - q^{n+2}}{p-q} = \frac{\Phi^{n+2} - \varphi^{n+2}}{\sqrt{5}}$

$J=1,\ K=1$ $\quad p = \frac{1+\sqrt{5}}{2}$ $\quad q = \frac{1-\sqrt{5}}{2}$

$J=1,\ K=3$ $\quad p = \frac{1+\sqrt{13}}{2}$

Lucas $\Phi^n + \varphi^n$ $\quad n=20$ $\quad n=21$

Both Lucas and Fib: ratio $\to \Phi$

All $A_n = J A_{n-1} + K A_{n-2}$ when $J = K = 1$

for any α, β initial conditions $\xrightarrow[n\to\infty]{} \Phi$ $\quad \frac{A_{n+1}}{A_n}$

Change the rate if J, K change?

RESONANCES IN

$F_{n+2} = F_{n+1} + F_n$

Δ		1	2	3	5	8	13	21	34	55								
F	1	2	3	5	8	13	21	34	55	89	144							
L	1	3	4	7	11	18	29	47	76	123	199							
	1	4	5	9	14	23	37	60	97	157								
	1	5	6	11	17	28	45	73	118	191								
	1	6	7	13	20	33	53	86	139	225								
	1	7	8	15	23	38	61	99	160	259								
	1	8	9	17	26	43	69	112	181									
	1	9	10	19	29	48	77	125										
	1	10	11	21	32	53	85											
	1	11	12	23	35	58	93											
	1	12	13	25	38	63	101											
	1	13	14	27	41	68												
	1	14	15	29	44	73												
	1	15	16	31	47	78												
	1	16	17	33	50	83												
	1	17	18	35	53	88												
	1	18	19	37	56	93												
	1	19	20	39	59	98												
	A	B	C		62													

Forbidden eigens [after column 3, 3]

6, 10, 12, 16, ~~18~~, 22, 24, ~~26~~, 30, ~~32~~, 36, 40

4 2 4 2 4 2 4 2 4 2 4

MISSING OUTSIDE COLUMNS ABC

~~4~~ ~~8~~ 6, 10, 12, 16, 22, 24, 30, 36, 40, 42, 46, 52, ~~54~~ ~~60~~ 64

~~3~~ ~~3~~ 2 4 6 2 6 6 4 2 4 6 ~~2~~ ~~10~~

~~3~~ 2 2 2 4 4 ~~6~~ 2 2 2 ~~3~~ 4 ~~8~~

Pattern?

DRAFT

DINOSAUR.WS4 DISK ESSAYS1 11/19/87 02/09/88

THE FASCINATION WITH DINOSAURS

Whatever their field of research, scientists usually find the subject matter of their work to be stimulating, exciting and oftimes engrossing. Of course scientists profess objectivity, which is supposed to mean freedom from emotion and attachment, but this is seldom the case. Like the rest of us they like to share their interest and excitement not only with colleagues but whenever possible with the public at large. Although they always feel rewarded and supported whenever some measure of their own interest is picked by the media and the public, it comes as a surpise to them when the general public sometimes develops a fascination with their subject matter which may exceed their own.

It is not difficult to understand why the public has keen interest in the results of medical research, in the capabilities of new aircraft, or in the potentials of new consumer products, which is to say in any development or product that will impact their life style. What is not easy to understand is why certain scientific findings which posess almost no economic or social implications nonetheless grab the public imagination.

A recent example of this was the public's fascination with black holes. Popular articles, lectures series and extension courses appeared. Paperbacks, TV shows and even a feature movie responded to the public's appetite for black holes. One public lecture series on astronomy was moderately well attended, but on the night when the lecture was to be on black holes, there was not even standing room. People had to be turned away. Public fascination with black holes became a phenomenon of interest as well as the black holes themselves.

However, the perennial example of public fascination with the results of such scientific research is with dinosaurs. Not only have there been numerous popular articles, lectures, books and movies, the public's love affair with dinosaurs has also produced posters, models, masks, inflatable balloons, calendars and bumper stickers. And the dinosaur cult ranges across generations, genders, races, political parties and sig groups. Dinosaurs push Peanuts and Disney for popularity.

What makes dinosaurs so charismatic? What is the source of their fascination? When such questions are asked of ~~the~~ cultists the answer is usually an ~~enthusiastic~~ "Wow", or "I don't know but they're sure neat". I have not seen a poll or survey on the subject, probably because there is not much use in ~~anyone~~ conducting a poll. True believers, whatever their ~~age~~ simply cannot articulate what it is ~~about dinosaurs~~ that beguiles them. However, questions directed at lay people ~~moderately~~ with genuine interest ~~in dinosaurs~~ but not into addiction, ~~have~~ can generate some useful leads.

THE PRINCIPLE OF PLENITUDE

In 1936 Arthur O. Lovejoy, Professor of philosophy at Johns Hopkins University, was invited to deliver the William James lectures at Harvard University. These lectures were subsequently published in a book entitled "*The Great Chain of Being*". The central concerns developed in the lectures and the book were derived from Plato's thoughts concerning the World of Ideas and the World of Becoming. Plato considered two questions: Why is there any World of Becoming in addition to the eternal World of Ideas? and What principle determines the number of kinds of beings that make up the sensible and material world? Lovejoy points out that no one asks this sort of question today. In the last century T. H. Green noted that "...every form of the question why the world as a whole should be what it is .....is unanswerable. " But much has happened since 1936 and the structure of the Observable World is seen to derive from the critical values of certain fundamental physical constants.

Plato believed in the world as a **continuum**, there were no gaps. But beginning early in the 20th century it was discovered that what exists is limited to certain discrete eigenvalues. This was first recognized in the energy levels of atomic structure and later was extended and generalized to a **discretum** that manifests a universe of a fractal nature. Plato's continuum was completely filled, no gaps, no missing links. Every idea that existed in the world of eternal essences had a temporal counterpart, otherwise there could be no intelligibility between the two worlds. The 'fullness' of the realization of conceptual possibility in the world of actuality inferred an isomorphic relation between the two worlds. This idea of effecting a fullness in the world was called "The Principle of Plenitude" by Lovejoy. This principle not only required that " the range of conceivable diversity is exhaustively exemplified, but also that no genuine potentiality can remain unfilled. The extent and abundance of creation must be as great as the possibility of existence and commensurate with the productive capacity of an inexhaustible Source ", and "Further, the intellectual world was declared to be deficient without the sensible." These are all significant notions that have affected the course of western philosophy. Also implicit in Plato's thought is the importance of diversity for the proper functioning of the world.

