Why 'Dialectical'?

The final paragraphs of <u>Part 1.a.</u> at least hint as to why you find the term *ideography* in our main title, instead of *calculus, algebra*, or even *arithmetic*. But why the term *dialectical* in that title? What *quality* do we denote by this term? A new *ideography*, we allege, emerges from 'the immanent critique of arithmetic'. In what way does this new ideography exhibit or describe that *dialectical* quality? How does that symbolic system, that explicit-rules-based "artificial" language, qualify as a *dialectical language*? Do we mean a *dialectical process of ideography*, i.e., a *dialectic of ideographic symbols*, a *dialectical symbolic process --* an *ideographical dialectic*? Do we mean an *ideography of dialectical process*? Do we mean an *arithmetic* whose operations somehow mime, simulate, emulate, hence *model*, dialectical development? Do we mean a *heuristic*, *'intensionality-denoting'*, *pure-qualitative*, *connotative calculus of categories* for both "*historical dialectics*" and "[meta-]*systematic dialectics*"? Do we mean *dialectical algorithms* and '*dialectical computers*', which 'compute', in a way *at once* both quantitative and qualitative, descriptions of *future statuses of the processes of nature* using a rules-system that operationalizes the «*organon*» of dialectics? We mean all of this.

The 'Eventity' Ontology. The following gedanken-experiment [thought-experiment] is crucial to the reception of all that follows. We propose that, throughout your reading of this essay, you test the following conceptual processes: (1) that you first not conceive phenomena, phenomenal objects, the objects selected by your perception, as purely noun-like entities. That is, we propose that you escape the concept of objects as atomistic, statical, invariant substances; as inert matters; as fixed content in eternal equilibrium. We further propose that you (2) not conceive such objects as purely verb-like abstract actions or events. That is, we propose that you also escape any concept of objects as "pure energies", "medium-less waves", or fluid-like "pure fields", devoid of any substantiality or morphological integrity. We propose (3) that you instead test a conception of objects as eventities -- as event/entities or process-objects and, simultaneously, as processsubjects ['subjects' here meaning 'agents', 'actors']. That is, we propose that you attempt to internally construct a perception of objects in general as 'subject-[verb]-objects' -- self-channeling, self-constraining, self-reentering, self-refluxive flow-forms or rheisms; self-changing, therefore evolving and 'meta-evolving' processentities; internally dynamized, ductile substantialities. We urge your testing of an ontology that grasps "entities" as prior syntheses of noun-like and verb-like qualities, for which the grammatical qualities of noun versus verb pose opposite directions of abstraction i.e., of 'homeomorphic defect', hence of omission. The proposed conception of an 'eventity' is one of a 'self-acting as well as other-acting action-object'. This concept involves conceiving of such an 'action-object' neither as an external "event" instantiating a 'pure verb', nor as an external 'entity' materializing a 'pure noun'. It points to an action-entity existent - an externally existent noun-verb or verb-noun. In essence, we urge your experimentation with a conception of objects neither on the model of atomistic "point-particles", nor of "linear waves", but on the model of nonlinear waves. It is our experience that the practice of this re-conception, at length, opens up the doors of perception as well.

By the term eventity we connote a being whose "substance" is event; whose "matter" is "energy". We mean a being "made of" action, of a specific, defining mode-of-action, which is its activity-essence, its self. We mean a being, in self-caused, self-ineluctable ways, not in other-caused, externally-imposed, contingent ways, existing only as a being of change, a continuing [self-]change of being; always in a "state" of self-induced 'nonstaticity', or motion, even absent any externally-induced motion; a being, a 'becoming', in evolution and 'metaevolution' = self-consistent, self-reproducing-cum-self-superseding self-development. A being at first self-becoming, but later on self-un-becoming. A doing self-doing, then self-un-doing, as a cumulative consequence of its preceding self-doing. The semi-conscious ontological commitments of today's "natural" languages, inculcated in us as children, before the age of critical thought, make this re-conception difficult. It is "natural" to think only of substances acting when "verbs" usually attend "nouns" in one's language. But "substance" resolves into activity. One may seek 'uncutables', a-toms or ¬(tom)s -- radically simple, unconstituted "elementary particles" from which all else is made. But, like clashing tomahawks, all empirically observable candidates, with a few seeming exceptions, "cut" or shatter each other -- into vast varieties of others -- when they collide. One may seek reduction to ultimate 'undifferentiateable' substance, but one finds the spontaneous selfconstruction of the cosmos. The universe reveals itself as a scale-layered, cumulative snowballing of past-topresent doings whose recurrent self-lamination regularly erupts new qualities of apparent new "substance", of new experienceable and measurable manifestation, of "being becoming".

Ultimate "substance" resolves, perhaps, into self-inflating "vacuum". Apparently "empty" space as plenum. Turbulent "Dirac Seas", seething with "virtual" materiality. Paired matter/anti-matter "particles" ceaselessly self-creating and self-annihilating. Active "nothingness". "Nothingness" acting. Apparent "Nothingness" -unmanifestation, but pregnant with potential finite manifestation -- as ultimate "substance". Action as substance. Action manifesting quality to our perception. Quality = quality of action.

Note that when we employ, herein, the term 'meta-evolution', we do not restrict its reference to mechanisms specific to the cellular – prokaryotic and eukaryotic – and multi-cellular/metabiotic intervals of cosmic evolution, namely the mechanisms of DNA-genetics, "competition for shared resources" and "natural selection". Our usage is more akin to that of dynamical systems theory, in phrases like "nonlinear evolution equation". Our definition is actually more restrictive than that of classical dynamics, centering on a concept central to the meta-dynamical meta-systems theory proposed herein – the concept we term 'self-bifurcation'.

The Tornadic Eventity. For an example of a "being" for which contemporary human perception readily and sensuously supports the eventity concept, consider a tornado. It is a temporarily self-sustaining, auto-mobile, semi-tangible -- and temporarily, partially morphologically invariant -- atmospheric flow-form "composed of" ordinarily invisible, ultra-diaphanous, seemingly "in-substantial", and "intangible" air. Also, and in essence, tornadoes are "composed of" a definite kind of motion, a specific mode of action, of that medium. They are "made of wind". They palpably display for direct human perception qualities they share with eventities of all 'ontos' according to the eventity ontology. Raw, immediate sensory support or no, we allege that other "beings" -- even "bones and stones" -- reveal the aptness of the eventity ontology to more probing metrics than those of the naked human sensorium as it has been shaped by the prevailing instru / mental culture of humankind. However, the tornadic eventity -- as well as atmospheric, cyclonic or anti-cyclonic toroidal vortices in general -- appear to be Heraclitean without being meta-evolution-mediating. They appear to lack any cumulative/depletive conversion-dimension in our 'meta-evolutionary' sense. They appear to build toward no irreversible self-bifurcation of the state or dynamics of the planetary atmosphere, or of the planet as a whole, though they clearly do self-terminate, thus are modelable as self-mediating the parameter shifts in their own control spaces that shortly shut them down.

<u>"Solid" "Like A Rock"</u>. Consider a "thing" many might view as typifying the 'nounically' inanimate -- an ordinary Terran rock. Yet, transferred to a hermetically-sealed laboratory container, it would typically *vaporize itself* in time, owing to self-heating via radioactive self-decay of the traces of Thorium which most Earth rock contains¹⁰. This potential for self-vaporization may actually be more centrally related to cumulative planetary/lithospheric/pre-biotic evolution than might meet the eye, or, at first, than might meet the mind¹¹.

The Solar Eventity. [forthcoming].

Fusion by Plasma Self-Confinement -- The "Plasma Bottle". An even more apt eventity image arises from an area of energy technology yet to be mastered by Terran humanity. Imagine a nuclear fusion reaction chamber, maintained in continuous net power generation mode. This would require sustaining the plasma it houses in the condition represented by a presently unknown location in the vast control-parameter-space of the nonlinear Boltzmann-Vlasov equation. There, we conjecture, the dominant mode of "self-consistent" motion of a plasma is a self-re-entering vortex, a cyclonic, toroidal-vortical flow-form, or plasma cyclone: a "rolling donut" cloud of ionized gas - "rolling" upon itself, and corresponding to a 'nonlinear standing wave' or "3-D soliton" solution of that equation. Flowing plasma spirals-in near the base of the chamber, and whirls up the "chimney" of the "eye-wall" region of this, its own, self-constituted cyclonic flow-form. Selfintensifying magnetodynamic self-confinement of the plasma ignites a fusion reaction midway up that "chimney", at the narrowest neck of the eye's wall, at the point of maximal self-confrontation and selfinteraction of the plasma, where the plasma most proximately meets itself. This fusion process yields usable surplus energy, in several forms, to be siphoned-off. It also releases vortex-regenerating power. This plasma flow is thus self-causing, self-regenerating, self-reproducing, given the maintenance of the chamber environment control-parameter settings.

This flow expels its resultant fused nuclei, mixed with still-viable fuel, out the top of that "eye-chimney", where some of that exhaust must be siphoned away. Otherwise this toroidal-vortical flow-form would selfbifurcate, self-(dis/re)-organizing to a different morpho-dynamic after its 'fuel ratio' parameter – measuring the concentration of its accumulating spent fuel -- exceeded its critical bifurcation-threshold value. Then, descending spirally down the outer sides of its own toroidal-vortical flow-form, the plasma flow mixes with fresh fuel injecta. As this flow again nears the bottom of the toroidal whirlpool of plasma, it is pulled spirally up once more, back into the chimney/eye ignition-region. Under the control parameter-values maintained in that chamber, the motion of the charged plasma particles just described continually [re]generates, *internally*, a plasma-*self-confining* electric/magnetic field. Such an intensity of field, i.e., of the electrical current necessary to create and sustain it, would vaporize, in fact 'plasma-ize', a solid-phase, metal wire electromagnet, thwarting any attempt to impose this degree of field-strength upon the plasma *externally*. But this plasma-internal, self-generated field also guides the plasma's particles to reproduce the very pattern of flow by which they generate that plasma field which, in turn, generates that plasma flow . . ., thus fomenting a sustained *self-re-iteration*; a nonlinear *self-consistent* "state" or 'consisting-of-self motion of the plasma.

The attempted *externally-imposed* toroidal or "donut" plasma morphology of the stellarators, tokamaks, etc. is replaced by the automorphogenesis of a toroidal vortex flow-form *internally-imposed or self-imposed by the plasma itself*. The self-moving plasma medium in that chamber *works upon itself*, and thereby "works itself up" to a higher level and quality of elemental existence, of nuclear-species content. This medium thus *develops itself* nucleosynthetically via its fusion of lighter into heavier nuclei, an energy-yielding self-development which is self-mediated by its own self-regenerating cyclonic motion.

This plasma, as processor, acting upon itself as *input*, yields itself again as *output*, but with a difference, a "delta", a ' $\underline{\Delta}$ ', a "gain", or a "loss" (of mass-energy), which is both a qualitative and a quantitative gain. Due to the squaring operation it involves, the formula below describes only the "pure-qualitative/-ontic" or ' $\underline{\Delta}$ ' gain:

<u>plasma</u> "of" <u>plasma</u> = <u>plasma[plasma]</u> = [plasma]²; [plasma]² = <u>plasma</u> + Δ [plasma] $\frac{1}{2}$ plasma.

Or, to bring in explicitly the relative timing of these changes -plasma [plasma] = $-[plasma] = [plasma]^2 = plasma + \Delta[plasma] = plasma + \frac{1}{2} plasma$.

The expression " Δ [Plasma]", written with upper-case 'P' and 'quanto-qualitative' " Δ " -- stands for the totality of the self-induced changes in the content of "the plasma" -- denoting not just the *quantitative changes* in that content, but the *qualitative changes* as well. The quantitative changes would include, for example, a reduced count -- the "subtraction" -- of some Hydrogen ions, and the reduced energy-content of the mass of the plasma due to the energy emitted by the fusion reaction. The qualitative changes -- changes in the kind, <u>quality</u>, or ontology of the composition of the plasma - would include, for example, addition of Helium ions where there were none before, i.e., the conversion of Hydrogen into Helium. The self-induced cyclonic flow of quantitatively and qualitatively self-meta-evolving plasma, in its eye's focus, overcomes the electrodynamic mutual repulsion of its ionic nuclei and their sub-atomic "particles". It creates the close-up *self-confrontation* of that medium which ignites its continuous, and *cumulative*, *self*-transformation, as long as the conditions represented by its location in *control-parameter-space* are sustained, via fresh fuel injection, fusion products exhaust, etc.

<u>Evolution</u>, 'Meta-Evolution', and 'Meta-Society'. The meanings of two technical terms, used with special meaning throughout *Dialectical Ideography*, are vital to the comprehension of all that follows. These terms are 'meta-evolution' and 'meta-society'.

<u>Meta-Evolution</u>. Using a geometrical metaphor for our usage herein, 'evolution' maps to the growth of the length -- the quantitative expansion -- of a growing line or curve; or to the expansion of the area of a plane, or to that of the volume of a cube. 'Meta-evolution' maps to growth of that line into a new direction or dimension, one perpendicular to/independent of the dimension of its past, defining extension or quantitative evolution; to the 1-dimensional line-segment's qualitative expansion into a 2-dimensional plane; to a 2-D plane's qualitative expansion into a 3-D cube, to a 3-D cube's qualitative expansion into a 4-D hypercube...

In standard idealization, such 'meta-evolutionary', 'quanto-qualitative' growths appear as infinite quantitative ones, as "singularity", as "discontinuity", as loss of the (former) identity or of the existence of the system so growing.

Herein however, such transitions are termed 'meta-finite', for, even in idealization, the resulting 'meta-state' is finite relative to itself, however "infinite" it may appear, in idealization, relative to its predecessor 'meta-state'. The plane that grows out of the self-perpendicular motion of a finite line segment has finite area, even if, in idealization, it "contains" an infinite number of such line segments -- is a 'meta-line' made up out of (an "infinity" of) such lines. The cube that may be "described by" or "generated by" the self-perpendicular motion of that 'plane-segment' has finite volume, even if, in idealization, it "contains" an "infinite" number of such plane-segments; is a 'meta-plane' made up out of (a "transfinite" number of) such planes.

Once the idealization is relaxed, or when such idealized mathematical metaphors are concretely applied to the physical actualities that they are fit to model, the mental chimera of "actual" or "manifest" "infinity" vanishes, and concepts of qualitatively different but quantitatively 'meta-finite' differences -- of qualitative 'meta-finite' change -- may arise, e.g., 1 mm.¹ \geq 1 mm.² \geq 1 mm.³..., viz. --



Per our standard 'level one' partitioning of cosmological meta-evolution, the following succession of transitions describe four successive 'meta-evolutionary leaps', 'ontology self-expansions', 'meta-finite transitions', 'self-bifurcation singularities', 'meta-dynamical self-movements, or 'meta-evolutions' of the 'meta-continuous' identity and existence of the 'meta-system' that is the thus evolving and 'meta-evolving' cosmos: (1) transitions of atoms to 'atoms squared'; i.e., to molecules in addition to atoms; to 'meta-atoms' made of [a perhaps large, but always finite number of] atoms, followed by transitions from (2) their continued co-evolutions to that plus that of 'molecules squared'; i.e., that including [prokaryotic] cells, those 'meta-molecules' made of [a perhaps large, but always finite number of) molecules, followed by transitions from (3) their co-evolutions to that plus that of '[prokaryotic] cells squared'; i.e., that including [eukaryotic] cells, those 'meta-molecules' made of the up of prokaryotes, followed by transitions from (4) all of their continued co-evolutions plus those of the "meta-phyta" and "meta-zoa", i.e., of '[eukaryotic] cells squared'; of those 'meta-eukaryotes', 'meta-cellular', "multi-cellular" organisms, made up out of [eukaryotic] cells.

In the various variants of *dialectical arithmetic* presented throughout *Dialectical Ideography*, and especially in Section III., <u>The Arithmetics of Meta-Evolution</u>, the operation of [self-]multiplication, the product rule, models *meta-evolution*, *metafinite self-bifurcation singularity*, or *metasystem transition*, while addition models *cumula*tion.

<u>Meta-Society</u>. We see the [meta-]evolution of language-based [proto-]human society as a process one firstorder 'meta-evolutionary' leap beyond that of the proto-language-based animal societies -- of even the most elaborate ones, as seen in some ant and termite colonies. We see the [proto-]human societies of today's Earth -- likewise those of Earth's antiquity -- as belonging, ontologically, to the qualitative increment of 'animalsocieties squared'; as 'meta-societies' made up of multiple [animal] societies [and plant 'societies']; as products of an "endosymbiosis" and of a "symbiogenesis" at the social level. That is, we see the endemic association of humans with animal and plant partners -- with dogs, horses, camels, oxen, cattle, etc., on the animal side, and with 'horticulturalized' or domesticated communities of plants, e.g., wheat, rice, corn, etc. on the plant side -- as not merely incidental, but as essential to the nature and existence of [proto-]human society as it has manifested to-date on Earth. Other such neologia are employed throughout Dialectical Ideography. They are defined in context in the body of the essay, and again, generally with greater generality, in the <u>Glossary of</u> <u>Neologia</u> sub-section of the <u>Postscripts</u>.

'Metafinity' & 'Meta-Fractality': 'Metafinite', 'Meta-Fractal' Structure of the 'Multi-Ontic Cumula' of 'Meta-Evolving' Universes [of Discourse]. Two additional concepts pervade the discourse of *Dialectical Ideography*. Herein, these concepts are named are 'metafinity' and 'metafractality'. ... [forthcoming].

Dinlectical Ideography

I- 28 Distributed «Samizdat» by Foundation Encyclopedia Dialectica

The 'Toroidal-Vortex' of Stellar/Atomic Meta-Evolution [The Self-Development of the Galactic Interstellar Medium / 'Cumulum']. Instances of such 'toroidal-vortical self-processor' eventities are not limited to human artefacts, let alone to merely conjectured ones! The cumulating "interstellar medium" of the Milky Way galaxy works upon itself in similar fashion. However, its toroidal-vortex-like self-processing pattern is not apparent to a merely physical-spatial visualization of its self-movement. Stars, we hold, precipitate *out of* the "interstellar" medium, originally made mainly of Hydrogen atoms. The fusion process which sustains stars as such, also builds higher atomic species within them. That very accumulation of populations of ever-heavier, less-andless 'fusionable' atoms finally precipitates a self-bifurcation, the self-negation of the star as star -- **star**

"operating upon" itself = star "of" star = star[star] = star "times" star = star² = not-star f star.

These stellar self-negatory crises, including those known as "novae" and "supernovae", range from the mildly to the massively catastrophic. Most involve the transfer of massive amounts of evolved atomic material back to the interstellar medium. Generation upon generation of stars build up the concentrations of higher atomic species in that 'cumulum'. New generations of stars condense out of it as double-stars, or, eventually, as single stars surrounded from inception by nebular discs. Discs with sufficient populations of higher atomic species and primitive molecules precipitate, at length, star-orbiting planets. Planet formation sets the stage for new stages of meta-evolution. Note the cumulative self-enrichment of the interstellar medium via its star processes.

We hold that certain habits of thought have been deeply engraved in Terran humankind recently by its incessant and ever-deepening placement of money-mediated exchange of commodities at the center of the daily life-process of individuals. This activity impresses the mind profoundly, sub-consciously as well as consciously, as it becomes the primary mode of day-to-day survival and of access to life-opportunity of every kind. This praxis involves a continual quantitative equation of qualitatively different goods via their prices. Prices are quantities expressed in qualitatively identical units of precious metal, e.g., of gold weight; of paper bank notes' units harking back to metal mass units ["pounds sterling"], of arbitrary units of state-issued paper currency, etc. These units apply to a diversity of goods so wide that these goods apparently share no other quality.

The money praxis has reinforced a widespread anesthesia to the qualitative dimension of arithmetic, and an omissive idea of number as qualitatively-homogeneous or completely unqualified "pure, abstract quantity".

We reference this psycho-historical, psycho-archaeological phenomenon as 'The Elision Of The Qualifiers'.

The 'dialectical arithmetics' presented herein are a late development in a protracted sequence of developments in 'advanced arithmetic', beginning with the emergence of the Rules-System of the so-called " \underline{C} omplex Numbers", denoted \underline{C} . We term that psycho-historical sequence '*The Re-Emergence of the Qualifiers*'.

Both of these developments, we hypothesize, contributed forcefully to the formation of *The Nonlinearity Barrier*. Monetized exchange -- counter-circulation of commodities and money, especially paper money -- may condition its subjects to a loss of both qualitative and dynamical sensitivity. But later generations' observations of later outgrowths of this exchange-praxis - e.g., of the capital form of exchange-value and its global capital-market and other sequelae - may tend to [re-]awaken paradigms of nonlinear or self-reflexive meta-dynamics; of dialectical and quanto-qualitative, ontologically dynamical self-developing process.

For example, the existential process of a single capitalist firm cries out for dynamical and meta-dynamical modeling. It is readily susceptible to such metaphors as that of the toroidal-vortical self-processor paradigm.

That paradigm of 'self-re-entry' meta-dynamics may be visualized via the following pictographic metaphor --



-- wherein the "output" or 'exhaust' of the self-processing self-flow of the medium in question is depicted as issuing spirally out at the top, thence flowing back down around to become 're-input' again at bottom, rising spirally again to the 'heart' of the 'eye', to the "umbilicoid" point where the two sides of the whirling flow nearly touch, where the radius of the 'eye chimney' shrinks nearly to zero. The 'self-interactivity' of this self-inducedly flowing metaphoric medium is maximized there. A starburst of radiance is depicted as issuing from that point of maximal self-interactivity. It symbolizes that the 'meta-evolutionary leap', the qualitative change, the 'ontological gain', the 'ontology expansion', the 'ontic-conversion 'meta-finite' singularity self-bifurcation', the 'Coulomb / topological-genus singularity', the 'change in meta-state' or in 'meta-attractor', in other words, the "meta-system transition" [cf. Turchin], arises at this point. The 'self-refluxion'; the self-inducedly flowing, 'meta-finitely' self-perturbing, cyclonically self-roiling medium of this metaphor becomes a multi-meta-ontic 'cumulum'. With each of its passages through its own 'eye' tunnel, and through its own 'umbilicoid' point, it adds to itself a new 'qualitative increment' []], a new concrete «arithmos monadikos» or population of units of new kind; a new complement of new ontology, of next-arising, next 'meta-fractal' scale 'meta-monadization', e.g., of Helium nuclei in addition to Hydrogen nuclei, wherein each isotopic Helium nucleus, as successor '[meta-]«monad»' or '[meta-]unit', is grasped as a 'meta-Hydrogen nucleus' made up out of a heterogeneous multiplicity of [isotopic] Hydrogen nuclei as its predecessor units or «monads», i.e., each successor, newkind, single «monad» is made up out of a multiplicity of its predecessor-«monads», as a result of those predecessor-«monads» own self-movement, or «auto-kinesis» -- their self-movement of 'self-internalization', 'self-subsumption', 'self-incorporation', 'self-re-entry', or 'self-composition', i.e., of 'self-«aufheben» 'self-negationcum-self-conservation'. The medium's content self-changes 'quanto-qualitatively' (▲), both in terms of the quantity of as well as the qualities of the 'ontos' extant, and also in terms of the 'meta-distribution' of the combined populations-counts, one separate population-count for each extant ontological category; for each qualitatively/ontologically distinct «arithmos monadikos» of qualitatively, typologically, ontologically different units or «monads», e.g., the "electron species" vs. the "Hydrogen nucleus species" vs. the "Helium nucleus species" -- forming thus a 'multi-meta-ontic', 'multi-meta-monadic' 'meta-population' 'distribution of distributions', 'distributions distribution', 'distribution squared', or 'distribution of second degree'.

The Capital Eventity. The capitalist enterprise, the "individual capital" -- the central 'logical individual', 'logical atom', or 'ontological unit'/'monad' and socio-economic object of contemporary "macro-economic" theories, and the universe of discourse of contemporary "micro-economic" theories -- may be grasped as an eventity which, in a helical self-process, "pulls-in" monetary capital, physical capital, and human capital. This collective-subject [ev]entity does so via capital stock sales and borrowings, plant and equipmental investment, purchases of raw materials, auxiliary materials, and power, plus procurement of employees, owners of various kinds and degrees of 'knowledge-capital' and 'skill-capital'. It designs to bring these "factors of production" into such interactions as "push out" specific, hopefully vendible commodities. In the process of producting these "internalities", it also produces "externalities", the totality of by-product impacts upon its "publics", i.e., that stakeholder/non-stockholder portion of the rest of the anti-physis comprising, in general, its non-employee, non-customer, non-supplier community, surrounding its operations, as well as upon the physis, the biospheric and sub-biospheric natural basis upon and from which society builds itself.

This activity provokes a reflux. The capitalist firm receives a "return" -- on itself, to itself - metered, 'ratio-ed' vis-à-vis its self-investment, its capital-value -- the monetary value of its capital asset content. This is a nounic way of describing that reflux. But this return, this 'self-refluxion', is better conceived as a transformed return on [and of] its own activity.

Monetary consciousness fixes attention upon the *financial quantity* of this return. It fixates upon the revenue stream which flows back to the firm from the market in response to the stream of commodities that flows away from the firm to that market. In reality, the life-history of an individual capital, of a capitalist firm, is the rhythmic, pulsing *self-refluxive process* in which the total [self-]return to [and *of*] this activity-entity, plus its "accidents", continually determines and continually 're-determines' determines its fate.

This total return includes refluxes of its externalities as well as of its 'internalities'. This $\underline{\Delta}$, the total profit, gain or loss in net, must thus include the total self-consequences of its impacts upon its publics and its natural basis.

The firm's quanto-qualitative *total* "*earnings*" include public goodwill and ill-will, lawsuits and awards, strikes and alliances, regulatory legislation and deregulation, regulatory interventions and commendations, and damage or enhancement to its natural basis, in addition to its monetary revenue. They all eventually, on a variety of time-scales, affect that revenue. This total reflux, and its effect upon the firm, involves the qualitative as well as the quantitative aspects of all that returns. The firm's total output thus returns, albeit partially in a transformed, mediated, *and usually partially-unrecognized* form, and becomes re-input, as part of its total new input, which also includes streams of action flowing to it from *other*, "*external*" eventities as well.

The *total product* of the firm, at the end of each natural period of its activity or production, is a *total cause* whose *total effect* includes the quality and quantity of the input to the firm's next round of existence = [self-re-]production-activity. The capitalist firm produces commodities. It also produces, reproduces, and changes *itself*. It produces "retarded" or "delayed" causes which affect it, which [later] 'self-re-flex' or 'bend back' and act back upon it itself as well as upon others. The objects receiving its [past] action include itself, its *present* self, the very subject or agent which initiated those actions, as well as others. It operates *now* upon inputs which reflect its past outputs, and inputs. It is *now* producing outputs which, in part, will determine its future inputs. Thus, the 'eventity' known as the capitalist firm also fits well the 'cyclonic', or *toroidal-vortical flow-form*, paradigm discussed above.

The capitalist firm, in each moment of its *production* – meaning both its production of its commodity output, and its production of *itself*, i.e., in each moment of its *process of existence*, of its essential, *existential activity* -- both consumes itself and produces itself, subtracts from itself and adds to itself. It thus continually transforms itself. It consumes, uses up, aspects of its inputs in producing its outputs. These inputs are not simply from its externity, but are partly 'internal', are partly *self*-inputs -- are partly *itself*. They include its total 'body', all of what it <u>is</u> -- its previously earned or purchased financial capital, raw and auxiliary materials, power, plant, equipment, and the portions of their daily lifetimes -- *of their very lives* -- that the firm has already purchased from its employees.

Its output is not just the commodities it sends to market. Its output is also the changed state of its capital --materials, work-in-process, fixed assets -- *employees, community*, and *natural environment* as a result of its use and *partial consumption of all of them* -- and *partial reproduction of all of them* -- in its just-previous round of production. These do not all vanish *completely* into the product /output of that round. The firm's *un-owned assets* appear among the firm's inputs, alongside the firm's direct, owned assets, its propertycontent. Many also re-appear, somewhat changed, partially or wholly among its outputs. The firm, by producing, and successfully selling, its nominal product, also reproduces itself, including all of these "elements", these "factors" of its self-reproductive activity. It thereby earns revenue required to repurchase, and thus replace, what it used up. In *using* its assets, it also alters, converts -- subtracts from /adds to -those of its assets which persist as parts of its "body" beyond one production round; which thus do not yet require repurchase.

The *input* upon which the firm works is thus, in part, *itself* -- itself as a whole. The *means* [of production] with which it works upon that input -- itself -- is also that firm as a whole -- *itself*. The *output* which emerges from this action of its means -- itself -- upon its input -- itself -- is also, in part, *itself* as a whole, but *changed* as a result, quantitatively *and qualitatively*. Again, because of the "squaring" operation it involves, the formula below describes only the "pure-qualitative" or " Δ " gain: *ontological* change in asset-category composition or content:

 $\underline{\text{itself}} = \underline{\text{itself}} = \underline{\text{itself}} = \underline{\text{itself}} = \underline{\text{itself}} = \underline{\text{itself}} = \underline{\text{itself}}^2 = \underline{\text{itself}} + \underline{\Delta}[\underline{\text{itself}}] = \underline{\text{itself}},$

or, making explicit the relative timing or epochal order aspects of this process --

 $\underline{\text{itself}}_{\tau}[\underline{\text{itself}}_{\tau}] = \sim \underline{\text{itself}}_{\tau} = \underline{\text{itself}}_{\tau} \text{ ```} \times \text{```} \quad \underline{\text{itself}}_{\tau} = \underline{\text{itself}}_{\tau}^{2} = \underline{\text{itself}}_{\tau} + \underline{\Delta}[\underline{\text{itself}}_{\tau}] = \underline{\text{itself}}_{\tau+\Delta\tau}^{2} \quad \underline{\text{itself}}_{\tau}.$

We elide, for now, the moment of the 'other-determination' of the firm's existence. We focus on its moment of 'self-determination'. We ignore the independent impacts of its 'externity' -- its environment of other *agents*, i.e., of other *subjects*, collective or individual, including competing firms. In expanded self-reproduction, a firm "consumes" or "changes" the totality of its assets in ways which do not merely deplete them, but which, *in the net*, also "develop", enhance, or expand them, quantitatively, and often, crucially, *qualitatively* as well --

assets 'inter-operating', or 'operating among' themselves = the function: assets "of" assets =

<u>assets[assets]</u> = $\sim assets$ = <u>assets</u> "'x''' <u>assets</u> = <u>assets</u>² = <u>assets</u> + <u>A[assets]</u> $\stackrel{>}{\stackrel{>}{\underset{\rightarrow}{\atop}}$ <u>assets</u>,

or, with explicit epoch-tagging and 'epoch-counting' via the symbol au --

<u>assets</u> [<u>assets</u>] = <u>assets</u> "'x''' <u>assets</u> = <u>assets</u>² = <u>assets</u> + Δ [<u>assets</u>] = <u>assets</u> $\frac{3}{5}$ <u>assets</u>

wherein ' Δ [_]' denotes 'pure-qualitative, ontic change of [_]'; wherein 'assets' describes the qualitative ontology of all of the human and non-human factors of production "owned" by or constituting that firm at the *beginning* of one "round" of production, at time-index value τ , where **assets**², or **assets** + Δ [assets], or **assets** describes that same [sub-]totality, the ontic "content" of the firm, at the *end* of that round of production, at time-index value $\tau + \Delta \tau$, and ' Δ [assets]', 'ontic change-in assets', denotes the ontic, qualitative aspects of the "total self-consequences profit" described above. I.e., Δ [assets] denotes the ontic, qualitative increment to assets induced by the mutual interaction, that is, the *intra*-action, as well as by the self-interaction, of this 'assets meta-«arithmos»' or 'assets meta-organism' as it was at the start of the production round, at τ , during that round of this [self-re-]production, of duration $\Delta \tau$. In contrast, the "change-in-assets" denoted by ' Δ (Assets)' describes the changes in ontic quality of these assets as well as their changes in quantity, during the time-period from τ to $\tau + \Delta \tau$: Δ (Assets) = Assets $\tau + \Delta \tau$ This "increment" can be *negative* in the net, implying net *loss*, and consequent *qualitative and quantitative self-contraction* of assets. It can be *positive*, implying net profitability, quantitative and qualitative/ontological *self-expansion* of assets. It can even, at one extreme, approach near-zero change in the qualities of the assets, with non-zero change in the qualities of assets, or, at the opposite extreme, near-zero change in the qualities of the assets, with non-zero change in their quantities. But, typically, changes in qualities and changes in quantities of assets go hand in hand. Thus, the ongoing *self-refluxive process* that *is* the capitalist firm can, in the net, be either one of expanded or contracted self-reproduction. But it can hardly for long be one of both **q** qualitative *and* **0** quantitative change -- a *linear* equilibrium, a 'Boolean' process of "simple reproduction" --

$$\underline{\mathbf{X}}_{\tau}^{2} = \underline{\mathbf{X}}_{\tau'} \qquad \underline{\Delta}\underline{\mathbf{X}}_{\tau} = \mathbf{q}_{0'} \text{ and } \underline{\mathbf{X}}_{\tau+1} = \underline{\mathbf{X}}_{\tau'} \qquad \underline{\Delta}\underline{\mathbf{X}}_{\tau} = \mathbf{q}_{0'}$$

wherein we have re-symbolized '<u>assets</u>' by ' \underline{x} ', and <u>Assets</u> by \underline{x} .

The "equilibrium" of "simple reproduction" is not "stable" -- is not an "attractor", but a "repellor" --

 $\underline{\mathbf{X}}_{\tau}^{2} \neq \underline{\mathbf{X}}_{\tau'} \qquad \underline{\Delta}\underline{\mathbf{X}}_{\tau} \neq \mathbf{q}_{0'} \quad \underline{\mathbf{X}}_{\tau+1} \neq \underline{\mathbf{X}}_{\tau'} \qquad \underline{\Delta}\underline{\mathbf{X}}_{\tau} \neq \mathbf{u}_{0}.$

Changes in quantitative attributes of **Assets** include changes in monetary value, as well as changes of quantity in non-monetary, including scale-of-operations, volumetric, attributes of the firm. Quality changes include emergence of new skills in the firm's workforce, installation of new technology in plant and equipment, and emergence of new features, e.g., design enhancements, in succeeding generations of the products previously offered for sale, as well as of innovations in the firm's product-line -- development of altogether new *kinds* of products. They also include "wear and tear" depreciation of the firm's assets – plant, equipment, and people -- i.e., of its owned assets and non-owned assets alike.

The capitalist firm, the individual capital itself, forms part of the *input* to each round of its production, together with other means of production drawn into it from outside of itself. That individual capital, as a whole, is also the *processor* which processes the totality of those inputs, in producing its total output. That individual capital, as a whole, also forms part of the *output* from each round of its production, together with other products, which may leave it and accrue to the rest of the world.

But what accrues *from it* to the rest of the world also determines, in part, what the rest of the world sends *back* to it, as its next-periods' input, including, but not limited to, its monetary revenues. The capitalist firm is thus, in part, a self-producer, a self-changer. It is a self-reflexive process and a self-refluxive process. The capitalist firm is a self-processor. An eventity. A toroidal-vortical flow-form.

If the outputs of the capitalist enterprise are well-received, received as 'goods', its reflux may promote its quanto-qualitative expansion. It may grow, and prosper. If its outputs are received as damage, as toxins, as 'bads', its reflux may poison it in turn, subtract from its substance, and send it into a waning spiral of contracted self-reproduction eventuating in its self-liquidation, its extinguishment, its dis-existence.

Indeed, a *daily-life-scale* example of the meaning of '*meta-evolution*' versus that of 'mere *evolution*' in our usage herein can be exemplified via the '*meta-modeling*' of this key object of micro-economic theory and practice, this entity or '*eventity*' known as the capitalist firm, regarded within such a scale and partitioning wherein it constitutes a '*meta-dynamical meta-system*' -- a sequence of distinct dynamical system-identities "bridged together" or '*meta-continuously connected*' by '*self-bifurcation singularities*', or '*metafinite transitions*'.

'<u>Evolution</u>' of a Firm. Take the Chart Of Accounts of such a system-firm during a given time-period as an 'accounting-model' of that firm/system. By the 'evolution' of the firm, we mean its 'accounts-balances trajectory in accounts-balances state-space'.

This potential evolution may be described as the "flow" or "vector-field" of the "purely-quantitative" changes, through time, of those accounts' balances, driven by transactions -- changes in their "pure quantitative" [currency-unit dimensioned, e.g., dollar-denominated], credit and debit contents as 'state' of the accounts of that firm, for those accounts that are 'extant' -- i.e., that "exist" within the given, fixed '[meta-]state' of its Chart Of Accounts, and that are 'populated' with debits and credits.

These accounts collectively define, for this view, the 'state-space' of the firm, and their balances-contents at any given moment of time within the time-period in question collectively define the '*state*' of this firm as a '*dynamical system*' as of that moment, the *coordinates* of its *position* in its accounts-balances state-space as of that moment, via *balances as "state-variables"* -- as "*functions of time*".

In particular, expansion/contraction of their quantitative, monetary-value-unit-ed "retained earnings" content may serve to index net cumulation/dis-cumulation of the "stocks", the net capital-assets-content, or "stockholder value" ["capital-value"] of this firm.

"<u>Meta-Evolution</u>' of a Firm. The 'meta-system' that is the firm passes 'meta-dynamically' from one systemidentity or 'meta-state' to a new, next system-identity or 'meta-state' whenever its Chart Of Accounts "mutates". Adjunction of [typically a whole spate of] new accounts to the Chart Of Accounts occurs. 'Extinction' of some former accounts may also be observed to occur. 'Hybridization' of other former accounts via their definitional adjustment relative to the emergent existence/definitions of some of that increment of new accounts may also be observed. These latter types of change constitute the 'meta-evolution' of the firm as 'meta-system', e.g., the 'quanto-qualitative' expansion of the operations of a 'quanto-qualitatively growing' firm. These changes in the firm's Chart Of Accounts are largely 'evolute', cumulative changes in its content and/or "structure", not 'convolute', erasive ones [meaning total disappearances of all prior accounts/structures].

The 'meta-finite' character of such changes in the ['meta-state' of the] predecessor Chart Of Accounts can be seen via this consideration: No amount of finite quantitative change in the credit/debit contents/balances of any number of accounts in the old ['meta-state' of the] Chart Of Accounts can amount to or attain or represent the new form or structure of the successor Chart Of Accounts, let alone its incremental quantitative content.

Nor can any "*infinite*" *quantitative change* concretely specify the successor '*meta-state*', a '*meta-state*' which is *finite* in content/structure, although it is also '*qualitatively*' ['*ontologically*'] *expanded* vis-à-vis its predecessor '*meta-state*' -- the latter being also finite, and '*meta-finite*' vis-à-vis *its* predecessors.

A growing firm's Chart Of Accounts can be seen as an *existential assertion* respecting the *content* of its *operations*, i.e., as an *ontology*. The accounts are the '*ontos*'. Expansions of its Chart Of Accounts mirror an expansion in firm's practical '*ontology*', results of its *quanto-qualitative* '*self-complexification*', as of its "*allo-complexification*" in response to *external* forces impinging from its total, *econo-politico-socio-ecological-climatological-...* environment.

Indeed, with accounts assigned as 'ontos', the $\underline{z} \underline{U}$ ideography can be applied to describe the 'quanto-qualitative' 'evolution' and 'meta-evolution' of firms as 'meta'-systems, by 'meta-modeling' of both the changing quantitative, debit and credit content of their accounts, and the changing qualitative / ontological content of their Charts Of Accounts, as per the Quanto-Qualitative Computation section of <u>Dialectical Ideography</u>, Part III.

A 'Meta-evolution' model of the 'sub-chart(s) of sub-accounts' of such a Chart Of Accounts would constitute the '2nd-level meta-model', were the firm taken as 'first level' or primary universe of discourse, or the 'n+1st level meta-model', denoted ${n+1 \atop_{f} U_{t}}$, were $2 < n \in \mathbb{N}$ taken as denoting the level of the firm-eventity with respect

to some *whole-cosmos-model* as 'first level' model, per a given partition-principle, denoted $\{ \begin{array}{c} n \\ u \\ 2 \end{array}\}$, for these nested universes of discourse.

A 'meta-evolution' model of the 'sub-sub-chart(s) of sub-sub-accounts' of the 'meta-evolving' Chart Of Accounts then constitutes the '**n+2**nd level', ${n+2 \atop f \underbrace{U_{\tau}}}$ 'meta-model', or the 'third-level meta-model' relative to the individual firm taken as 'first-level' or primary universe of discourse. And so on.

If we adopt **f** as our label for the individual <u>f</u>irm being modeled, then the $\underline{z} \underline{U}$ 'meta-model' for the quantitative evolution and quanto-qualitative 'meta-evolution' of **f** looks like this, where () enclose 'quantifiers', [] 'qualifiers', and () 'quanto-qualifiers' --

$${}^{n}_{f} \underbrace{U}_{\tau} = u_{0} + \underbrace{\Sigma}_{(j-1,2^{\tau})} \left({}^{n}_{f} \rho_{+j}(\tau) \cdot {}^{n}_{f} \overset{\circ}{u}_{+j} + {}^{n}_{f} \rho_{-j}(\tau) \cdot {}^{n}_{f} \overset{\circ}{u}_{-j} \right) \cdot \$ = \$ \underbrace{\Sigma}_{(j-1,2^{\tau})} \left({}^{n}_{f} \rho_{+j}(\tau) - {}^{n}_{f} \rho_{-j}(\tau) \right) \cdot \left[{}^{n}_{f} \overset{\circ}{u}_{j} \right]$$
$$= u_{0} + \underbrace{\Sigma}_{(j-1,2^{\tau})} \left[\$ \right] \cdot \left({}^{n}_{f} Balance_{j}(\tau) \right) \cdot \left[{}^{n}_{f} \overset{\circ}{u}_{j} \right] = \left(\$ \underbrace{\Sigma}_{(j-1,2^{\tau})} {}^{n}_{f} Balance_{j}(\tau) \cdot {}^{n}_{f} \overset{\circ}{u}_{j} \right)$$
$$= \$ \cdot {}^{n}_{f} Balance_{1}(\tau) \cdot {}^{n}_{f} \overset{\circ}{u}_{1} + \$ \cdot {}^{n}_{f} Balance_{2}(\tau) \cdot {}^{n}_{f} \overset{\circ}{u}_{2} + \$ \cdot {}^{n}_{f} Balance_{3}(\tau) \cdot {}^{n}_{f} \overset{\circ}{u}_{3} + \ldots$$

-- wherein (1) \$ denotes the 'quantifiable' 'metrical qualifier' for the currency unit -- here the US -- the unit of ["continuous"] measure in which the account-balance 'quantifiers' are expressed; wherein (2) ${}^{n}_{f_{u_{j}}}$ denotes the 'metrically-qualifiable' 'ontological <u>unit-qualifier</u>' or 'ontic qualifier' of the **j**th account, as 'onto' or ontological category, in the 'meta-state' of the Chart Of Accounts as of τ , and wherein (3) ${}^{n}_{f}\rho_{+j}(\tau)$ denotes the period-cumulative credits to the **j**th account, and ${}^{n}_{f}\rho_{-j}(\tau)$ the period-cumulative debits to that same account, as of "time" τ , so that ${}^{n}_{f}U_{\tau}$ denotes the 'state' of the firm as the "set" or 'non-amalgamative sum' of the balances of all accounts extant and "populated" in the firm's Chart Of Accounts 'meta-state' as of τ .

Accounts not yet extant in the Chart of Accounts as of τ -- that is, accounts which belong to a *later-manifesting 'meta-state*' of the firm, or which, though *possible* for the firm in question at τ , do not *actualize* -- are treated as having **\$0** balances, so that they accrue to \mathbf{u}_0 , denoting the 'quanto-qualitative existential zero' which denotes the 'totum' of all ontological qualities, categories, or 'ontos' [and of their 'unmanifest quantities'] that are non-extant or 'unmanifest' at τ , viz. --

$$\mathbf{\$} \cdot \mathbf{0} \cdot \mathbf{n}_{\mathbf{f}_{2^{t}+1}}^{\mathbf{a}} = \mathbf{u}_{0}.$$

Also, u is 'Hridayamic' or 'all-absorptive', and 'additively idempotent' as well, i.e. --

 $z \in \mathbb{Z} \implies z \cdot u = u$, and, u + u = u.

'Extinct' accounts, formerly manifested during previous values of τ , but not conserved, not carried forward -- no longer 'extant' in the Chart Of Accounts corresponding to the current value of τ -- are also treated as having **\$0** balances, and thus as also accreting to u_0 . The value u_0 is 'omittable' because it is an "additive identity" for $\underline{z} \underline{U}$ arithmetic: $u_0 + \hat{\underline{u}}_k = \hat{\underline{u}}_k$.

The \hat{g}_k meta-numbers are similar to the $\hat{g}_{k'}$ except that the \hat{g}_k are "additively idempotent", like Boolean values, i.e., are 'unquantifiable', 'un-add-able', or 'non-additive' --

$$\left[\hat{a}_{k} + \hat{a}_{k} = \hat{a}_{k}\right]$$

-- whereas the g are 'quantifiable' or 'add-able' --

 $[\hat{\underline{u}}_{k} + \hat{\underline{u}}_{k} = 2\hat{\underline{u}}_{k}].$

The ${}^{n}_{f}\rho_{\pm j}$ are 'bifurcation-functions' of control-parameter arguments -- (1) of other ${}^{n}_{f}\rho_{\pm k}(\tau - i)$, $k \neq j$, [already manifested in past epochs $\tau - i$]; (2) of their own past values, ${}^{\ell}_{f}\rho_{\pm j}(\tau - i)$, for all <u>levels</u> of their [sub-]ontos, $\ell \in \mathbb{N}$, and; (3) of the past values of external [market, regulatory, climatic, etc.] parameters, quantifiers of the [sub-]ontos of all levels of other, $\neg f$, interacting, 'co-meta-evolving' meta-systems:

$${}^{n}_{f}\rho_{\pm j}(\tau) = {}^{n}_{f}P_{\pm j}(\{{}^{\ell}_{f}\rho_{\pm k}(\tau-i)\}|_{k=1,2^{\tau-1}}; {}^{\ell}_{\in \mathbb{N}}, \{{}^{p}_{\neg f}\rho_{m}(\tau-i)|_{m=1,2^{\tau-1}}; n \neq p \in \mathbb{N}\}, \tau \geq i \in \mathbb{N}).$$

The 2^{τ} potential new accounts that accrue at every transition from τ to $\tau + 1$, allowing, e.g., up to every former account splitting into 2, may be *dearth* for some actual cases [and for some actual accountants!], surfeit for others.

In both \underline{Q} and \underline{U} , units of unequal subscript or 'index' are "inhomogeneous" or 'qualitatively heterogeneous', so that they are also 'non-amalgamative', or 'mutually-orthogonal' in addition.

That is, $\mathbf{k} \neq \mathbf{m} \Rightarrow \hat{\mathbf{g}}_{\mathbf{k}} \stackrel{?}{\neq} \hat{\mathbf{g}}_{\mathbf{m}} & \hat{\mathbf{g}}_{\mathbf{k}} \stackrel{?}{\neq} \hat{\mathbf{g}}_{\mathbf{m}}$, like the proverbial "apples and oranges", so that $\hat{\mathbf{g}}_{\mathbf{k}} + \hat{\mathbf{g}}_{\mathbf{m}}$ does not "reduce" to some $\hat{\mathbf{g}}_{\mathbf{k}}$, and $\hat{\mathbf{g}}_{\mathbf{k}} + \hat{\mathbf{g}}_{\mathbf{m}}$ does not "reduce" to some $\hat{\mathbf{g}}_{\mathbf{k}}$.

Thus, for example, in this model of the 'meta-dynamics' of a firm, account balances are kept separate; are not "lumped together", just as distinct unit-vector "factors" or 'qualifiers' block "amalgamation" of "vector magnitudes" belonging to different "dimensions"/"directions".

The symbol \underline{zU} denotes that arithmetical Rules-System which includes \underline{zU} , the "set" or 'space' of all $b_{\underline{a}}^{\circ} a$ "such that" ["|"] all **a**, **b**, **c** are "elements of" [" \in "] the Integers, **Z** -- or, for short, | **a**, **b**, **c** \in **Z** -- just as \underline{zQ} denotes the Rules-System for the "set" or 'space' \underline{zQ} of all $b_{\underline{a}}^{\circ} a$ | **a**, **b**, **c** \in **Z**:

$$z\underline{U} = \{ b\underline{\hat{g}}_{a}^{c} | a, b, c \in \mathbb{Z} \} = \{ \underline{Z}\underline{u}_{Z}^{Z} \}; \quad \underline{z}\underline{Q} = \{ \underline{Z}\underline{g}_{Z}^{Z} \}.$$

In the $\underline{z} \underline{U}$ arithmetic, minus signs can "travel around" from **a** to **b** to **c**, without changing a meta-number's value, i.e., *additive inverses, multiplicative inverses, negative integer powers,* and *negative integer subscripts* all coincide in operatorial meaning and effect, so that:

 $+ \hat{\underline{v}}_{-k}^{*+1} = - \hat{\underline{v}}_{+k}^{*+1} = + \hat{\underline{v}}_{+k}^{-1} = u_0 / + \hat{\underline{v}}_{+k}^{*+1} = + \hat{\underline{v}}_{-k}^{*+1} / u_0 \text{ and therefore } - - \hat{\underline{v}}_{+k} + \hat{\underline{v}}_{-k} = \hat{\underline{v}}_{+k}^{*+1} + \hat{\underline{v}}_{+k}^{*-1} = \hat{\underline{v}}_{+k} / u_0 + u_0 / \hat{\underline{v}}_{+k} = + \hat{\underline{v}}_{k} - \hat{\underline{v}}_{k} = u_0.$

Thus each term of the $\prod_{j=1,2^{\tau}} \sum_{j=1,2^{\tau}} \prod_{j=1,2^{\tau}} p_{+j}(\tau) \times \hat{\mathbb{I}}_{+j} + \prod_{j=1}^{n} p_{-j}(\tau) \times \hat{\mathbb{I}}_{-j}$ takes a "balance", a difference of credits and debits, namely: $\binom{n}{t} p_{+j}(\tau) - \prod_{j=1,2^{\tau}} p_{-j}(\tau) \times \hat{\mathbb{I}}_{j}$.

We have focused so far on the single firm as "the capital eventity" -- on the local, the micro-economic, the individual capital scale. What of "the capital eventity" on the global, the macro-economic scale? What of the total, worldwide capital meta-system as that of "the production of commodities by means of commodities"¹²; of the production [& reproduction] of capital by means of capital?

What of the 'quanto-qualitatively' self-expanding, "extended scale" self-re-production of capital, autocatalytically self-growing in both the quantity of capital value and of physical fixed capital extant, and in the quality or ontology of the new, unprecedented, but likewise in the to-the-new-adjusted kinds of old capital included in that "capital accumulation", that quanto-qualitative 'capital cumulum', or 'meta-social' cumulum, with global human society as a whole taking the form of the capital eventity?

Planet wide Market 'Macro-Meta-Dynamics' - 'Toroidal-Vortical' Model of Clobal Social Reproduction. Consideration of the capital-process at the "micro-economic" scale, that of the individual capital or firm, calls also for regress to the "macro-economic" scale, that of the "world market", as well. That scale, of globalized capital, is also that of the global self-reproduction of human society, mediated by the capital mechanism. It is that of the combined biological and politico-economic/cultural reproduction of the human civilization, or of the planetized humanity, of Earth. The focus for this scale should be that of the true unit of reproduction. The reproductive unit for the planetary human species is not the biological individual, nor the nation-state, nor even human society planet-wide. It is that global society together with the natural basis upon which it is founded, and upon whose reproduction its reproduction depends -- at minimum, the global biosphere. Models of global social reproduction must therefore encompass not just the planetary macroeconomy, but the planet's dynamical *econo-ecology* as well. They must be anthropological-psychological, political-economic, *econo-ecological* models.

This is not the place for a full discussion of such models. To introduce their formulation in the language of dialectical ideography would require a book of its own. We *will* return to these models in *this* book, with somewhat greater amplitude, in the section on *Higher Level Applications*.

Our task here is to: (1) indicate how the 'toroidal-vortex paradigm' applies to the phenomenology of global social reproduction; (2) construct and name some key concepts that we will apply to this meta-scale of phenomena and to this epoch of cosmological meta-evolution, and; (3) use the example of the phenomena of this meta-scale to work out a major augmentation of our fundamental meta-evolution equation, our contender for a trans-Leibnizian, meta-dynamical version of Leibniz' *Characteristica Universalis*.

The self-refluxive system paradigm, the toroidal vortex model, fits the phenomenology of the macroeconomic scale of *the capital autocatalysis* no less than it fits that of the microeconomic scale of the individual firm or household. The world economy likens to a multi-dimensional dynamical fractal, a macro eddy composed of many micro eddies, forming a self-enriching *'cumulum'* containing a whole spectrum of scales of magnitude.

As with the individual capital, so with the totality of capital: the self-reproduction of capital involves the self-operation of the capital eventity; the self-reflux, the *flowing back to self*, i.e., the self-re-input of previous self-output.

In the process of global social reproduction, mediated by the capital mechanism, the capitalized means of production, subjective vs. objective, human capital/labor-power vs. artefactual capital [meaning raw materials, auxiliary materials, energy, financial capital/securities, objectified information capital and knowledge capital] -- all products of previous capital-production -- form the major *input* to each new whorl of capital-[re]production. Other input includes the changing state of potential of the *natural basis* of society and of the *social basis* to support that next round of reproduction. The latter potential may vary due to exonospheric and even exo-biospheric causes -- changes in climate due to Milankovitch and other insolation effects; exolithic impacts; volcanic eruptions, earthquakes, tectonodynamic or "continental drift" events; as well as due to plague/pandemic propagations, neglect of public social infrastructure, etc.

Expanded self-reproduction of capital means the repositing, at the end of the current round of reproduction, of an equivalent of the capital-value laid out or input at its start, *plus* an increment of profit, retainable earnings, capitalized surplus product, etc., all in those physical, etc., forms suitable for further expanded reproduction. The total input to each current round of capital reproduction, described above, is input to what is in fact a part of the social reproduction processor itself, *qua* the global system of the [attempted] expanded self-reproduction of capital. That total system of 'society-[re]production' is thus also the *processor* which processes the totality of those inputs, in producing this system's total output.

That global process of capital-reproduction, as a whole, also forms a main *output* of each round of its production, together with its other products, which leave it and accrue to the rest of nature, especially to the planetary biosphere. What accrues *from it* to that biosphere also determines, in part, what that biosphere sends *back at it*, as part of its next input, for the next annual round of global social reproduction, especially in the form of the potential of the natural basis of society to support further social reproduction. If those outputs to the biosphere, in the net, build-up and improve extra-human nature, add to its potential to support further human production, then future expanded social reproduction is made more likely. If the net effect of those outputs is to undermine that potential, then contracted social reproduction, even social extinction, may result.

The global, social, capital-process is thus, in part, self-producer, and self-transformer. This capital-process is a *self-reflexive process*. Its action of production *bends back upon itself* and *acts back upon itself*, through the medium of its past output, which ever becomes its present input. It is *a self-refluxive process*, in that its outflow flows back to itself, as next inflow. It is a *self-processor*, an *eventity*, in that it cannot statically 'be' if it is to 'endure' or continue to exist, to 'extend' its body any further along the temporal, "4th", dimension. To continue to 'be' in this sense, it must 'do' its essential activity of self-reproduction, or continual *'production again of itself'*. If production stops, eating, drinking, heating, and living stops. Society dies. If its society dies, so does capital. This process is *toroidal vortex-like*. What it pulls in at one end, it later emits, with modification, at the other end. It then pulls that outflow and/or its consequences back around and inflows it/them again. 'It' as totality-present takes in its own totality-past, and works upon [*that past*] itself. Its totality-present processes that intake – i.e., its [past] self -- then outputs that totality, + gain/loss, again. Society is [part of] the 'raw material', society is the means of production, and society as a whole is [part of] the product of this global social reproduction. The generalized language-model for this process, of which the social reproduction process is a special case, is:

processor[input] -> output,

denoting that **processor**, acting upon **input**, produces **<u>output</u>**. Said better, the "product" of the "*interaction*" of **processor** and **input** is **<u>output</u>**. The conventional interpretation of this paradigm has it that these three terms are completely distinct, as in:

means-of-production[raw-material] -> product.

What is unusual about the Reflexivity Paradigm of *Dialectical Ideography* is that it sees the aspect in which only **output** is qualitatively distinct from **processor** and **input**. It sees **processor** and **input** as, in that aspect, forming an *auto-dyad* – two as one, one as two. It perceives an *intra-dual* but unitary eventity, notated doubly merely so as to 'explicitize' the internal tension of its 'verbic' aspect and its 'nounic' aspect, its 'subject' aspect and its 'object' aspect. This *in*-tension would otherwise be invisible, merely implicit, in a sequence of singular-occurrence, "first degree", "linear" symbols, viz., **society** \rightarrow **society**', or, **society** \rightarrow **society**_{r+Ar}', so we instead employ a *nonlinear*, *quadratic*, **2**nd degree notational *self-doubling* to denote this *self-antithesis* or ontological, onto-dynamical *self-duality*:

<u>society[society]</u> \rightarrow <u>society</u>' = -<u>society</u> = <u>society</u> + <u>A[society]</u>; <u>society</u>' $\stackrel{>}{\leftarrow}$ <u>society</u>.

The appropriate euphemism or 'pronoun' for global Terran human society today – since its reproduction is increasingly mediated entirely through the capital-relationship, comprising financial investment, profit, and the private exchange of wage and salary monies [also capital] for skill-based personal activity – is <u>capital_r</u>:

$\underline{capital}_{\tau}[\underline{capital}_{\tau}] \rightarrow \underline{capital}_{\tau+\Delta\tau} = \underline{capital}_{\tau} + \underline{\Delta}[\underline{capital}_{\tau}] = \underline{capital}_{\tau}^{2} \stackrel{2}{\leftarrow} \underline{capital}_{\tau}.$

These partially phonetic formulae contain a 'formulaic picture' of the toroidal-vortical process. The medium, or ontological, onto-dynamical '*cumulum*', which creates and sustains a toroidal vortical meta-dynamic as a *self-mediation* of its own *bildung*, is *ingredient in*, *contained in* all three moments of that process – the *input*, the *input-transformer*, and the *output*.

In our present example, the self-developing medium or '*cumulum*' is the *human population* together with its 'artefactual infrastructure' of "humanized nature" or "objectified humanity", meta-socially forming and self-re-forming; the self-globalizing Terran human *society-process* --



-- wherein the "ellipsis dots" superscript denotes ever escalating numbers of "primes", '''.

An "ellipsis dots" subscript, denoting ever escalating values of τ , would work here just as well in the above.

We might imagine this "self-duality" as one which, during each epoch or round of self-transformation, ripens or matures, from a barely perceptible self-split at the beginning, to a full-blown, climactic one at its end; one that yields dramatic ontic, qualitative change, creating a categorically distinct, new epoch of the life-history of the eventity. This new epoch, once posited, thence begins its own, qualitatively new form of self-splitting:

society,	→	society [society]	=	society, "of" society,		society _τ "times" society _τ =
~society	=	society, "squared"	-	$\underline{\text{society}}_{\tau}^2 = \underline{\text{society}}_{\tau+1}$	=	society + A[society] } society.

Notice again that, here, we are *not* dealing with "simple reproduction", with a "zero-net-change" "linear equilibrium" dynamic, whose "logic" is $\mathbf{x}^2 = \mathbf{x}$. We are dealing, quantitatively and qualitatively, with either an expanded or a contracted self-reproduction, in which the *ontology-cumulum* '**Society**', operating upon itself, does return simply \mathbf{x} , but also returns, in addition, an increment, a 'social profit'. This 'social profit' or 'socio-mass increment' is either 'positive' in the case of expanded self-production, of self-reproduction on an extended scale, or 'negative' in the case of contracted social reproduction. Substituting for the phonogramic symbol '**Society**' the (borrowed-from-the-phonetic-alphabet) ideographic symbol ' \mathbf{x} ', we obtain --

$\underline{x} \rightarrow -[\underline{x}] = \underline{x}[\underline{x}] = \underline{x} \times \underline{x} = \underline{x} \cdot \underline{x} = \underline{x} = \underline{x}^2 = [\underline{x} + \underline{\Delta x}]; \text{ and } \underline{\Delta x} \stackrel{3}{\leftarrow} \underline{x}.$

While the $\underline{\mathbf{x}}$ component of what ' $\underline{\mathbf{x}}$ of $\underline{\mathbf{x}}$ ' returns is of like ontic quality to that of the $\underline{\mathbf{x}}$ that was input, the increment, $\underline{\Delta \mathbf{x}}$ is of different quality than that input. The quantitative meaning of expanded social self-production is more of the same, more of the social surplus product in terms of the same kinds or ontos of products that also existed before, in $\underline{\mathbf{x}}$. The qualitative, ontological content of this 'pure-qualitative' incremental term, $\underline{\Delta \mathbf{x}}$, denotes, in expanded social self-reproduction, the element of "surprise", the factor of "innovations", advances in social productivity, i.e., in the level of the social forces of [social self-re-]production, hence, in social reproductivity; emergence of new science, new knowledge, hence discovery of new natural resources; births of new subjective capacities, new skills, new kinds of human capital and labor-power; appearance of novel products/services and production technologies; mutation of social institutions, that is, of the social relationships of [social self-re-]production.

Our model for expanded reproduction is not $\mathbf{x}^2 = \mathbf{x}$, nor even $\underline{\mathbf{x}}^2 \neq \underline{\mathbf{x}}$, restricted to $\underline{\mathbf{x}}^2 \stackrel{>}{\leftarrow} \underline{\mathbf{x}}$, but $\underline{\mathbf{x}}^2 \stackrel{>}{\leftarrow} \underline{\mathbf{x}}$.

Global social reproduction in the form of the self-process of capital did not arise *ex nihilo*. Its existence presupposes a protracted sequence of prior social formations. These formations were both initially, temporarily self-reproductive and eventually self-destructive or self-superseding. They were "self-organizing systems" that *self-consistently* turned into 'self-*dis*-organizing systems'. Adequate modeling of the capital eventity requires, we hold, *a model of human history*. This model must encompass, for past time, not only the deterministic -- self-determined or essence-determined -- evolution and meta-evolution of those formations, but their accidents, and the choices among alternatives by their human[oid] populations as well.

An overview of this 'model of history', encompassing the capital formation, and its predecessors, from the emergence of the biological or 'genotypological' human species on Earth, is addressed as part of the notational experiment which follows.

<u>Notational Experiment</u>. Let's assign, to our <u>meta-system variable</u> **m**, the value <u>humanity</u>. Let's describe the internal, 'second-level' meta-evolution of this <u>humanity</u>, the sequence of its social formations, including global capital and its predecessors, as a succession of qualitatively different human species. They are different not so much 'genome-ically', but 'memenome-ically'; culturally, anthropologically, especially in terms of their modes of social reproduction. Each such 'instauration' of humanity is indexed and distinguished using consecutive values of an ordinal subscript, τ .

Hypothesis: Starting from the last Ice Age, we find a blood-affinity, kinship-based, tribal Terran human species characterized by predation of plants and animals, "hunting and gathering". "Success" -- population expansion, hence relative densification and 'self-envelopment' -- of this predation of other multicellular organisms yields self-predation or self-hunting and self-gathering. Hunting of humans by humans arises. I.e., cannibalism and war appear. Hunting rises to nomadic herding, then to sedentary corralling, animal husbandry, and deliberate planting. Domestication of other multicellular and cellular organisms refluxes to the self-domestication of humans. Neolithic, agricultural humanities emerge, surrounded by hinterlands of predatory humanities. Self-herding unfolds as productivity rises sufficiently to sustain captives with a sufficient net gain. Practices of retaining prisoners of war alive for their labor-power appear. Social formations founded on "servile relations", herding and domestication of other human beings treated as domestic "draft animals", i.e., slavery, serfdom, etc., emerge alongside the preceding formations. Barter between tribes, $C \rightarrow C'$, appears, alternating with feuding or war. Commodities C with specific physical characteristics sort-out as «numeraires» or Money-commodities, M. Monetized exchange emerges alongside continued/money-modified barter. Inversions of the $C \rightarrow M \rightarrow C'$ pattern of monetary exchange, to $M \rightarrow C \rightarrow M'$, inaugurate mercantile capital. Loaning of specie, $M \rightarrow M'$, inaugurates usury capital. Capitalist humanity begins to emerge . Our generic formula for all of these 'human[oid]-social phase transitions', as for others not yet mentioned, is:

humanity_ = humanity_[humanity_] = humanity_ "of" humanity_

= <u>humanity</u>, "times" <u>humanity</u> = \sim <u>humanity</u> = <u>humanity</u>² = <u>humanity</u> + <u>A[humanity</u>]

= $\underline{humanity}_{\tau+1}$ $\frac{1}{\tau}$ $\underline{humanity}_{\tau}$.

A similar – "homeomorphic" -- model can be formulated in terms of a distinction between the "physis", or "growth dynamic" of pre-human and extra-human nature on the one hand, and, on the other hand, the newer, emergent '*neo*-physis' of humankind, centered in the geographical region(s) of human[ized] nature, that is, of subjective/*subjectified* and *objectified* human nature, those patches of emergent noosphere within the biosphere, which the ancient Greeks termed the "*anti*-physis":

 $\underline{anti-physis}_{\tau+1} = \underline{anti-physis}_{\tau}[\underline{anti-physis}_{\tau}] = \underline{anti-physis}_{\tau}$ "of" $\underline{anti-physis}_{\tau} = \sim \underline{anti-physis}_{\tau} =$

 $\underline{anti-physis_r}^2 = \underline{anti-physis_r} + \underline{\Delta}[\underline{anti-physis_r}] = \underline{anti-physis_{r+1}} \stackrel{?}{\leftarrow} \underline{anti-physis_r}.$

By 'humanity' here we mean the developing [sub-]totality of humankind including all of its artefacts, all of its self-objectifications. That is, we mean the human social formation entire -- with all of its socialendosymbiotic, instrumental, and even effluent accouterments. Indeed, the entire character of the people themselves should be seen as, in part, an artefact -- their own artefact. An artisan who laboriously etches something new upon the outer world, also, simultaneously *etches inward* -- conceptually, emotionally, and bodily changing the embodied self of that artisan. Sculpting the material of the external world, human sculptors also sculpt the material of themselves, humanity. Reshaping the outer and exo-somatic world, they also reshape their somatic and inner worlds. Transforming extra-human Nature, they also transform their own nature, human-nature. Human [pre-] history is the historical labor of *the self-production of humanity*, of the *self-construction* of the human species as a 'trans-biological' *onto*, a meta-genomic, 'meme-nomic' *meta-species*. *The labor of history*, the labor of *human* history and of its pre-history, is that of the building and *«bildung»* of humanity; the labor of giving birth to humanity by *pre-humanity* -- by both *proto-humanity* and *sub-humanity* alike. *Glorious fruition* and *hideous abortion* are both still possible ends for Terran human kind.

Thus, ' Δ [humanity_r]' includes the effects of conqueror upon conquered, and of conquered upon conqueror. It includes the subjective consequences of daily work/life -- the wounds, the healings, and the scars as well as the fruits of the mutually beneficial cooperations -- all of it.

Another homeomorphism is framed via the term "noosphere", used by Vernadsky and Chardin to name the 'concentric' layer of "knowing" meta-socio-matter lately 'nesting' or enveloping and 'environmenting' the biosphere, the earlier envelope, of bio-matter [prokaryotic and eukaryotic uni-cellular onto-mass, meta-zoan / meta-phytan onto-mass, animal-society socio-onto-mass, plus their hybrids'] on whose 'shoulders' the noosphere is rising:

$\underline{noosphere}_{\tau+1}$	=	noosphere,[no	osphere,] =	noos	phere	τ "of" <u>noosphere</u> τ	-	~ <u>noosphere</u> ,	-
noosphere,2	=	<u>noosphere</u> +	<u>∆[noospher</u>	<u>e,</u>]	-	noosphere _{r+1}	¥	<u>noosphere</u> ,	

This *meta-evolution* of humanity, of it *as* "[anti-]physis", *as* "noosphere", is what we mean by the self-changing self-evolution of the "human species", or of 'human nature(s)', as a succession of quality-distinct *social species*:

<u>human-nature</u> = <u>human-nature</u> [human-nature] = <u>human-nature</u> "of" <u>human-nature</u>	=
<u>human-nature</u> , "times" <u>human-nature</u> , = <u>human-nature</u> , "•" <u>human-nature</u> ,	=
<u>human-nature</u> "x" <u>human-nature</u> = \sim <u>human-nature</u> = <u>human-nature</u> ²	=
<u>human-nature</u> + Δ [human-nature] = <u>human-nature</u> , $\frac{1}{4}$ <u>human-nature</u> , whereby;	
$\underline{human-nature}_{0} \rightarrow \underline{human-nature}_{1} \rightarrow \underline{human-nature}_{2} \rightarrow \underline{human-nature}_{3} \rightarrow \underline{human-nature}_{4} \rightarrow \dots$, or;
<u>sociocultural-species</u> → <u>sociocultural-species</u> → <u>sociocultural-species</u> →	

By "human-nature", or by its synonym as used here, "anti-physis", we mean that *objective*, empirically observable, self-expanding "patch" of "*humanity-transformed* nature" emerging initially within the biosphere. This includes the human population plus all the "objective infrastructure" produced by that collective subjectivity/activity. It includes all artefacts of the activity of those subjects. Originally upwelling locally, from Earth's biosphere, this zone of "human[ized] nature" has gradually grown global, spreading to engulf the entire surface of this planet, inaugurating a whole new layer of its own, the incipient global noosphere.

An eventity, as a mode-of-action entity, has both object-like or "object-ive", and subject-like or "subject-ive" aspects. An eventity is a [sub-]hol or [sub-]totality, a unity of these [inter]twin[n][ed] aspects. Their duality is an indivi-duality, an 'indivisible duality'. It is "indivisible" or "uncuttable" in that the subjective aspect cannot be severed from the objective aspect without the disappearance, or mitosis, of both. The "south" polarity of a bar magnet is not severed from its "north" polarity by cutting the bar into two. On the contrary, such cutting induces a mitosis into two sub-wholes, into two new whole bar magnets, each with both an "N" and an "S" pole at opposite ends. Indivi-duality is internal-division-duality, intra-duality, intro-duality, endo-duality, or immanent duality, not the probably more familiar inter-duality or exo-duality of duals conceived as separable, mutually alien, and mutually external. The name of – the noun denoting – an individual eventity can properly fulfill **3** kinds of roles: (1) that of a "subject" in the grammatical sense – denoting an initiator of action upon, an actor on, other objects, or, reflexively, upon itself as object; (2) that of a grammatical "object", a recipient of action from other subjects, or from itself as subject; (3) that of the verb denoting that "action" which is the essential, defining operation, process, or mode of doing, mode of self-doing, mode of self-reproduction/self-perpetuation of that eventity.

Contemplating the construction of a *model of history* for the history of humanity brings up the fact that humanity is not *the* totality, the whole of nature, but only a part, a sub-totality, a sub-whole within that more encompassing whole. Humanity is not even an 'autarkic', fully-"autonomous" sub-totality within that totality; is not a universe-unto-itself.

Human history is driven -- affected and effected -- by external causes as well as by internal causes. Human history is not entirely causa sui. The causa essendi of human history include causa transiens as well as causa immanens. Humanity's history is the joint product of self-activity and other-activity, of humanity's own activity upon itself, and of the activity of other agencies, of other subjects, of other eventities, upon humanity. The intra-action of humanity within itself in conjunction with the inter-action of humanity with the rest of nature is what generates that history -- our history.