What diversity is to the plenum, self replication and numerical abundance is to each element of the plenum. We thus arrive at two formulations of the Principle of Plenitude, one for eco-plenum and one for each component part.

> 1) The Principle of Plenitude states that all things possible in nature are actualized and that in the process of actualization new potentialities are created. Alternate formulations are "nature fills every niche", "can do implies will do". The actual ever increases to replace the potential. However not all that is actualized must persist. Much that is actualized may disappear through instability or incompatibility or through serving to effect further actualizations. The Principle of Plenitude seems to be responsible for form and variety to be continually increasing.
>
> 2) The Principle of Plenitude also seems to govern the increase in size, number and capability of individuals and species. Each structure tends to impose its own organization on the cosmos. It is the drive to growth as well as governor of evolution. (Growth and evolution are two processes by which the potential becomes actual.) In growth for any species the principle takes on two aspects, the increase in number and the manipulation of the context (environment) to enhance itself and delimit and inhibit competitors. Thus the principle operating on the species level may run counter to its operation on the plenary level.

In summary, Plato's continuum has today become a discretum, the gaps are part of the structure not just missing links. Further, instead of a limitless inexhaustible world we live in a finite limited world. Instead of every possibility being realized only a portion are actualized. It appears that there is not infinite variety, but variety is limited and restricted. Plato's belief that the two worlds are defective without each other has been replaced with a mono-only-one-world exists. The present view is that the important dichotomy is species/ecology rather than potential/actual.

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It appears that our notions that every element is unique are wrong — there are large overlaps

PRNPLEN1.P51 DISK:GST May 25, 1991

The principle of plenitude as applied to species or organisms has two aspects:

> Every organism tends to proliferate itself as extensively as possible by 1) unlimited reproduction of itself, and 2) modification of the environment so as to be more favorable to itself and less favorable to competitive species.

This statement of the principle of plenitude seems to be of more general applicability than just to living organisms. There is evidence that interstellar molecules also practice the principle of plenitude by their absorbing and scattering light of certain wavelengths thereby enhancing their own being and penalizing molecules that differ.

A generalized version of the principle of plenitude would state that **structures tend to impose their own particular organization on the cosmos.** This by self-replication, destruction of the competition, or any other means. By cosmos is meant here any environment or context in which the structure is imbedded.

. . . . . .

Note: Edward R. Harrison uses the term 'principle of plenitude' in a totally different manner. In his book, Cosmology, The Science of the Universe, he describes the principle of plenitude as follows:

> In its simplest form the principle of plenitude states that a beneficent Creator has given mankind for its own use an Earth of unlimited bounty. The Earth and the other parts of the universe necessarily display every possible form of reality in unlimited and inexhaustible profusion. (p18)

Harrison takes this definition of the principle of plenitude from Lovejoy, (The Great Chain of Being, 1936). Lovejoy writes,

> "Not so very long ago the world seemed almost infinite in its ability to provide for man's needs, and limitless as a receptacle for man's waste products. Those with an inclination to escape from worn-out farms or the clutter of urban life could always move out into a fresh, unspoiled environment. There were virgin forests, rich lodes waiting to be discovered, frontiers to push back, and large blank regions marked unexplored on the map... it has, so far as I know, never been distinguished by an appropriate name, and for want of this, its identity in varying contexts and in different phrasings seems often to have escaped recognition by historians. I shall call it the principle of plenitude."

This definition of the principle of plenitude is about the erroneous belief in the unlimited and inexhaustible nature of the Earth which derives from belief in the omnipotence of the Creator and his turning the Earth over to mankind.

See also: Material on the Principle of Plenitude in the Growth Curve Notebook

75-2

c. 1974

THE PRINCIPLE OF PLENITUDE

See more material in growth curves

THE Principle of plenitude states that all things possible in nature are actualized and that in the process of actualization new potentialities are created. It is not part of the principle, however, that all that is actualized must persist. Much that is actualized may disappear either through instability or through serving to effect further actualization. Nor does the principle insist that new potentialities must come about only through processes of actualization. New potentialities may also arise through chance or through intervention by extra-systemic processes.

Growth is the process by which that which is potential becomes actual.

Aristotle

Exponential curves grow to infinity only in mathematics. In the physical world they either turn around and saturate or they break down catastrophically.

Dennis Gabor

It is only through the conversation of man with man that ideas come into existence. Two human beings are as necessary for generation of the human mind as they are for the generation of the human body.

Feuerbach

THE PRINCIPLE OF PLENITUDE AND GROWTH

Future states can be predicted with some degree of confidence for systems that are subject to a time dependent principle. For example, future ultimate states of most physical systems can be predicted on the premise of their being subject to the second law of thermodynamics. However, This most common example of a universal time dependent principle is of little use for most systems of current concern since its time table is based on units of too great a span to be reflected in the time spans of concern to the forecaster. A second general time dependent principle that is of importance in contemporary time spans is the Principle of Plenitude. It is a principle that appears to hold for all living systems and evidently also for systems created by living systems. The principle of plenitude states that all things possible in nature are actualized and that in the process of actualization new potentialities are created. Alternate formulations include "can do implies will do", "nature fills every niche", etc. The principle implies the existence of two domains; the actual and the potential possible, and the existence of a dynamic; the actual ever increases to replace subsume the potential. It is not part of the principle, however, that all that is actualized must persist. Much that is actualized may disappear through incompatibility or instability or through serving to effect further actualizations. Neither does the principle insist that new potentialities must come about only through processes of actualization. New potentialities may also arise through chance or through intervention ~~of~~ by extra-systemic processes. The principle of plenitude seems to be ~~the~~ a basis of principle of evolution, ~~in which~~ responsible for form and variety continually ~~are~~ increasing. But it also applies to such non-evolutionary changes as increase of weight, size, ~~number~~ and capability (e.g. speed) of organisms, organizations and systems.

S. M. Greenfield: Of course, there is a real question as to whether or not it is ice.

Y. Mintz: Well, it could be ice, but not solid carbon dioxide at the −20°C temperature of the summer pole. The winter pole, on the other hand, might be just about at the frost point for carbon dioxide at the pressures involved.

S. M. Greenfield: I believe that polarization measurements made at Pic du Midi indicate the presence of some ice, but you say that not all of it is frozen water?

Y. Mintz: Well, I do not know. My guess is that the polar cap is solid water in the form of a thin layer of hoarfrost that is directly deposited on the surface itself and directly removed, seasonally, without going through the liquid phase.

R. H. Emmons: I have read repeatedly of a dark line which forms as the Martian polar caps recede. I was wondering if we can reconcile this with what you have said.

Y. Mintz: I believe this is supposed to be an indication that the polar cap is melting, not subliming, and the ground is getting wet. I have my doubts about this. The dark wave is said to cross the equator. But the radiometrically observed surface temperature variation at the equator, a diurnal variation of the order of 100°C, is inconsistent with a wet ground (and is inconsistent with a mean daily ground temperature of the order of −50°C). The observed large diurnal surface temperature variation requires us to believe that the surface of Mars is made of a dry, loose, very fine grained material—which therefore has a low thermal conductivity and which goes through no diurnal phase change.

S. M. Greenfield: I think Mr. Emmons posed a different question. If sublimation takes place, the moisture must be carried down in the direction in which the dark wave is moving. Can you resolve this type of motion from north to south in your circulation model?

Y. Mintz: The dark wave is a puzzle. Even if there was a large amount of ice in the polar cap—which is not tenable—it is difficult to believe that the water from melting ice would flow across the equator. The water would simply collect in shallow places and form lakes, producing specular reflections. But these have never been seen.

S. M. Greenfield: Suppose water was carried by the atmosphere?

Y. Mintz: Why should water vapor in the atmosphere make the ground dark?—Although I suppose one can always invent some chemical mechanism that is sensitive to relative humidity changes.

S. M. Greenfield: Or unless you have a true vegetation which responds to the moist air.

Effect of local winds on planetary atmospheric circulation

C. M. James: Would the presence of large, local dust clouds of fairly high altitude modify the lapse rate and introduce perturbations that would destroy a wave regime?

Y. Mintz: Very likely such clouds would affect the local winds, but I do not think they could greatly alter the planetary scale characteristics of the circulation.

W. W. Kellogg: We can make some deductions about the Martian atmosphere from the way in which clouds and dust storms move across its face. For example, Frank Gifford of Oak Ridge has made a study of this. Could you summarize some of the observations that might bear out the theory you presented?

Y. Mintz: Recently, I heard a talk by Dr. Miyamoto, the Japanese astronomer. He had independently reached a similar conclusion about the seasonal reversal of the middle and upper level zonal winds on Mars, not on the basis of theory, but from observation. He pointed out that at the time of the summer solstice

Aristotle said that growth is the process by which that which is potential becomes actual. Today he may have preferred to say that growth and evolution are two processes by which that which is potential become actual. But it is evident that Aristotle's definition is consistent with the basic ~~nature~~ role of the principle of plenitude in growth. The problem of growth is the formulation of the process by which potentiality is actualized. A process must be described by which all of the different kinds of growth , biological, economic, ~~industrial~~, cultural, technological, etc. can be accounted for. At the present several models of growth, depending on ad hoc assumptions and intra-disciplinary laws have been proposed. Because the shape of the growth curves are similar, much has been proposed based on analogy and metaphor. But there is no underlying model to account for the S-shaped curves that occur in such diverse instances as the increase in weight of ~~the~~ individual cactus wrens or the lengths of successive ocean liners. Starting with something as general as the principle of plenitude can S- shaped curves be inferred? It is necessary to establish the relation between the actual and the possible but it is not necessary to define with great precision what the domain of the potential is. Actual and potential may both be taken as primitives in the construction of a theory of growth. The principle of plenitude assures that each organism will attempt to become as large as possible, so we must understand what determines the limit of the possible.

Recapitulating, we shall attempt to construct a process of a very general nature that will account for the observed sigmoidal growth curves starting from the principle of plenitude and Aristotle's definition of growth.

It is easily shown that to a first approximation, the net torque on the fluid in the annulus is zero when

$$\frac{U_0}{U_4} \approx -\left(\frac{\Delta r}{d} + 1\right), \tag{10}$$

where U_0 and U_4 are the mean zonal current velocities at the top and bottom of the annulus, respectively. Δr is the width of the annulus, and d is its depth.

The vertically averaged zonal current velocity is

$$U_2 = \frac{(U_0 + U_4)}{2}.$$

By Eq. 5, the phase speed of the waves C (the rate of eastward drift of the troughlines of the waves) equals U_2 when β is 0. Therefore, by substitution, we obtain for the steady state,

$$\frac{C}{U_0} = \frac{1}{2}\left[1 - \frac{(d/\Delta r)}{(d/\Delta r) + 1}\right] \tag{11}$$

where C/U_0 is the ratio of the phase speed to the current velocity at the top of the annulus and $d/\Delta r$ is the ratio of the depth to the width of the annulus. Thus, we can see that if the ratio of depth to width is very small, the bottom zonal current U_4 will approach zero and the phase speed of the waves will approach one-half of U_0. However, if the ratio $d/\Delta r$ is very large, the zonal current at the bottom will approach the zonal flow at the top in magnitude but will be of opposite sign, and the phase speed of the waves will approach zero.

The theoretical relation given in Eq. 11 is shown by the curve on the right in Figure 14. The short vertical bar in the figure indicates the observed ratio of phase speed to zonal current velocity U_0 as a function of $d/\Delta r$, as obtained in Hide's experiments. The top of the bar represents the average of many cases of wave number 2, and the bottom of the bar, the average of many cases of wave number 5. The observations for wave numbers 3 and 4 fall in the middle of the bar. (For each wave number, the standard deviation of C/U_0 is less than the length of the bar.) This is a remarkably good agreement between theory and observation.