Our earlier formulations describe only the action of an $\underline{\mathbf{x}}_{\tau}$ upon itself, where $\underline{\mathbf{x}}_{\tau}$ denotes the state of activity of an eventity $\underline{\mathbf{x}}$ during the $\boldsymbol{\tau}$ th instar of its meta-evolution, and where $\boldsymbol{\tau}$ denotes an ordinal whole number. For the purposes of the present discussion, let's assign $\underline{\mathbf{x}}_{\tau} \nleftrightarrow \underline{\mathbf{humanity}}_{\tau}$:

 $\underline{\mathbf{x}}_{t} \rightarrow \sim [\underline{\mathbf{x}}_{t}] = \underline{\mathbf{x}}_{t}[\underline{\mathbf{x}}_{t}] = \underline{\mathbf{x}}_{t+\Delta t} = \underline{\mathbf{x}}_{t}^{2} = [\underline{\mathbf{x}}_{t} + \underline{\Delta \mathbf{x}}_{t}] \stackrel{\Sigma}{=} \underline{\mathbf{x}}_{t}.$

Our model of history should take into account also the rest of the totality, the remainder of the universe – namely $\overline{\mathbf{X}}_{\tau} = \underline{non-humanity}_{\tau}$, the 'synchronic complement' of $\underline{\mathbf{X}}_{\tau} = \underline{humanity}_{\tau}$ -- and the *interaction-products* it adds to the universe by its action upon humanity, as well as the interaction products which humanity adds to the universe by its action upon 'non-humanity'. In other words, our model must describe the action of the totality, *including humanity*, denoted $\underline{\mathbf{I}}_{\tau}$, upon humanity, $\underline{\mathbf{X}}_{\tau}$. At least a trichotomy of $\underline{\mathbf{I}}_{\tau}$ into $\underline{\mathbf{X}}_{\tau}$, $\underline{\mathbf{X}}_{\tau}$, and a non-empty boundary eventity, $\underline{\partial}_{\tau}$, would be more coherent and consistent than a dichotomy, as we shall see. But if, for now, we partition $\underline{\mathbf{I}}_{\tau}$ as the *dichotomy* "humanity' +' its 'synchronic complement', then

 $\underline{\mathbf{I}}_{\tau} = [\underline{\mathbf{X}}_{\tau} + \underline{\mathbf{X}}_{\tau}], \text{ and } \underline{\mathbf{X}}_{\tau} \stackrel{\stackrel{>}{\underset{\leftarrow}{\tau}} \underline{\mathbf{X}}_{\tau}. \text{ Thus: } \underline{\mathbf{X}}_{\tau} = [\underline{\mathbf{I}}_{\tau} - \underline{\mathbf{X}}_{\tau}], \text{ and: } \underline{\mathbf{X}}_{\tau} = [\underline{\mathbf{I}}_{\tau} - \underline{\mathbf{X}}_{\tau}].$

Our "Universal Characteristic" then becomes, from the point of view of the part x rather than of the totality:

 $\underline{\mathbf{X}}_{\tau+\Delta\tau} + \underline{\Delta}[\overline{\mathbf{X}}_{\tau};\underline{\mathbf{X}}_{\tau}] = [[\underline{\mathbf{I}}_{\tau}][\underline{\mathbf{I}}_{\tau} - \overline{\mathbf{X}}_{\tau}]] = [[\underline{\mathbf{X}}_{\tau} + \overline{\mathbf{X}}_{\tau}][\underline{\mathbf{X}}_{\tau}]] = [\underline{\mathbf{X}}_{\tau} + \underline{\Delta}\underline{\mathbf{X}}_{\tau} + \underline{\Delta}[\overline{\mathbf{X}}_{\tau};\underline{\mathbf{X}}_{\tau}]] \stackrel{2}{\leftarrow} \underline{\mathbf{X}}_{\tau}.$

Using our "syncopated rhetorical algebra", and assigning this $\underline{\mathbf{x}}_{}$ to <u>human-nature</u>, we obtain:

$\underline{human-nature}_{\tau+\Delta\tau} + \underline{\Delta}[\underline{extra-human-nature}_{\tau}; \underline{human-nature}_{\tau}] = \underline{totality}_{\tau}[\underline{human-nature}_{\tau}]$

- = <u>hol [human-nature]</u>
- = <u>universe</u> [human-nature]
- <u>nature</u> [human-nature]
- whole-cosmos [human-nature]
- whole-cosmos [whole-cosmos] extra-human-nature]
- $= \underline{\mathrm{I}}_{\mathrm{v}}[\underline{\mathrm{I}}_{\mathrm{v}} \underline{\overline{\mathrm{x}}}_{\mathrm{v}}] = \underline{\mathrm{I}}_{\mathrm{v}}[\underline{\mathrm{x}}_{\mathrm{v}}] = [\underline{\mathrm{x}}_{\mathrm{v}} + \underline{\overline{\mathrm{x}}}_{\mathrm{v}}][\underline{\mathrm{x}}_{\mathrm{v}}] = \underline{\mathrm{x}}_{\mathrm{v}+\Delta \mathrm{v}} + \underline{\Delta}[\underline{\overline{\mathrm{x}}}_{\mathrm{v}};\underline{\mathrm{x}}_{\mathrm{v}}] \stackrel{\mathrm{\scriptscriptstyle g}}{=} \underline{\mathrm{x}}_{\mathrm{v}'}$

wherein we have to subtract the term denoting the 'complementary entity', '**extra-human-nature**', from the term denoting the totality, **whole-cosmos**, if we want only terms involving **human-nature** to appear -- to be tracked -- per the 'aufheben evolute product' rule of the dialectical arithmetic described herein.

This rule, to be detailed below, involves *additive idempotency* or '*non-addibility*' for *pure-ontic values* of identical onto-type: $\underline{\mathbf{x}}_{t} + \underline{\mathbf{x}}_{t} = \underline{\mathbf{x}}_{t}$, not $2\underline{\mathbf{x}}_{t}$. Indeed, $\underline{\mathbf{n}}\underline{\mathbf{x}}_{t} = 2\underline{\mathbf{x}}_{t} = 1\underline{\mathbf{x}}_{t} = \underline{\mathbf{x}}_{t}$ [$\forall \mathbf{n} \in \mathbb{N}$]. This is rather like $\infty + \infty = \infty$ and $2 \cdot \infty = \infty$.

Symbols like **x** do not denote "transfinite" values, in the sense of infinite quantities, nor do they belong to the realm of finite 'pure-quantitative' differences. They denote 'metafinite' values; <u>qualitative finite differences</u>.

If we want to track the meta-evolution not just of the part, <u>human-nature</u>, but of the totality, '<u>totality</u> = [<u>human-nature</u> + <u>extra-human-nature</u>]', in terms of *our* classification or partition of it into the two complementary parts, '<u>human-nature</u>' and '<u>extra-human-nature</u>', then no such subtracting-out of the synchronic complement is required, and we have:

 $\underline{I}_{t+\Delta t} = \sim [\underline{I}_t] = \underline{I}_t [\underline{I}_t] = \underline{I}_t^2 = \underline{I}_t + \underline{\Delta I}_t \stackrel{3}{\leftarrow} \underline{I}_t.$

In the 'syncopated rhetorical equations' above, we employ rules of a 'non-Pythagorean arithmetic'. This arithmetic involves a partially 'genealogical', 'cumulative', or 'evolute' rule of "'multiplication'", an 'aufheben' product rule for the "multiplication" or "proliferation" of ontological types or qualities. This rule prescribes a "product" or result of the 'multiplicative' interaction between the denotations of two symbols which exhibits the 'ancestry' or source of that result as a part of that result, along with another part which qualitatively exceeds, augments, or increments that ancestry. The 'meta-numbers' or 'dialectors' of this arithmetic, denoted below by **a**, **b**, **c**, **& d**, when "multiplied", i.e., when 'interacting with' / 'operating upon' one another or themselves, behave as follows:

 $\underline{a} \times \underline{b} = \underline{a} \cdot \underline{b} = \underline{a}\underline{b} = \underline{a}[\underline{b}] = \underline{a}[\underline{o}\underline{f}]\underline{b} = \underline{b} + \underline{\Delta}[\underline{a};\underline{b}] = \underline{b} + \underline{c};$ where $\underline{b} \notin \underline{c}$, so $\underline{b} \notin \underline{b} + \underline{c}$.

The corollary of this behavior-rule, in the special case where $\underline{\mathbf{a}} = \underline{\mathbf{b}}$, is:

$\underline{a} \times \underline{a} = \underline{a} \cdot \underline{a} = \underline{a} [\underline{a}] = \underline{a} \cdot \underline{o} \underline{f} = \underline{a} = \underline{a} = \underline{a}^2 = \underline{a} + \underline{\Delta} [\underline{a}; \underline{a}] = \underline{a} + \underline{\Delta} [\underline{a}] = \underline{a} + \underline{\Delta} \underline{a} = \underline{a} + \underline{d}; \quad \underline{a} \stackrel{\scriptscriptstyle \pm}{\leftarrow} \underline{d}.$

Note also that "addition", in this arithmetic, is the *function* which forms an aggregate or 'set' without any *internal* interaction or "multiplication" among the members of that aggregate: $\underline{a} + \underline{b} = \{\underline{a}, \underline{b}\}$. Thus, if $\underline{a} = \underline{b}$, then: $+[\underline{a}, \underline{b}] = \underline{a} + \underline{b} = \underline{a} + \underline{a} = \{\underline{a}, \underline{a}\} = \{\underline{a}\} = +\underline{a}$. That is, for this *onto-logical* arithmetic, the *possible* presence or present existence of *any number* – one *or more* – of eventities of a given *ontological type* or *quality*, call it \hat{g} , is asserted by writing ' \hat{g} ' or '+ \hat{g} '. The expression ' $\hat{g} + \hat{g}$ ' is, in this semantic context, but a redundant, prolix equivalent of just ' \hat{g} ', for which just ' \hat{g} ' can be substituted. The rule that $\hat{g} + \hat{g} = \hat{g}$ is also termed that of "additive *idempotency*". The *ontic, dialectical arithmetics* share this rule with *Boolean arithmetics*.

Note also that the "sums" above, such as '<u>b</u> + <u>c</u>' or '[<u>human-nature</u> + <u>extra-human-nature</u>]', are also 'sets', or "*inhomogeneous* sums", that is, '*qualitatively heterogeneous*' and therefore "*non-amalgamative*" sums. Just so, the general 'complex number' **ar** + **br**<u>j</u>, or the 'Real Cartesian vector' **5x** + **3y** + **11z**, or the oft-cited "apples + oranges" represent '*multi-unit-of-measurement additions*' or '*poly-qualinomial sums*' which *do not reduce* to a single, "purely-quantitative", cardinal number. Carrying out the "multiplications" indicated in the equation-models above, we obtain:

{ <u>human-nature</u> + <u>extra-human-nature</u> }[<u>human-nature</u>] = [<u>human-nature</u>]² + <u>extra-human-nature</u> [<u>human-nature</u>] = [<u>human-nature</u> + <u>Δ[human-nature</u>] + <u>Δ[extra-human-nature</u>; <u>human-nature</u>].

Synonymously assigning 🗙 😁 anti-physis, yields a model homeomorphic to the last model
{ <u>anti-physis</u> + <u>physis</u> }[anti-physis] =
[anti-physis ₁] ² + physis ₁ [anti-physis ₁] =
anti-physis + ∆[anti-physis] + ∆[physis ; anti-physis] ≹ anti-physis .
Synonymously assigning x \leftrightarrow noosphere yields another homeomorphic model
[<u>noosphere</u> + <u>non-noosphere</u>][<u>noosphere</u>] =
[<u>noosphere</u>] ² + <u>non-noosphere</u> [<u>noosphere</u>] =
$\underline{noosphere}_{t} + \underline{\Delta}[\underline{noosphere}_{t}] + \underline{\Delta}[\underline{non-noosphere}_{t}; \underline{noosphere}_{t}] \stackrel{3}{\leftarrow} \underline{noosphere}_{t};$
$\underline{x}_{\tau} \stackrel{\stackrel{\circ}{\scriptscriptstyle{\tau}}}{=} \underline{\Delta x}_{\tau} \stackrel{\stackrel{\circ}{\scriptscriptstyle{\tau}}}{=} \underline{\Delta [\overline{x}_{\tau}; \underline{x}_{\tau}]} \stackrel{\stackrel{\circ}{\scriptscriptstyle{\tau}}}{=} \overline{\underline{x}}_{\tau} \cdots$

The 'hybrid' term denoted $\Delta[\bar{\mathbf{x}}_{\tau}; \mathbf{x}_{\tau}]$, or $\Delta[\underline{non-noosphere}_{\tau}; \underline{noosphere}_{\tau}]$, etc., stands for the products of interaction of $\bar{\mathbf{x}}_{\tau}$ with \mathbf{x}_{τ} , of <u>non-noosphere</u> with <u>noosphere</u>, etc. Hybrid products 'belong' to both 'parent' processes or, alternatively, to *neither*. They form a non-empty ontological boundary, $\underline{\partial}_{\tau}$, a *tertium quid*, "between" $\bar{\mathbf{x}}_{\tau} \& \mathbf{x}_{\tau}$. Per the computational rules of the *dialector algebra/arithmetic* set forth herein, hybrid [ev]entities differ *qualitatively*, or *ontologically/taxonomically*, from both of their 'parent' eventities, denoted above by $\bar{\mathbf{x}}_{\tau}$ and $\underline{\mathbf{x}}_{\tau}$, as well as from the 'non-hybrid' or 'self-hybrid', 'parthenogenetic', reflexive increments, or self-increments [self-developments], of each 'parent' eventity, denoted above by $\underline{\Delta} \, \underline{\mathbf{x}}_{\tau} \& \Delta \underline{\mathbf{x}}_{\tau}$, respectively.

Examples of constituents of the Δ [non-noosphere; noosphere] instantiation of the generic Δ [\mathbf{x}_{τ} ; \mathbf{x}_{τ}] term include the fossilized skeletal remains of individual human bodies. They also include moldering archaeological ruins -- fossils of humanity's collective, societal body; skeletal remains of societal infrastructure. These qualify as such hybrid entities especially when in those meta-states in which they existed *before* being unearthed, that is, before their re-mining and re-minding by archaeological excavation, and their reincorporation into the museums and laboratories of contemporary societal infrastructure. They qualify as such, i.e., in that meta-state in which they were buried in, and assimilated into, the lithosphere/biosphere *boundary* of socio-bio-geo-sedimentary rock.

Though useful for the present purpose, the above models represent a rather biased, anthropocentric way of 'parsing' and conceptually partitioning the universe. The relative *physical* magnitude of the Terran noosphere is miniscule, even if measured in rather indiscriminate, inertial terms, comparing the 'meta-sociomass' or 'nöomass' of this, Earth's latest self-lamination, to the remaining biomass of Earth's biosphere, let alone to the remaining mass of the cosmos. The imbalance between the physical minuteness of what \underline{X}_{τ} denotes in the above, and the physical vastness of what is there lumped together under \overline{X}_{τ} , is egregious, to say the least. And yet the potential of this \underline{X}_{τ} to transform all of \underline{T}_{τ} -- both \underline{X}_{τ} and \overline{X}_{τ} , quantitatively and qualitatively, in the future, and in league with other planetary instances of \underline{X}_{τ} and beyond -- is immense. Another approach

to a 'model of human history', at a different 'meta-fractal' scale, might begin as a project of economic archaeoanthropology, of archaeo-economics via archaeological reconstruction of ancient human[oid], including Neanderthal, economies.

This approach forms 'meta-dynamical Leontief Input/Output models', i.e., 'self-expanding inter-activity flow matrices', for past-to-present Terran human economies, starting with the most primitive that can be empirically grounded. Formed partly in the "closed", Bródy format [András Bródy, Proportions, Prices, and Planning, Elsevier, 1970, ISBN 444-10006-7], counting labor-powers/skills/human-capitals of various onto-types as both 're-products' and 're-products' of other products/ themselves, such meta-models would map both evolution and meta-evolution of Terran humanity as its [pre-]historical quanto-qualitative net expansion of the social inventory of products = social ontology of activities/skills/occupations = social division/ontology of labor. Economic evolutions map to changes in magnitude of matrix entries [productivities], meta-evolutions to changes-of-matrix; changes in its dimensionality or rank; mitosis of rows/ columns; appearance of new / disappearance of old categories = rows/ columns as entry-quantifier values cross critical thresholds, with net gain in rows/ columns counts as τ^+ . Thus evolutions, at self-bifurcation quantifier thresholds, yield meta-evolutions, with new onto-qualifier emergence.

Why 'Psycho-Historical'? [forthcoming].

<u>Personal Psyche/Soma Meta-Dynamics</u>. From childhood, humans engage a personal dialectic of social and moral/experimental learning. A child may notice that delivering slaps to the faces of playmates provokes slaps in return. Snatching their toys makes it likely that they will do the like in response. Giving them gifts that bring their smiles may motivate them to actions that bring smiles to the giver's face as well.

A person, as *subject*, operates upon the world, acting [mainly] upon a part thereof. This makes the world, via that part [mainly], the *object* of that operation. Later, the tables turn. That world, via [mainly] a[nother] part thereof, as *subject*, operates *similarly* upon that person, thus making that person the *object* of a similar operation. Human personal growth involves growing sensitivity to such 'justitial' and temporal symmetries.

The toroidal vortex model serves here too. Output becomes input. Giving becomes receiving. "Dishing it out" becomes "taking it". Acts of one self, imposing experiences upon other selves, engender later acts by said others imposing like experiences upon that self. Action flows back to its source "in kind" – in the same *quality*.

The action of an individual subject or self upon the world 'reflects' -- 're-flexes' & 're-fluxes' -- upon that self via the consequences of that action. That person receives back, after varying lapses of time, 'mirrorings' of that person's earlier actions; *refluxes*, *back-flows*, *return-flows*, *re-actions* which reflect the qualitative content of those earlier actions. As do echoes and boomerangs, actions *emitted* by a subject to its environment return as actions *transmitted back* from, *feedbacks* emitted by, that subject's environment, back to that subject. Action is requited.

A crucial step in the process of personal ethical [meta-]evolution arrives in that moment of insight wherein the person's critique of others, of environment, progresses to the point of reaching back around to self; the moment when exclusive critique of others is transformed to include self-insight and critique of self. The person may thenceforth become increasingly sensitized to the internal dynamics within self which chronically lead self to actions damaging to the rightful interests of other selves, and, ultimately therefore, damaging to self as well. Once the internal dynamics of this "iblis" attain to self-awareness, qualitatively new possibilities for accelerated self-development emerge.

Thereafter, noticings whose elicitation require, in childhood, the most dramatic or traumatic refluxes, may evolve, in adult development, to a highly tuned perception of the subtlest nuances of consequence in the interpersonal "politics" of the family and the work group, the cooperative labor arena of the adult person.

<u>Hypothesis</u>. For any being of human [or of 'humanoid'] genome to become truly human, the phenotype must overcome the genotype. "Nurture" -- especially 'self-nurture' -- must overcome "nature". For each emergent planetary humanity as a whole to survive, to flourish, and to continue to evolve and 'meta-evolve', to pass its 'planetary selection test', the 'Meme-nome', or the 'Phenome', must overcome the Genome, and not in the sense of repression, or even suppression, but in the «aufheben» sense, and the sense of conscious, freely-chosen self-desting and self-destination. The dialectic of moral learning outlined above is continual and incessant, operating at the most intimate, personal scales of individual evolution and meta-evolution. In this process, moral insight may be born, even in ever increasing degree.

Insight thus gained into cause and consequence may extend beyond the time-scale of immediate and shortlag refluxes, slap for slap, interpersonal or political slight for interpersonal or political slight, to encompass greater stretches of time, the scale of human history, even that of cosmological meta-evolution itself. If selfdiscovery, self-location, self-identification, self-identity expands, beyond the boundaries of skin-envelope, family, tribe, religio-ethnicity, company, industry, nation-state, planet . . . then even *moral intelligence* may awaken. Thus may human subjects become fitted to participate, with self-awareness, in, *and with all-beneficial contribution to*, evolution *and meta-evolution* at ever larger [meta-]scales. If, at a given locus of humanization, this process occurs in sufficient proportions of human subjects and at the *right times*, then another *planetized humanity* may achieve *the moral fitness to survive*, and to live on, into the meta-evolutionary stages of full planetization, and beyond. The <u>I AM[I AM]</u>, tetragrammaton-like quanto-qualitative expansion-process of the personally self-recognized *self-identity-ontology* of a human[oid] individual may be modeled as:

Ī	\rightarrow	~[1]	=	<u>I[I]</u>	-	II	==	\underline{I}^2	=	$[I + \Delta I]$	ŧ	L, or as:
Ι _τ	->	~[I,]	=	I ₁ [I ₁]	=	$\underline{I}_{\tau+\Delta\tau}$	=	$\underline{I}_{\tau}^{\ 2}$	=	$[I_{\tau} + \Delta I_{\tau}]$	¥	$\underline{I}_{\tau'}$

where $\underline{\Delta I}_{\tau}$ denotes an increment of *qualitative*, *ontological expansion* of the 'I' of the self, and \underline{I}_{τ} denotes an *individual human*[*oid*] *identity-ontology* in its τ th epoch, with $\underline{I}_{\tau} \sqsubset \underline{h} \Leftrightarrow \underline{g}_{256}$ per our *standard* $\frac{1}{\underline{D}}$ *partitioning* \blacksquare .

Personal Meta-Evolutions -- Life-Habits, Skill-Levels, Persona. Partitioning on aspects of the psycheological meta-evolution of the human person, instead of the meta-evolution of the total psyche/soma as subtotality, one may gain insight by modeling each of these aspects in distinction, applying the putative 'Universal Characteristic', $\underline{\mathbf{x}}_{\tau} \rightarrow \underline{\mathbf{x}}_{\tau+1} = \underline{\mathbf{x}}_{\tau} [\underline{\mathbf{x}}_{\tau}] = \sim [\underline{\mathbf{x}}_{\tau}] = \underline{\mathbf{x}}_{\tau}^2 = \underline{\mathbf{x}}_{\tau} + \underline{\Delta \mathbf{x}}_{\tau}^{\frac{3}{2}} \underline{\mathbf{x}}_{\tau}$, to each.

Partitioning upon the development of 'habit-formations' -- those systems of mental/physiological 'software' and 'self-automation' which form a key infrastructure of human personhood, and whose acquisition begins in earliest childhood, we might encode this aspect of the self-induced and other-induced expansion of 'personal ontology' thusly --

<u>habituation</u> \rightarrow <u>habituation</u> [habituation] = ~[habituation] = [habituation]² = <u>habituation</u> + <u>A[habituation]</u> = <u>habituation</u>² + <u>habituation</u>

Similarly, parsing on training, informal as well as formal, and the *meta-evolution* / ontological expansion of personal "skill-sets", we obtain --

$$\frac{\text{skill-level}_{1} \rightarrow \text{skill-level}_{1}[\text{skill-level}_{1}] = \sim [\text{skill-level}_{1}] = [\text{skill-level}_{1}]^{2} = \frac{\text{skill-level}_{1} + \Delta [\text{skill-level}_{1}] = \frac{1}{2}}{\frac{1}{2}}$$

$$\frac{1}{2} \rightarrow \frac{1}{2} = \frac{1}{2} + \frac{1}{2} [\text{skill-level}_{2}] = -[\text{skill-level}_{2}] = [\text{skill-level}_{2}]^{2} = \frac{1}{2} + \frac{1}{2} [\text{skill-level}_{2}] = \frac{1}{2} + \frac{1}{2} + \frac{1}{2} [\text{skill-level}_{2}] = \frac{1}{2} + \frac{$$

If, instead, we partition upon the succession of personas of the developing, 'meta-evolving' personality and personality-ontology, we obtain --

$$\frac{\text{persona}_{1} \rightarrow \text{persona}_{1}[\text{persona}_{1}] = \sim [\text{persona}_{1}] = [\text{persona}_{1}]^{2} = \frac{\text{persona}_{1} + \Delta[\text{persona}_{1}] =}{\text{persona}_{2} \rightarrow \text{persona}_{2}[\text{persona}_{2}] = \sim [\text{persona}_{2}] = [\text{persona}_{2}]^{2} = \frac{\text{persona}_{2} + \Delta[\text{persona}_{2}] =}{\text{persona}_{3} \rightarrow \text{persona}_{3}[\text{persona}_{3}] = \sim [\text{persona}_{3}] = [\text{persona}_{3}]^{2} = \frac{\text{persona}_{3} + \Delta[\text{persona}_{3}] = \dots,$$

wherein: persona 2 persona 2 persona 2 persona

Personal Meta-Evolutions - Nature and Nurture. The self-iterations above are doubly-omissive: (1) they describe 'partials' or aspects of the developing human psyche/soma eventity, and (2) they describe it with reference to the moment of self-causal or reflexive ontological elaboration alone. They address the self-impacts of the 'internities' of these various 'natures'. They make no reference to "nurture", to the impact of the 'externity', the "environment" of these features, either in terms of other features of the psyche/soma, or of the features of the non-psyche/soma. In short, the formulae set forth above address the moment of self-determination, of re-flexion, of intra-action or self-interaction, but not that of flexion, of other-action, of inter-action with exterior otherness.

Less omissive model-making maps the co-meta-evolution of the individual self and of its "environment"--

x = the ontological ['pure-qualitative'] meta-state of the psyche / soma self as of stage τ;

 $\overline{\mathbf{X}}_{\tau}$ = the ontic meta-state of the not-self; of the self-complement, of the self's environment as of stage τ ;

 $\underline{\mathbf{T}}_{t} = \text{ontic meta-state of the totality } (\underline{\mathbf{x}}_{\tau}, \text{here as 'parsed' from the point of view of } \underline{\mathbf{x}}_{\tau}; \underline{\mathbf{T}}_{t} = [\underline{\mathbf{x}}_{\tau} + \underline{\mathbf{x}}_{\tau}];$

$$\begin{split} \underline{\mathbf{I}}_{\tau+\Delta\tau} &= -[\underline{\mathbf{I}}_{\tau}] = \underline{\mathbf{I}}_{\tau}[\underline{\mathbf{I}}_{\tau}] = \underline{\mathbf{I}}_{\tau}^{2} = \underline{\mathbf{I}}_{\tau} + \underline{\Delta}\underline{\mathbf{T}}_{\tau} \stackrel{3}{\leftarrow} \underline{\mathbf{I}}_{\tau} \\ [\underline{\mathbf{X}}_{\tau} + \underline{\mathbf{X}}_{\tau}] &\to [\underline{\mathbf{X}}_{\tau+1} + \underline{\mathbf{X}}_{\tau+1} + \underline{\Delta}[\underline{\mathbf{X}}_{\tau}; \underline{\mathbf{X}}_{\tau}] + \underline{\Delta}[\underline{\mathbf{X}}_{\tau}; \underline{\mathbf{X}}_{\tau}]] = [\underline{\mathbf{X}}_{\tau} + \underline{\mathbf{X}}_{\tau}][\underline{\mathbf{X}}_{\tau} + \underline{\mathbf{X}}_{\tau}] = [\underline{\mathbf{X}}_{\tau} + \underline{\mathbf{X}}_{\tau}]^{2} = \\ [\underline{\mathbf{X}}_{\tau} + \underline{\Delta}[\underline{\mathbf{X}}_{\tau}] + \underline{\mathbf{X}}_{\tau} + \underline{\Delta}[\underline{\mathbf{X}}_{\tau}; \underline{\mathbf{X}}_{\tau}] + \underline{\Delta}[\underline{\mathbf{X}}_{\tau}; \underline{\mathbf{X}}_{\tau}]] = [\underline{\mathbf{X}}_{\tau} + \underline{\mathbf{X}}_{\tau}][\underline{\mathbf{X}}_{\tau} + \underline{\mathbf{X}}_{\tau}] = [\underline{\mathbf{X}}_{\tau} + \underline{\mathbf{X}}_{\tau}]^{2} = \\ [\underline{\mathbf{X}}_{\tau} + \underline{\Delta}[\underline{\mathbf{X}}_{\tau}] + \underline{\mathbf{X}}_{\tau} + \underline{\Delta}[\underline{\mathbf{X}}_{\tau}; \underline{\mathbf{X}}_{\tau}] + \underline{\Delta}[\underline{\mathbf{X}}_{\tau}; \underline{\mathbf{X}}_{\tau}]] \end{split}$$

-- in which calculation we have applied, again, the rules of the ontological or onto-dynamic arithmetic. We have applied, in particular, the rule of 'ontological' or 'ontic' 'multiplication'; of the 'aufheben' 'vestigial' and 'evolute' product rule, and of "idempotent" addition, glossed above, and explored with greater amplitude in subsequent sections below. In the products-sum expression above, $\Delta[[\underline{x}_{\tau}; \underline{x}_{\tau}]]$ denotes the pure-ontic products or consequences of the action(s) of the τ th ontic meta-state of this individual upon the τ th ontic meta-state of this individual's environment, and $\Delta[[\underline{x}_{\tau}; \underline{x}_{\tau}]]$ the pure-ontic products of the action(s) of the τ th ontic meta-state of this individual's environment upon that of this individual, so that, in toto, per this calculus of qualitative differences:

 $\underline{\mathbf{I}}_{\tau+1} = \underline{\mathbf{I}}_{\tau} + \underline{\Delta}[\underline{\mathbf{I}}_{\tau}] = [\underline{\mathbf{X}}_{\tau} + \underline{\Delta}[\underline{\mathbf{X}}_{\tau}] + \underline{\mathbf{X}}_{\tau} + \underline{\Delta}[\underline{\mathbf{X}}_{\tau}] + \underline{\Delta}[\underline{\mathbf{X}}_{\tau}; \underline{\mathbf{X}}_{\tau}] + \underline{\Delta}[\underline{\mathbf{X}}_{\tau}; \underline{\mathbf{X}}_{\tau}]] = [\underline{\mathbf{X}}_{\tau} + \underline{\mathbf{X}}_{\tau}] + [\underline{\Delta}[\underline{\mathbf{X}}_{\tau}] + \underline{\Delta}[\underline{\mathbf{X}}_{\tau}] + \underline{\Delta}[\underline{\mathbf{X}}_{\tau}; \underline{\mathbf{X}}_{\tau}] + \underline{\Delta}[\underline{\mathbf{X}}_{\tau}; \underline{\mathbf{X}}_{\tau}]];$ $\underline{\mathbf{I}}_{\tau} = [\underline{\mathbf{X}}_{\tau} + \underline{\mathbf{X}}_{\tau}] = [nature \text{ of } \underline{\mathbf{X}}_{\tau}' + 'nurture \text{ of } \underline{\mathbf{X}}_{\tau+1}'] = ['self-nurture \text{ and } exo-nurture \text{ of } \underline{\mathbf{X}}_{\tau+1}'];$ $\underline{\Delta}\underline{\mathbf{T}}_{\tau} = [\underline{\Delta}[\underline{\mathbf{X}}_{\tau}] + \underline{\Delta}[\underline{\mathbf{X}}_{\tau}] + \underline{\Delta}[\underline{\mathbf{X}}_{\tau}; \underline{\mathbf{X}}_{\tau}] + \underline{\Delta}[\underline{\mathbf{X}}_{\tau}; \underline{\mathbf{X}}_{\tau}]].$

Though useful in some applications, the 'partitioning' employed in the above may manifest a rather "egoistic", "egocentric", "narcissistic", or self-distorted, if not self-deluded, emphasis in that a single self is singled-out, and the vast 'remainder' of the totality, $\underline{\mathbf{T}}_{\mathbf{r}} - \underline{\mathbf{X}}_{\mathbf{r}}$, including all other such selves, is lumped together into the single term $\underline{\mathbf{X}}_{\mathbf{T}}$. This yields a special kind of 'homeomorphic defect' accordingly.

More adequate models generally require a more proportionate representation of reality; a vastly more detailed sub-'parsing' of \underline{x}_{τ} . The ontological partitioning principle, $\{\begin{array}{c}n\\u\\2\end{array}\}$, applied in a given modeling effort, is at least as much a map of modeler, the modeling subject, as of objective/external reality. It maps the *perceptual organization* and priorities of that subjectivity. Many partitionings are possible. Each exacts its own price in homeomorphic defect. The <u>Q</u> Characteristica Universalis aims to accommodate and facilitate a great diversity of such "points of view".

Personal Meta-Evolutions -- Judgment and Mode of Cognition [«Organon»]. The ideation process in creative mentation, and the "waves" or "trains" "of thought(s)" which meta-evolve thereby, involve a dialectic in which the thinker, as subject, reflects upon re-presented previous meta-states of that subject's own subjectivity, of that subject's own thought, of the previous thought-contents of that self, thus objectified in this re-minding self-reflection or self-re-thinking of/by those contents. Reflection of the subject as thinking-process-present upon an object which is the self-dual, self-other, self-previous self-representation and self-object-ification of one and the same thinking-eventity or thought-eventity. Self-confrontation of present/"living" thinking-capacity with representations of itself as its own past/'dead' thought-product may evoke into awareness previously unnoticed self-inconsistencies and self-inadequacies of that previous thought-product, as well as previously unnoticed inter-connexions, and intra-connexions within, that network of idea-objects, idea-eventities, or idea-ontos. Such 're-cognitioning' may thus amount to an 'immanent- or self-critique of thought by thought itself yielding a meta-finitely, qualitatively advanced, ideo-ontologically self-expanded thought-product as its next outcome -- Thought thoughting thought'; 'thinking thinking'; thinking rethinking thinking lialectic of ideation]:

idea ₁	\rightarrow <u>idea</u> ₁ [idea ₁] =	$[\underline{idea}_1]^2 = \sim [\underline{idea}_1]$	= $\underline{idea}_1 + \underline{\Delta}[\underline{idea}_1] =$	idea ₂ →	idea ₃ ‡	<u>idea</u>
thought	\rightarrow thought [thought] =	$\sim [\underline{\text{thought}}_1] = \underline{\text{thought}}_1$	+ $\Delta[\text{thought}_1] = \frac{\text{though}_1}{1}$	$\frac{1}{2} \rightarrow \frac{1}{2}$ thoug	<u>ht</u> ₃ →	
<u>thinking</u>	$\rightarrow \underline{\text{thinking}}_1$	$[\underline{ing}_1] = \sim [\underline{thinking}_1] =$	$\frac{\text{thinking}}{1} + \Delta[\text{think}]$	king ₁] =	thinking ₂	→

Another generic name for the product/producer of such mental objects or mental products is "judgment". We can model the immanent improvement, or self-critique, of the *quality* of a judgement which is being embodied or simulated by the mind of a thinking human[oid] subject via the same kind of succession --'Judgment judgment'; 'judgment of judgment'; 'self-judgment of a judgment'; (a) 'judgment of 2nd degree':

$\underline{\text{judgment}}_{\tau+1} = [\underline{\text{judgment}}_{\tau}]^2 = -[\underline{\text{judgment}}_{\tau}] = [\underline{\text{judgment}}_{\tau} + \underline{\Delta}[\underline{\text{judgment}}]] \stackrel{2}{\neq} \underline{\text{judgement}}_{\tau}.$

Again, bringing in the influence of external forces – such as the effects of external experiences or experiments in the meta-evolution of a scientific hypothesis -- requires that the 'non-autonomous' as well as the 'autonomous' moments of this self-iteration of judgement be modeled. Shifting 'meta-fractally' to a larger scale of observation of the developing mental processes of a meta-evolving human[oid] person, we may model the meta-evolution of the organon or 'technology of thought' of that person; their metafinite succession of modes of cognition or «mentalité», $\{ \underline{m} \}$, after the fashion of Piaget:

- <u>d</u> \leftrightarrow <u>d</u>ialectical operations, or quanto-qualitative, meta-dynamics-, historicity-, & negentropy-cognizant stage.

<u>m</u>	=	<u>c</u> ;																			
<u>m</u> ₀₊₁	=	<u>m</u> ²	=	<u>c[</u>	<u>c]</u>	=	<u>cc</u>	=	~ <u>c</u>	= <u>c</u> ²		-	<u>c</u> + <u>∆c</u>	=	<u>m</u> 1	=	f	X	<u>c</u> =	<u>m</u> _1	;
<u>m</u> 1+1	=	<u>m</u> ₁ ²	-	f[f	1	=	ff	=	~ <u>f</u>	= <u>f</u>	2 -	-	<u>f</u> + <u>∆f</u>	-	<u>m</u> ₂	-	<u>d</u>	24	<u>f</u> ;	;	
in sum	mary	, <u>m</u> 0	**	<u>m</u> 1	*	<u>m</u> 22	;	n	n τ+1	= ~ <u>r</u>	<u>n</u> =	m	² = <u>n</u>	<u>n</u> +	<u>∆m</u>	, & <u>1</u>	<u>n</u> τ+1	=	<u>m</u> ₀ ^{2^{τ+1}}	ł	<u>m</u> ₀ ^{2^τ} .
Dialectio	cal Ideo	graphy								I-	49	Dístri	buted «Se	unizd	at» by F	ound	ation	Ency	clopedia/	Diale	ectica

Personal Meta-Evolutions -- The Somatic Dialectic. [forthcoming]

Personal Meta-Evolutions – Methodologies and Technologies of *The Sciences of Subjectivity*. We earlier alluded to formulae of the following form as formulations of 'anthropogenesis' or 'anthropopoiesis', wherein the meanings of 'awareness of awareness' or 'meta-awareness', and of 'awareness of self' qua 'self as awareness', converge --

```
<u>sentience</u> → <u>sentience[sentience]</u> = [<u>sentience]</u><sup>2</sup> = <u>self-sentience</u> \frac{3}{2} <u>sentience</u>; or

<u>awareness</u> → <u>awareness[awareness]</u> = [<u>awareness]</u><sup>2</sup> = <u>self-awareness</u> \frac{3}{2} <u>awareness</u>.

The next step in this progression might thus be modeled as the self-reflexion of this 'meta-sentience' itself -

<u>self-awareness</u> → <u>self-awareness[self-awareness]</u> = ~[<u>self-awareness]</u> = [<u>self-awareness]</u><sup>2</sup> =

<u>self-awareness</u> + Δ[<u>self-awareness]</u> = '<u>self-awareness</u> of <u>self-awareness</u>' =
```

'self-awareness of higher (2nd) degree' $\frac{1}{4}$ self-awareness; [self-awareness]² = [sentience]^{2²} =

 $[sensory-awareness]^{2^{2}} = [mere-consciousness]^{2^{2}}, wherein the meanings of 'meta-self-awareness' or 'self-awareness' and of 'awareness of meta-self' qua 'meta-self as self-awareness itself' converge.$

Traditions endure, descending from ancient times in Earth's Orient and Occident alike, which remain semiesoteric and partly hidden to this day, and which may be grasped as protocols of a self-reflexive, dialectical psycho-physiological praxis; as forms of individualized self-activity accelerating the immanent development of the infrastructures of human self-awareness. These traditions involve the cultivation of forms of profound or intensified attention that arise to 'meta-attention' -- 'attention to attention', 'attention of the second degree', 'the self-attention of attention itself', and of the self-amplification of attention. They involve the cultivation of a profound concentration that becomes 'meta-concentration' -- 'concentration upon concentration itself', 'the self-concentration of concentration', self-amplified concentration. They require a contemplation that intensifies to 'meta-contemplation' or 'self-contemplation' - 'the contemplation of contemplation itself by contemplation itself'. These psycho-physiological practices include psychophysiological technologies which accomplish a self-refluxion and self-reflexion of will/attention. They apply the will to turn attention back upon the physiological organs that appear, phenomenologically, to generate or manifest will-attention. They thereby produce -- much as the feeding of a loudspeaker's output back into its microphone produces a crescendo of sound -- a crescendo of consciousness, a self-intensification of willattention, 'meta-will', a 'willing of will itself', a change of willingness, a simultaneous gain in the willingness to change and in the capability to change:

 $\underline{\text{will}}_{r}[\underline{\text{will}}] = \underline{\text{will}}_{r}^{2} = -[\underline{\text{will}}_{r}] = \underline{\text{will}}_{r} + \underline{\Delta\text{will}}_{r} = \underline{\text{will}}_{r+1} \stackrel{\frac{3}{2}}{=} \underline{\text{will}}_{r}$

These practices amount to a 'nonlinearization of self-awareness', to a deliberate induction of a self-refluxion of self-awareness, and a self-reflexion of self-reflection itself; a bending-back-upon-itself again of 'proprio-perception'.

Other and deeper secrets of the self-reflexivity of 'inner Nature' in general, and of subjective human[oid] nature in particular, are discoverable within these traditions of practice, such as those known as Raja Yoga, Kriya Yoga, and Tantra Yoga. We present nothing further of them here. We believe that comprehension is better served – for those who choose for themselves to conduct such a program of self-research -- to encounter such discoveries in the full-context experience of their own self-experiments, carried out in the laboratories of their own psyches/somas, rather than to first confront them as verbal formulae, representing phenomena never yet experienced by them, in abstraction from any such context of experience and personal experiment.

Indeed, in some variants of these traditions, the theory and practice of such *exercises of consciousness* forms an extensively elaborated science of 'internal nature', or *science of subjectivity*, complementary to the lately more familiar science of 'external nature', or *science of objectivity*. In those variants, these meditative practices amount to a methodology and technology of the science of subjectivity. Self-humanizing individuals, at a certain stage in the course of their psyche-ological/somatological development, tend to discover or rediscover such practices, which may then lend celerity to their further personal meta-evolution.

Personal Meta-Evolutions: An Enormous Discovery, The Revelation of Iblis, The Discovery of an Enormity and of an Enermy Within. The awakening of insight into the self-reflexive moment of the constitution of personal life/experience, of the partially self-refluxive or echoic content of personal occurrences, may, at length, precipitate a crucial discovery. This discovery is potentially enormous in its implications and in its consequences, for the life of the discoverer and for the experience of every other person whose life is touched by that discoverer's life thenceforth; the revelation of self-infliction --

« . . . Culprit, c'est moi ».

'The main culprit in my life is me'. 'The primary cause of the mischief in my life is my way of doing me'.

Once attained with clarity, this discovery offers the meta-evolving person a new and far more powerful methodology for the investigation and amelioration of personal difficulties: to probe first for causes of those difficulties in the past-to-present action of that self-same causal agent and subjectivity. The self itself, not some other, becomes the self's prime suspect. The self itself is typically the greatest offender against its own experience. If [other-and-self-]offending action is thereby uncovered, the subject may endeavor to re-design its practice of self, promulgating a program of reformed self-activity whose refluxes, or 'returns-to-self', are more congenial for all concerned, self included.

Deepening insight into one's own misdeeds, and into their deep-seated and difficult-to-exorcise origins within,

tends also to awaken a salutary compassion for one's fellow mis-doers; for the disfiguring, tragic, and even horrific personal consequences of undiscovered, unacknowledged, and unchecked iblis; for the enormous inner war which each must undertake to acknowledge, check, and overcome *the enormity within*.

Capacity may thus develop to not only, at times, "be hard with your "beast", but also, at times, to be gentle with others', though they harbor this "beast" no less than do you. This iblis is the reason why:

"Power corrupts, and absolute power corrupts absolutely".

Evil has an embassy in every psyche borne of this cosmos. Abuse of power, parasitism and sadism – the pitiless, vampiric emotional, sexual, and economic exploitation and torture of other beings, by an exploiter who is not only not appalled by, but takes perverse pleasure in, the horrific suffering that it causes – these are the invariant 'marks' of this 'beast' of iblis in its [re-]crudescence full-blown.

Thus, the elimination of unchecked power, the building-in of elaborate controls, checks, and balances, is a key moral principle for the design of viable social institutions. Yet all of that is in vain unless a sufficient proportion of individual members of society choose to struggle to build sufficient "checks and balances" into their own psyches.

A major crossroads looms, often in late adolescence, when self-knowledge breaks through to recognize, within self, the seeds of the corruption up 'til then known only externally, in social institutions and in other beings, often figures of authority within those very institutions.

When this crossroads is reached, the being may take up the arduous path of self-reform. Or, that person may "surrender" to iblis, taking a willing place among the willingly corrupt; spending the remainder of life bickering over the spoils of corruption. The latter path is not hopeless. Some who take it first are later overcome by self-revulsion, and propelled by that self-revolt to the path of self-reform. The former path is not dauntless. Many snag along its way. Some revert.

In either case, the aftermath of this crossroads is to re-confront its likes again and again. Progress in selfreform is far from popular. Synthesis appears to be mere antithesis -- and, at least at first, *anathema* -- to *both* thesis and anti-thesis.

What a terrible shock of recognition when self-exploration reveals the hideous face of iblis -- the horrific adversary that one has fought so hard for so long in the outer world -- hidden and harbored, aided and comforted within one's own psyche, a psyche thus traitor to itself! One discovers -- seeded in oneself -- the monstrosity so malignantly manifest in even the most infamous of 'human' monsters who litter the history of humankind. These inner seeds need but to fall on the fetid soil of times too hard - or too easy - to sprout in hideous fruition. This discovery is a trauma both salutary and indelible: one which can incent, incite, and insight to further meta-evolution! Strong motive is required. The path that leads from the 'life' of iblis to greater life passes through the valley of the shadow of death.

<u>Self-Reflexivity/Self-Refluxivity as the Essence of Dialectical Meta-Dynamics</u>. Dialectics is most essentially about those processes described in, e.g., English phonetic or phonogramic language, by sentences in which the subject and the object are identical; i.e., in which the same noun -- the same name, or a pronoun standing for that name -- holds both the subject place and the object place; sentences describing processes in which the subject acts upon itself as its own object, through a verb which is also an action-name of that self-same subjectobject, naming a mode of action which inheres in the very nature or essence of that three-way-named -- subject-verbobject-named -- eventity.

What such a sentence describes is a self-reflexive process by which the eventity denoted by the subject-verb-object of the sentence <u>changes itself quantitatively and qualitatively</u> [i.e., <u>ontologically</u>], or [in a 'dialectized' version of the language of dynamical systems theory], partially controls its own control-space, via its own states, and thereby self-induces its own self-bifurcation(s).

The "nonlinear terms" of the extant ideographic mathematical language -- the components that make mathematical equations "nonlinear" and typically also "unsolvable" within the extant epoch of mathematical meta-evolution -- are mathematical expressions and ideographic formulations of dynamical [and, in some cases, of *meta*-dynamical] self-reflexivity. Terms like $x(t)(x(t)) = x(t) \times x(t) = x(t)x(t) = x(t)^2$ and $w(x,y,z,t)(w(x,y,z,t)) = w(x,y,z,t) \times w(x,y,z,t) = w(x,y,z,t) \cdot w(x,y,z,t) = w(x,y,z,t)w(x,y,z,t) = w(x,y,z,t)^2$ denote the self-application or reflexive application of a[n "unknown"] mathematical operation; the operation *upon themselves* of the function-values, here denoted x(t) or w(x,y,z,t), of a *function-valued* or *operation-valued* function-"unknown"; an operation or function here denoted x or w.

As expressions of *self-reflexive process*, they are expressions of *dialectical process*.

The term 'self-reflexion' connotes a 'bend-ing' ['flex-ion'] again or back [re] upon self. Hence, the phonogramic term 'self-reflexivity' is one we use to name the quality of a 'self-consequential' operation, an operation or mode-of-activity which applies itself to itself, or acts back upon itself; i.e., to name the quality of self-activity. We identify this quality as the defining attribute of dialectical processes, that is, of dialectical eventities.

In relation to classical nonlinear dynamics, dialectics constitutes a *meta-dynamics*. It does so because it deals with changes not restricted to changes of location *within* a given "state-space", and to changes in '*trajectory-morphology*' within a quantitatively and qualitatively *unchanged* "state-space". It deals with epochal, revolutionary changes. It deals with system-induced, state-trajectory-induced change of "state-space"; with the change to a different and *qualitatively* expanded [not just quantitatively expanded] "state-space" and coupled "control-space" or "parameter-space", i.e., one in which new dimensions, not just new volume or new flows are added.

Such 'changes of space' arise because the "control parameters" of nonlinear, 'self-reflexive', 'self-refluxive', dialectical or meta-dynamical 'meta-systems' -- parameters often [mis-]described as "constant coefficients" in the equations of state-evolution -- are not truly constant, hence are not truly "constants". They too are variable, are variables, are even self-variables.

They too, not just the "state-variables", are dynamical. 'Change of space' may result when *cumulative* changes in one or more control-space parameter-values reach and cross their critical threshold values, "bifurcation" values. 'Dialectical' 'meta-systems' are dynamical systems whose own essential behavior, as expressed/described by their state-space trajectories, partially control their control-space positions, and which thus self-induce "bifurcations" of their state-space behavior.

Relatively sudden, deep, qualitative self-change results from movements in the system's control-space which are driven by the self-movement of the system through its state-space, that is, by the system's integral, internal, self-propulsion -- in both its state-space and its parameter-space or control-space, or better, in its unified 'state/control meta-space'. Such unified state/control meta-dynamics exhibit a generic phenomenology which we term self-bifurcation. This phenomenology is explicated in the section on self-bifurcating systems in the sequel, and is homeomorphically encoded in the 'arithmetical' Rules-Systems of the \underline{Q} , \underline{U} , & $_{\alpha}\underline{\mu}$ dialectical ideographies, and beyond.

Again, in summary: dialectics is about processes most readily and naturally described by sentences in which subject, verb, and object name different aspects of the self-same process-entity or 'eventity'. Such sentences are traditionally characterized, in the technical terminologies of 'grammatics' [grammar] and linguistics, as "reflexive" or "self-reflexive" sentences, connoting the "bending [flex] back [re] upon self" [self-re-flex-ion] of the sentential subject upon itself, as sentential object, through the mediation of [its own self again, as] the sentential predicate or verb/verbal phrase.

We believe that *The Nonlinearity Barrier* has its thickest historical root in Western classical antiquity, in the promulgation and codification of a logic that ruled out, by assumption, time and change, and therefore also self-change. At least one major shoot off that tap-root can be traced to the incipient recovery of Western Civilization from the horrific and protracted episode of contracted social reproduction known as the "*Dark Ages*"; can be traced to the first great resurgence of light after the break in that darkness, at the base of the Medieval period, in the 1200s; at the start of the *Dim Ages* of Terran humanity, which have not yet ended.

Thus, Aquinas:

"Now the same thing cannot at the same time be both actually **x** and potentially **x**, though it can be actually **x** and potentially **y**: the actually hot cannot at the same time be potentially hot, though it can be potentially cold. Consequently, a thing in process of change cannot itself cause the same change: it cannot change itself. *Of necessity therefore anything in process of change is being changed by something else*."¹³

However, returning to our earlier example of stellar evolution, a proto-star -- in the process of its formation from a self-gravitating, self-concentrating, self-densifying mass of inter-stellar gas and dust -- is, at many points in its self-development, both "actually hot" and "potentially hotter still". It can -- and does -- move itself from "hot" to "hotter". A typical proto-star moves itself from the state "partially hot" to the state "fully hot", in that its state converges, through a succession of transient, proto-stellar temperature regimes, to its "essence-ial", long-lasting "main-sequence" temperature regime, reflecting sustained Hydrogen-fusion in its core. The primary causes of this transition and convergence are *internal* to this stellar eventity, not external to it. The primary causes of this self-convergent or essence-convergent behavior arise from, arise as, and operate within the physical internity, the interior substance-and-dynamic of this "automorphogenesis" and "auto-metamorphosis" -- this self-shaping, "self-forming content", the proto-stellar body. The primary causes are not located in the proto-star's exterior environment, in the surrounding externity of matter-energy-process. The "something" which causes this "heating-up" is the proto-star itself, not "something else". The proto-star 'causes' the star; causes itself to become the star, causes the transition from proto-star to main-sequence star:

protostar[protostar] = protostar² = star = not-protostar = ~protostar + protostar.

More generally, and contrary to Aquinas' [unknowing] implication, nonlinear differential equations can have solutions. In terms of their state-spaces, that is, in terms of the 'dynamical analytical geometry' of such equations, and of their 'geometries-of-solution' or 'solution-geometries': a dynamical system can have an "attractor" structure as its solution-geometry. That attractor may be a single state-point or an orbit-of-state-points in its state-space, toward which its trajectory tends regardless of its initial position in that state-space [or within the sub-region of that state-space which is the "basin" of that attractor]. The existence of such an 'essence-ial' behavior or "dynamic" implies no teleology, no causation of present states by future, not-yet-existent states. It simply implies existence of cybernetic "self-steering" mechanisms. Such confluences of negative and positive feedbacks -- such self-refluxions -- self-constrain the system's behavior in every present moment so that its states converge upon this 'essence-ial' behavior. Similarly, the rule of a finite sequence may make it always end presently with the same value, via computations carried out in 'presents-past-up-to-present', rather than via anything carried from some [presently-nonexistent] future backward.

By the term 'eventity', we name an ontological conception of beings as subject-verb-object unities, whose continuing self-activity induces continuing and self-consistent, directional -- essence-directed -- self-change, or self-development. By 'eventities', i.e., we mean "beings" that self-induce changes that are in accord with their natures, essences, or [meta-]attractors. We mean activity-entities whose essential activity constitutes a process of graduated "self-attainment"; a "self-creation", "self-making", or "self-production"; an autopoiesis. Eventities are thus self-meta-evolving entities comprehended as dialectical self-becomings or essence-becomings.

The characteristic mode of activity of an eventity, its active character, is not optional. To be itself, it must do this, and do this to itself. A star cannot stop the fusion at its core and remain a star. The essence-process of an eventity is its essence-process, its essential process, its necessary process, its [self-]defining process, its existential process, the process of its existence, the process which is its existence. A star cannot both be a star and stop the process of depletion of its most vital resource, its internal fusion fuels. Yet their consumption by that star itself at length brings that star's existence -- as such, as star -- to an end.

'Meta-Monadology': A Unitary Conception of "The Dialectic Of Nature" [The Ubiquity of the 'Graduated Cumulum' of "being-for-itself" Proto-Subjectivity] -- of the 'Self-Bifurcative' Processes of Human Nature, Pre-Human Nature, and Extra-Human Nature -- in Relation to the Concept of 'Meta-Dialectics', The 'Higher Degree' Dialectics of Dialectics Itself; of Its Own Self-Activity, Self-Reflexion, & Self-Refluxion.

Indo-European "natural" languages abstract, or conceptually separate-out, subject and object, nominal aspects, from one another, and from verb/predicate aspects, of their sentential descriptions of each single eventity. This forces their users to redintegrate their descriptions by talking and writing in terms of an interaction, a two-way communication of information, negentropy, energy, forces, or effects, among as if separate subject, object, and predicate/verb aspects of that self-same eventity. Metaphorically, using the interpersonal and intrapersonal processes with which human beings are most intimately familiar as the ground of this metaphor, this redintegration can be likened to a material dialogue, a self-conversation and a self-dispute or self-controversion between the subjective and objective aspects of this unitary eventity. Per ageold Terran human philosophical convention, human subjectivity is taken to be the collective, historical subjectivity proper, and sometimes as the sole historical subject/agent with which dialectics should be concerned. When observing that convention, one might refer, for the dialectics of pre-human nature, to metadynamical eventities which emerged in the natural history prior to the emergence of human[oid] subjects, but as part of the meta-evolutionary sequence allegedly leading to humankinds, variously as that of 'presubjects', 'proto-subjects', or 'sub-subjects', hence also as 'pre-objects', 'proto-objects', or 'sub-objects' in their 'object-ive' aspects. One might, in the same vein, refer to their self-bifurcations, that is, to their metafinite transitions or conversion-singularity meta-dynamics as a 'pre-dialectic', 'proto-dialectic', or 'sub-dialectic' -the dialectic of pre-human[oid] nature. One might also refer to the ongoing, partially independent or 'parallel' self-reflexive development of cosmological extra-human nature, synchronic with self-developing human nature, but, in large portions, substantially isolated from direct human[oid] impact, as a 'co-subjectivity' and as a 'co-objectivity'. One might refer to the meta-dynamics of this contemporary sub-realm of the cosmos as a 'co-dialectic' -- the dialectic of extra-human nature.

When not observing that convention, we will refer to each eventity discussed, according to the operatorial or sentential role of its name or other symbol in its descriptions -- its grammatical "moment", regardless of its location in 'the great chain of [evolute] self-becoming' -- as simply a "subject" / 'agent' and an "object", or, in totality, as a 'subject/verb(s)/predicate(s)/object'. The first of these conventions tacitly implies that an eventual meta-evolutionary self-supersession of the presently-extant, 'meta-social' Terran humanity, emerging, by self-reflexion, from within that humanity, if it should arise, would be conceived of and addressed in terms of a 'super-subjectivity', a 'super-objectivity', and of a 'super-dialectic' or 'hyper-dialectic' -- the dialectic of post/meta-human[oid] nature. In short, in the perspective of this theory of dialectics, dialectics also applies to itself. There is also a 'dialectics of dialectics', a 'meta-evolution' of the dialectic itself, and that 'meta-evolution' is also 'dialectical'. The "laws" of dialectics, the 'meta-patterns' codified in dialectical logic, are subject to their own 'meta-dynamics'. 'Dialectics', used to mean the conceptual praxis of the collective subjectivity of the Terran human community of dialecticians, if it exists as such, must continually selfrevolutionize itself. This continuing self-revolution is its ongoing, open-ended attempt to keep up with cosmological actuality in the context of the ever-expanding possibility-space/actuality-space multi-ontic cumulum arising from ongoing universal 'onto-dynamasis'/'meta-dynamasis' at all 'meta-fractal' scales/levels, for all ontic levels, and the consequently ever-growing 'knowledge deficit'. This meta-evolution of dialectics is intimately bound up with the emergence of new ontology, of qualitatively different historical 'subject[ivitie]s' or 'agen[cie][t]s' in the course of the history of nature. If we hold that human history/society is the realm of dialectics proper, then we have the following relationship of that "dialectics" to its immediate epochal predecessor and successor:

proto-dialectics -> proto-dialectics[proto-dialectics] = [proto-dialectics]² = ~[proto-dialectics]=

 $[proto-dialectics + \Delta[proto-dialectics]] = [proto-dialectics + [meta-proto-dialectics]] =$

<u>dialectics</u>; <u>dialectics</u> \rightarrow <u>dialectics[dialectics]</u> = [<u>dialectics</u>]² = ~[<u>dialectics</u>] =

$[\underline{dialectics} + \underline{\Delta}[\underline{dialectics}]] = [\underline{dialectics} + [\underline{meta-dialectics}]] = \underline{hyper-dialectics} \rightarrow \dots$

Otherwise, we might simply formulate this meta-dynamics of dialectics via the following formulae:

dialectics	->	~[dialectics ₀]	=	dialectics	->	~[dialectics]	=	dialectics	→
<u>subject</u>	->	~[subject_]	=	subject	->	~[subject _]]	=	<u>subject</u>	→

The 'Operator' Concept within Operatorial Ideography and the Ideography of 'Eventity' and of 'Self-Duality'. In the mathematical ideography already extant, there has emerged the concept of an "operator". This concept is a synthesis of the conceptions of "pure number", "pure quantity", or "mathematical noun" -supposedly, for "pure quantity" conceptions, exemplified by ideas such as those denoted by the ideograms **2**, **3**, or **4** -- and of "pure operation", or "mathematical verb" -- again, supposedly, for such "purist" conceptions, exemplified by the ideograms **+**, -, **x**, **+**.

The operator conception means that the meaning of a "sign of operation", like x in an algebraic expression like $y \times z = y(z) = yz$, is no longer necessarily "times". That meaning is no longer independent of the meaning of the "numeral" -- or of the "algebraic literal" standing for a "numeral" -- i.e. of the "[meta-]number" denoted by the ideogram to its left, here y. If, for example, y denotes the "Real" number 2.000..., then the x denotes our familiar "Real" multiplication operation. However, if y denotes the "Imaginary" number +i, a value of the square root of -1, then x in $y \times z = y(z) = yz$, does not denote "Real" multiplication. It denotes the 'function' or "operation" that defines +i, the operation that +i denotes, describable analytic-geometrically as a 90° counter-clockwise circular rotation in the plane-space of the "Complex" ["Real" & "Imaginary"] numbers.

An operator is a 'mathematical eventity'. [cf. the "object" concept of "object-oriented programming"].

Certain mathematical operators -- or 'meta-number-ized' functions/operations -- can aptly model *physical* eventities.

We employ this convention of general operatorial ideographies in the *dialectical ideography*, and for essence-ial reasons. Use of x as a separate ideogram denoting "pure operation" is rendered redundant. It is obviated by the simple *juxtaposition* or contiguity of operator symbols, as in **yz**. The action of the operator or operation **y** upon the operator or operation **z**, and the product of the interaction of **y** and **z**, is known from the definition, nature, or essence of **y** and **z** -- from their operational meaning, from the choreography, the form of analytic-geometric motion, the kind of number, the type or quality of "quantity", that each symbolizes.

Operatorial ideography is an 'arithmetic' of *functions applied to functions*, of *operations applied to operations*, of 'meta-numbers' applied to 'meta-numbers'. Operatorial ideographies are about functions taking other functions, and themselves, as "arguments". They are about operations operating upon other operations; 'ideographic verbs' operating upon other 'ideographic verbs', plus the special case of operations/verbs operating upon themselves. Adjacency, contiguity, juxtaposition -- the absence of space or separation between two symbols -- signifies their '*multiplicative interaction*' or '"multiplication'". This is already the convention in ordinary algebra, in matrix linear algebra, and in calculus/analysis. However, its usage in operatorial ideography generalizes this tacit meaning and concept. The literal symbols of ordinary algebra are assumed to represent but one kind of operator, one 'quality of "quantity" '-- namely, the "**R**eal" or at most the "**C***omplex*" *number* kind. In *operatorial ideographies*, many different kinds of *operators* may interact.

This touching of two operator signs thus signifies the activation of the operations they denote, the one upon the other. But, if the operators are not **R**eal numbers, the operation activated is no longer "times" or standard "multiplication". We need a new name, one that covers all cases. We use the term 'flexion', or 'inter-flexion', connoting the mutual "bending" or "de-flection" of the trajectory, or characteristic number-space motion, definitive of each operation, by that of the other. Expressions like \underline{YZ} may thus be read off as ' \underline{Y} flexion \underline{Z} ', or as ' \underline{Y} flex \underline{Z} ', or as ' \underline{Y} (de)flects \underline{Z} ', instead of as ' \underline{Y} times \underline{Z} ', when $\underline{Y}, \underline{Z} \notin \mathbf{R}$. When $\underline{Y} = \underline{Z}$, so that $\underline{YZ} = \underline{YY} = \underline{ZZ}$, we may read this as ' \underline{Y} flex \underline{Y} ' or ' \underline{Y} flex itself'. We may thus also term that which such self-juxtapositionings denote variously as '*intra*-flexion', '*self*-flexion', '*re*-flexion', '*self*-*de*-flection', or '*self*-*re*-flexion'. This 'operator' concept -- this synthesis of the concepts of 'number' and of 'operation' -- is radically fundamental to all that follows, both notationally and epistemologically. Operatorial ideography is the very *ideography of eventity*.

We employ <u>underscored boldface black letters</u>, phonograms like $\underline{\mathbf{x}}$, as ideograms to denote a new kind of 'operator', also called (1) 'ontological' or 'ontic' '*unit-<u>qualifiers</u>*', '(2) unquantifiable <u>qualifiers</u>', (3) [especially the 'evolute'] 'meta-numbers', (4) '*dialectical operations*', (5) dialectical 'meta-vectors', or simply (6) '*dialectors*'.

This usage of $\underline{\mathbf{X}}$ is serendipitously fitting, providing mnemonic and connotative support to the eventity concept. On the one hand, this usage continues the tradition of classical algebra, where the phonogram \mathbf{X} , used as an ideogram, denotes an unknown value to be solved-for, a general variable, or a generalized "pure number". This usage of $\underline{\mathbf{X}}$ also simultaneously evokes the traditional "pure operation" ideogram for multiplication, namely, \mathbf{x} . This is a sign for the operation of "taking the product" of two numbers, that is, for *multiplication*, or 'produc-tion'. Such 'product-tion' means the positing of a new number, or "product", as a result of this action *upon* one number by another, or of this mutual action *between* two numbers.

We will also employ $\underline{\partial}$, a pure-qualitative take-off from the quantitative "boundary operator" or "partial differential" operator, ∂ , as an ideographic modifier of phonogramically-symbolized English words. We use it as shorthand for the epithets "partly" and "partial", and as an acknowledgment of the insights of fuzzy set theory. That is, we use it as an assertion of the *non-extremal* nature of most phenomena we will be describing, their status as *neither all* nor *none* of the totality to which they belong, i.e. as but *some* of that totality.

The meta-evolutionary models which the language of the *dialectical ideography* renders via ideogramic, mathematics-like formulae are *dialectical models* in this sense: they are semantically hyper-condensed shorthand for -- ideogramic 'translations' of -- what would, in e.g., English phonogramic form, be expressed via *subject-verb-object-identical* sentences of great length and complexity.

<u>From Reductionist & Statical Ontologies to the 'Self-Constructionist', 'Meta-Monadizing', 'Meta-Genealogical' Onto-Dunantics of Dialectical</u> <u>Ideography</u>. Consider a generalized, ontological eventity activity-category, or existential/'actional' quality. Denote it ideographically by the symbol **g**_n, where subscript **n** denotes some cardinal value. This ideogram serves here as our pure-ontic 'eventity variable', potentially ranging over all the varieties of being/doing identified by humankind in its study of 'cosmological [meta-]evolution', of "natural history", including of its own, '[meta-]social history', to date.

<u>Hypothesis</u>: Consider any emergent, durable *eventity*, or *mode-of-action being*, of ontological type $\underline{\mathbf{q}}_n$, at some stage within some domain of cosmic emergence/meta-evolution. The interaction of individuals of type $\underline{\mathbf{q}}_n$ with those of their precursor type(s) -- with individuals of ontological type(s) which emerged prior to the emergence of type $\underline{\mathbf{q}}_n$ -- will typically be *autocatalytic*, at first. The interaction will, in the net, at least for a time, continue to *convert* individuals of precursor categories into individuals of category $\underline{\mathbf{q}}_n$. Precursor processes/qualities will be *depleted* in favor of the *accumulation* of the latest, 'meristemal' ontological process/quality, $\underline{\mathbf{q}}_n$.

Production and accumulation of individuals of type \mathbf{g}_{n} , and physical-spatial "concentration" or 'densification' of populations of such eventities -- typically iterated synchronically across many causally-∂isolated spatial loci -- mounts, for a time. Locales thus appear in which individuals of type gn are densely 'surrounded' or 'environed' by others of their own kind, not by predecessor other-kind, as previously. This emergence of localized 'self-surround-ments' or 'self-environ-ments' of ∂ of the g_n means that a new kind of interaction becomes possible, even locally-dominant, emerging within contexts previously dominated by interaction of eventities of ontic quality \mathbf{g}_n with those of \mathbf{g}_n 's predecessor ontic qualities. With the rise in concentration or space-density of the gn, the self-confrontation and self-interaction of this action-mode -- the confrontation and interaction of beings/doings of type \mathbf{q}_n with other beings/doings of type \mathbf{q}_n -- also intensifies. That interaction of \mathbf{g}_n with \mathbf{g}_n is notated, ideographically, invoking the conventions of function-notation, by $\mathbf{g}_n[\mathbf{g}_n]$. It stands for the self-function[ing] or reflexive function of **g**n, read "**g**n of **g**n". This may also be notated by **g**n**g**n, dispensing with the parenthesis, or \underline{q}_n^2 , using the superscript exponent notation common to classical algebra and other branches of conventional mathematics. This quadratic nonlinearity [if gn is an "unknown"], this selfoperation or self-reflexion of action-category \mathbf{g}_n in part denotes just the autocatalysis, the self-replication or self-reproduction, of the population of type gn, often in the form of increasingly advanced specimens or subspecies of that type, yet still within its category. But this action of the 'actor' or 'negator' or 'change-or' gn upon \underline{q}_n -- the self-interaction of \underline{q}_n -- also gives rise to a new type: a higher-degree, qualitatively distinct eventity-category, a new action-mode, here denoted \underline{q}_m , such that m > n, which literally incorporates but also transcends [cf. Hegel's "aufheben"] gn:

$\underline{\mathbf{q}}_n \rightarrow \underline{\mathbf{q}}_n[\underline{\mathbf{q}}_n] = \sim [\underline{\mathbf{q}}_n] = \underline{\mathbf{q}}_n^2 = \underline{\mathbf{q}}_n + \underline{\Delta}\underline{\mathbf{q}}_n; \quad \underline{\mathbf{q}}_n[\underline{\mathbf{q}}_n] = \underline{\mathbf{q}}_n + \underline{\mathbf{q}}_m; \quad \underline{\mathbf{q}}_m = \underline{\Delta}\underline{\mathbf{q}}_n; \quad \underline{\mathbf{q}}_n \neq \underline{\Delta}\underline{\mathbf{q}}_n.$

This self-reflexion of the [proto-]subject class, **g**n, [typically expandedly] reproduces that [proto-]subject class, but also produces a qualitatively new, compositionally-higher class of [proto-]subject-objects, gm. That is, the product of gn with itself is an evolute product. The operand factor re-emerges as part of the product or output, as in parthenogenesis/parthenogenic sexual reproduction. This bears likeness to the evolute spirals of certain seashells, in which succeeding whorls leave preceding whorls open to view. This notational process also mirrors processes of 'pas-de-deux' biological sexual reproduction, in which parents do not "disappear" into their offspring, but typically, initially, at least, co-endure with them. It mirrors the ontological dynamics of cosmic meta-evolution as a whole, in which previous 'ontos' continue to co-exist, though in an interactively adjusted form, with their successor-'ontos'. This contrasts with mathematically more familiar, convolute products in which, as with the convolute spirals of other seashells, succeeding whorls hide preceding whorls from view. Both factors vanish in[to] their product. What we call 'convolute' products are technically known as "linear" products. The arithmetics that exclusively employ them may be termed "linear arithmetics", their algebras "linear algebras", their numbers 'linear numbers' or "linear operators". The term "linear" here means that the product of any two of their "qualitative units", like +1, or +1, yields just one of the other qualitative units. An arithmetic with an evolute product is thus a kind of 'non-linear arithmetic', its algebra a 'non-linear algebra', its numbers 'non-linear numbers'.

Dialectical Ideography, the dialector arithmetic, is thus a non-linear arithmetic in this sense. The algebra of this arithmetic, the dialector algebra, is a non-linear algebra. Its 'evolute meta-numbers' are non-linear numbers. The dialector evolute product does not produce quantitative change, "multiplication of quantities", as does the

"times" product of ordinary **R** arithmetic. The dialector product produces "pure" qualitative change --"multiplication of qualities", propagation or proliferation of new ontos:

$\underline{\mathbf{q}}_n^1 \rightarrow \underline{\mathbf{q}}_n^1 [\underline{\mathbf{q}}_n^1] = - [\underline{\mathbf{q}}_n^1] = \underline{\mathbf{q}}_n^2 = \underline{\mathbf{q}}_n + \underline{\mathbf{q}}_m; \ \underline{\mathbf{q}}_n \stackrel{3}{\xi} \underline{\mathbf{q}}_n^2; \ \underline{\mathbf{q}}_n \stackrel{3}{\xi} \underline{\mathbf{q}}_n + \underline{\mathbf{q}}_m; \ \underline{\mathbf{q}}_n \stackrel{3}{\xi} \underline{\Delta} \underline{\mathbf{q}}_n = \underline{\mathbf{q}}_m; \ \underline{\mathbf{q}}_n \stackrel{3}{\xi} \underline{\mathbf{q}}_m.$

The ideogram $\frac{1}{2}$ depicts that relationship which is the *simultaneous denial* of both the 'greater than or equal to' (\geq), and 'less than or equal to' (\leq) relationships. We use it to represent the '*strong*' form of inequality, i.e., *non-quantitative inequality*, or *qualitative inequality* -- 'multi-dimensional inequality', as distinct from 'weak' or 'one-dimensional', merely *quantitative* inequality.

Our pictographic "analytical geometry" of the anisotropic "space" of dialectical metanumbers will appropriate the conventional mathematical metaphor in depicting first-order qualitative versus quantitative difference -- the metaphor employed by Buee, Wessel, Gauss, Mourey, and DeMoivre in their geometric interpretations of the inter-relationship of the so-called "Real" and the so-called "Imaginary" numbers.

Distinct points, or directed line-segments ending at or 'pointing to' those points, if along the same axis denote different quantities of the same quality. Points or directed axial line-segments, if on different, mutuallyperpendicular axes, denote quantities of different qualities. Each ontic quality of a given taxonomic level may be depicted by a distinct "axis", "quantity-scale", "numberline", or "dimension", perpendicular to those of all other ontic qualities of that level. Different such axes or dimensions -- interpretable as denoting qualitatively distinct ontic qualities -- intersect only at the universally-shared "empty set" point, qo, the "origin" of metanumber space, and their sole intersection with one another's distinct 1-D number-spaces. In this space, every axis or dimension is 'unified' or 'unit-ified' by a unique "qualitative unit", 'quality of unity' or 'unit qualifier'. Every point on every such axis represents some whole, fractional, or irrational, transient quantoquality 'counted' or 'measured' in units of that axis' quality, of that qualitative unit, as the metric of that point's "perpendicular distance" from the origin of the space. Every such axial point or directed axial linesegment has a unique ideographic name, of the form pg_X , where p, 0 , the point's 'quantifier', tells thepoint's distance from the origin, and where qx, the point's 'qualifier', tells which axis the point inheres in, i.e., the *direction* that the directed axial line-segment points in, with ordinal subscript or index x indicating the **x**th ontological type in the order of emergence. Every such point thus represents a *qualified quantity* and, equally, a quantified quality. An elemental 'dialector' or '[meta-]number' is defined as the conjunction, juxtaposition, or combination [product] of a unit qualifier and a quantifier. A unit qualifier, generically $\mathbf{g}_{\mathbf{X}}$, is defined as $1q_x$, i.e., a metanumber in which p = 1. Interpreted geometrically, $q_n \nmid q_m$ means that the [undirected] line-segment $[\mathbf{q}_0, |\mathbf{q}_n|]$ is perpendicular to line segment $[\mathbf{q}_0, |\mathbf{q}_m|]$: $[\mathbf{q}_0, |\mathbf{q}_n|] \perp [\mathbf{q}_0, |\mathbf{q}_m|]$; that \mathbf{q}_n and \mathbf{q}_m inhere in distinct, mutually-orthogonal number-lines. In the sequel, we will show how the relationship which '{ denotes arises immanently at that juncture in the self-consistent self-meta-evolution of classical arithmetic where it yields the first of the convolute metanumbers, the so-called "imaginary unity", i, square-root of -1: $i(i) = i^2 = -1$ --

 $i \ge -1$; $i \ne -1$; $i \le -1$; $\therefore i \ge -1$; thus i satisfies the 'inequation' $\underline{x}^2 \ge \underline{x}$.