Fultz has given the experimental data for C/U_0 for only the five wave number case in the deep annulus of Figure 10. This is shown on the right in Figure 14 by the circle at $d/\Delta r = 5.3$. All other observations of C/U_0 that can be obtained from Fultz's published experimental data are for shallow annuli in which the depth is less than the width $(d/\Delta r < 1)$. These cases are also given in Figure 14. Although one of these points lies far from the theoretical curve, in general there is good agreement between theory and experiment.

The ratio U_0/U_4 is given by Eq. 10 and the difference $U_0 - U_4$ is given by a thermal wind relation corresponding to Eq. 4. We can therefore theoretically determine the absolute magnitude of the steady-state mean zonal current velocity at all elevations, including the top surface, from ΔQ alone.

The great success of the geostrophic-based theory in correctly "predicting" the observed characteristics of planetary circulations in laboratory models, as well as its good results for the atmosphere of the earth, should give us some confidence in the predictions we have made about the Martian atmosphere. In fact, the lack of appreciable water vapor in the atmosphere of Mars, and the absence of oceans for the seasonal storage of heat makes the behavior of the atmosphere of Mars, as I have shown, more like the laboratory annulus than like the earth.

Relationship between the Martian surface temperature and the composition of the polar caps

L. G. Stoddard: If I understood you correctly, the maximum mean daily temperature at the pole on Mars is −20°C. If this is true, how do we account for the well-observed fact that the polar caps melt? Does this mean that the polar caps are not ice as believed by many scientists today?

Y. Mintz: If we look at Figure 7 again, we see that in summer, the zero degree temperature for the warmest time of day is not reached until about 60° latitude. This leaves a rather large polar cap with below freezing temperatures at all times. Therefore, if the polar cap is made of ice, it would have to grow smaller by sublimation. For example, given a descending current of dry air over the pole, water would pass directly from the solid phase to the vapor phase. If the ice layer is very thin, perhaps just a hoarfrost, bathing it in a stream of dry air at below freezing temperatures would remove the ice without going through the liquid phase, and without adding any substantial amount of water vapor to the air.

TO LEN via COLINK

@OUTLINE EMERGENCE BOOK AWLT Ø1Ø6/Ø5/82Ø6/Ø5/82 2,15Ø 1

EMERBOOK
OUTLINE OF EMERGENCE BOOK: June 5, 1982

CHAPTER 1.

Historical review of past approaches to form. Discrimination between form and origin of form. Snapshot view: d'Arcy Thompson, L.L. Whyte,... World-line view: Goethe, Steiner,... The significance of the question of the emergence of form.

CHAPTER 2.

The morphology of the flaws, defects, inadequacies in classical thinking--cracks in the paradigm--paradoxes. The consequences of persistance with the "65Ø B.C." view. The key questions.

CHAPTER 3.

The discrimination of horizontal and vertical

HORIZONTAL	VERTICAL
permutative potential	innovative potential
intra-level proliferation	inter-level proliferation
evolution	emergence
crossing	naming (G. Spencer Brown)
programmed	transcendence
bio-metamorphosis	geo-metamorphosis
adjustment	transformation (psycho-therapy)

CHAPTER 4.

Review of hierarchy concepts. Species of hierarchy. Characteristics of levels, fine structure, cybernetic levels (no inference of a supernatural), Deutsch's Theorems. Empirical verification of hierarchies and levels.

CHAPTER 5.

Images of a 'unit of emergence', reduction to simplest case. Metaphors diagrams and examples (real phenomena). Criteria for recognition and discrimination of an emergence event. Predictability of emergence? Prerequisites and specifications for processes of emergence.

CHAPTER 6.

Candidate mechanisms of emergence. Platt's processes, Eastern processes. Hypotheses, predictions of hypotheses, and tests of hypotheses. Limitations of the horizontal, the vertical.

CHAPTER 7.

Evaluation of the mechanisms. Most probable mechanisms.

CHAPTER 8.

Toward a unified theory of emergence.

CHAPTER 9.

Reinterpretation of classical phenomena in terms of the unified theory of emergence. Explaining the unexplained. (and the inexplicable).

CHAPTER 10.
FUTURE DIRECTIONS

EMRMEMØ1.WS1 WORDSTAR v3.3 XPXHD AUGUST 2Ø,1986
EMERGENCE MEMO No Ø1

ITEM I. Much thanks for sending the reprints, but the one I want is the one in which your editorial or commentary summarizes four basic concepts in G.S.T. It was one of the best synopses of the significant in G.S.T. that I have seen. Please try again, it is less than three years old.

ITEM II. Looking again, after four years, I am still strongly of the opinion that we are not openly looking for a solution to the matter of emergence, but are looking for a solution within a constraining framework (which in all probabiliity does not contain the solution). Our first problem is to identify the constraints, both explicit and tacit, that we are insisting any explanation of the phenomenon of emergence must satisfy.

As an example, in the 2Øth century all acceptable dynamic processes must either be some species of determinism or statistically attributable to chance. Teleological processes, those involving inputs from outside the system, or possessing some finalistic directive, are generally repudiated. I feel the across the board rejection of teleological process is predicated on the historical views of such processes--usually some variety of supernaturalism, rather than on a consideration of the essential systems nature of teleology. One variety of teleological system acceptable currently for model building, and possessing no taint of supernaturalism, is the cybernetic or control system. Our models should not proscribe the possibility of a cybernetic component operating in evolution, particularly in emergence.

A second constraint, intimately related to the first example, involves the insistence on restricting models to one level systems. Since cybernetic systems are of necessity at least two level, they have been ruled out by this constraint. I suppose most of the constraints center on the line of reasoning:

1) Supernaturalism has no role in scientific models.
2) Any system involving the supernatural is of more than one level.
3) Therefore, all multi-level systems are unscientific.

The flaw, of course is that the class of multi-level systems contains the class of supernaturalistic systems rather than vice versa.