We symbolize, for example, by $\{\sum_{n} \underline{\mathbf{q}}_{n}\}$ or $\underline{\mathbf{NQ}}$, one whole "set", sequence, or space of dialectical metanumbers $\underline{\mathbf{NQ}}_{n}$, wherein the subscript variable $\underline{\mathbf{n}}$ varies over the cardinals, i.e., over the "**N**atural Numbers". Take the case wherein we assign one particular instance of the $\{\sum_{n} \underline{\mathbf{q}}_{n}\}$ -- as merely one of many possible "interpretations" or "applications" of the $\{\sum_{n} \underline{\mathbf{q}}_{n}\}$ -- namely, the metanumber $\underline{\mathbf{q}}_{j}$, where $\underline{\mathbf{j}}$ represents some specific cardinal value, to represent the ontological form of being/doing that we call *atoms*: $\underline{\mathbf{q}}_{j} \Leftrightarrow \underline{\mathbf{atoms}}$. Suppose we further interpret/assign another member of $\{\sum_{n} \underline{\mathbf{q}}_{n}\}$, namely $\underline{\mathbf{q}}_{k}$, to denote that ontological category or action-quality we call *molecules*: $\underline{\mathbf{q}}_{k} \Leftrightarrow \underline{\mathbf{molecules}}$.

Substituting phonetic/phonogramic names for corresponding ideograms in the equations and 'inequations' [inequalities] posited above, we have:

<u>atoms[atoms]</u> = "<u>atoms</u> of <u>atoms</u>" = <u>atoms</u>² = <u>atoms</u> + Δ [<u>atoms</u>] = <u>atoms</u> + <u>molecules</u>; <u>atoms</u> = <u>atoms[atoms]</u> = <u>atoms</u>²; <u>atoms</u> = <u>atoms</u> + <u>molecules</u>; <u>atoms</u> = <u>molecules</u>; atoms $\frac{1}{2}$ -[atoms] = atoms²; atoms $\frac{1}{2}$ atoms + molecules; atoms $\frac{1}{2}$ molecules.

In summary, we might then interpret the equations and inequations above as modeling the following:

[1] Interaction of indivi-duals [eventities] belonging to local, concentrated, condensed populations of ontic type g.

[2] Self-application of the mode of action represented by \mathbf{g}_{j} . Action of the [proto-]subjects denoted by \mathbf{g}_{j} upon themselves/each other as their own [proto-]objects. Hegel's "being-for-self" moment of the being/doing -- that is, of the self-becoming -- represented by \mathbf{g}_{j} , wherein "being-for-self" means self-beholding, self-reflecting, and therefore self-affecting being; the moment denoted by $\mathbf{g}_{j}[\mathbf{g}_{j}]$ or $-[\mathbf{g}_{j}]$ or \mathbf{g}_{j}^{2} . This self-application or self-operation causes the irruption of a qualitatively new action-onto, \mathbf{g}_{k} , where $_{k > j}$, while also replicating and reaffirming, at least potentially or temporarily, the ontological, or onto-dynamic, action-mode or ontic quality represented by \mathbf{g}_{j} .

[3] Self-reflexion of the eventity represented by \mathbf{g}_j . The "[proto-]subject-ive aspect" of the eventity represented by \mathbf{g}_j , denoted $|\mathbf{g}_j[_]|$, is symbolically juxtaposed with, as it actually materially confronts, the "object-ive aspect", that is, the "being-in-itself"/"being-for-other-beings" of that eventity, \mathbf{g}_j , the aspect denoted $|\mathbf{g}_j|$. This propels emergence of a new action-onto, \mathbf{g}_k , k > j, while also replicating and advancing, at least potentially or temporarily, the ontological -- and onto-dynamic - category of eventities denoted by \mathbf{g}_j .

[4] Self-refluxion of the eventity represented by **q**_j. The "flowing-back-to-self" of the consequences of the 'existence' of '**q**_j', grasped as the [control-parameter-shifting] existential <u>activity</u> that defines its very 'self'.

[5] *Self-bifurcation* of *population-systems* of the eventity-type or onto-type denoted **g**_j. The propulsion of the control-parameter-space *path* of those systems across a critical, bifurcation threshold, driven by the same core process which also manifests as/drives the *trajectories* of those populations-systems in their state-space.

Thus:	lq _n	~	<u>a</u> u[au]	-	~[0	<u>]</u> n]	=	<u>q</u> _n ²	=	<u>q</u> n	+	Δ	$\mathbf{v}\mathbf{q}_n =$	<u>q</u> n	+ <u>q</u> n+n =	<u>q</u> n	+	<u>q</u> _{2n}	₹ <u>q</u> n;	more	gen	erally	
<u>][q</u> n, <u>q</u> x	J	->	<u>qx[q</u> n]	=	<u>q</u> n	+	Δ	q _x , q	n]	= 9	<u>9</u> n	+	<u>q</u> x+n	ł	<u>q</u> n and	, equ	ally	7:					
		→	q _n [q _x]	-	qx	+	Δ	q _n , q	x	= (qx	+	q _{n+x}	**	g _x , all per	r the	rul	e: 0	k[qi]	-	qi	+ qk-	+1/

describe potential qualitatively expanded reproductions at the ontic level -- at the level of ontological or existential possibility. That is, they describe components of a universe[-of-discourse] with a growing, or, more precisely, with a self-growing, self-expanding potential ontology; a self-expanding existential possibility-space with "time-varying", dynamical 'ontics'. In it, qualitatively new ontos are continually emerging from the interactions with others and from the self-interactions -- i.e., from the '[de-]flexions' and 'self-re-flexions' or 'self-[de-]flexions' -- of the individuals constituting the populations denoted by the previously-emerged ontos. The possibility of any $\mathbf{g}_{\mathbf{x}}$ -- the existence or extant-ness of a potential ontic population-type indicator, $\mathbf{g}_{\mathbf{x}}$, in the possibility-space as of "epoch-index" or 'self-bifurcation index' value τ -- does not preclude the "extinction" or zero probability of manifestation of any individuals of that ontic type in actuality as of index value τ .

Shifting from the 'pure-qualitative', 'ontodynamic', existential possibility-space models, $\underline{\mathbf{Q}}_{\mathbf{x}} = \underline{\Sigma}_{[\mathbf{k}=1, 2\tau]} \underline{\mathbf{Q}}_{\mathbf{k}}$, to the quanto-qualitative 'probability-space', or 'populations-space' models, $\underline{\mathbf{U}}_{\mathbf{x}} = \underline{\Sigma}_{[\mathbf{k}=1, 2\tau]} \rho_{\mathbf{k}}(\tau) \underline{\mathbf{u}}_{\mathbf{k}}$, where any of the "densities" { $\rho_{\mathbf{k}}(\tau)$ } may be **0**, we see that ontodynamic potential existence and actual existence need not coincide. The quanto-qualitative 'population of populations' meta-distribution function $\underline{\mathbf{U}}_{\mathbf{x}}$ can have zeros.

The Phenomenology of 'Indivi-Duality': The Paradox of 'Indivisible Duality' [of 'Undivided Duals']. We have earlier alluded to a putative universal phenomenology of dialectical eventity, which may be variously termed Indivi[sible]-duality, self-duality, internal division duality, intra-duality, intro-duality, or endo-duality. We have done so, in part, to help distinguish its concept from the more familiar concept that might be named inter-duality or exo-duality -- of "duals" or "opposite poles" conceived as separable, mutually alien, and mutually external. We have so far presented this phenomenology in a merely metaphoric, mnemonic, and indeed mythopoeic manner. Scientific exposition of this alleged universal, for specific ontic classes of eventity or 'indivi-duality', will require us to hypothesize the specific, empirical -- observable and testable -- "mechanisms" [or 'organisms'] of this proposed principle of 'non-dualismic duality'. This will be accomplished, in part, in the sequel.

Here we want to address some of the characteristics of the concept of self-duality itself, apart from its justification, in a way which, in our experience, by using formulations which are paradoxes and puzzles for the prevailing concepts of dualism, help liberate the fertility of the mind, and of the imagination, for the dialectical paradigm, and for the more exacting and empirically testable -- but otherwise opaque and starkly unfamiliar -- quanto-qualitative hypotheses which follow, and which flow therefrom.

Dialectics is not, primarily, but only secondarily, about the mutual alien-ness, the *external division* dualism of pairs of mutually-exclusive opponent forces. Dialectics is not primarily about 'exo-divi-duality', exterior conflicts, outward confrontations, or linear-mechanical "outer contradictions" of entities conceived as radically-separable.

It is not mainly about 'interlog' between the externally-paired dirempt wholes of putative radical dualisms.

Dialectics is essentially about '*intralog*', the dialog *within* (a) [meta-]system, a unity, an individual, an individuality; the *internal dialog* of an externally *un*divided whole or sub-whole, wherein the very *self-formation*, *self-partition*, *self-particulation*, *self-individuation*, sub-wholeness, sub-unity, and *existential out-standing-ness* or self-exertion of each eventity is constituted by its *internal division* or *self-division*; where its very existence is powered by its *self-consistent self-contradiction*, or *self-controversion*.

Dialectics is about the 'tomy' of 'a-tomy'; the cutting of the uncuttable; the ineluctable self- or intra-cut-ness of the externally un-cut. It is about the self-division, the "internally self-ravaged ground", of a single, outwardly undivided self, an 'in-divid-ual', an 'un-divided-duality' -- whether that self formation or subject-verb-object be galaxy, star, planet, planetary biosphere, planetary noosphere, individual human psyche/soma, or beyond.

Dialectical duality or 'di-ality' is the inescapable 'inner tension', 'in-tension', or 'ex(is)-tension' of every "thing", of every self, of every [proto-]subject that forms; that appears; that manifests.

It is the duality of one, not the duality of two. It is the duality of unity, as well as the unity of duality. It directly addresses the phenomenology of internal polarity -- of the internal self-polarization of unity -- not that of external polarization of dualismic duals.

This universality of this phenomenological paradox of self-duality, of this *self-splitting* of eventities, is connected to the paradox of 'Objective Subjectivity' and of 'Subjective Objectivity'; to the paradoxical existence of the objective-ness or objective aspect of a subject, and of the subjective side or subjective-ness of an object; and to the gradient of increasing sentience of the sequence of formations appearing in the history of nature.

It is also exhibited -- today with a predominantly dualismic bias -- in the grammatical structure of phonogramic formulae, that is, of "natural language" sentences, in the form of the inter-dualisms of noun versus verb, and of sentential subject versus sentential object. This same self-duality is captured, in a latently and tendentially less dualismic way, in the ideographic formations of the "artificial language(s)" of modern mathematics. The standard expression of *dynamical nonlinearity*, i.e., of the *self-re-flex-ivity* and *self-re-flux-ivity* of [meta-]dynamical [meta-]systems, implicitly formulates and notatively exhibits this *self-splitting* -- e.g., $x_{\tau}(x_{\tau}) = x_{\tau}x_{\tau} = (x_{\tau})^2$, or $x(t)(x(t)) = x(t) \times x(t) = x(t)x(t) = x(t)^2$, etc. The double presence of the symbol, x_{τ} or x(t), which denotes and ideographically names the momentaneous [meta-]state of the self, the subject, the object, the verb, the eventity -- the [meta-]dynamical system -- being modeled by the ideographic mathematical equation, expression, or formulae from which this "nonlinear term" is extracted, subconsciously signifies the ineluctable intra-activity and the self-transforming nature of that nonlinear [meta-]system.

Employing the ideographic symbol '#' to denote the 'dialectical contradiction', 'internal contradiction', or immanent, 'self-consistent *self-contradiction*' of a natural formation, we may further define the 'auto-dyadic' or 'self-dyadic' character of the dialectical concept of individuality as follows: $\underline{\mathbf{x}}_{\tau} # \underline{\mathbf{x}}_{\tau}$ means $[\underline{\mathbf{x}}_{\tau}]^2 - \underline{\mathbf{x}}_{\tau} \neq \mathbf{q}_0$, i.e., that $\underline{\mathbf{x}}_{\tau}$ harbors the potential[-"energy"] for self-transformation, for further meta-evolution; that $\underline{\mathbf{x}}_{\tau}$ is not a "fixed point" or "stable equilibrium-state" with respect to its own reflux, its own self-action; that $\underline{\mathbf{x}}_{\tau}$ contains an operatorial *self-discrepancy* or self-"*defect*" such that $\underline{\mathbf{x}}_{\tau}[\underline{\mathbf{x}}_{\tau}] \neq \underline{\mathbf{x}}_{\tau}$. The expressions $\underline{\mathbf{x}}_{\tau} # \underline{\mathbf{x}}_{\tau}$ and $\underline{\mathbf{x}}_{\tau}[\underline{\mathbf{x}}_{\tau}]$ or $\underline{\mathbf{x}}_{\tau} \underline{\mathbf{x}}_{\tau}$ present $\underline{\mathbf{x}}_{\tau}$ syntactically as 'opposite itself or 'self-opposite'; as self-juxtaposed, self-meeting, and self-confronting. Semantically, via $\underline{\mathbf{x}}_{\tau} # \underline{\mathbf{x}}_{\tau}$ explicitly, and via $\underline{\mathbf{x}}_{\tau}[\underline{\mathbf{x}}_{\tau}]$ in a subtler way, $\underline{\mathbf{x}}_{\tau}$ is depicted as being 'beside-itself' and 'opposite to itself' or 'self-opposing' in the way that subject opposes object, that 'subject' is the semantic antonym of 'object'.

<u>The</u> <u>w</u><u>Q</u> <u>Dialectical Ideography as Contra-Boolean Algebra</u>. Take $\underline{\mathbf{x}} = \underline{\mathbf{x}}^1$ as a meta-algebraic variable, ranging over all dialectical metanumbers, or dialectors, in {**Q**_i}, however interpreted. That is, consider $\underline{\mathbf{x}}$ as a generic 'pure-qualitative' ontological meta-state descriptor for whatever metadynamical phenomenology is to be modeled. Then:

$\underline{\mathbf{X}}^2 = \underline{\mathbf{X}}^1[\underline{\mathbf{X}}^1] \neq \underline{\mathbf{X}}^1,$

meaning both that $\underline{\mathbf{x}}^2 \stackrel{*}{\overleftarrow{\epsilon}} \underline{\mathbf{x}}^1$ and that $\underline{\mathbf{x}}^1[\underline{\mathbf{x}}^1] = \underline{\mathbf{x}} + \underline{\Delta \mathbf{x}}, \quad \underline{\Delta \mathbf{x}} \neq \mathbf{q}_0.$

The above are exact contraries of what Boole called the "Fundamental Law of Thought" or "Law of Duality":

$$x^2 = x^1(x^1) = x^1$$

which asserts, essentially, that, for the domain for which it is interpreted, only what Marx termed "simple reproduction"¹⁴ is possible. Interpreted for "*The Simple Reproduction of Ideas*", and, per Boole, as a description of the "mental act" or "mental operation" of *thinking an idea* ["[s]electing" a concept] it implies the Parmenidean/early-Platonic view that all ideas are *pre-existent fully-formed*, *eternally immutable*, "*cut and dried*". It asserts that second ideation or re-ideation is identical to first ideation; that second cognition or recognition is identical to first cognitions, that second conception or re-conception is always identical to first conception; that, universally, ideas/cognitions/conceptions, generically denoted by the algebraic variable **x** or **x**¹, cannot be improved by 're-thinking'; that 're-thinking' makes no difference. It asserts that, for all of its interpretations, *nonlinearity reduces to linearity*. The *second* power is the *first* cardinal degree of nonlinearity. The first power is the exact degree which signifies linearity. Boole's "Fundamental Law" of 'linear logic' simply equates the two. Boole himself noted the deep analogy of his logico-algebraic equations to *linear* differential equations. Within Boole's original arithmetic and algebra for logic, this single equation captures -- is homeomorphic to -- the three basic rules of Aristotelian formal logic.

Dialectical ideography as exposited here may thus be characterized as a *Contra-Boolean Algebra*, rooted in a '*Contra-Boolean Arithmetic*'. Its formulae are readily interpretable ontologically -- or onto-dynamically -- as an 'onto-logic', a logic of meta-evolutionary onto-dynamism which constitutes an ideographic '*contental logic*', as distinct from Boolean and later symbolic or ideographic "*formal logics*". We thus refer to existences which behave as described by the formula $\mathbf{X}[\mathbf{X}] \stackrel{*}{\leftarrow} \mathbf{X}$, as 'contra-Boolean' entities, or as '*dialectical eventities*'. As we shall see in the course of this exposition, among the names that aptly describe this fundamental formula of Dialectical Ideography as a *Contra-Boolean Algebra* -- in the spirit of Boole's names for his contrary fundamental formula -- are the following:

- The Fundamental "Law" of Dialectical Thought; the "Law" of the improvement / idea-ontic enrichment of cognitions / conceptions via re-cognition / re-conception;
- (2) The "Law" of Self-Duality, of Endo-/Intra-Duality [vs. Boole's Law of Dichotomy; of Exo- or Inter-Duality];
- (3) The "Law" of Unity, or of 'indivisible duality' or 'indivi-duality';
- (4) The "Law" of Plurality, of Trans-Binary Diversity, more-than-dual Multiplicity, or of Poly-Qualitative Heterogeneity; The "Law" of Multi-Ontic Cumulation;
- (5) The "Law" of Expanded or Contracted Self-Reproduction, of Non-Equilibrium Meta-Dynamism, and of the Impossibility of Simple Self-Reproduction;
- (6) The "Law" of Irreducible Nonlinearity;
- (7) The "Law" of Qualitative Change; The "Law" of Emergence -- of Emergent Properties;
- (8) The Law of Self-Bifurcation; The "Law" of Ontological Dynamics; The "Law" of Ontology Expansion;
- (9) The Law of Meta-Finite Singularity, Meta-Finite Transition, or Meta-System Transition [cf. Turchin];
- (10) The Law of the Immanently-Induced Escalation of Logical Type in the axiomatically-asserted ontologies of Axiomatic Logical Systems [The "Law" of 'Logical Meta-Evolution' or of Dialectical Axiomatics] and;
- (11) The "Meta-Law" of the Self-Transformation of "Laws".

In contradistinction to the assertion of the Boolean "Fundamental Law" of 'linear logic', namely, that nonlinearity or self-reflexivity makes no difference at all, our 'fundamental 'rule' of dialectical ['nonlinear'] logic', $\underline{\mathbf{x}}^2 \stackrel{2}{\leftarrow} \underline{\mathbf{x}}^1$, asserts that *nonlinearity*, or self-reflexivity/self-refluxivity, makes the strongest possible kind of 'meta-finite' difference: *ontological difference; ontology-difference; qualitative difference*.

The «Aufheben» Conservation of 'Peanicity': The <u>N</u> Dialectical Ideography as "Non-Standard Model" of Peano "Natural Numbers" Arithmetic. [forthcoming]

Dialectical 'Meta-Systems' as via-Conversion Singularity Self-Bifurcating 'Meta-Systems'. Classical Dynamical Systems Theory uses the ideographic mathematical language of total differential equations to model the dynamics of natural systems. Its findings simulate and corroborate classical notions of dialectical process in many ways, especially in the case of the unsolved *nonlinear* dynamical systems, largely suppressed until recent decades. It also echoes much of classical Aristotelian 'essential-dynamics' or 'essence-dynamics'. It developed mathematical concepts which are highly homeomorphic to essentialist concepts of essence [ousia], dynamis [potentia], energeia, ergon, entelecheia, telos, etc. This sub-section introduces connexions of Dynamical Systems Theory to 'Dialectical Meta-Systems Theory' as 'Dialectical Meta-Dynamics', via the 'Self-Bifurcation' paradigm of dialectical process.

<u>Nonlinear Dynamical Systems Theory and Dialectics</u>. The nonlinear integrodifferential equations that formulate the so-called "laws" of nature are primarily "partial" differential equations. This means that they involve solution-functions S = s(x, y, z, t, ...), whose values vary with physical-spatial position -- with the space-coordinates x, y, and z -- as well as with the time-coordinate, t, plus, in some cases, with other independent variables as well. The equations thus involve "partial differentiation operators" $\partial l \partial x$, $\partial l \partial y$, $\partial l \partial z$, and $\partial l \partial t$, which measure the variation of S in terms of "infinitesimal" variations in x only, y only, z only, or t only, respectively.

The closed-form 'solution-operation' or solution-function for such an equation, here denoted by s, is an algorithm that "predicts", i.e., a 'recipe' that tells the user how to compute, the *state* of any point of space (x, y, z), *in terms of* the phenomena-measures that the equation models, for any value t, *past or future*, from the input values x, y, z plus from the initial 'state of [the] space' "occupied by" this system, that is, from the phenomena-measurements -- the states -- of the points-set {(x_0 , y_0 , z_0)}, as measured "at" initial time t_0 .

Dynamical Systems Theory traditionally models with "ordinary" or "total" differential equations, linear or nonlinear. These involve solution-functions of the form X = x(t). There is but one ultimate independent variable to "differentiate with respect to" -- namely t, the time-variable. Time differentiation of X, using the 'non-partial' differentiation operator, d/dt, is thus "total" differentiation of X. The state-"vector" x(t), for any value of t, is an ordered list of values of the various "state-variables" or 'system-attribute measurements', which are the model's [pre]dictions or predications of these key 'total' or 'holistic' aspect-metrics [vs. the partial-differential, spatially-distributed aspect-metrics] of the dynamical system modeled, if taken at that t value.

The closed-form 'solution-operation' or solution-function for such an equation, here denoted by \mathbf{x} , is an algorithm that "[pre]dicts" or [pre]states, i.e., a 'recipe' that tells the user how to compute, the *state* of the system, the value of each of the "state-variables" or modeled 'attribute-measurements' of that system, for any value of \mathbf{t} , past or future, from the input value \mathbf{t} , and from the original 'state' of the system, that is, from the original values of all of the state-variables, their values as of the modeler-chosen 'initial' time denoted \mathbf{t}_0 .

State-variables should be 'holistic', 'overall' metrics of facets of the system being modeled. I.e., they should characterize the *entire* physical body of the system '*all at once*', not differing in their values substantially -- within the utility of the model -- from spatial/synchronic point to point on or within that body. Otherwise, they belong in a "*partial differential*" model. Take your body, for instance. To model its physiological dynamics, you might use "systemic" state-variables like temperature, T(t), blood pressure, P(t), and heartrate, H(t), which can be approximated as uniform throughout the soma, to partially characterize your body's changing physiological state at various moments, t. Hair density, which varies widely over the body's surface, and vanishes for much of its interior, would not make a good "total differential" state-metric. Your "total-differential", 'solved' lifetime body-model, a "state vector valued" solution-function, would then be of the form X = x(t) = (T(t), P(t), H(t)).

The first-order "total" or "ordinary" integrodifferential equation-model states the '*slope-invariant*' or, more generally, the '*change-invariant*' of the function-values, x(t), of the unknown function or operation x; the invariant "law" of its function-values' variations, the pattern of variation of the "state" of the system, x(t), as the time t varies. Such equations are termed "*nonlinear*" if their expression of that change-"law" contains terms of degree $\neq 1$ in x(t), and/or in its differentials, and/or in its integrals, and/or in any products of itself, its differentials, or its integrals with any such forms of itself or of other function-unknowns, if any.

Said differently, if the equation stating the change-rule of the values of the unknown operation, **X**, which is to

be discovered from that equation, contains any 'self-reflexions' of those values, terms containing $x(t)^n$, $n \neq 1$, or any terms containing 'flexions' with function-values of other operator-unknowns, with or without any order of integral or differential operators as 'coefficients', then the term is said to be "nonlinear". The equation containing such (a) term(s) is also said to be a "nonlinear" differential, integral, or integrodifferential equation.

The equation may be termed just "differential" if it contains no integration operations, just "integral" if no differentiation operations, or "integrodifferential" if it contains either or both.

If any equational occurrence(s) of the 'unknown function-values variable' or "dependent variable", $\mathbf{x}(t)$, is of the form $\mathbf{x}(t)^n$, $\mathbf{n} = \mathbf{1}$, i.e., 'simple presences' of those function-values, without self-action, and without interaction with any other function-unknown(s)/dependent variable(s), then the integrodifferential equation is said to be "linear".

State-Space Trajectories, Control-Space Paths, and Bifurcations. The 'dynamical algebra' of "total" [or "ordinary"] integrodifferential equations involves new operations, "differentiation" and "integration", involving "limits" of conceptually infinitary processes, which, as such, are foreign to classical algebra. It also entails expressions involving "functions of time", or 'operations on time', like **x(t)**, not encountered in that 'statical' algebra. But this 'dynamical algebra' does have, like 'statical algebra', an "analytical geometry"; not the 'statical' analytic geometry of Descartes, but a special, dynamical analytical geometry called "Phase Space" or "State-Space".

Our hypothetical 'dynamical-algebraic' model, x(t) = (T(t), P(t), H(t)), corresponds to a 3-dimensional 'dynamical-geometric' model, formed by 'crossing' 3 mutually perpendicular numberlines, scales, or axes, one assigned to T(t), one to P(t), and one to H(t), at their origins or 0-points. Any value of t, representing a moment of time, an "exact date", corresponds to 3 coordinates, computed by applying the state-functions or operations T, P, and H to that value of t. These three values together define a single point in this conceptuallyconstructed, non-physical, imaginary 3-dimensional space. That point is identified with "the state of the System S at time t". Obviously, if, as the time-value, t, changes, the values of one or more of the "state-variables", T(t), P(t), and H(t), also change, the position of this state-point will change as t changes. "Connecting the dots" of the different state-points computed for different t values forms a track in this space, called the "State-Space Trajectory" of system S. The totality of points representing possible combinations of T(t), P(t), and H(t), whether the state-point of a given instance of S ever gets to them or not, is called the "State-Space" of **S**. If the integrodifferential equation solved by $\mathbf{x}(t) = (T(t), P(t), H(t))$ is *linear*, the State-Space Trajectory will be rather simple. The solution-geometry of **x(t)** must be dominated by a single "fixed point", or "equilibrium" point, essentially [0, 0, 0], the origin, surrounded by a field of "transient" trajectories that leave it, and/or approach it, or neutrally orbit it. Any t = 0 starting point, or 'birth state', in the State-Space will be for all time attracted to and/or repelled by the origin, or will neutrally orbit it, without attraction or repulsion. If attracting, the solution-point is called an "attractor"; if repelling, a "repellor", if of mixed effect, a "saddle", if neutral, a "center". The "dynamics" of linear systems with attractor solutions is more aptly described as an 'anti-dynamics' -- a monotonic taxis toward a point of equilibrium, that is, a point of no further change, of eternal non-change. Closed form solutions have long been known for general linear total differential equations.

If the integrodifferential equation solved by $\mathbf{x}(t) = (\mathsf{T}(t), \mathsf{P}(t), \mathsf{H}(t))$ is *nonlinear*, the repertoire of possible State-Trajectories is vastly richer. The ultimate or "asymptotic", $t \rightarrow \infty$ solution-geometry can involve (1) *two* or more fixed points, (2) various combinations of fixed points with attracting, repelling, mixed, or neutral asymptotically *periodic orbits* of vast shape-variety, and/or various multiplicities of so-called "chaotic", asymptotically *aperiodic*, "strange attractor" orbits of even vaster shape-variety. The latter represent fractal, never-repeating but ever self-similar, not "random" but *deterministic* patterns of state-flow, surrounded by complex flow-fields. 'Non-pointal', that is, 'orbital' attractor solution-geometries describe various kinds of sustained self-oscillations, regular or irregular, of the state-variables or measured aspects of the modeled nonlinear systems. Especially the irregular "self-oscillator" orbits analogize to business "cycles", climate "cycles", and myriad other "imperfect" or "never exactly repeating", 'fluctuatory' processes in nature. Orbital attractors, orbital repellors, and orbital saddles cannot arise in linear dynamical systems. Neutral orbits <u>can</u> arise in <u>linear</u> differential systems, but only in cases of systems with *pure-"imaginary"* eigenvalues, $\lambda = ar + bi$, a = 0.

Closed form solutions have been discovered only for special cases, usually "barely" *nonlinear* total differential equations. However, those solved special cases have yielded great treasure, both theoretically and practically.

The states of a dynamical system will also be affected by "external conditions" and "accidents", not determined by its "internal" dynamics. The state of our hypothetical system, **S**, for example -- the temperature, blood pressure, and heart-rate of your body -- will be partly determined by current air temperature, oxygen concentration, and acoustical noise level, etc. in the physical space that surrounds it.

Measurements of these conditions may appear in the integrodifferential equation of the system as "constant parameters" -- constant "coefficients" of terms involving the state-variable-function-unknowns; constant terms, etc. -- incorporated into the state-variable functions **T(t)**, **P(t)**, and **H(t)**, or as time-varying "forcing functions" or "drivers" All such parameters are mapped to mutually perpendicular numberlines or axes in what is usually conceived as a separate, *second* system-space, called the "*Control Parameter-Space*" of the system. In engineered environments, such parameters can be "shifted" or adjusted by agents operating external *controls*, such as thermostats. The "Parameter-Space" of a dynamical system is thus often also termed its "*Control-Space*". Parameter "shifts" can, if they cross through certain "critical values" in the Control-Space, cause sudden, qualitative changes in the solution-geometry exhibited by the first space, that is, metamorphoses in the system's State-Space Trajectory and attractor(s), its Trajectory "flow" or "vector-field". An Attractor Trajectory, for example, may suddenly become a Repellor, Saddle, or Neutral Trajectory. Such deep breaks in behavior-pattern are traditionally termed "Bifurcations". They often involve the branching of one solution-geometry into two new solution-geometries, starting from the critical point of the "*bifurcation diagram*" of the system-behavior, hence the term "bifurcations".

State-Space, Control-Space [Parameter-Space], and State/Control-Metaspace. In classical Dynamical Systems Theory, a system's state-point and even its control-point may change location, but the state-space and the control-space do not change. They are statical, not dynamical. Their structure does not vary with time, state, or parameter. Their dimensionality is fixed. They form a static backdrop against which state-change and control adjustment occur. Even if the system develops partial 'self-control', so that the state-point begins to control the control-point; so that the control-point begins to move in correlation with the movements of the state-point, both spaces remain both separate and 'unmoved' per the classical conception and convention. This convention restricts the scope and coherence of evolution-models. They tend to be limited to a single epoch or stage of 'meta-evolution'. The models tend to end with misleading, counter-empirical predictions, e.g., of asymptotic -- that is, infinitely-delayed -- approaches to final attractors, or with "singularities", apparently infinite values of state-metrics, attained "at" finite values of the time parameter. The actual dissipative systems soon abandon and bifurcate away from these, due to their 'essence-ial' dissipative depletion of the resources fueling their old dynamic, and the emergence of new dynamics, defining new resources. Static state-space models tend, for example, to encompass but one phase of stellar burning, or even one generation of stars, but not repeated 'phase transitions'; not repeated generational transitions, not the cumulative enrichment of the interstellar medium that the latter entail, and its consequences for latergeneration dynamics, e.g., 'planetogenesis'. They typically omit the ineluctable system self-subversion in the single epoch they cover. Next epoch and preceding epoch models disconnect. Models must be reconfigured at every epochal transition. Successive models have trouble "passing the baton" across epochal, self-bifurcation boundaries, let alone merging into single, unitary models of natural history, covering entire successions of such transitions. Rightly-formulated dynamical equations, and their solution-functions, should not be 'oneepoch models'. They should describe both sides of the dual self-consequential process of the meta-evolutionary self-accumulation within each natural formation: both the self-growth, and the eventual self-bifurcation which that self-growth entails.

The proposed 'meta-dynamics' merges state-space and control-space in a unified 'state/control metaspace'. State-shifts driving parameter-shifts is par for the course. State-Space Trajectory and Control-Space Path merge into a unified *Course Of Development*. The resulting unified metaspace is also itself a dynamical object. Its axial content changes. Its dimensionality changes -- usually grows -- "as a function of time". Each system-self-induced bifurcation builds new axes, new dimensions, new state-variables, into the "state-space" 'side' of metaspace, converting former control axes into state axes, and sprouting new control-axes out of the origin. This self-expanding metaspace is an integral part of a meta-dynamical model. 'Change of [meta-]space', as well as mere change of place of the state/control point inside a fixed 'metastate' of that [meta-]space, mirrors predicted quanto-qualitative, epochal changes in this unitary, multi-epochal, meta-dynamical model. *Change of place* models fulfillment of "laws". 'Change of space' models change of "laws". Dynamics change. Dynamics change themselves, by self-bifurcation. *Change-of-space, change-of-"laws*", change-of metrics also imply ontology-change.

This 'Meta-Dynamics' is a dynamics of dynamics, 'dynamics squared', the nonlinear, second degree of dynamics. We claim that this 'Meta-Dynamics' is also Dialectics.

Self-Bifurcation. A dialectical meta-system itself, its 'essence', its "law" of change, is expressed by its entire state/control meta-space, the total "flow" of its possible courses of development within that space, that is, the actions and defining mode of action of the entire family of meta-systems of which a given individual metasystem is an instance. This meta-system-action is also mediated through the control-path that the meta-system itself induces for itself in its parameter-space or control-space, by which it acts back upon its own state-space trajectory. The meta-system quanto-qualitatively changes itself, mediately, when the control parameter variables that its own state-motion drives cross their critical values. One visualization of this "change of [state/control meta-]space" is as a kind of "jump" from one meta-space to an other, separate meta-space, somehow located "elsewhere". This is a 'convolute' paradigm of change at the level of the meta-space as a totality. Here we will visualize this change differently, 'Evolutely'. Cumulatively. The meta-space changes by expanding [occasionally, old axes will, in effect, wither away as well, so meta-spaces can change by at least partially contracting also]. A new axis, or several new axes, sprout from **0**, the origin of the meta-space, each perpendicular to any other newcomer-axes as well as to all previously-sprouted axes. The new axes correspond to the new state-variables and new control-parameters, new measurements or metrics/metrical ontos needed to describe the meta-states of the mediately self-transformed meta-system going-forward, in the meta-system's post-transformation epoch. The new axes or dimensions cover qualitative change(s) -increment(s) of new qualities, meta-system ontology-expansions -- gained in that self-transformation.

Thus, typically, all or most of the metrics or state/control-variables of the preceding meta-system meta-state and of its old meta-space remain. The expansion of the meta-space is a *qualitative* as well as a *quantitative* expansion, because the new axes of the added state/control-variables measure newly-emerged qualities or attributes, tied to new metrical ontos, of the self-bifurcated meta-system. The meta-space expansion is thus a *quanto-qualitative* one. It is also an 'evolute' one. The meta-space grows cumulatively, accumulating ever more new axes, metrics [qualities, attributes, predicates, metrical ontos], or dimensions, as the self-bifurcations sequence continues. But some of the old metrics or state/control-variables may "vanish", collapse back into the origin, to intermittent or even steady **Q** values, signifying the *extinction* or obsolescence of the system-qualities or metrical ontos they measured. Traditional approaches also visualize the control-space, as located "elsewhere", separate from the state-space, though as if exerting an 'action-at(from)-a-distance' upon it.

The proposed Meta-Dynamics visualizes the control-space as embedding -- engulfing, surrounding, and permeating -- the state-space. This view visualizes control-space as another set of orthogonal axes sharing the same origin as the state-space's state-variable axes. This approach views the control-space as also a dynamical entity; as changing. When the action of a dialectical meta-system, as recorded in its state-space by its state-space trajectory, drives that system's parameter-space path to a critical, self-bifurcation threshold value, and beyond, that old control-parameter axis ceases to exist as such. Instead, it transfers to the state-space, becomes a new state-variable axis of a new, thereby expanded, post-bifurcation state-space. Concurrently, a new control-space is born. New control axes or dimensions, representing the new control qualities or metrics, extend from $\underline{0}$, replacing the old control parameter-space, now extinct or accrued to the state-space, with a new one, constituted of metrics measuring qualitatively different control attributes.

Stellar [meta-]evolution exemplifies this meta-dynamic. Partial differential equations, not total differential equations, are the usual language for stellar evolution models. However, our context is that of a hypothetical finite dimensional state/control meta-space model, a *total*-differential model, of stellar [meta-]dynamics. During the Hydrogen-burning phase of a star's life-process, stellar core relative Hydrogen mass-concentration is a key state-variable. Helium is a "waste product" or 'entropy' of the Hydrogen burning process. Relative Helium concentration, at this stage, in the stellar core, is the key self-bifurcation control-parameter. The key state-process, Hydrogen fusion, converts more and more core Hydrogen to Helium. That state-process thus also progressively shifts the value of the core Helium-density control-parameter higher, as it depletes more Hydrogen, and accumulates more Helium, in the stellar core.

When the Helium parameter crosses a critical threshold, the expansive force of the Hydrogen fire wanes in the stellar core. Accelerated self-gravitational self-re-contraction thus ensues. This contraction compressively heats the stellar core. Depending upon the star's initial conditions, the temperature threshold for Helium ignition may thereby be breached.

Helium ignition may be modeled as a self-bifurcation, and as a *metafinite conversion-singularity*, of the star's state-trajectory. The star's core life-process, hence its external appearance and outer behavior, transforms quanto-qualitatively. A core-process founded on Hydrogen fusion transitions to a core-process founded on Helium fusion. The former '[self-]*pollutant*' of the Hydrogen-burning star, Helium, becomes its new vital *resource*. That former 'entropy' of the star becomes its new 'negentropy', or "free energy" resource. Relative Helium mass-concentration, former control-variable, becomes new state-variable. Metrics of the relative mass-concentrations of the "wastes" of Helium fusion become the new control-variables. Most of the star's mass is still Hydrogen. Hydrogen fusion, continuing peripherally and intermittently, mainly outside the core, continues to co-determine the states and meta-states of the star. The metric of relative Hydrogen concentration thus continues to function as a state variable. The state-space has expanded to incorporate a former control-axis. A new control-space [axis / dimension / metric] has emerged.

The vantage of self-bifurcation, of dialectics or meta-dynamics, sees neither state-space nor control-space as static. The state-space itself, as a totality, is a dynamical self-variable -- not only in its basin/attractor contouring or flow structure, but even in its *fundamental geometry*, its very *dimensionality*. Likewise control-space. We see a unified or unitary and [self-meta-]evolving state/control metaspace, combining state-space and control-space axes.

These meta-dynamical processes are not captured, not modeled, by standard integrodifferential equation models of such self-reflexive, self-refluxive meta-systems. These standard equations generally track no further than the boundaries between the sub-critical and critical values of control parameters, at best. The meta-evolutionary drive by which such systems *propel themselves* across their critical thresholds in control-space and beyond is not rendered in them. Coupling of state-variables and control-variables is usually omitted. *Cumulative* movement of control-point in response to the self-movement of the state-point is neglected. It is usually tacitly assumed that control parameter settings can be reset only by forces *external* to the system itself. The possibility of *internal* control, self-determination, self-transformation is usually not considered.

Yet it is the very way of things. Self-bifurcative metadynamism is *ubiquitous* in nature, including 'human nature'.

Consider an 'onto-dynamic' cosmos-model which identifies the following succession of ontos, plus their various hybrids, as forming the prime gradient of cosmic meta-evolution: (1) sub-nuclear 'nonlinear waves', "quantum fields" or "particles", (2) sub-atomic "particles" ['meta-sub-nuclear "particles" 'made of sub-nuclear "particles", 'meta-fields made of fields', or 'meta-waves made of waves']; (3) atoms ['meta-sub-atomic "particles" 'made of sub-atomic "particles"]; (4) molecules ['meta-atoms made of atoms'], (5) prokaryotic 'pre-cells' or 'proto-cells' ['meta-molecules made of molecules']; (6) eukaryotic cells ['meta-prokaryotes 'made of prokaryotes']; (7) "multi-cellular organisms", i.e. plant and animal 'meta-biota' [[eukaryotic] 'meta-cells made of [eukaryotic] cells']; (8) animal societies ['meta-organisms made of organisms'], and; (9) human [or humanoid] 'meta-societies' ['meta-animal-societies made up of animal societies' via 'social endosymbiosis' or 'social symbiogenesis']. We omit from this onto-dynamical cosmos-model both the 'multi-ontic cumulum' of 'hybrid' micro-formations and the macro-cosmic and meso-cosmic 'vessels' of these micro-ontos, galaxies, stars, "solar" systems, intra-"solar"-systemic planets, intra-planetary oceans, lithospheres, atmospheres, biospheres, noospheres, etc., but only for the moment.

<u>Hypothesis</u>. If we choose to begin our model of *the onto-dynamics of cosmopoiesis* at that epoch in which *sub-atomic evolution*, the emergence of electrons, protons, neutrons and their "anti-particles", is the meristem of *cosmic meta-evolution*, then the ontological contents of the cosmos consists of both the *sub-nuclear* and the *sub-atomic* ontos, in addition to any unidentified/unknown/unrecognized *pre-sub-nuclear ontos*.

Sub-nuclear processes continue a net conversion of sub-nuclear into sub-atomic "particles", while still reproducing some varieties of "free" sub-nuclear "particles" as well. Sub-atomic processes also, in the net, expandedly reproduce populations of sub-atomic "particles", which thus accumulate from both sources. [Self-]Organization of "matter"/"energy" beyond the sub-atomic level is not yet extant/manifest.

Sub-nuclear population density is, in this epoch, a state-variable of this cosmos. The sub-atomics' densitymetric functions as both state-variable and control-variable. Sub-atomics' interaction-density may rise in certain loci as sub-atomic "particles" accumulate. When the value of the *sub-atomic populations' interactiondensity* parameter crosses its critical threshold, '*self-bifurcation* 1' occurs: sub-atomic processes begin to form *atoms* as well, sub-atoms 'of second degree'; 'meta-sub-atoms' *made of* sub-atoms.

The sub-atomic populations' interaction-density metric, formerly part control-parameter, now accrues wholly to the thus expanded cosmological state/control meta-space. The new, unprecedented interaction-density metric of atomic formations/populations becomes both meristemal state-variable and new control-parameter.

When, at various synchronic loci, the *atomic populations' interaction-density* values cross their critical threshold, *'self-bifurcation* **2**' occurs. Atomic formations have become developed enough, populous enough, and dense enough in their interactivity with one another to form *molecules* as well, atoms 'of second degree'; 'metaatoms' *made of* atoms. The atomic interaction-density metric, formerly part control-parameter, now passes entirely to the thus further expanded cosmological *ontology-metaspace*. The interaction-density metric of the new molecular formations/populations emerges as the new, dual state/control variable.

When, at various synchronic loci, the molecular populations' interaction-density values cross their critical threshold, 'self-bifurcation 3' occurs. Molecular organizations of 'meta-atomic' matter-energy have densified sufficiently to form prokaryotic pre-cells, molecules 'of 2nd degree'; 'meta-molecules' made of molecules. The molecular interaction-density metric, formerly dual, state/control variable, now transfers entirely to the thus further self-expanded universe-ontology metaspace. The interaction-density parameter of the new prokaryotic pre-cellular formations/populations emerges as new state/control variable.

When, at various synchronic loci, prokaryotic populations' interaction-densities exceed critical, 'self-bifurcation 4' eventuates. The prokaryotic 'meta-molecular', 'pre-cellular', 'proto-cellular', or "a-cellular" organizations have interaction-densified sufficiently to form *eukaryotic cells*, prokaryotes 'of second degree'; 'meta-prokaryotes' made of prokaryotes. The prokaryotic interactivity-metric, formerly dual, state/control variable, now accretes entirely to the thus further expanded *universal-ontology metaspace*. The interaction-density parameter of the new eukaryotic cellular formations/populations emerges as the new state/control variable. When, at various synchronic loci, *eukaryotic populations' densities* exceed critical, 'self-bifurcation 5' ensues: eukaryotic cellular organisms achieve sufficient "mass-energy action-density" to form *metazoa and metaphyta*, burgeoning *multicellular* plant and animal biomass, cells 'of second degree'; 'meta-cellular organizations' made of cells. The eukaryotic-cellular interactivity metric, formerly state/control variable, now devolves entirely to the thus further expanded *universal-control* state/control variable, now devolves entirely to the thus animal biomass, cells 'of second degree'; 'meta-cellular organizations' made of cells. The eukaryotic-cellular interactivity metric, formerly state/control variable, now devolves entirely to the thus further expanded *cosmo-ontological meta-space*. The activity-density parameter of metabiotic biomass emerges as the new state/control variable; its new axis sprouting out of the origin.

When various synchronic loci of *metabiotic populations' biomass activity-density* values cross their critical threshold, '*self-bifurcation* **6**' occurs. Multicellular self-organizations become ubiquitous enough to form *animal societies* -- termite metropolises, ant colonies, bee hives, wasp nests, herds of herbivores, schools of fish, flocks of birds, etc. There arise *metazoa 'of second degree'*; '*meta-meta-cellular* self-organizations', or 'meta-*multi*-cellular organisms' *made of* meta-cells, 'meta-meta-zoa' *made of* meta-zoa. . . .

The pre-atomics + atomics cosmos, we hold, is a cosmos qualitatively different from the previous, pre-atomics only one. It exhibits quantitatively and qualitatively different possibilities, different dynamical "laws", and different actualities, because of the new ontos, the new ontic qualities of activity, which it has added to itself.

The pre-molecular + molecular cosmos is again a qualitatively unprecedented, qualitatively expanded one vis-à-vis its predecessor. It exhibits possibilities, probabilities, and actualities that differ in kind from those of preceding stages of ontic evolution, because of the new ontos, the new ontological qualities of action self-added, while it continues to exhibit adjusted versions of the previous ontos' dynamics, cumulatively, or evolutely, not convolutely. The pre-cellular + cellular cosmos is also precisely an «aufheben» of the previous cosmos a cumulative self-negation of that cosmos, which integrally, concurrently (1) innovates upon it, (2) "cancels" it, (3) "elevates" it, and (4) "preserves" it. Likewise the, previous + metabiotic and previous + 'societic' universes.

The above is a verbal, narrative, phonogramic rendition, though eliding any mention of the hybrid ontic formations, of an *ontodynamic* model of the self-activity and self-bifurcative self-development of the cosmos. It models "cosmic meta-evolution", "cosmogenesis", or 'cosmological autocatalysis/autopoiesis' at the ontological level. This model, summarized in the second section of this **Prolegomena**, is presented in *full regalia* in the sequel, in an ideographic or "mathematical" form supplementary to the phonogramic, narrative form given above, via the arithmetics/algebras of *the dialectical metanumbers*, in the sub-section of the *Applications* section entitled "*Taxonomic Level One Application of* **Q** and **U** -- A Dialectical Model of the Nature/ "Physis» [«Aufheben» Structure/Meta-Fractality' of the Physical Universe]".

The Ontological Conversion 'Meta-Dynamic'. Cosmic meta-evolution and its self-bifurcation meta-dynamic are replete with depletion/accumulation meta-dynamics. No ontic formation is self-subsistent. Each subsists from, and expands its population(s) via transformation(s) of, its externity, consisting of populations "belonging to" previously-emerged onto(s), which it converts into its own kind. Each "accumulates" self by 'ddis-accumulating' predecessor(s). Mediating atomic evolution, stars subsist by converting sub-atomic "particles", Hydrogen ions, i.e., subatomic proton plasmas, protons naked of any negatrons (electrons), and later naked Helium nuclei and other multi-nucleonic nuclei, into "higher atomic species". Molecules accumulate as the self-conversion, into chemically-bound structures, of the 'free atoms' accumulated by stars. Prokaryotic cells formed and grew by conversion of 'free molecules' into themselves. Heterotrophic multicellular organisms formed from and ultimately feed off of 'free cells', 'cellular matter', matter organized up to the cellular level but no further, as well as multicellular matter. Animal societies formed from 'free'/socially-un-organized multicellular animals, and feed from 'multicellular matter', plant and animal, by predation and by proto-domestication [e.g., ants 'proto-domesticating' aphids].

This pattern reveals the *relativity* of concepts like 'pollutant' and 'natural resource', and of meta-evolutionary 'material entropy' versus 'material negentropy'. Helium is a 'waste-product', a 'material entropy' [substance unable to drive evolutionary process] *relative to* the process of Hydrogen fusion. But it becomes the primary 'natural resource', a 'potential free energy', or 'negentropy' source for Helium fusion. The most advanced enduring products of stellar/atomic evolution -- the Thorium, Uranium, etc., produced in the cataclysmic final death-moments of stellar supernovae -- are utter entropy-mass for any kind of star-sustaining fusion. They are hypothesized also to be, through radioactive decay heating and natural fission reactor formation in planetary interiors, key driving forces of planetary and lithospheric molecular and prokaryotic evolution -- outgassing and atmosphere/ocean/continent-formation; mantle convection and tectonodynamics; orogeny, volcanism and seismicity, etc., on up to biopoiesis itself.

Oxygen released by Earth's early autotrophic cells was a waste product, and a *toxic pollutant*, for themselves and for other "anaerobic" "autotrophic" ("plant") and heterotrophic ("animal") protocells and cells. But, relative to the emergent, higher-productivity 'natural technology' of aerobic respiration -- supersession of the previous, an-aerobic technology of fermentation -- Oxygen became a vital 'natural resource', a potent new 'material negentropy'. Accumulating atmospheric O₂ also formed the ozone ultraviolet shield, aiding an originally oceanic-only biosphere in enveloping developing continental land surfaces. Carbon dioxide is often labeled a "pollutant" by proponents of "global warming crisis" hypotheses. But CO₂ is actually a prime -- and currently depleted -- natural resource for the plant kingdom, the "primary producers" supporting the entire [surface] biosphere [with certain sub-oceanic and perhaps other subterranean exceptions].

The status of any natural formation, of any product of nature [including of human-nature], in terms of the "resource" vs. "pollutant", "ash vs. fuel", "food vs. toxin", "waste vs. raw material", and 'material energy/negentropy vs. entropy' epithets, does not arise via some absolute, intrinsic characteristic of that physical material. It is *relative* to the 'natural technology' in question. Planets and human bodies form from the "wastes" and "poisons" of stellar evolution; that fact alone makes plain this relativity. Only [Rocke-]Nazis and other genocidal and humanocidal maniacs hold that "people are pollution". Natural 'meta-evolution', that is, the *self-meta-evolution* of nature; *the dialectic of nature*, through its continual innovation of new '*natural technologies*', regularly *converts past pollutants into present resources*, poisons into nutrients, waste-products into fuels, 'material entropies' into 'free energies'. In human-social meta-evolution, *mutations in praxis and knowledge* convert *formerly unrecognized natural substances* into *valued and vital means of life*. Just consider the history of petroleum. Human mastery of plasma technology, including development of nuclear fusion power reactors, makes "mere" water eclipse petroleum and uranium alike as resources for energizing *biospherically beneficent* expansions *of human-social reproduction*.

Cosmo-auto-poiesis and its 'inter-epochal meta-dynamic' of 'self-bifurcation' is driven by ontological conversion 'meta-dynamics'; self-accelerating depletion/accumulation processes. Even 'mono-epochal', 'intra-epochal', 'evolutionary' differential equation system-models -- vis-à-vis 'multi-epochal', 'meta-evolutionary' 'meta-system' models -- are typically formable, if nonlinear, via denominator-resident dynamical ["time-varying"], 'ontology conversion-functions'. These dynamical functions subtract a conversion-rate-times-time, "time-varying" term from a time-invariant or "constant" parameter-value which measures the $\mathbf{t} = \mathbf{0}$ 'fund' of an evolutionary propulsion-/conversion-resource. At some <u>finite</u> \mathbf{t} value, that cumulative subtraction yields a $\mathbf{0}$ quantifier in the denominator, signifying the effectively complete conversion of that resource within a typical 'conversion locus' or 'evolutionary engine' of a 'conversion formation' of the evolutionary epoch in question. This marks, by a "singularity", the pure-quantitative infinity that results from purely-quantitative zero division, the 'epochal boundary', the 'conversion crisis', and the 'meta-dynamical', 'self-bifurcation leap' into the next ontic epoch.

Suitable metrical-ontic '*re-qualification*' of such equation-models via the ${}_{\alpha}\underline{\mu}$ arithmetic reveal the singularity's apparently "meaningless" [actually *infinitely erroneous*] and apparently "quantitatively infinite" value to be both tractably meaningful and qualitatively, ontologically '*metafinite*'.

<u>Self-Bifurcating Meta-Systems and the Nonlinearity Barrier</u>. We do not hold that the nonlinear equations which encode the "laws" of nature, as those "laws" are currently conceived by scientific consensus, are adequate descriptions of the nature-eventity, needing only to be solved as they stand.

<u>Hypothesis</u>. *The Nonlinearity Barrier* does arise, in part, from the mis-apprehension of the functions required to satisfy these equations, but also from mal-formulations of the equations themselves.

The Fetishism of "The "Laws" Of Nature". Inadequacies and incompletenesses of the "law" equations, plus some scientists' semi-conscious reifying, subject/object-inverting, pseudo-agent, pseudo-subjectivity-positing causation-externalizing discourse about "the laws that govern natural phenomena", further obstruct apprehension of actual solutions. Nature is not legislated. Nature has no legislature. The "laws" and 'law-equations' that <u>humans</u> formulate to describe observed diachronic and synchronic self-similarity patterns of natural phenomena obviously do not somehow dictate the behaviors of natural processes. About such cases, it is more accurate to state that 'phenomena govern "laws" ' than that "natural "laws" govern phenomena". The latter formulation may be considered a mere "figure of speech" by many of its users, but such "figures" subliminally influence human thought-processes. Science happens when self-sentient subjects aptly formulate language-based descriptions of nature's habitual behaviors. But these descriptions -- mental objects and symbolic, linguistic objects -- are obviously not the material causes of the phenomena and of the patterns that these idea-objects describe. The equations which formulate these descriptions are not prior, empowered agents which "govern" actual phenomena.

Terran scientific idiom today is habitually and consistently *hypostatizing*, *reifying*, and *fetishistic*, albeit figuratively, in positing "laws" and "equations" as if exo-potent '[*pseudo-]subjects*' which "govern" the actualities external to the human mind, which are thereby constructed as the passive/inert '[*pseudo-]objects*' of the '[*pseudo-]action*' of "natural law". These semi-conscious habits of scientists' speech and writing subconsciously infect their thinking as well, distracting their attention from the actual subjects and causes, and especially from their self-reflexive aspects. They deform the development of mathematical, ideographic insight and language no less than they deform discourse in natural language, and the creative processes of the *pre-conscious* imagination, *tending to block conceptual formation of 'The Reflexivity Paradigm*'.

The Fetishism of Abstract Time. The true solution-functions should explain time as a result of concrete/empirical self-duality, inter-/intra-activity, and self-/other-induced change, not the other way around. Dynamicists write, speak, and, subconsciously, think of the states of systems as being "time-varied", when, in actuality, time is the result of the self-variation [and other-induced variation] of the ensemble of all systems' states. Indeed, the actualities that dynamical systems model are 'time-varying', but in the sense of 'varying time', 'changing time' or 'contributing incrementally to' the ensemble 'time-in-general', as a result of their inherent activity -- of the fact that they are activity -- rather than in the sense of their being "varied by time". [self-induced and other-induced] change is the cause of time. Time is not the cause of change. In the prevailing conventions of the ideographic formulation of integrodifferential equations, the time parameter, 't', is habitually afforded the role of ultimate independent variable, as if 'ultimate cause', with the states of systems formulated as ultimate dependent variables, as if but the ultimate 'effects' of "time". These equations -- and, more importantly, the semi-conscious thought-processes associated therewith, supported by the ideolinguistic, ideo-grammatical syntax of the equations -- should exhibit 't' as ultimate dependent variable instead. Abstract 'Time' is not the ultimate Subject of Nature. 'Time' as perceived by self-sentient eventities such as ourselves, is the ultimate object, result, or effect of the constantly [self-]changing nature of Nature. Time is not the cause of the world's dynamism. The world's inherent [meta-]dynamism is the cause of time. The concept of time expressed in statements such as "Time changes all things" is a reified, fetishistic, and subject/object inverted one, like that of natural "law". The totality of concrete, self-/other-induced change causes or creates the existence of "time". The abstraction 'Time' is not the cause of concrete changes. What contemporary Terrans perceive and conceive as "objective time" is simply 'co-change-in-general', a summary, aggregate amalgam/abstraction of the concurrent manifold of concrete, specific, particular changes. The formulation of solution-functions as expressions in which the t variable subliminally appears to be the ultimate cause, the universal independent variable, however notationally convenient in many contexts, semiconsciously expresses and reinforces this subject/object inverted, cause/effect confused habit of thought. That formulation subliminally, mentally erects the abstraction 'Time' as a process-external agent causing the observed changes in the world as if from outside the world; a 'pseudo-subject' to the world-contents thus constructed as the passive/inert 'pseudo-objects' of 'Time'.

It thereby distracts cognition from the *real, internal, immanent* subjects or agents which "compose" [the symphony of] the world; of its changes, of it *as* coherent change; *the actual evolutionary and 'meta-evolutionary' self-causal mechanisms.* It thus tends to block formation of '*The Reflexivity Paradigm*'. '*The Self-Bifurcation Paradigm*' can help in the healing of these semi-conscious conceptual pathologies. It invokes state-trajectory-propelled shifts in the values of self-bifurcation control-parameters to model the causation of meta-change; *process-immanent self-variations,* modeled by *self-bifurcation control-parameters,* which measure concrete accumulation/depletion [conversion] processes. Such concrete ontological *conversion*-processes are the *plural, multi-dimensional* "substance(s)" of time, for which the generic, pure-quantitative, and single-dimensional 't' variable, and the *system-external,* physical clock-processes which it encodes [e.g., *planetary rotations and revolutions*], are but *omissive proxies.*

<u>The Fetishism of Abstract Quantity</u>. We trace the 'semantic collapse' brought on by **0**-division "singularities" in especially the *nonlinear* integro-differential equation representation of dynamical systems to the use of 'unqualified zeros', 'purely quantitative zeros', in place of 'qualified zeros' or 'quanto-qualifier zeros', i.e., 'existential', 'specific', 'determinate', 'concretized', 'contextualized', 'quanto-qualitative' zeros, in 'denominator-resident' time-variable expressions whose range of variation encompasses, not any absolute, unqualified nullity of all extant ontos or of all extant units of measure, but merely the origin or zero of a specific physical dimensional unit, e.g., at the point of effectively complete conversion of one onto-mass into another within a 'conversion-locus' of a given naturally-arising 'conversion-formation'. Psycho-Archaeological excavations reveal roots of this mis-use of 'pure-quantitative zero' in an 'Elision of the Qualifiers' which began in Medieval Europe. It began most explicitly in the arithmetic/algebraic work of Vieta and Stevin. That work was partly inspired by the ancient Alexandrian proto-algebraic manuscripts believed to have been authored by Diophantus, circa 250 C.E. This 'Elision Of The Qualifiers' manifests ideographically in their elision of Diophantus' <u>Monad abbreviation-symbol</u>,

 \mathbf{M} , and *ideologically* in their conception of arithmetic as a language of '*pure, unqualified quantifiers*' -- their mode of rejection of the classical Greek *«arithmoi* <u>Mo</u>*nadikoi»* conception. The susceptibility and proneness of collective mathematical thought to this elision at this time, we hold, was conditioned by the growth of '*the monetary experience*'; of the 'equation' of qualitatively different commodities, in exchange, by means of a common unit of increasingly vanishing qualitative connotation, the unit of currency, e.g., $\mathbf{\pounds}$, $\mathbf{\$}$, etc. The conceptual resolution of these difficulties resides, we hold, in the deliberate, explicit formulation of an *integrally 'quanto-qualitative'* or '*qualo-quantitative' arithmetic / algebra* of ideographically '*qualified quantifiers*', or, equivalently, of '*quantified qualifiers*'.

"Transformation of Quantity into Quality". "The Self-Bifurcation Paradigm' models the [revolutionary] "transformation of quantitative change into qualitative change" via gradual, coupled ontological accumulations/dis-accumulations, to critical 'onto-mass' interaction-density, modeled by increasing or decreasing quantities of corresponding self-bifurcation control-parameter values, mirroring what successive actual measurements of the waxing/[self-]densifying or waning cumula of those dynamical substances would reveal. When these increases or decreases exceed definite quantitative thresholds, relatively sudden and qualitative/ontological changes manifest. Modeled determinations of this quanto-qualitative change include: (1) change/expansion of the state-space; (2) change to a new control parameter space; (3) emergence of one or more qualitatively new control-parameter dimensions/metrics, (4) emergence of one or more qualitatively new statevariable dimensions, including former control-parameter dimension(s) transferring-in to the new/expanded state-space, and; (5) old attractors' dissolution or modification, plus new attractors' emergence, i.e., expanded "essence"-dynamics; formation of new, "historically-specific", 'epoch-delimited' "emergent properties", entelechies, or "laws" of motion. In Summary, $\Delta \Box \Delta \rightarrow \Delta \rightarrow \Delta \rightarrow \dots$

<u>Summary: Model of Conjectured Conceptual Meta-Evolution to Meta-Dynamics Using Rhetorical Meta-Dynamics</u>. The following formulae, formed per the *rules-system* of the 'syncopated rhetorical algebra' version of symbolic dialectics, encode our model of an *immanent critique* or self-critique of contemporary Nonlinear Dynamical Systems Theory. This model foresees a meta-evolutionary emergence of 'Dialectical Meta-Systems Theory' or 'Dialectical Meta-Dynamics', as a 'metafinite conceptual singularity' or 'conceptual self-bifurcation' of contemporary Dynamics:

<u>Dynamics[Dynamics]</u> = <u>Dynamics</u> "of" <u>Dynamics</u> = <u>Dynamics</u>² = <u>Dynamics</u> + Δ [Dynamics];

<u>Dynamics</u> \rightarrow ~<u>Dynamics</u> = <u>Dynamics</u> + Δ [<u>Dynamics</u>] \Box <u>Dialectical Meta-Dynamics</u>;

Static State-Space w/State-Flow & Static Control-Space w/Externally-Induced Parameter-Shifts -> Dynamic State/Control 'Meta-Space' w/Dynamic State/Control-Flow via State-Flow-Induced Control-Parameter-Shifts.

<u>A Breakthrough in the Ideography of Dialectical Negation [Ontological Self-Innovation]</u>. In our usage, any operation which adds determinate qualitative differences, which induces changes w.r.t. the qualities/attributes of an operation/eventity upon which it operates, or with which it interacts, which are also changes w.r.t. its own qualities, is a *determinate negation* operation. It is a dialectical '*negator*'.

It is this not necessarily in any moral or outcome-evaluative sense, but simply in the technical sense that it is a cause of such changes. That is, we term such an operation a '*negator*' or '*negation*' even though typically the ontic changes it induces may be deemed net-beneficial.

The contra-Boolean assertions $\underline{\mathbf{X}}^2 \neq \underline{\mathbf{X}}$; $\underline{\mathbf{X}}^2 = \underline{\mathbf{X}} + \underline{\Delta}\underline{\mathbf{X}}$, and; $\underline{\mathbf{X}}^2 \stackrel{*}{\overleftarrow{}} \underline{\mathbf{X}}$, imply the assertion that, for eventities, 'the negative of the negative', 'negator of negator', 'negator negating itself', 'self-applied negation', or 'negator squared' does not equal some prior "positive", but something quantitatively and qualitatively different. Negation of negation does not revert to mere 'posit-tion' or 'pose-ition'. This may not be obvious from a surface reading of these inequations. We can attain this insight from them, however, as follows. In the context of dialectics, the negatory operation -- often denoted '~' in ideographic ("symbolic") formal logic -- relative to \mathbf{X} , is \mathbf{X} itself. With respect to \mathbf{X} , for \mathbf{X} , specific to \mathbf{X} : $\mathbf{A} = \mathbf{X}$.

That is, **x** itself is the *determinate* negation operation for **x**; **x** as a whole is the *immanent* negator for **x**:

 $-\underline{X} \equiv \underline{X}\underline{X} \equiv \underline{X}^2$, and $\underline{X}\underline{X} \equiv -\underline{X} \equiv --- \neq \underline{X}$.

The symbol for the dialectical negation operation should not be conceived as a symbol distinct from the symbol for the dialectical [ev]entity -- the concrete sub-totality or dialectical, meta-dynamical meta-system -- which is operated upon by, which is the object of, the negation operation that this symbol denotes. Dialectical negation is ontological self-critique. We can thus rewrite our contra-Boolean law in a form with which formal logics partially agree:

$$\sim \neq \sim$$
;
 $\sim^2 = \sim \sim \frac{1}{2} \sim$

The meaning of "negation" in this context is, of course, different from that appropriate to the context of formal logic. Here, the dialectical negation operation connotes discrete, quantized, ontological steps, self-bifurcation steps, in self-iterative processes of self-becoming. 'Self-becoming' here describes a non-teleological conception of self-constrained, self-convergent progress toward a defining meta-dynamical meta-attractor, which better manifests the 'true selves' or 'essences' of 'meta-systems' whose prior appearances or manifestations were in even greater self-discord with, or alienation from, or at substantial metastate-distances away w.r.t., their essences:

self-negation = self-change = self-transformation = change induced by self and change constrained by self -- i.e. by the "law" of self or that is self ('auto-nomy'), the self essence -- to convergence upon a fuller/more direct manifestation of that essence, and beyond;

- self-alienation, in the helical meta-trajectory where intermediate/mediating results of 1st negation register loss of the original, primitive *pre-vestige* of the appearance of key talifications of essence; loss of their *pre-echo* of that full essence, lost/forfeited *in gain of another such talification*, but *ultimately regained*, after 2nd negation/self-induced advance toward fuller manifestation of self or essence, and beyond;
- self-affirmation, self-realization, or self-assertion in the sense of ultimate essence-assertion, of the fuller positing or materialization or realization or actualization of essence, and beyond;
- self-transcendence, self-supersession, both in the sense of (a) successive negation of each partial, incomplete, relatively true but thus also relatively false, "half-way house" expression of essence along the way to fuller actualization of essence, and eventually also in the sense of (b) what succeeds that fuller appearance of essence. Essence-induced change of appearance; essence-governed change, driven by the "potential energy", the tension created by the discrepancy between essence and appearance, followed by essence-consistent essence-transcendence = formation of a new, higher meta-dynamical essence.

The self-iteration of such self-negation is *analogous* to the *internally-stimulated* taxis of a *dynamical system* from its birth-state or "initial condition(s)" towards its *attractor*, by means of a *transient* trajectory.

Dialectical Ideography seeks to *model* such patterns of change as a '*meta-dynamic*'; the *bifurcation sequence* of a '*self-bifurcating meta-system*' which attains and then grows beyond a whole series of 'meta-attractors', or dynamical "laws". It does so, because the consequence of its state-space action or "motion" within each successive 'meta-state' of its metafinitely changing state-space and basin(s) of attraction is the *accumulation or dis-accumulation* of a meta-attractor-specific kind of material or 'onto-mass' whose appropriate metrical quantification is its self-bifurcation control-parameter for that meta-dynamical regime and state/control 'meta-state'. The critical value of each such successive self-bifurcation control-parameter marks the boundary-of-dissolution of the '*law'-of-motion*, *self-quality*, or *dynamical essence* expressed 'geometrically' by the attractor of that basin, by its state/control 'meta-state' as a whole; by its coupled and co-evolving state-space and control-space as sub-wholes of that whole. That critical self-bifurcation threshold value also marks the birth "place" of a new, expanded, successor state-space and of its corresponding new control-space.

Note that 'dialectical negation', per this sub-section, is 'ontological' negation, not "propositional" negation. As asserted implicitly above, and as will be addressed explicitly later in the sequel, this ontological self-negation can also be characterized in terms of a 'meta-fractal', 'meta-monad-izing' 'self-composition', 'self-re-entry', or 'self-internalization'. Additional 'homeonymic' terms connoting this "universal" characteristic of dialectical self-negation, include 'self-[in]volution', 'self-infold-ment', 'self-enfolding', 'self-enclosure', 'self-envelopment', 'self-surround-ment', 'self-environment', 'self-containment', 'self-ingestion', 'self-re-injection', 'self-incorporation', 'self-constitution', 'self-content-ification', & 'self-part-ification [the turning itself into, or becoming-a-"mere"-part] of the whole', viz.:

subatomic "particles"	= 'meta-sub-/pre-nuclear "particles" ' made up out of sub/pre-nuclear "particles";
atoms	= 'meta-sub-atomic "particles" ' made up out of sub-atomic "particles";
molecules	= 'meta-atoms' made up out of atoms;
prokaryotic cells	= 'meta-molecules' made up out of molecules;
eukaryotic cells	 'meta-prokaryotes' made up out of prokaryotes;
meta-biota	= [metazoa & metaphyta] 'meta-eukaryotic meta-cellular organisms'; "meta-cells' made up out of a heterogeneous multiplicity of 'eukaryotic-cells';
animal societies	= 'meta-metazoa' made up out of metazoa;
human societies	"meta- <u>animal</u> -societies' made up out of <u>animal</u> -societies [proto-humans', dogs', horses', pigs', chickens', and cattles' <u>animal</u> -societies, etc.] & of "plant communities", by way of "mutual domestication" [" <u>social</u> symbiogenesis" / " <u>social</u> endosymbiosis"].

The Relativity of Quantitative Difference and of Qualitative Difference. Gottlob Frege argues, in discussing logical foundations for the concept of number [<u>The Foundations Of Arithmetic</u>, Northwestern U. Press, (Evanston, IL.: 1968), pp. 61-62, et passim.], that the correct numerosity to be predicated by any quantitative part of a logical proposition is determined by the concept applied by that proposition, and, we would argue, by the ontological partitioning of the universe of discourse implied by that concept. Thus, holding in hand a dollar coin and a euro coin, one will speak of a single unit each of two different kinds when speaking within the concepts "euro" and "dollar", but of two units of a single kind, when speaking within the concept "coin". An apple and an orange number "one" each if our ontology distinguishes apple from orange, but "two" if our ontology divides "fruit" from all else, sans sub-dividing the 'onto' "fruit". Thus, we hold, the number of a proposition is relative to its concept. Quantification is ontology-relative, relative to the 'principle of partition' applied in positing the universe of discourse. 'Qualification', we hold, is likewise, and even more fundamentally, relative to our ontological partitioning of the universe of discourse. Each category assigned its own **q**_k, and thus posited as differing "in 'ontic' kind" or 'qualitatively' from other such categories in a given ontodynamic model will be one of the "types" existentially asserted in our "ontological commitments" for that modeling purpose. Those commitments are made explicit via our perhaps multi-'level' **[n-'level']** partition-

operations, $\{ \prod_{n=0}^{n} \}$, for **u**, our chosen <u>universe</u> of discourse. Of course, our very designation of a *universe* of

discourse as such is in itself our primary act of partitioning, to which subsequent ontic partitioning within that universe is secondary. There is wide latitude in the choice of at least locally-coherent partitionings within typical universes of discourse to fit different modeling objectives.

Different ontic partitionings incur different patterns and costs of 'homeomorphic defect' relative to different modeling purposes. At one extreme, the "extreme reductionist" is possible, e.g., for $\mathbf{u} = \text{total known cosmos}$, $\mathbf{n} = \mathbf{1}$, the partition treating sub-/pre-nuclear particles as "the ultimate atoms" and the only onto, other than the space-time "background" ["the void"], and regarding all organizations of such as mere "aggregations", without onto-qualitative distinction. An opposite extreme would be to define the "logical individuals" of the universe, and assign each one its own $\mathbf{q}_{\mathbf{k}}$, treating each such individual as onto-qualitatively unique. Practical modeling efforts typically employ 'onto-partitionings' that fall between these extremes.

The Multi-Meta-Ontic 'Cumulum': 'Meta-Fractal', 'Evolute', 'Cumulatively-Enlangled' Character of a Dialectical Time-Energy/Space-Matter [Dis-]Continuum. If even just $-\underline{x}$ is -[-] or $\underline{x}[\underline{x}]$, a [self-]negation, a negation of negation, a negation "squared", then what becomes, in this ideography of dialectics, of the classical dialectics concept of "the negation of the negation", which some might see as $-[-\underline{x}]$? Should it mean $\underline{x}[\underline{x}[\underline{x}]]$, or --, or \underline{x}^3 ; negation "cubed"? Or, something else?

The answer to this question falls out directly from the careful application of the fundamental principle of dialectical negation just annunciated above, from the principle that dialectical negation -- determinate negation, internal negation, ontological negation -- is *self*-negation.

The "algebra" -- the "dialectical calculation" -- which dis-closes this is a bit intricate, but the resulting insight is fundamental to Dialectical Ideography, and to the structure of the *dialectical [dis-]continuum* or *metafinite*, *multi-dimensional/multi-meta-ontic/multi-meta-monadic cumulum* that it encodes. This insight is further expressed, by other narrative and picto-symbolic means, in other parts of this exposition. Here we endeavor to evoke it by *algebra-like* means.

Distinctly for dialectical negation, vis-à-vis formal-logical, propositional negation, the result of second negation does not equal that of *no negation*. Second negation does not simply return the 'negatand' to its state *prior to* first negation. Second negation of first negation is not flatly circular, or *cyclical*. It is *helical*, representing a further *qualitative* advance beyond *both* the original state and the first-negated state:

where ' ⊢' is the Frege-descended, Russell/Whitehead, Principia Mathematica ideogram for assertion or affirmation¹⁴.