ITEM III. Jumping to the conclusion that evolutionary theories must abandon one level models, I feel the next step is to parameterize such systems by comparing, for example, the following:

1) Homeostasis
2) Growth
3) Adaptation
4) Emergence

The three components in each system are the ambient,the normative, and the error signal. In 1) the error signal operates on the ambient (here, organism), the normative is fixed. In 2) the error signal operates on the ambient (again, organism), the

normative follows a sigma curve, but of course this sigmoidal curve is the result of part of the error signal "leaking" into the normative. In 3) the error signal operates on the normative, the ambient (external, here) being relatively constant. In 4) the error signal operates massively on the normative, but of more importance, the error signal seems to have come, not from the ambient (environment) alone, but a component of it comes from a source we might call the "meta-normative". This implies that whereas stasis, growth and adaptation can be subsumed into two level systems, emergence requires a 3 level system.

This sketchy discussion conveys what I feel the framework of any model succeeding in explaining emergence must involve. Whether or not this is so, it would still be useful to categorize and parameterize systems along this line. We may learn something.

EMRMEMØ2.WS1 WORDSTAR v3.3 XPCHD AUGUST 27,1986
EMERGENCE MEMO No Ø2

Continuing along the idea that if we are to successfully model emergence, or even adaptation, growth, and stasis, we must begin with a multi-leveled cybernetic framework. The following notions are pieces of such a model:

1) The ecology constitutes a cybernetic control level for all organisms contained in it.

The species, (and even individuals), in the ecology operate under the dynamic (or normative) of the Principle of Plenitude. (I shall mean by the Principle of Plenitude a) the telos of each species to proliferate itself as broadly as possible and b) to expedite this process by influencing the ecology toward conditions favorable to its kind and/or unfavorable to competitive species. This may include cooperation and symbiosis when such is felt to advance a).)

2) The ecology itself operates under a higher cybernetic system which sets a meta-normative for it. While the normative for the organism level may be approximated by the Pr of Pl, the normative for the ecology is less well understood. It may be something like the Pr. of Pl. with variety substituted for number, or it may be the optimization of potentiality, or it may be simply some form of stasis.

Whatever, A generalization may be surmised, viz.: Each cybernetic level has its own unique normative. If this is true, then the level of a system may be ascertained through an identification of its governing normative. (The terms normative, dynamic, telos, motivation all mean about the same in the present description.) Speculating further along this line, at some very high level the normative may be the Second Law of Thermodynamics. At the universe-level the normative could even be Parmenides' total changelessness.

3)Stasis, adaptation, etc can be handled with one-level normatives. My surmise is that emergence results from the interaction or vertical transfer of multi-leveled normatives. At least for some period of time the system is submitted to a different normative than the prevailing one for its level. This creates a 'software' difference resulting in relatively short time in actual hardware change. The causes of emergence, thus cannot be found on the level of their occurrence.

We can glimpse part of this process in the transformation of certain human individuals. Transformation is characterized by the introduction of the normative of a higher system. The transformed person, remains physically pretty much the same, but there is unquestionably a major software change. Going further, Emergence is a transfiguration (i.e. hardware change) occurring in response to a previously occurring transformation (i.e. software change). On the other hand, adaptation is a hardware change occurring in response to a change in the ambient or environment of the same level.

EMRMEMØ3.WS1 WORDSTAR v3.3 XPCHD SEPTEMBER 2,1986
EMERGENCE MEMO No Ø3

ITEM I. Come to think of it, I believe that the text I am anxious to acquire which you wrote sometime in the last year was an introduction to a proceedings, which one I do not know.

I have had no trouble in printing your EDLIN memos. Your first Wordstar memo had lines that were too long and consequently printed double space. Could we agree both to use Wordstar for its usefulness in future cut and paste editing, but set the text width at no more than 6Ø characters?

Having suitable pigeon holes in which to put our memos is rapidly becoming important. I have so far desisted from an attempt to restructure an outline of the subject, but such an exercise should be on the agenda of our next meeting, it is too difficult to do by modem.

ITEM II. Your MEMO86Ø5 contains some very insightful notions. I am especially intrigued with: "From this perspective all levels share the same field and are the result of the same process." Futher, "System isomorphies are the drivers of the process." If this be so, then we are dealing with some generalized type of resonance as a transfer agent of not only energy, but of information. Later you say, "Isomorphies are not merely comparisons across levels as they are currently perceived to be (and which makes them constructs of the mind, figments of human imagination, less real than the real systems compared), but rather are more real than the systems themselves." Here you touch on an ontological anomoly. Ascribing a scale to reality, rather than considering real/unreal as a binary dichotomy, drives a wedge into current Western beliefs that, if followed up, will expose the difficulties inherent in the postulation of an 'out there' objective reality. (Since Locke the invisible has generally been held to be unreal). But rather than proceed with an ontological perspective, I feel that what you are saying should be put into a signification frame. Not reality, but importance of role, is what is involved. The more ubiquitous and more general, the more important. Conventionally, we emphasize the nodes in our networks and overlook the linkages, but as universal informational bridges, whether resonances or not, isomorphies certainly take on greater cosmological significance than the particular systems which happen to be isomorphic. Or as Li Kiang once said, "Relationship more important than relatives."

ITEM III. A footnote to last week's EMRMEMØ2: Zwicky was always perturbed by 'dose bastards' stealing his ideas. I just came across a quote from dot bastard Aristotle that sums up what I was saying about software and hardware in the memo:

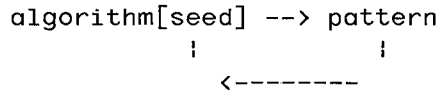
Sent Wed Oct 8, 1986

"Soul and body, I suggest, react sympathetically upon each other: A change in the state of the soul produces a change in the shape of the body and conversely, a change in the shape of the body produces a change in the state of the soul."

ITEM IV. My thinking this week branches into still another direction. (You will be glad when I settle down to writing something on one of our original 28 topics.) I am increasingly impressed with the implications of the work on cellular automata. Conway's game of LIFE, Fredken's algorithm resulting in iterative replication of original patterns, and of course, the Mandelbrot Set, all point to a paradigmatic revolution in which nineteenth century clocks and twentieth century dice are being displaced by algorithms operating on seed distributions. The algorithmic approach is an epistemologist's delight. Nowhere else do we get so much out for so little in: Creating an entire universe from an initial simple pattern and a set of rules that usually can be written in three or fewer lines. If ever the inverse problem of given the pattern time-line, derive the algorithm can be solved, we shall be able to incorporate and process prodigious complexity within our intrinsic informational limitations.

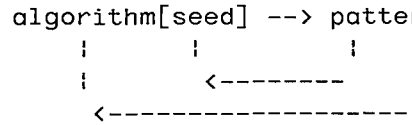
But here our subject is emergence. Is emergence implicit in THE ALGORITHM? Experiments to date have shown astonishing parallels between simple algorithms and processes such as growth and cell division. And the generation of variety, as with the Mandelbrot algorithm, seems almost to rival nature's profusion. Is there a simple algorithm that will produce something of a higher order than anything contained in the seed patterns?

Algorithms in cellular automata experiments usually have the form:



meaning the algorithm operates on the seed pattern, producing a new pattern which in turn is the next seed, etc. This operation is deterministic, i.e non-branching; every realizable pattern is implicit in the algorithm and the seed. Let us call this a Class I algorithmic process. Such processes can account for growth and possibly with more sophisticated algorithms also account for evolution. The duality between the algorithm and the pattern time-line is somewhat like that between genotype and phenotype.

A Class II algorithmic process would have the form:

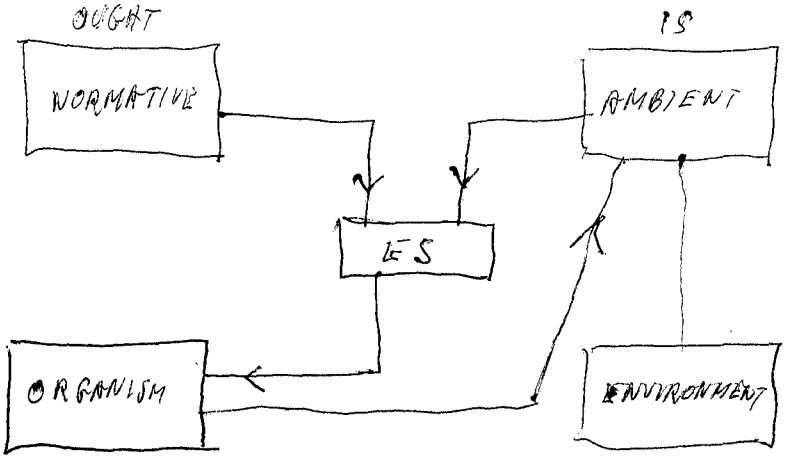


meaning that from time to time special patterns would trigger a modification (non-branching) or conditionally trigger a modification (branching) in the algorithm itself. But even in these two cases, everything is still implicit in the algorithm and the seed, there being no outside intervention since the preparation of the initial seed. Although in the branching case, not all the potential is realised.

But a Class II algorithmic process might be able to account for emergence when certain isomorphic relations come into being between first and second level time-line patterns To explore this, we would first have to conduct extensive experiments with Class II algorithms, and to my knowledge these have neither been written nor parameterized.

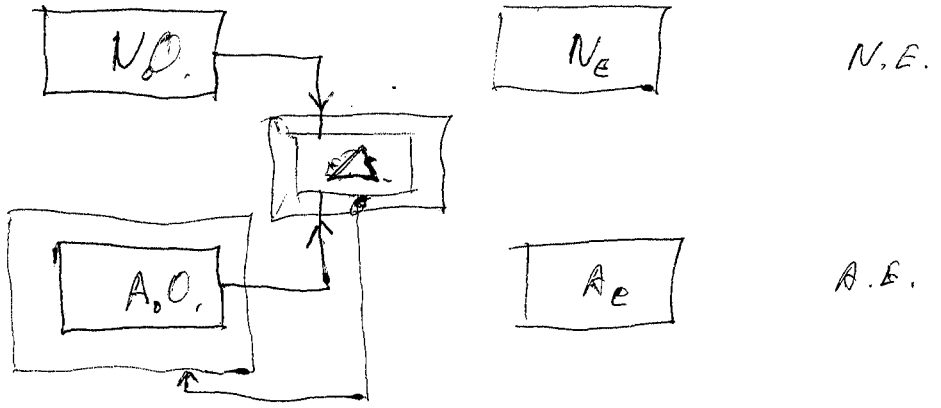
Cellular automata operating under certain algorithms produce such abundance of form that, as with nature's profusion, signification and selection must be artificially invoked because of the insufficiency of our informational bandpass. Even when there may be no actual branching, only the deterministic unfolding of a great single time-line pattern, we are forced to focus on subsets of the pattern, ignoring the rest as though it had not been realised. Thus in effect we create a "virtual branching" by the necessity of our piecemeal way of perceiving. All para-worlds exist, but we choose not to perceive them since it would overload our information processing capacity.

In both branching and virtual branching time-line pattern are aware only of themselves.



IS_e IS_o A_o A_e

N_e N_o N_o N_e



OUTER BOXES 1° LEVEL ENERGY
INNER BOXES 2° LEVEL INF

STASIS
GROWTH
ADAPTATION = 2nd Level Stress
TRANSFORMATION = 2nd level growth

SPECIAL DINNER/LECTURE: 16 Sep 6-1Ø pm
with visiting teachers **Shizuko Yamamoto,**
Patrick McCarty and Meredith McCarty
fee $15 Reservations Required

Join us on the special evening with dinner at 6 cooked by Meredith McCarty, author of the new macrobiotic cookbook, **American Macrobiotic Cuisine**, followed by shiatsu demonstrations by Patrick McCarty and Shizuko Yamamoto, authors of the new book, **Macrobiotic Family Health Care and Shiatsu.** Patrick and Shizuko will be available for individual consultations and treatments during this time -- please call the Ginkgo Leaf for appointments.

MACROBIOTICS: TOOLS FOR TRANSFORMATION is part of a global network of macrobiotic activity adapting universal principles of balance and dynamics of change to meet the demands of the California environment, culture, and life style. Through membership in the Pacific Macrobiotic Community, we coordinate learning opportunities and information exchange with similar groups throughout southern California. Call for times and places of scheduled events and for the store in your neighborhood featuring macrobiotic foods, books and staples.