This abrogates the pattern, rule, or "law" of the ideography of [propositional] negation for formal logic, wherein:

Secondly, and crucially, the 2nd *negator* in $\neg \neg \underline{\mathbf{x}}$ cannot equal the 1st *negator*. The 2nd negation operation must be an operation *qualitatively different* from the 1st negation operation. This follows immediately from the principle of self-negation. The "meta-state" $\neg \underline{\mathbf{x}}$ is already *qualitatively* different from the "meta-state" $\underline{\mathbf{x}}$. Therefore, negating $\neg \underline{\mathbf{x}}$ with the same negator with which $\underline{\mathbf{x}}$ is dialectically negated would fail to constitute a *self*-negation of $\neg \underline{\mathbf{x}}$. It would be merely a *flexion* of $\neg \underline{\mathbf{x}}$ by \neg , not a *reflexion* of $\neg \underline{\mathbf{x}}$ by $\neg \underline{\mathbf{x}}$ itself. Thus also, the result of the "double negation" of $\underline{\mathbf{x}}$ differs *qualitatively* from that of its "single negation" and also from that of its "non-negation":

 $\underline{\mathbf{X}} \xrightarrow{\frac{1}{2}} -\mathbf{-}\underline{\mathbf{X}} = -\mathbf{-}\underline{\mathbf{X}} \begin{bmatrix} -\mathbf{X} \end{bmatrix} \xrightarrow{\frac{1}{2}} -\mathbf{\underline{X}}$

Above, we have already resolved the putative "unary" application of one \sim operation in $\sim \underline{X}$, into an iterated, binary self-application of that same \sim operation, as asserted by the [in]equations:

$$\sim \underline{X} \equiv \underline{X}\underline{X} \equiv \underline{X}^2 \equiv \sim \sim \equiv \sim^2 \frac{1}{2} \sim \cdots$$

Dialectical Ideography

I- 76 Distributed «Samizdat» by Foundation Encyclopedia Dialectica

Iterated application of dialectical negation operations entails qualitative distinctions among successive negation signs once such signs appear in succession three times or more if it is to be consistent with the principle of *dialectical negation as self-negation* expressed above.

A syntactic, notational rule which captures this semantic and conceptual principle is to regard the tilde, '~', in the context of this Dialectical Ideography, as a "*leftward horizontal ditto*".

As such, that tilde '~' stands for, and is replaceable by, the whole of whatever ideogram or ideographic symbol-string stands to its right. Thus, $\sim \mathbf{X} = \sim [\sim \mathbf{X}]$, and if $\sim \mathbf{X} = \mathbf{X}^2$, then $\sim [\sim \mathbf{X}] = \sim [\mathbf{X}^2] = [\mathbf{X}^2][\mathbf{X}^2] = \mathbf{X}^4$, not \mathbf{X}^3 , i.e. $\sim \sim \mathbf{X} = \mathbf{X}^4 = \sim^4 \neq \sim^3$ or \mathbf{X}^3 . The meaning of '~', which denotes the ideographic 'subject-predicate' or 'subject-verb', depends upon symbolic context, upon what symbol(s) stand(s) to its right, as its operand, argument, '[predicate-]object' or '[verb-]object'.

The syntax of the conventional "ditto" meaning of the symbol '"' is that of a 'downward vertical replication' indicator:

х		х
	⇔ ["is equivalent to"]	
		Y

If we 'leftward-horizontalize' that syntactic function/operation, and rotate its symbol by 90°, we have --

	= [X]	⇔ ["is equivalent to"]	<u>x[x]</u> ,
i.e.,	~[X]	⇔ "" "	<u>x[x]</u> .

That is, the **90°-**rotated ditto-sign, '=', signifies or indicates to us that we are to copy or replicate the symbol *or symbol-string* to the right of this '=' symbol, replacing this '=' symbol with that entire symbol or symbol-string, juxtaposing that symbol(-string) to itself by substituting it itself, on its own *left* side, for the = sign.

That procedure also describes the *syntactical* function of this 'dialectical negator' symbol, '~', which enables it to function *semantically* as the ideogram and '*idea-gram*' for this idea of *dialectical negation* as '*evolute*, *cumulative negation*' in this dialectical ideography or '*idea-graphy*', wherein juxtaposition of symbol(-string)s denotes an 'ontological' or '*qualitative product*' -- *qualitative multiplication* or ontological 'product-tion' -- as opposed to the 'pure-quantitative' multiplication or 'pure-quantitative product-tion' of ordinary arithmetic.

Applying this *syntactical rule* for the '~' symbol re-iteratively, starting with ~[X], and applying rules of exponentiation familiar from ordinary arithmetic at the "superscript" or "exponential" level, and, in addition, at the 'super-superscript' or 'meta-exponential' level, we obtain:

~[X]	=	[x][x]	=	xx	=	<u>x</u> ²	=	<u>x</u> ² ;
~[X][X]	=	[X][X][[X][X]]	-	<u>xx[xx]</u>	=	<u>x²[x²]</u>	=	<u>x</u> ^{2²;}
~[X][X][[X][X]]	=	[x][x][x][x]]/ [x][x][x][x]]]	=	xxxx[xxxx]	=	<u>x</u> ⁴ [x ⁴]	-	<u>x</u> ^{2³;}
~[<u>x</u> ⁴ [<u>x</u> ⁴]]	=	[x ⁴ [x ⁴]] <i>[</i> [x ⁴ [x ⁴]] <i>]</i>	=	xxxxxxxx[xxxxxxxx]	=	<u>x⁸[x⁸]</u>	=	<u>x</u> ^{2⁴;}
~[<u>x</u> ⁸ [<u>x</u> ⁸]]	=	[x ⁸ [x ⁸]]/ [x ⁸ [x ⁸]]]	=	<u>xxxxx</u> [xxxxx]	=	<u>x</u> ¹⁶ [x ¹⁶]	=	<u>x</u> 25;
~[x ¹⁶ [x ¹⁶]]	=	[x ¹⁶ [x ¹⁶]]/ [x ¹⁶ [x ¹⁶]]]	=	<u>xxxxx</u> [xxxxx]	=	<u>x</u> ³² [x ³²]	=	<u>x</u> ² ⁶ ;
~[x ³² [x ³²]]	-	[x ³² [x ³²]]/ [x ³² [x ³²]]]	=	<u>xxxxx</u> [xxxxx]	=	<u>x</u> ⁶⁴ [x ⁶⁴]	=	<u>x</u> ² ⁷ ;

Dialectical Ideography

I- 77 Distributed «Samizdat» by Foundation Encyclopedia Dialectica

Another way to see this principle of ontological self-change or self-negation is to employ a subscript notation, with $-_i$ and $-_k$ denoting qualitatively different negation operations, whenever $\mathbf{j} \neq \mathbf{k}$, and here given $\mathbf{X} = \mathbf{X}_1$:

~~ <u>×</u>		- ₂ - ₁ - ₁	=	~ ₂ [~ ₁ ~ ₁]	=	~ ₂ [~ ₁ ²]	=	~2[~2] =	~2~2	= -	$\sim_2^2 =$	[~1 ²] ² =	~31	pá	~13
or															
~~ <u>X</u> 1		<u>X2X1X</u> 1	=	<u>X</u> 2[X1X1]	=	$\underline{\mathbf{x}}_{2}[\underline{\mathbf{x}}_{1}^{2}]$	=	<u>x</u> 2[x2]	$= \underline{\mathbf{X}}_2 \underline{\mathbf{X}}_2$	=	$\underline{\mathbf{x}}_2^2 =$	$[\underline{x}_1^2]^2 =$	<u>x</u> ₃ ¹	pá	<u>x</u> ₁³,
where	in:														
~1 }	~2	₹ ~3, i.e	e., j	<u>x</u> 1 + <u>x</u> 2	2	(3, or, eq	uiv	alently, 2	(1 ¹ ¹ ¹ ¹	(1 ² }	<u>x</u> 1 ⁴ .				

The meanings of the strings of ideographic symbols above may seem obscure to you if you are unused to notation-intensive reading and thinking, as also if you are used to ideographic notations which adhere to a strict "numeral $\frac{1}{4}$ operation" or "argument $\frac{1}{4}$ function" '*ideogrammar*', or because of the level of abstraction and lack of sensuous exemplification of that which is here denoted by the universal ontic variable $\underline{\mathbf{x}}$. Therefore, let's clarify these meanings via natural language symbols, still highly abstract, but with connotations familiar for those who've experienced previous accounts of dialectics. Consider the following [dis-]continuum of qualitative differences:

 $\frac{\text{pre-pre-thesis}}{\text{or}} \stackrel{\frac{3}{4}}{=} \frac{\text{pre-thesis}}{\frac{3}{4}} \stackrel{\frac{3}{4}}{=} \frac{\text{post-thesis}}{\frac{3}{4}} = \frac{\text{synthesis}}{\frac{3}{4}} \stackrel{\frac{3}{4}}{=} \frac{\text{post-synthesis}}{\frac{3}{4}} = \frac{1}{2} \frac{1}{2$

Let's replace the ideogramic term $\underline{\mathbf{x}}_1$ with the phonogramic term $|\underline{\mathbf{thesis}}_1|$, and replay the "double negation" sequences above. Note how superscripts add, but subscripts follow a different rule:

 \sim -<u>thesis</u>₁ = <u>thesis</u>₂[<u>thesis</u>₁[<u>thesis</u>₁]] = <u>thesis</u>₂[<u>thesis</u>₁²] = <u>thesis</u>₂[<u>thesis</u>₂] = <u>thesis</u>₂² = <u>thesis</u>₁⁴ = <u>thesis</u>₃¹ \neq <u>thesis</u>₁³.

Thus $\underline{\mathbf{x}_1}^2$, '*the self-reflexion of* <u>thesis</u>₁', or '<u>thesis</u>₁ *squared*', is also '<u>synthesis</u>₁', and <u> $\mathbf{x}_1[\mathbf{x}_1]$ </u> expresses that synthesis as the *full* development of a prior antithesis, the antithesis of <u>thesis</u>₁ *with itself*.

That is, in $\underline{\mathbf{X}}_1 \rightarrow \underline{\mathbf{X}}_2 = \underline{\mathbf{X}}_1^2$, the symbols $\underline{\mathbf{X}}_1^2 = \underline{\mathbf{X}}_1^1 [\underline{\mathbf{X}}_1^1]$ denote the *completion* of the $\underline{\mathbf{X}}_1$ self-duality, its full-blown self-antithesis.

The route from $\underline{\mathbf{x}}_1^1[\underline{\mathbf{x}}_1^0] = \underline{\mathbf{x}}_1^1[\underline{\mathbf{1}}] = \underline{\mathbf{x}}_1^{1+0} = \underline{\mathbf{x}}_1^1 = \underline{\mathbf{x}}_1$ through $\underline{\mathbf{x}}_1^1[\underline{\mathbf{x}}_1^{1/2}] = \underline{\mathbf{x}}_1^{3/2} = \underline{\mathbf{x}}_1^{1.5}$ and on through $\underline{\mathbf{x}}_1^1[\underline{\mathbf{x}}_1^{99/100}] = \underline{\mathbf{x}}_1^{199/100} = \underline{\mathbf{x}}_1^{1.99}$ to $\underline{\mathbf{x}}_1^1[\underline{\mathbf{x}}_1^1] = \underline{\mathbf{x}}_1^2 = \underline{\mathbf{x}}_2^1$ is the course of the self-development of that self-antithesis:

<u>thesis</u>₁ \rightarrow <u>thesis</u>₁[<u>thesis</u>₁] = <u>thesis</u>₁² = <u>thesis</u>₂ = <u>synthesis</u>₁ \rightarrow <u>thesis</u>₂[<u>thesis</u>₂] = <u>thesis</u>₃ = <u>synthesis</u>₂..., where the ideogram ' \rightarrow ' denotes "directional metafinite transition", the phrase "goes to", or the verb "becomes".

<u>Relativity of the Dialectical Negation Operation</u>. In summary, the meaning of the dialectical negation operation, denoted \sim , is not absolute and fixed, non-contextually; the same wherever the ideogram ' \sim ' appears. That meaning is *relative* to that which is being negated. The meaning/content of a determinate negation operation is determined by its object; by that to which that operation is applied in the context of each given formulaic occurrence of its ideogram. Dialectical negation signs are *context-dependent* or *context-relative* in the sense of being 'operand-dependent', 'operand-determined', or 'operand-evaluated'. They pair, as 'subject/object identicals'; 'function/argument identicals'; 'operand/operator identicals', plus as 'operation/numeral identicals'.

We can reconstruct preceding stages of a "dialectical [dis-]continuum" by back-analyzing from the present stage. Call that present stage '<u>thesis</u>₁'. Apply the notational principles <u>thesis</u>₁ = <u>synthesis</u>₀ = [<u>thesis</u>₀]², and 'square-root of <u>thesis</u>₁' or 'self-reflexive-source of <u>thesis</u>₁' = $\sqrt{[thesis_1]} = [thesis_1]^{1/2}$ = <u>thesis</u>₀. Use '<u>a</u> \leftarrow <u>b</u>' to signify that '<u>b</u> arose from <u>a</u>', or '<u>b</u> is the offspring of <u>a</u>', or '<u>b</u> points back to <u>a</u> as its source / origin'. Use '∂' to denote the modifier 'partially-formed'. Then you have:

... pre-thesis \leftarrow pre-thesis[pre-thesis] = pre-synthesis = thesis = synthesis^{1/2} = $\sqrt{[synthesis]}$, or

 $\dots \underline{\text{thesis}}_{0} \leftarrow \underline{\text{thesis}}_{0} [\partial \underline{\text{thesis}}_{0}] = \underline{\text{thesis}}_{1}^{1/2} [\partial \underline{\text{thesis}}_{1}^{1/2}] \leftarrow \underline{\text{synthesis}}_{0} = \underline{\text{thesis}}_{1} = \underline{\text{synthesis}}_{1}^{1/2}$

You can, therefore, resolve any *present*-ation, call it <u>thesis</u>₁, into its own reflexive history, via the following iterative, 'pyramidal' analysis. [This analysis becomes much more complex when interactions with *other* eventities, not just the iterated *self*-interactions of the <u>thesis</u> eventity itself, are included]:

[[thesis ₁] ²] ¹	=	$[[thesis_{+1}]^1]^2 =$
[thesis ₀ [thesis ₀]] ²	=	$[[thesis_{+0}]^2]^2 =$
[[thesis_1[thesis_1]] ² [thesis_1[thesis_1]] ²]	=	$[[thesis_{-1}]^4]^2 =$
[[[thesis_1thesis_2]] ² [thesis_1thesis_2]] ²][[thesis_2[thesis_2]] ² [thesis_2[thesis_2]] ²]]	=	$[[thesis_2]^8]^2 =$

The past is literally contained in, "rolled-up" into, and accumulated in and as, the 'cumulum' of the present moment.

For example, look at your own wrist. From your present vantage, it may be possible, at first, to imagine that, were you to examine it under the unlimited magnification-power of an ideal 'fractal microscope', the substance

of your skin would *telescope* in the same way that, *conceptually*, the **3**-dimensional "**R**eal continuum", **R**³, regresses. But, upon further reflection, you would find that, in actuality, a progressively increasing magnification would reveal a 'dis-continuum' of eukaryotic cells, **e**, and then, within each eukaryotic cell, a dis-continuum of prokaryotic-remnant organelles, **p**, and then, within each organelle, a dis-continuum of <u>molecules</u>, **m**, and then, within each molecule, a dis-continuum of <u>sub-atomic</u> "particles", **s**, and then, within each sub-nuclear particle, a dis-continuum of sub-<u>n</u>uclear "particles", **n**, as summarized ideographically in the following 'dyadic/diactic decomposition', wherein 'hybrid ontos' are omitted, and only the 'meristemal', *non-hybrid* or 'self-hybrid' component of each *nested scale* of the 'ontological meta-state' is shown explicitly --

[b] + ... = [[e][e]] + ... = [[[p][p]][[p]]] + ... =

[[[[m][m]]][[m][m]]][[[m][m]][[m][m]]]] + ... =

((())))

This descending synchronic meta-scaling recapitulates diachronic succession *in reverse*. In this sense, the *present* content of "space" recapitulates the *past* content of "time". If physical-spatial size-changes or changes of "geometric" scale -- of synchronic scope -- are associated with transitions from **thesis**_k to **thesis**_{k+1}, then the pattern notated above involves self-similar, dyadic structure at many qualitative [meta-]scales, that is, a *spatial 'meta-fractal' structure* of self-duality or 'indivi-duality'. If '*temporal accelerations*', changes of duration-scale or diachronic scope, accompany transitions from **thesis**_k to **thesis**_{k+1}, then the pattern notated above is also a *temporal 'meta-fractal*' pattern.

If $\underline{\mathbf{X}}$ even "standing by itself" is a negator as well as a "self-positor", then what is $\underline{\mathbf{X}}$ a negation of, and what is it, standing by itself, negating?

It is, of course, the *potential future* negator of itself. But, when just emerged, or just asserted as the value, measure, or description of the current meta-state of some meta-system, as the result of the immediately preceding self-transformation of that meta-system, one might answer, somewhat metaphysically, that, ultimately, $\underline{\mathbf{X}}$ denotes a *determinate* negation of its own non-existence, of $\neg \exists \underline{\mathbf{X}}$ or \mathbf{q}_0 . Determinate, finite manifestation of $\underline{\mathbf{X}}$ negates its *infinitesimal* manifestation, or *non*-manifestation, its [earlier] unmanifest meta-state, absenting its absence, negating its abstract/total negation as a non-existent.

More concretely, $\underline{\mathbf{x}}$ is the result or product of a *prior* negation, of the self-negation of its immediate predecessor, of the self-operation of the "square-root" of $\underline{\mathbf{x}}$, the 'meta-state' denoted $\sqrt{\underline{\mathbf{x}}}$ or $\underline{\mathbf{x}}^{1/2}$. It, $\underline{\mathbf{x}}$, represents a *moment* in a process of self-development, in a process of self-iteration, a succession of determinate self-negations, of self-re-positings; of self-re-posit-tionings; a chain of self-developing dyadic / 'diactic' / quadratic self-antitheses or self-syntheses.

It, $\underline{\mathbf{X}} = \underline{\mathbf{X}}^1$, denotes the outcome of the self-synthesis of $\underline{\mathbf{X}}^{1/2}$, of the full development of the *antithesis* of $\underline{\mathbf{X}}^{1/2}$ with itself, just as $\underline{\mathbf{X}}^2$ is the self-synthesis of $\underline{\mathbf{X}}$ or $\underline{\mathbf{X}}^1$, the fruition of the *intra-antithesis* or self-confrontation of $\underline{\mathbf{X}}^1$. Note again that superscripts of juxtaposed variables -- "exponents", or "powers" -- add in dialector algebra, as in ordinary algebra:

 →	<u>x</u> ^{1/8}	→	<u>x</u> ^{1/4}	→	<u>x</u> ^{1/2}	→	<u>x</u> ¹	\rightarrow	<u>x</u> ²	->	<u>x</u> ⁴	->	<u>x</u> ⁸ -	*;
	- <u>x</u> ^{1/8} =	= <u>x</u> ^{1/4} ;	$\sim \underline{x}^{1/4} =$		<u>x</u> ^{1/2} ;	~ <u>x</u> ^{1/2} =	<u>x</u> 1;	~ <u>X</u> ¹ =	<u>x</u> ² ;	~ <u>x</u> ²	= <u>x</u> ⁴ ;	~ <u>×</u> ⁴ =	<u>x</u> ⁸	;
	<u>x</u> ^{1/8} x	$\underline{x}^{1/8} = \underline{x}^{1/8}$	^{1/4} ; <u>x</u> ^{1/4} x ^{1/4}	=	<u>x</u> ^{1/2} ;	$\underline{\mathbf{x}}^{1/2}\underline{\mathbf{x}}^{1/2} =$	<u>x</u> 1; <u>x</u>	$\underline{x}^{1}\underline{x}^{1} =$	<u>x</u> ² ;	$\underline{x}^{2}\underline{x}^{2}$	= <u>x</u> ⁴ ;	$\underline{x}^{4}\underline{x}^{4} =$	<u>x</u> ⁸	;
	<u>x</u> ^{1/8}	2	<u>x</u> ^{1/4}	¥	<u>x</u> ^{1/2}	*	<u>x</u> ¹	2	<u>x</u> ²	2	<u>x</u> ⁴	2	<u>x</u> ⁸	 .

This world of dialectics is, from one point of view, a world of *self-haunted entities*. The systems modeled by <u>X</u> are *self-haunted systems*. As eventities, what they do is what they manifestly are, and everything they do "comes back to haunt them", the good, the bad, the indifferent! The "sentient" entities among them are *self-haunted* not just in an interior sense of mental/emotional phenomena, but -- and in an inwardly/outwardly coordinated way -- in an 'exterior' sense as well. Both inwardly and outwardly they are surrounded, in part, by the 'reflux cumulum', the cumulative products and consequences, of their own past actions, and are forced to thus confront their own past selves at every turn at least outwardly, even should they attempt to block, if selfsentient, the internal faces of those past selves from awareness inwardly. As we note further on, this formulation hints at the common essence of the logical and set-theoretical paradoxes and of the problem of nonlinearity. It also locates a "rational kernel" of those ancient observations, handed down to the contemporary Nations of the Earth in virtually every human cultural tradition, under names like "The Golden Rude", ""The Law of All Action", "The Law Of The Cause And Effect Of Action", "The Law Of The Echoic Re-Action Of Action", "The Law Of Compensation", or "The Law Of Karma".

You may have noticed a pattern within the sequence of formulae above. That syntactic pattern images the semantic 'meta-pattern' of what might be described, variously, as the "negation of the negation structure", the "comprehensive self-reflexive structure", the "nonlinear structure" or the 'karmic structure' of the 'time-cumulum'. This 'cumulum' is a 'continuum' that embraces relative dis-continuum, or sudden, qualitative change, as a phenomenon which regularly results from the self-bifurcations of dialectical, 'meta-dynamical', 'meta-systems'.

This 'meta-pattern' can be formulated *ideographically* in terms of a 'dynamical reflexion' or of a temporalized self-reflexive function involving two levels of superscription, which are used to signify two levels exponentiation. We again invoke a single level of subscription as well, as employed earlier, via the identification $\underline{X} = \underline{X}_0$. Note well the rule or pattern in the subscript and superscript notational phenomena displayed below:

· x	- ₁₋₁	- _{z/t} *	- L _t /I	1 ⁴ /1 × -	\$/T A~	_	A.~
× ۲- ک	${\bf X}^{0}_{3-5}$ =	\mathbf{X}_{0}^{\dagger} =	= [_{8/1} °] =	= X ⁰ _{8/1}	8/I 0 X~	= 8-1	⊼~ .
$\overline{\mathbf{X}}^{0}_{5_{+2}} \rightarrow \cdots$	$\leftarrow \mathbf{X}_{\mathbf{x}_{+\mathbf{x}}}^{0} \rightarrow \mathbf{X}_{\mathbf{x}_{+\mathbf{x}}}$	$\overline{\mathbf{X}}^{0}_{5_{0}} \rightarrow \overline{\mathbf{X}}^{0}_{5_{+}}$	$\overline{\mathbf{X}}_{\mathbf{x}_{-1}}^{0} \rightarrow$	$\mathbf{X}^{0}_{z-z} \rightarrow$	X ⁰ ₅₋₃ →	←	
ć ← ^{1/8} 0X	→ X ⁰ ∜,1 →	$\overline{\mathbf{X}}^{0}_{\mathrm{J}/\mathrm{J}} \rightarrow \overline{\mathbf{X}}^{0}_{\mathrm{S}/\mathrm{J}}$	X ⁰ _{1/5} →	$\overline{\mathbf{X}}_{1,t}^{0} \rightarrow$	X ⁰ ^{1/8} →	~	
X ⁺³ →	$\rightarrow \mathbf{X}^{+_{\mathbf{X}}} \rightarrow$	$\mathbf{X}^0 \rightarrow \mathbf{X}^{^{+1}}$	x ⁻¹ →	x ^{-s} →	⊼⁻³ →	←	

 $\cdots - \mathbf{X}^{+3} = -\mathbf{X}^{0}_{4/1} = \mathbf{X}^{0}_{4/1} [\mathbf{X}^{0}_{4/1}] = \mathbf{X}^{0}_{8} = \mathbf{X}^{0}_{8} = \mathbf{X}^{0}_{3}_{+3} = \mathbf{X}^{+3} \cdots ;$ $\cdots - \mathbf{X}^{+1} = -\mathbf{X}^{0}_{3/1} = \mathbf{X}^{0}_{3/1} [\mathbf{X}^{0}_{3/1}] = \mathbf{X}^{0}_{4} = \mathbf{X}^{0}_{4} = \mathbf{X}^{0}_{3+3} = \mathbf{X}^{+1} \cdots ;$ $\cdots - \mathbf{X}^{0} = -\mathbf{X}^{0}_{1/1} = \mathbf{X}^{0}_{1/1} [\mathbf{X}^{0}_{1/1}] = \mathbf{X}^{0}_{5} = \mathbf{X}^{0}_{5} = \mathbf{X}^{0}_{5+3} = \mathbf{X}^{+1} \cdots ;$ $\cdots - \mathbf{X}^{-1} = -\mathbf{X}^{0}_{1/5} = \mathbf{X}^{0}_{1/5} [\mathbf{X}^{0}_{1/5}] = \mathbf{X}^{0}_{5} = \mathbf{X}^{0}_{5} = \mathbf{X}^{0}_{5+3} = \mathbf{X}^{0}_{5+3} \cdots ;$ $\cdots - \mathbf{X}^{-1} = -\mathbf{X}^{0}_{1/5} = \mathbf{X}^{0}_{1/5} [\mathbf{X}^{0}_{1/5}] = \mathbf{X}^{0}_{1/5} = \mathbf{X}^{0}_{1/1} = \mathbf{X}^{0}_{50} = \mathbf{X}^{+1} \cdots ;$ $\cdots - \mathbf{X}^{-1} = -\mathbf{X}^{0}_{1/6} = \mathbf{X}^{0}_{1/6} [\mathbf{X}^{0}_{1/6}] = \mathbf{X}^{0}_{1/5} = \mathbf{X}^{0}_{1/5} = \mathbf{X}^{0}_{50} = \mathbf{X}^{+1} \cdots ;$

 $\cdots \rightarrow \mathbf{\overline{X}}^{-2} = [\mathbf{\overline{X}}^0]_{\mathbf{S}_{-2}} \rightarrow \mathbf{\overline{X}}^{-1} = [\mathbf{\overline{X}}^0]_{\mathbf{S}_{-1}} \rightarrow \mathbf{\overline{X}}^{-1} = [\mathbf{\overline{X}}^0]_{\mathbf{S}_{-1}} \rightarrow \mathbf{\overline{X}}^{0} = [\mathbf{\overline{X}}^0]_{\mathbf{S}_{0}} \rightarrow \mathbf{\overline{X}}^{+1} = [\mathbf{\overline{X}}^0]_{\mathbf{S}_{+1}} \rightarrow \cdots$

$\overline{\mathbf{X}}^{n+1} = \overline{\mathbf{X}}^n [\overline{\mathbf{X}}^n] = [\overline{\mathbf{X}}^n]_{\mathbf{x}}^{n+1}$ $\overline{\mathbf{X}}^n = \overline{\mathbf{X}}^{n-1} [\overline{\mathbf{X}}^{n-1}] = [\overline{\mathbf{X}}^{n-1}]_{\mathbf{x}}^{n+1}$

 $\overline{\mathbf{X}}^{t} = \left[\overline{\mathbf{X}}^{0} \right]_{\mathbf{S}_{t}}^{t}$

I- 81 Distributed «Samizdat» by Foundation Encyclopedia Dialectica

yndergoohl Inoitoolnid

Note the font size emphasis of the last three equations. They encode the pattern of the preceding multitude of instances. They employ *subscript-variables* and *superscript-variables*, the latter involving a *super-superscript*. The Greek phonogram τ , named *tau*, used as an ideogram, here denotes the *self-bifurcation index* or *immanent time epoch-index* for an ontology-level dialectical process or eventity, whose meta-state as of τ is denoted \underline{x}_t . The second-to-last equations assert that each successor-formation in a sequence of self-formations arising immanently in a dialectical succession-process is the result of the self-change, i.e., of the *self-duality*, manifesting as self-activity; the self-[re]flexion, or self-bifurcation, of its immediate predecessor-formation:

$$\underline{\mathbf{X}}_{\tau+1} = -\underline{\mathbf{X}}_{\tau} = \underline{\mathbf{X}}_{\tau}\underline{\mathbf{X}}_{\tau} = \underline{\mathbf{X}}_{\tau}^{2}$$

The last equation asserts that any 'meta-state-description' -- any description of the 'meta-state' of this dialectical process *as of 'self-bifurcation*' number τ -- can be computed from the *zeroth* 'meta-state-description'. Description **0** denotes that which the modeler chose to define as that of the *initial, original* 'meta-state' of the process. The τ th 'metastate description' is constructed from the **0**th by a **2**-to-the- τ -fold pairwise self-operation

of that original 'meta-state-description': $\underline{\mathbf{X}}_{\tau} = \underline{\mathbf{X}}_{0}^{2^{\tau}}$.

Note that the designation of the zeroth or initial 'meta-state-description' is somewhat arbitrary. The zeroth 'meta-state' need not imply an absolute beginning, a 'meta-state' without antecedents. The zeroth 'meta-state' is the successor of the minus-first 'meta-state', which is the successor of the minus-second 'meta-state', and so on. Designation of the zeroth 'meta-state' is a model design, model-specification decision. Note also the apparently deterministic computability of past and future 'metastate-descriptions' from the designated initial 'metastate-description'. This assumes that the eventity or dialectical self-formation being modeled is

the totality -- a totally autonomous universe-unto-itself, without externity. The solution $\underline{X}_t = \underline{X}_0^2$ tracks only "necessary change". By this, we mean essential (<u>essence-ial</u>) change; change arising from the dynamical essence of the self-formation or self-becoming in question. It excludes "accidental change", or even other predictable, deterministic effects on <u>meta-system</u> <u>m</u>, arising from other dialectical eventities external to that essence. However, most self-formations of interest are sub-totalities, subject to [or better, object to] "accident", to other external, environmental vicissitudes, interactions with other meta-systems at their own and at other 'levels' and 'meta-fractal scales', that can scar, deflect, or even abort their 'essence-ial' development. Practical dialectical sub-totality models cover external determination along with internal or self-determination. They must incorporate the consequences of direct fluxes, direct inputs from other sources, as of the re-fluxes of the self source, the self-re-inputs of previous self-outputs. Such 'meta-system' 'meta-models' must map the being-for-others moment, as well as the being-for-self moment, of dialectical dynamics. Per these formulae, the being-for-self aspect of a dialectical self-formation is described by a self-iteration, by an auto-iterative model, in contrast to conventional 'other-iterations' -- allo-iterative or hetero-iterative models:

"Other-Iterations' or 'Allo-Iterations':	'Self-Iterations' or 'Auto-Iterations':
$F \stackrel{*}{{\leftarrow}} x_0; j \neq k \text{ implies } x_j \stackrel{*}{{\leftarrow}} x_k$	$\underline{\mathbf{X}}_0 \neg \frac{3}{4} \underline{\mathbf{X}}_0; \mathbf{j} \neq \mathbf{k} \text{ implies } \underline{\mathbf{X}}_j \frac{3}{4} \underline{\mathbf{X}}_k$
$Fx_0 = x_1 = F^1x_0$	$\underline{\mathbf{x}}_{0}\underline{\mathbf{x}}_{0} = \underline{\mathbf{x}}_{1} = \underline{\mathbf{x}}_{0}^{1}\underline{\mathbf{x}}_{0}^{1} = \underline{\mathbf{x}}_{0}^{2}$
$Fx_1 = x_2 = F^2x_0 = F^1(F^1x_0)$	$\underline{X}_{1}\underline{X}_{1} = \underline{X}_{2} = \underline{X}_{0}^{2}\underline{X}_{0}^{2} = \underline{X}_{0}^{2}$
$Fx_2 = x_3 = F^3x_0 = F^1(F^1(F^1x_0))$	$\underline{\mathbf{X}}_{2}\underline{\mathbf{X}}_{2} = \underline{\mathbf{X}}_{3} = \underline{\mathbf{X}}_{0}^{4}\underline{\mathbf{X}}_{0}^{4} = \underline{\mathbf{X}}_{0}^{2}^{3}$
In summary	In summary
$\mathbf{x}_{\tau} = \mathbf{F}^{\tau} \mathbf{x}_{0}$	$\underline{\mathbf{X}}_{\tau} = \underline{\mathbf{X}}_{0}^{2^{\tau}}$
Dialectical Ideography I- 82	Distributed «Samizdat» by Foundation Encyclopedia Dialectica

Application of these paired formulae to a recently emergent domain of computer simulation modeling -- one that has become a hallmark of "complexity theory" -- clarifies key aspects of their divergent meanings.

Suppose C_{τ} denotes the status and configuration -- the total, multi-dimensional meta-state -- of a population of "adaptive software agents" in a rule-based computer simulation modeling a "complex adaptive system" via their "artificial life world" or "virtual universe" "game". Suppose **R** denotes the totality of the rules modeling the actual behavior of this complex adaptive system, formulated as a '<u>R</u>ules-Operator', wherein, for every value of τ , **R** \neq **C**_{τ}, and where, indeed **R** $\stackrel{1}{\leftarrow}$ **C**_{τ}. Then, classically, we can describe each step in the simulation by the equation: $C_{\tau+1} = R(C_{\tau}) = RC_{\tau}$, and, if τ_* denotes the maximum iteration count or stopping time-step index-value for the simulation, then the final, outcome meta-state of the simulation can be expressed as:

$$C_{\tau_*} = (R^{\tau_*})(C_{\tau}) = R^{\tau_*}C_{\tau}$$

What if we were to recast this model as a *dialectical simulation* model? Such a simulation might also be termed an *essential* simulation, because, in it, the onto-dynamic constituents of the Rules, $\mathbf{R}_{,}$, *themselves* also evolving, meta-dynamically, would inhere in the natures/definitions of the individual adaptive software agents themselves, and in that of their totality, so that, for every value of τ , $\mathbf{R} = \mathbf{C}_{,}$.

The generic description for the onto-dynamics of each step of the simulation would then become:

$$\underline{C}_{t+1} = -[\underline{C}_t] = \underline{C}_t[\underline{C}_t] = \underline{C}_t\underline{C}_t = \underline{C}_t^2 = [\underline{C}_t + \underline{\Delta C}_t] \stackrel{3}{\neq} \underline{C}_t$$

and the onto-dynamics of the final meta-state of the simulation could be expressed as:

$$\underline{C}_{\tau_*} = \underline{C}_0^{2^{\tau_*}}$$

These formulae describe a 'self-Ruled' or "auto-nom-ous" (self-developing; autopoietic) "virtual universe", $\mathbf{R}_{\tau} = \mathbf{C}_{\tau}$, as opposed to an 'other-Ruled' or "hetero-nom-ous" universe, $\mathbf{R} \stackrel{3}{\leftarrow} \mathbf{C}_{\tau}$, wherein a fixed set of Rules, are superimposed upon that universe of adaptive agents, as if from outside of it. Here the adopted English word element "nom" or "nomy" is from an ancient Greek word element, denoting "law", "custom", or "rule". Note that the "quadraticity' or 'self-squared-ness' of $\mathbf{C}_{\tau+1} = \mathbf{C}_{\tau} [\mathbf{C}_{\tau}]$ is such that the ontics 'inside' the "Self-Rule", $\mathbf{C}_{\tau} [_]$, and 'inside' the meta-state, $[\mathbf{C}_{\tau}]$, both change together -- "vary with τ " -- and differ qualitatively, at every epoch of their self-bifurcation, from those of their preceding and succeeding epochs. Thus, in general, the form $\mathbf{x}_{\tau} = \mathbf{F}^{\mathsf{T}} \mathbf{x}_{0}$ connotes other-determinism, external determinism, control by an F such that $\mathsf{F} \stackrel{2}{\neq} \mathbf{x}_{\tau}$, whereas the form $\mathbf{x}_{\tau} = \mathbf{x}_{0}^{2^{\mathsf{T}}}$ connotes internal determinism or self-determinism. Actual sub-totality systems are essentially a mixture or combination of both of these moments of determination, 'auto' and 'allo'.