Macrobiotic books, supplies, speciality foods and cooking utensils are available at classes and seminars or by MAIL ORDER with credit card. Call Donna Wilson at the Ginkgo Leaf **818/716-6332** for your special needs.

Plan now to attend the 13th Pacific Macrobiotic Community Conference in San Diego on Sep 18, 19, 2Ø, & 21. Carpools and accomodations will be arranged.

LPN FROM COLINK

Dear Al,

This is my first time using the IBM, MOVIT, and Edlin. If it works we have jointly defied probability law.

First, a problem. Denise reminds me that she and I have scheduled a vacation for next Thursday, and I have a tooth capping appointment for the Thurs after that. Can we re-schedule our automatic transfer days to Wednesdays at 4 pm. Mon and Tues at 4 are also open.

In looking through my past Theory of Emergence files I find the following possible notebook headings:

...Alternative Metaphors
...Alternative Mechanisms
...Empirical Clues
...What Emergence Must Explain
...Differences Between Evolution and Emergence
...The Role of Duality (Counterparity Meditations)
...Boundary Conditions and Natural Clustering
...Historical Context: Past Attempts to Explain
...Predictions For Each Alternative Mechanism
...Alternative Formalisms
...Possible Tests of the Theory
...Guiding Linkage Propositions As Clues
...Corrollaries to the Theory
...Discriminating Questions
...Required Study Readings and Citations
...Taxonomies or Types of Emergence
...Morphological Matrix of Emergence Processes
and more...

Perhaps that is enough for now. I have pages on each. For next time we could offer each other outlines categorizing the above. Seems the above already are too many for notebook headings. We need to construct a common outline including both lists of suggestions.

Hope all is well with you and Donna. Denise just called me at wits end with Matthews irritability or colic today. I must run home to help her.

Love, Len

NEXT CONTACT WEDNESDAY, AUGUST 13, 1986 4:00 P.M.

MOVIT 12

—9 TA H N

Dear Al,

I disagree with part of my last message. Even though I suggested many headings, I feel now that each should still constitute a notebook divider heading. That way we maintain specificity. Each of our messages should be a stand-alone statement or contribution to one of these. Then we could assemble our printouts of messages in our notebook and rearrange them in any of several alternative outlines for various publications or the book we plan together... The Theory of Emergence.

You probably have not yet received the editorial which you requested. I sent two and even then I am not sure either is the one you wanted. I'm afraid I do not keep track of my editorials at all.

Additional headings for the notebooks follow:

...Significance of Systems Allometry for Emergence Theory
...Contributions of Emergence Theory to the Conventional Disiciplines.
...How To Distinguish Emergent Levels from Subspecialization Levels.
...Consistent (Orthogenetic) Parameters Trends and Emergence.
...Process Outline Workspace.
...Need For A Theory of Emergence.
...A Spectrum of Processes of Emergence.
...The Problems of "Fields" or Action At A Distance.
...Three Case Studies of Significant Application of the Theory of Emergence.
...Publication Strategy.

As you can see some of these headings are practical rather than epistemological. I believe both are needed. We are servants. We must keep our heads in the clouds and our feet on the ground. How will we decide which headings we will share? I do not expect you will be turned by some of these. Do we cut now or later?

Each heading should have some short code name so that we can preface each standalone statement with the code name and so know where to place it in our studybooks.

Incidently, did I tell you about Pete Antonelli's new book. You may remember us meeting this topologist by the LA Museum and trying to get him interested in Emergence. He has now edited a book (apparently on a mathematics conference) entitled "The Emergence of Form." Well, even if we do not do anything, we can be confident of being scooped. I rather wish he would have invited us to contribute. I have not seen the book yet. Could you trace down its source thru the book catalogue you must have at the store and order two for us.

Bye for now. Len.

Dear Al,

The following are some of the differences between evolution and emergence that I have been considering:

evolution	vs	emergence
continuous		discontinuous
constraint dominated		potential field dominated
variation dependent		variation independent
negative feedback dominated		positive feedback dominated
led by environment-env unchanged		environ & subject cochange
bottom-up oriented		top-down oriented
within scalar level		new scalar level
non-isomorphic generated		isomorphic sensitive

I do not necessarily believe in any or all of these. They are for debate purposes. I have published a paper entitled "On A Possible Discrimination Between Evolution and Emergence Processes" wherein I suggest that there may be more than one level of emergence process anyway. We must discuss these ideas on our way to figuring out a mechanism of emergence...n'est pas?

On a personal level I dislike these terribly limited exchanges. But they are necessary. Imagine us as incarcerated in cells where we can exchange but limited info every once in a while. In a sense this is true and might help us produce this magnum opus.

My love to you and Donna from all of us.

.PO 13

First, a couple of housekeeping items. Your wordstar file did not translate correctly to my screen. It showed a large number of rather strange characters. However, it did print ok on my Epson FX-85 although about every third character turned out an italics font. Do you know why. I am using Edlin the standard editor on IBM to produce these files. Are you receiving info without any problems of translation? Second, I have quickly purused the remaining Bulletins which I have in my library and cannot find the editorial which you want. Are you sure it was mine? Can you tell me in which issue. This is finals week and next week my obligations will diminish sufficiently for me to conduct a more detailed search. Could it have been part of an article or intro for a Proceedings and not a Bulletin editorial.

Your last message on the cybernetic nature of emergence is well taken, if I understand your point correctly. I would like to make a procedural point before discussing it. My last several messages have emphasized the practical; your last emphasizes the broadest possible perspective of writing a book on the theory of emergence. We are approaching the project from opposite or dualistic positions. Fine. Each of us, I know from past experience, can switch to the opposite position at will. We need both. The project, however, will not add up at the end unless we allocate these sub-files to appropriate sections of a composite, cumulative work. Your last message stimulates me to add a new heading to the lists I've already sent.

...Guiding Tenets of Emergence Theory: Challenging Rigid Conventional Assumptions.

Perhaps the subtitle is too strong. Might read "Suggesting New Modes of Thought." Having a notebook with these 28 sections designated allow me to xerox subsections of each of our communications to include under the appropriate titles. After a year of work we will have a considerable amount of material in each section to rewrite. Voila, a book of substance and detail and hopefully many insights. How do we reconcile these 28 titles with the Chapter headings you sent in the first message. I would suggest making headings for the Chapters if they are not already in the 28 and proceed. It is important the we both agree on the headings, keep the records faithfully, and entitle each subsection of our messages with one or another of the headings, for example, "To Alternative Mechanisms."

Another practical, operating, or functional concern is portability. I will have to xerox, cut and paste subsections to different titles. But one cannot do this to the floppy diskette record we both are probably keeping of these proceedings. Can I read edlin files into wordstar? If so, then we could cut and paste, and update, and edit electronically. If not, I had better start using wordstar for the making of these messages.

This completes this short message on edlin on practical matters. I will be sending two files this time. The next message will be written on my wordstar as a test for portability to your machine and as a test for future portability. I will also try to bring up your wordstar file on my wordstar version. The next message will

also be on the wider perspective discussion you initiated in your last message. Until then, Len

Transmitted Aug 27, 1986

.PO 13

Wordstar File Theory of Emergence Book Wilson & Troncale

"To Guiding Tenets"

You speak of identifying constraints to thinking that interfere with recognition of emergence as a phenomenon. You cite two instances; 1) non-application of what might be considered acceptable non-deterministic processes like cybernetics to phenomena, and 2) consideration of multi-level systems. My approach to emergence is similar and different.

It was evident at the outset of my education in science that reductionists were highly committed to one scalar level of phenomena. Worse the necessity of covering the literature in great detail and being on top of every development required specialization so restrictive that even if one was studying chemistry (which might be considered only one or two scalar levels in total reality) one was limited to a very tiny sub-sub-set of that scalar level if one was to compete effectively or contribute effectively. In my chosen field of biology the same occurred. One became a molecular biologist, or a cellular biologist (i.e. concentrating on a scalar level) and then within that level became a specialist on one of 5Ø organelles in the cell, and then within one of several approaches to that organelle, etc. In recent times it has become clear to some biologists that biology itself is an obligate multi-level phenomena. Evolution cannot be considered on only one level but requires input from all of the levels from the pre-molecular, to the molecular, to the cellular, to the organellar, to the multi-cellular, to the organismic, to the ecologic, and beyond. It is the wrestling with these new inputs that makes modern evolution an exciting new field as it attempts to incorporate them into the old theoretical frameworks.

I did not accept this constraint. From the beginning I considered phenomena far afield from the specialty problem I was trying to solve for clues. This brought me a great deal of disapproval in cell biology and still does. My first paper in systems theory in 1972 expressed this by proposing consideration of a "meta-hierarchy" of levels as one phenomena in itself. Each level was inseparable from the others; the cascade of levels was a unit when considered from another perspective; the sequence of origins was unbroken from beginning to end (and man had not now and probably never would come to the end of beginning or end levels). From this perspective all levels shared the same "field" and were the result of the same process. I suggested that systems isomorphies were the drivers of this field and process. At the time this was dimly perceived. My reception in general systems circles was not much better than in science; while science had refused to consider the use of outliers in understanding a reductionist phenomena and objected, supposedly general systems people just ignored the work entirely.

Now this work may be more acceptable as modern physics teaches us with current results that the "things" we think are real to measure such as sub-atomic particles are really only intersects of other forces, and perhaps even strings or intersection of forces in other dimensions only dimly perceived on our level at all. Similarly, the very levels of scalar reality we live in may be considered less "real" than the pervasive cross-level

processes and isomorphies which drive their appearance. In my latest paper (which I will send you today) I suggest that isomorphies are not merely comparisons across levels as they are currently perceived to be (and which makes them constructs of the mind, figments of human imagination, less real than the real systems compared), but rather are more real than the systems compared. They are isomorphic because they preceded the formation of the real systems they are found in. Isomorphies are thus properties of the environment of what we call real systems not of arbitrary human thinking. Real systems are merely the level-by-level manifestations of pre-existing optimizations which reveal themselves as isomorphies after many levels are produced.

These tenets actually are the reverse of conventional thinking, or put conversely, conventional thinking is a constraint as you would define it on this kind of thinking. Yet this kind of multi-level perception is absolutely necessary to perceive the conventional scalar levels, often assumed to be separate phenomena, as actually a series of outputs of the selfsame process and as a single, undifferentiable phenomena.

This multilevel perception also agrees with the concepts of non-equilibrium thermodynamics. The sequence of levels of the metahierarchy is maintained by a constant flow of energy from the first to the last. Each scalar level is, in fact, a local manifestation at a new scalar of the overall field. Each is dependent on its prerequisite scalars and in some ways on the descendent or upwards scalars. Just as the order in Belousov-Zabotinsky reactions is maintained by the flows through the components, the order of levels is maintained by the flows thru the levels. Thus, the level-to-level sequence is similarly irreversible providing a times arrow to emergence which we observe. Also the usual physical limitations of entropy demands obtain yielding our observations on Zipf's Law, and probabilities, and timelines, etc. across the sequence of levels.

And this brings me to the final point. The scalar levels perceived in this multilevel way provide us with clues to the process that creates them. We can measure upper limits and lower limits for the same several parameters for each level thus quantifying both the levels themselves non-anthropomorphically as well as the "gaps" between levels across which emergence works. We can also measure trends across levels for those same parameters, as well as correlations between those parameters to obtain traces of the process. This is what my students and I will attempt over the next year as an assist to our writing this book. But conventional science has never attempted to measure across levels like this since their thinking cannot admit the possibility of there being meaning to such comparisons. If and when our measurements provide evidence of consistent trends and correlations we will have not only clues to the emergence process, but also some evidence that it occurs as a multilevel phenomena.

And so our approaches may not be identical to constraints on current thinking which inhibit perception of emergence, but they are in agreement and mutually supportive. We now have two or three ideational entries for the section on "Guiding Tenets of Emergence Theory: Exposing Constraints In Current Thinking."

Len