Engels describes, in Anti-Duhring, various "negations" of a grain of barley and of a metamorphosing insect:

".... if ... a grain of barley meets conditions which are normal for it, if it falls on suitable soil ... it germinates; the grain as such ceases to exist, it is negated, and in its place appears the plant which has arisen from it, the negation of the grain. But what is the normal life-process of this plant? It grows, flowers, is fertilized, and finally once more produces grains of barley, and as soon as these have ripened the stalk dies, is in its turn negated. As a result of this negation of the negation we have once again the original grain of barley, but not as a single unit, but ten, twenty, or thirty-fold. Species of grain change extremely slowly ... we get as a result of this negation of the negation not only more seeds, but also qualitatively better seeds, and each fresh repetition of this process, each repeated negation of the negation, increases this improvement ... But someone may object: the negation that has taken place in this case is not a real negation: I negate a grain of barley also if I grind it down, an *insect* if I crush it under foot ... I must not only negate, but also in turn sublate the negation. I must therefore so construct the first negation that the second remains or becomes possible ... If I grind a grain of barley, or crush an *insect*, it is true that I have carried out the first part of the action, but I have made the second part impossible. Each class of things therefore has its appropriate form of being negated in such a way that it gives rise to a development"¹⁵

We propose that the "appropriate form" of negation is 'intra-', internal, immanent or self negation, that is, the subject-verb-object identical form of negation. Note that Engels' images and interpretations here connote 'convolute' negation, in which $\underline{\mathbf{x}}$ vanishes into its $-\underline{\mathbf{x}} = \underline{\Delta \mathbf{x}}$, rather than 'evolute' negation, where, in $-\underline{\mathbf{x}}$, the ontic qualit(y)(ies) of $\underline{\mathbf{x}}$ (is)(are) 'conserved', reappearing with, 'added back to', $\underline{\Delta \mathbf{x}}$, if with hybrid-onto, interaction term quality-adjustments of the past to the latest ontic emergence in $\underline{\Delta \mathbf{x}}$, and perhaps in differing quantity in $\underline{U}_{\mathbf{x}}$.

Via this quote from Engels, we have shifted context, from $\underline{\mathbf{x}}$ denoting an *onto* to $\underline{\mathbf{x}}$ denoting an *individual* eventity "belonging to" or 'within' some onto or ontological category/population. We pass over here, and reserve for later sections, our discussion of the many consequences of this shift.

Illustrating the above by using phonogramic symbol-strings -- phonetic nouns with emboldened and underscored letters -- to translate the ideographic symbolism of the dialectical algebra, we write as follows:

<u>x[x]</u>	=	barley-grain[barley-grain]	-	[barley-grain] ² ,	given the assignment $\underline{\mathbf{x}} \leftrightarrow \underline{\mathbf{barley-grain}}$	Ŀ
<u>x[x]</u>	-	insect[insect] = ~insect	=	[insect] ² , given	n the interpretation x 👄 insect .	

The above-posited form of negation-of-self, or change-of-self, denotes self as internal, primary subject -- here the individual barley-grain or the insect -- acting as proto-subjective being-for-self, as 'self-beholding' being, meaning also self-*acting* being. On the contrary, the actions of grinding the barley grain or crushing the insect under foot belong to a different primary subject, an 'external' subject, acting upon barley-grain or insect as its object, in the sense of each being a relatively passive being-in-itself or being-for-another; as being-for -- that is, as a being-beheld-by, and also as a being *acted upon by* -- in this case, the human subject who performs the operation, of crushing or grinding, upon eventities which are, for that human subject, non-self, 'external' others, pre-human objects and pre-human proto-subjects:

 $\partial \underline{x}(\underline{x}) = \underline{partial-not-barley-grain[barley-grain]}$, if $\underline{x} = \text{that individual barley-grain}$, and if;

a some part [**a**] of the contemporaneous non-**x**, here, a determinate human subject, or:

- $\partial \tilde{x}(x) = \partial other[insect] = specific-human-individual[insect], if x = that individual insect, and if;$
- 9ž

= a portion [∂] of X , that is, of the insect's synchronic complement, otherness, or 'externity' [external environment], here a determinate human individual.

Dialectical Ideography I- 84 Distributed «Samizdat» by Foundation Encyclopedia Dialectica

<u>The Space of Dialectical Operations</u>. The [self-]negator, \underline{X} , is also an 'affirmor', a positive assertion, a posit, a position, a pose-ition, a posed or posited value. Moreover, it denotes a spatial position, a directed line segment that points to a determinate point, in the 'dialector space' which forms the "analytical geometry" of \underline{X} 's algebra. That space is a space of operators, a space of [higher or meta-]numbers grasped as operations. It is a manifold, multi-axial, multi-dimensional space in which each point in effect denotes a determinate function or operation; each axis interpretable as denoting a qualitatively distinct operation-al realm or kind or 'onto'.

This 'Space of Dialectical Operations' is 'unified': "domain-space", "range-space", and "function-space" are one.

This differs crucially from mathematical spaces as usually conceived -- as spaces of 'hetero-iterators'. In such conceptions, the operator, the iterating operation or function, call it F, does not belong to the same space as the state-descriptors, the x_i, which get iterated by F. The space of dialectical operators contains its own iterators in a double sense. One space contains both 'mathematical subject' and 'mathematical object', and both 'mathematical noun' ["number"], and 'mathematical verb' ["operation"]. We have $Fx_i = x_ix_i$ because $F = x_i$. The x_i play both roles, function and argument, operator and operand, in self-iterative or dialectical systems. An expression of the form $\mathbf{x}[\mathbf{y}]$, including its special, self-reflexive case $\mathbf{x}[\mathbf{x}]$, represents a 'meta-number' as operation, x[], operating upon itself as value, [x]. The position in that space resulting from the completion of the movement or trajectory prescribed by the operation of some operator x as applied to some previouslyattained position or point y -- point[point] = position[position] = operator-as-movement applied to operatoras-value -- is thus itself a (re-)pos-ition(ing) "of" a pos-ition, a new 'move' or "movement" "on top of" [any] previous ones, in other words, a negation "of" (a(ny)) [previous] negation(s), a negator "of" a [series of] negator(s), a negation of [at least] the most recent previous determinate negation itself, an operation of negation applied to [another negator or to] itself. The previously-attained position, the argument of the function, the operand of the operator, is the result of (a) previous movement(s) -- i.e., of a previous deposition or dis-position or ~position; a previous negation of (a) previous [sequence of] position(s). In the case of $\mathbf{x} = \mathbf{y}$, the resultant position arises from the negatory operation \mathbf{x} or \mathbf{y} operating upon/moving itself, qua previously attained point, in accord with itself qua pattern of movement, i.e., as analytical choreographic symbol. Thus we have a subtly "*positional*" notation for this algebraic ideography of operations: \mathbf{x} denotes a different aspect of **x** than does **[x**].

Such movements do not, *in general*, return to the point $\underline{\mathbf{y}}$. That would be the case in cases of linear dynamical systems, and of linear equilibria, modeled by *fixed point* operators, such as the two Boolean operators denoted **1** and **0**, for which indeed $\mathbf{0}(\mathbf{0}) = \mathbf{0}^2 = \mathbf{0}^1 = \mathbf{0}$ and $\mathbf{1}(\mathbf{1}) = \mathbf{1}^2 = \mathbf{1}^1 = \mathbf{1}$. Such (de)*flexion* or *deflection*, both *hetero-flexion*, $\underline{\mathbf{x}}[\underline{\mathbf{y}}]$, $\underline{\mathbf{x}} \neq \underline{\mathbf{y}}$, and *auto-flexion*, *self-deflection*, *self-dis-equilibrium*, or *self-re-flexion*, $\underline{\mathbf{x}}[\underline{\mathbf{x}}]$, typically yields a '(*self-)alienation*' of \mathbf{y} , a movement *away from* point $\underline{\mathbf{y}}$, to a new, different operating-position.

The ideogram $\underline{\mathbf{X}}$ denotes, simultaneously and inseparably, both a 'posit(or)' and a 'negator', a 'position' and a 'negation' (movement), a *point*, denoting an attainable location in *a space of* operations, a location attained by (a) movement(s) induced by [previous] [re-]flexions of (an)other operator(s), and an *operation* which, when applied to that point, or to most any other point in that space, generates a move to *another* point, *is a definite movement* or *trajectory*, a *dance with a distinctive choreography*. That choreography "distances" or *alienates* from themselves the positions upon which it operates. That choreography, of $\underline{\mathbf{X}}$, propels positions in that space to *other positions*, but in a *specific*, $\underline{\mathbf{X}}$ -characteristic fashion, along a specific, $\underline{\mathbf{X}}$ -characteristic or $\underline{\mathbf{X}}$ -essence-ial trajectory.

Grasped 'geometrically', in terms of the movements in mathematical spaces that they induce, numbers in general, operations in general, operators in general are 'choreographic', and their symbols might be termed 'choreograms'.

Dialectical completeness requires that the repertoire of 'choreograms' include symbols for that form of motion which is *not*-motion; for that kind of dance which is *non-dance*. That requirement is filled by the unity of the 'Real' numbers, namely +1, and its higher analogues. Over-familiarity with that kind of unity, and the rectilinear choreographies of its positive multiples, renders many users of arithmetic unprepared for the vast variety of choreographies encoded by other kinds of unity, such as $+i = \sqrt{-1}$; by other qualities of "quantity".

Consider then, for exemplification, the self-reflexion, or "self-multiplication", of the 'convolute' metanumber $+i^1 = +\sqrt{-1}$: $+i(+i) = i^2 = -1$; $i \neq -1$. The operator i denotes the movement of 90 degree counterclockwise circular rotation in the 2-dimensional plane-space spanned by the mutually-perpendicular intersection, at their sole common point, the 0 point, of one "Real Number" axis or dimension and one "Imaginary Number" dimension or i-axis. The point +i, as completion of previous movement or operation, might result from the application of this +i movement to the +1 point, which, indeed, arrives at the +i point itself, one unit above the 0 point. [It might also result from the application of the -i operation to the point denoted -1].

The +1 point is located one unit to the right of the **0** point. So +**i** operating upon +1 produces a 1/4-circle *counter*-clockwise move, starting from +1 and stopping at +**i**: +**i**(+1) \rightarrow +**i**. [Likewise, -**i**(-1) \rightarrow +**i**, a 1/4-circle *clockwise* movement]. Next, the application of the *choreography* denoted +**i** to the *point* thus also denoted +**i**, i.e., the self-flexion: +**i**(+**i**) = +**i**(+**i**(+1)) \rightarrow -1, thus moves another counter-clockwise 1/4-circle, from point +**i** to point -1, located one unit to the left of the **0** point. The unit operator +**i** is thus 'Contra-Boolean':

 $+i(+i) \neq +i$. So is the Real-Number operator 2, and other such numbers, except 0 and 1: $2(2) = 2^2 \neq 2$.

We call **i** a 'convolute operation' because **i** itself does not reappear in the result of 'producting' **i** with itself. The self-reflexion \mathbf{i}^2 is not of the form $\mathbf{i} + \Delta \mathbf{i}$. We call **3** an 'evolute' operator, because $\mathbf{3}(\mathbf{3}) = \mathbf{3} + \mathbf{6} = \mathbf{3} + \Delta \mathbf{3}$. However, in the case of such conventional arithmetic operators, $\Delta \mathbf{3} = \mathbf{6} - \frac{1}{2}$ **3**. That is, only a quantitative change relative to **3**, but not any qualitative change -- no change from a position on one Number-axis or Number-dimension to a position on another -- results from the operation of **3** upon itself. The ontic dialectors or metanumber operators of Dialectical Ideography -- denoted $\{\mathbf{g}_k\}$ or \mathbf{Q} -- exhibit a product or flexion which is both evolute and qualitative. Self-operation of such metanumber "functions" or 'operations' produces a change of metanumber-axis or of meta-number dimension, as with the self-operation of **i**, but the result is 'evolute' rather than 'convolute': $\mathbf{g}_n[\mathbf{g}_n] = \mathbf{g}_n + \Delta \mathbf{g}_n$. The self-operating \mathbf{g}_n re-emerges in its self-product, together with a qualitatively different increment $\Delta \mathbf{q}_n$, an increment that differs qualitatively, non-quantitatively, from \mathbf{g}_n .

The Meaning of Dialectical Contradiction: 'Onto-Dynamical' 'Self-Duality'/'Self-Momentum'. When a metanumber or dialector, denoted $\underline{\mathbf{x}}$, is such that $\underline{\mathbf{xx}} \neq \underline{\mathbf{x}}$, i.e., such that $\underline{\mathbf{x}^2} - \underline{\mathbf{x}} = \Delta \underline{\mathbf{x}} \neq \underline{\mathbf{0}}$, then the foregoing 'inequations' provide an *arithmetical metaphor* for the *self-incompatibility* of any multi-ontic meta-population or meta-dynamical meta-system' whose momentary 'meta-state' can be *aptly* represented by a '*pure-ontic*' 'meta-number variable' or 'dialector variable' such as $\underline{\mathbf{x}}$. Such a meta-system, denoted $\underline{\mathbf{x}}$, is involved in a self-reflexive, self-refluxive, toroidal-vortex-like self-feedback dynamic. *Mediately* and later, it receives back a reflux of its own past output as part of its new input. The "nonlinear defect" of $\underline{\mathbf{x}}$, the difference between $\underline{\mathbf{x}}$ and $\underline{\mathbf{x}}[\underline{\mathbf{x}}]$, the change, or movement to a different metastate, $\underline{\mathbf{y}} = \underline{\mathbf{x}}^2$, which results from the self-operation of the 'pure ontological' description of the meta-state denoted $\underline{\mathbf{x}}$, represents *self-creative potential*, the *potential for further meta-evolution*; the "internal contradiction", "self-contradiction", or 'self-antithesis' of that meta-system while "in" that ontology-state or meta-state, $\underline{\mathbf{x}}$.

The expression $\Delta \mathbf{x} = \mathbf{x}^2 - \mathbf{x}$ is a measure of that immanent potentiality or 'self-contradictiveness', and of the gain which it generates, by self-flexion or re-flexion. Such a meta-system receives a reflux of its own past action, which reflux interacts with it, operates upon it, and affects it; in short, changes it qualitatively, 'ontically'.

Ergo, entering [into] meta-state $\underline{\mathbf{x}}$ contradicts -- is inconsistent with -- remaining [in] meta-state $\underline{\mathbf{x}}$. The very move into, and the being "in", that state-of-activity, $\underline{\mathbf{x}}$, generates a self-bifurcation self-force which drives the meta-system onward, out of that state-of-activity, and into a qualitatively different one.

Dialectical contradiction is contental, internal, existential, ontological, 'essence-ial', necessary/inescapable contradiction [i.e., escapable only via 'transcendence', via synthesis -- via 'meta-evolution'], not the formal, propositional contradiction of formal logic. Any given meta-dynamical meta-system, being [in] a constant condition of [self-]activity, is therefore [in] a continuing activity-condition of self-movement, of combined auto-catalysis and 'auto-dis-catalysis', of self-propelled, self-induced [as well as other-induced] constant change. 'Dialectical, (meta-)dynamical self-contradiction' names the self-relationship of an eventity that cannot stay the same -- in quantity, in quality, in 'meta-state' -- not [just] because of causes external to its essence, but because of causes internal to its essence, 'internal causes'; because of itself -- because of its very essence or essential, self-defining activity. Such a meta-system is 'meta-dynamical "law" of its self-affected control-space or parameter-space; due to the susceptibility of that special ["asymptotic"] trajectory or path/ pattern of motion which is its state-space attractor to 'self-bifurcation'.

Not "outside agitators", but 'inside agitators' are the core causes of 'meta-evolutionary' change for such 'dialectical', that is, for such self-consequential meta-systems.

Consider a meta-system, whose momentary onto-dynamic meta-state[-of-activity], whose momentary output to, or action-upon, its environment, upon *the rest* of its universe [of discourse], is aptly measured, purely ontologically, by a '*meta-value*' \underline{X} , denoting a metanumber-"vector", "list", "set" or 'sum' of ontically-interpreted metanumber qualifier values or components/constituents. Suppose this is a meta-system which receives back, at some later moment, [a mediated form of] that output, also still aptly measured by the *ontic quality-list*, \underline{X} , as its [re-]input. Such a meta-system is [in] a condition of *non-equilibrium dynamism*, or *dynamical self-contradiction* if $\underline{X}[\underline{X}] \neq \underline{X}$. The *meta-dynamic*, the [*meta-evolutionary*] *movement*, the unified, *state-trajectory*-plus-*control-path course of development* of that meta-system, is the meta-dynamical expression and the outward manifestation of that condition of *existential*, *essence-ial*, *contental*, *ontological*, *dialectical internal contradiction*.

Not any synchronic, statical, or external condition of tension or contrast or conflict, but only such *diachronic*, *meta-dynamical* and, in fact, *"time"-generating* self-contradiction is what we mean by *dialectical contradiction*.

We denote this relationship, of *dialectical self-contradiction*, by the ideogram '#', depicting a doublyslashed, hence doubly-negated, equality sign¹⁶. It pertains whenever we consider the self-reflexive metadynamics of a 'toroidal-vortical' meta-system. By this, we mean a 'self-processor' which, at a certain moment, *receives itself*, i.e., receives a reflux of its own self-essential, self-metering action, having previously applied that action, no doubt with an intensity that "varies with distance", to its previous *total* universe, *including to itself* as a determinate part thereof:

x as "operation"	#	<u>x</u> as "number";
x as operator	#	x as meta- <i>state</i> or 'status' / 'condition-of-being';
x as (pattern-of-) <i>move</i> ment	#	x as arrival-point, or as starting-point;
<u>x</u> as 'verb'	#	<u>x</u> as 'noun';
x as active agent of change	#	<u>x</u> as <i>passive material</i> being changed by an(other) active agent of change;
<u>x</u> as subject	#	<u>x</u> as object;
<u>x</u> as subject-verb-	#	X as -verb-object.

The formula $\underline{\mathbf{X}} \ \ \underline{\mathbf{X}} \ \ \ \mathbf{X}$ may be read off variously as ' $\underline{\mathbf{X}}$ contradicts $\underline{\mathbf{X}}$ ', or ' $\underline{\mathbf{X}}$ opposes $\underline{\mathbf{X}}$ ', or ' $\underline{\mathbf{X}}$ self-contradicts', or 'the self-antithesis of $\underline{\mathbf{X}}$ ', 'the antithesis [of] $\underline{\mathbf{X}}$ versus $\underline{\mathbf{X}}$ ', 'the antithesis of $\underline{\mathbf{X}}$ with *itself*', the 'self-duality of $\underline{\mathbf{X}}$ ', or the 'indivi-duality [*indivisible-duality*] of $\underline{\mathbf{X}}$ '. The "state-of-affairs" or of self-relationship denoted by $\underline{\mathbf{X}} \ \ \underline{\mathbf{X}} \ \ \ \underline{\mathbf{X}} \ \ \underline{\mathbf{X}}$

$\underline{\mathbf{x}}^2 - \underline{\mathbf{x}} = -\underline{\mathbf{x}} - \underline{\mathbf{x}} = \underline{\Delta}\underline{\mathbf{x}} \neq \mathbf{q}_0 \text{ i.e., } \underline{\Delta}\underline{\mathbf{x}} \stackrel{\frac{1}{2}}{\mathbf{q}}_0, \text{ or } \underline{\mathbf{x}}^2 = -\underline{\mathbf{x}} = \underline{\Delta}\underline{\mathbf{x}} + \underline{\mathbf{x}} \stackrel{\frac{1}{2}}{\mathbf{t}} \underline{\mathbf{x}}.$

The relation denoted by $\underline{\mathbf{x}} \# \underline{\mathbf{x}}$ is syntactically a self-opposition. In it, the eventity/meta-dynamical meta-system, whose momentary 'meta-state' is denoted by $\underline{\mathbf{x}}$, is syntactically 'opposite [to] itself', 'self-opposite', 'self-opposing' -- 'self-op-posed', and semantically "other-to-itself". In contrast, the self-product syntax $\underline{\mathbf{x}}[\underline{\mathbf{x}}] = \underline{\mathbf{x}} \underline{\mathbf{x}} = -\underline{\mathbf{x}} = \underline{\mathbf{x}}^2 = \underline{\mathbf{x}} + \underline{\Delta}\underline{\mathbf{x}}$, has the subject/verb/object 'meta-state' $\underline{\mathbf{x}}$ self-juxtaposed as well as 'self-opposite'. The syntax connotes an 'eventity' which exists in the form of "being-for-itself", $\underline{\mathbf{x}}[_]$, by way of being "'self-related''' as "other-to-itself", 'self-other', that is, of being "for-another", or 'object-to-another', $_[\underline{\mathbf{x}}]$, that "other" being 'noneother' than itself as subject, $\underline{\mathbf{x}}[\underline{\mathbf{x}}]$. Its 'subject-ive' aspect as 'agency-of-change', 'movor', function, or operator ' $\underline{\mathbf{x}}[_]$ ' is applied to or is "versus" its 'object-ive' aspect, its aspect as [previously-moved-to/already-attained] value, argument, or operand, ' $_[\underline{\mathbf{x}}]$ '.

The Boolean/Aristotelian law of formal logic, $\mathbf{x}(\mathbf{x}) = \mathbf{x}^2 = \mathbf{x}^1 = \mathbf{x}$, asserts that, for formal-logical operators, \mathbf{x} , *nonlinearity* [the "square" or "self-quadratic" of \mathbf{x} , the **2**nd degree of \mathbf{x} -- and, by induction, any higher finite *integer* degree of \mathbf{x}] makes no difference, no change, no $\underline{\Delta}$, no $\underline{\Delta}\mathbf{x}$; that *nonlinearity is equivalent to linearity* [= the first degree of \mathbf{x} , $\mathbf{x}^1 = \mathbf{x}$]; that *nonlinearity reduces identically to linearity*; that self-reflexion, denoted $\mathbf{x}(\mathbf{x})$, is gainless; that, if $\mathbf{x}^2 = \mathbf{x} + \underline{\Delta}\mathbf{x}$ then the gain, denoted $\underline{\Delta}\mathbf{x}$, is identically zero; $\underline{\Delta}\mathbf{x} = \mathbf{0}$.

<u>Dialectical [Self-]Contradiction in the Context of Human[oid]</u> Group Dialogue/Deliberation. The achievement of a [temporary/transient] consensus or 'new epoch basis' -- i.e., of a new, undeveloped / infinitesimally manifest self-antithesis, $\underline{X}_t^{1+\delta} \approx \underline{X}_t^1$ -- in the context of group deliberations, may be signaled by silence, by a cessation of dialogue, after the statement of a new summary thesis by one of the parties -- i.e., a thesis assertion that provokes no immediate objections [assuming a group-culture of honesty / 'speakability' / non-intimidation, etc.]. That summary thesis or 'syn-thesis' then becomes an 'agreement' or 'contract', an inter-subjective 'con-scientia', or group world-view 'constitution-element' for the given group, for the duration of the [under-]development of the self-antithesis of that new thesis, a development that will be driven, in part, by the activity/praxis of that group or 'sub-society' of the given humanoid 'meta-society'. Objections/anti-theses voiced along the way to that 'meta-stable' syn-thesis/'meta-equilibrium' need not be 'external contraries' or 'external contradictories' with respect to that group. They may be part of that group's 'internity'. They may reflect the group's own 'internal, self-contradiction' or 'intra-duality', with different group members voicing different anti-theses that reflect their differing 'localacy-biases' or "points-of-view" within the group. The group 'self-dialogue' or 'intra-logue' process can thus be modeled as --

$\underline{G}^1 \rightarrow \underline{G}^1[\underline{G}^1] = \underline{G}^1\underline{G}^1 = -\underline{G}^1 = \underline{G}^2 = [\underline{G}^1 + \underline{\Delta}[\underline{G}^1]] \stackrel{3}{\leftarrow} \underline{G}^1.$

That is, the dialogic process works to expand the 'conceptual ontology' and 'fact ontology' of the group in it's synthesizing of its 're-solutions' to its internal disagreements/controversies/disputes. If the opinion-function of each one of the group participant's is modeled as an 'onto-unto-itself', then we obtain a 'multi-logue' model,

$$[\underline{q}_{\alpha} + \ldots + \underline{q}_{\Omega}]^{1} \rightarrow \sim [\underline{q}_{\alpha} + \ldots + \underline{q}_{\Omega}]^{1} = [\underline{q}_{\alpha} + \ldots + \underline{q}_{\Omega}]^{2} = [[\underline{q}_{\alpha} + \ldots + \underline{q}_{\Omega}]^{1} + \underline{\Delta}[\underline{q}_{\alpha} + \ldots + \underline{q}_{\Omega}]^{1}],$$

in which the 'ontos' added in each self-interaction/self-iteration of the group also signify 'ideo-ontological' additions to the 'opinion-ontology' of each participant.

<u>Meta-Dynamical Nonlinearity and Dialectical Process</u>. The contra-Boolean law $\mathbf{x}[\mathbf{x}] = -\mathbf{x} \notin \mathbf{x}$, asserts that -- for qualitative, ontic variables in qualitative [self-]multiplication -- nonlinearity makes a difference, and not [only] a quantitative difference, as in $\mathbf{x}^2 \neq \mathbf{x}$, such that $\mathbf{x}^2 \notin \mathbf{x}$, but, on the contrary, that nonlinearity makes a <u>qualitative</u> difference: $\mathbf{x}^2 \notin \mathbf{x}$. Reflexion upon this key contra-Boolean principle reveals the way in which nonlinearity is the contemporary mathematical form of dialectic, unrecognized as such.

Dynamical, temporalized nonlinearity as it appears in the models and the "natural law" formulations of modern science is the mathematical marker, sign, and symptom of uncomprehended dialectical content in the physical processes that those equations endeavor to describe. This apparently merely 'dynamical', 'evolutionary' nonlinearity is symptomatic of such 'uncomprehension' especially given its present association with, as the cause of, the general unsolvability of such equations.

We hold that the nonlinearity of -- the nonlinear terms in -- the nonlinear partial differential equation formulations of today's known "laws of nature" is an implicit, unconscious reflection of the 'dialectical-ness', 'dialecticality', or 'di-ality' [i.e., the 'self-dialog-ic' or 'self-duality'] of the processes of natural history that those equations seek to describe. However, it is far from a perfect reflection of that self-reflexive, self-refluxive quality of natural processes. We do not hold that the *full measure* of the self-refluxivity of those processes is mirrored in those equations, or in their nonlinear terms in particular.

These equations are generally not formulated so as to encompass the self-imposed limits of those processes, their *self-bifurcation boundaries*.

Therefore, these nonlinear equations typically leave out the self-transcendence, the *«self-aufheben»*, and the qualitatively new, emergent *ontos*, to which the actual processes of self-bifurcation give rise.

The nonlinearity of dynamics and of dynamical systems theory does constitute a *shadow* of the self-reflexive, dialectical meta-dynamic of self-bifurcating meta-systems. But it is in the meta-dynamics of self-bifurcation proper that dialectical process is visible full blown. Conventional mathematical models generally neglect that order of phenomenology, the level where transitions between one epoch of a meta-evolutionary process and its successor-epoch are observable.

These *self-bifurcation boundaries* or '*conversion-crises*' often manifest, in current equational idealizations of the nonlinear "laws" of nature, as "*singularities*", i.e., as *infinite pure-quantitative values*, obtained for finite values of the "time" parameter and the control-parameters. Whereas, in the empirical actuality of the natural processes described, only metrically *finite* phenomena, *if often neo-qualitative phenomena*, manifest at the moments corresponding to those critical finite time-parameter and control-parameter values, the standard equations predict infinite values at those moments.

Such singularities are thus places of *infinite homeomorphic defect* and of *infinite empirical falsification* for the existing equational idealizations; points where the answers given by those equational models are *infinitely wrong*; junctures where the quantitative state descriptions generated by those equation-models are *infinitely mal-descriptive* of empirical actuality, because the answers they give are infinite, whereas the reality they attempt to describe remains finite for all of their state metrics. This is *The Paradox of Singularity*: *almost-all-times-accurate, almost-all-t 'mega-meaningful*' models appear "*absolutely meaningless*" at isolated finite values of **t**.

The "[meta-]numbers", "higher mathematical objects", or "higher mathematical operations", $\{ \underline{q}_k \}$, which form the arithmetical basis of the algebra of these \underline{x}_s -- the symbolic system of this dialectical ideography -- thus differ

qualitatively from the classical, so-called "real" numbers, wherein $\mathbf{x}^n \stackrel{>}{\neq} \mathbf{x}^1$ for all integers $\mathbf{n} \mid \mathbf{0} \leq \mathbf{n} < \infty$.

The material internal 'dialogue', 'self-disputation', 'self-controversion', or (proto-)dialectic within (1) each individual subject/verb/object or eventity, grasped as an internalized 'population' of ontic qualities in its own right; and, synchronically, also within (2) each population of a given kind of eventity, as well as within (3) each 'self-diversified' 'multi-ontic', 'meta-histogramic', 'meta-distributional' 'meta-population' or 'population of populations' cumulum of multitudinous different kinds of eventities -- of each with[in] itself -- yields "ontogeny and phylogeny"; ontogenic development and the emergence of new kinds of populations. This constitutes a phenomenological, empirical actuality that is, per the Rules-Systems of Dialectical Ideography, to be measured, in 'quanto-qualitative' ideographical descriptions, or 'meta-models', by means of *new metrics*, 'qualified' by new *units*[-of-measurement], tied to the emergent new *ontos*, new kinds of eventity, new kinds of activity. Thus this *material self-dialogue*, continually underway at all 'meta-fractal' scales of cosmological existentiation, yields change and cumulative multiplication of ontic *qualities*, driving and *deriving universal meta-evolution itself*.

<u>Crux</u>: Immanent derivation of this *dialectical* rule-based arithmetical language from, and its latency within, classical arithmetic is treated in the sequel. Per this new arithmetic of dialectics, the progression of continuing self-activity, self-reflexion, or self-bifurcation of (a.) an *onto* (an ontological eventity-category for a given universe of discourse, denoting, in effect, an entire *population* of '*self-evolving*' and '*self-meta-evolving*' individuals so-categorized), of (b.) the *dynamical ontology* or "universe (of discourse)" as a whole, and of (c.) an individual eventity or specimen/exemplar of a given "meta-dynamical meta-system", continually begets new qualitative difference; expanded universes(-of-discourse) with expanded ontologies; emergence of new ontic qualities of being/doing, as modeled by and measured via successor metanumber varieties. That progression of iterated self-reflexion or self-operation is symbolized algebraically, or, better, *formulaically*, by a self-escalating magnitude in the *super-script, exponent, degree, power*, or *self-bifurcation index*, or equivalently in the sub-script, of the ideogram which represents the original or a previous meta-state-value in that sequence of ideograms.

That ideograms-sequence in turn models the succession of meta-states of a *self-changing ontology*. That metastates-succession may be employed to model (I.) the total cosmos, (II.) a sub-universe within that totality, or (III.) an individual eventity or meta-dynamical system which instantiates some *onto* or *sub-onto*. Such models aim at a *meta-temporal summarization* of an eventity's dynamical and 'meta-dynamical' essence, an expression of its meta-"law" of self-and-other-induced motion, which univocally reconstructs its past, characterizes its present, and predicts its future, within the limits of contingency. For universe-models mapping the total cosmic *«physis»* [including emergent humanoid '*«*anti-physes*»*'], formulated in the language of Dialectical Ideography, there is a continuing self-generating proliferation of new, first-level ontological as well as *sub-meta-system*, *sub-ontic qualities*, new kinds of being/doing. This *multiplication of qualities* maps arithmetically to generation of successor meta-number varieties; pictographically, analytic-geometrically, topologically, or *topometrically*, to a sprouting of *new dimensions*, *new directions*, perpendicular to all previously protruded axes in this *metanumber space* interpreted as a unitary, state/control metaspace. That *self-expanding meta-space* models '*meta-growth*'; *self-meta-evolution*' of this self-changing cosmological ontology.

<u>Hypothesis</u>: Dynamical nonlinearity is a mathematical expression of the dialectical quality, which is that of self-reflexiveness or self-refluxiveness. Dynamical linearity is the mathematical expression of an atomistic, 'interaction-less', '[self-]collision-less', mechanistic, reductionistic, anti-dynamical, degenerate asymptote of dialectics.

The "laws" of nature uncovered by modern mathematico-science are typically expressed in the form of systems of dynamical *nonlinear* partial integrodifferential equations that have never yet been "solved", that is, *decoded* of their total predictive implications/knowledge-content. These neveryet-solved nonlinear equations-systems include: (1) equations of laser photonics; of the nonlinear optics of *coherent* electromagnetic radiation; (2) the equations describing gravitic dynamics, the dynamics of multiple mutually-gravitating and self-gravitating bodies, in either their Newtonian or their Einsteinian forms; (3) the equations describing the electro-magneto dynamics of *ĝ*ionized elemental-atomic gases or "plasmas", which remain the primary constituent, by mass, of the observable cosmos [e.g., the Boltzmann-Vlasov Equation]; (4) the equations describing the gravito-thermo flowdynamics of *ĝ*neutral [*f*non-ionized] molecular gases and liquids, including the meteorological and climatological dynamics of and physicalspatial self-distribution-dynamics of "molecular species", chemically-reacting atoms and molecules in *ĝ*liquid phase or *ĝ*gaseous phase media, especially when reflexive-catalytic and auto-catalytic effects are included; (6) the equations describing the population/distribution ecologic-dynamics of both cellular and multi-cellular, plant, animal, and animal; society biota; (7) the equations of the economic macro-/meso-/micro-dynamics of human societies, especially when the expanded reproduction of labor-power as output or product of the "household" or "consumer" sector, plant, are included. Apparent exceptions include the Faraday-Maxwell Equations describing self-propagation dynamics of *incoherent* electromagnetic, radiations/photonic populations, and the quantum-mechanical DeBroglie-Schroedinger Equations, describing probability distribution dynamics for the actions of sub-atomic eventities, modeled as "quanta", atomistic "point-particles", or "linear waves". Issues raised by these seeming ex

Dialectical Ideography

I- 90 Distributed «Samizdat» by Foundation Encyclopedia Dialectica

■ Development of a mathematics of dialectics thus holds the key to *The Nonlinearity Breakthrough*. ■ As a source of insight into what '*a mathematics of dialectics*' might usefully mean in relation to *The Nonlinearity Breakthrough*, our next section seeks to reconstruct the historical '*dialectic of mathematics*', in what we hold to be the heartland of that subject, namely, that of the 'meta-evolution' of *arithmetics*.

Conjecture: The Fundamental Theorem of Dialectical Ideography. Proof for this conjecture would presuppose an axioms-system for Dialectical Ideography. Such requires, we hold, if we start from the Zermelo-Fraenkel [ZF] system, amendments to old, and additions of new, axioms, entailing 'ideo-ontological' expansions, replacement of the Axiom of Choice, and of the 'transfinitary' Generalized [Cantor] Continuum 'axiom' with the 'meta-finitary' 'Generalized Cumulum' axiom, addressed in Part III. Also, such an augmented ZF system, or, alternatively, e.g., a Topos approach, cannot, per the 'Dialectical Axiomatics' of <u>)H</u> set forth herein, be complete/final, per 'The Gödelian Ideo-Meta-Dynamic'. It will contain loci where its syntax 'exceeds' its semantics; new "unsolvable" though well-formed equations, and their related "undecidable" propositions, impending ever-further 'axiom-ic'/'ideo-ontological' accruals.

Furthermore, some sub-propositions below are not only 'contingent'/'conjunctural' 'species-strategic' but also, 'psycho-historical', "meta-psychological" assertions, alien to the 'ahistorical'/'eternalistic' styles of Parmenidean / early-Platonic mathematical traditions, and to the very content-limits of "mathematics" as they define it. Deductive proofs related to these issues are concentrated in the Derivations section of the Post-Scripts.

- §0. <u>Definition of an 'Arithmetic'</u>. A rules-system for performing a species of mental operations, that uses only "known values" [versus 'algebraic' variables/"unknowns"], but values which may not be ordinary numbers. These operations must be 'externalized' or 'mapped', in writing, via an ideographic symbols-language. These mental operations may or may not be interpreted for any domain of 'concrete'/'external'/physical operations.
- §1. <u>The Intra-Duality of "Natural" Arithmetic</u>. Any "first order" formal description of the "Standard "Natural" Numbers", N = {1, 2, 3,...}, inescapably describes "<u>Non-Standard ["Natural"</u>] Numbers", { N_{NS} }, as well, plus "Non-Standard Arithmetics", { N_{NS} }, just as conceptually fundamental as the "Standard Arithmetic", <u>N</u>.
- §2. The \underline{Q} as "Non-Standard" Natural Numbers. The { \underline{Q} } Dialectical Arithmetics are in { \underline{N}_{NS} }: { \underline{Q} } \Box { \underline{N}_{NS} }.
- §3. <u>Two Modes of Mutability</u>. Change may be divided into two modes, 'evolution' vs. 'meta-evolution'; quantitative change within a fixed ontology vs. ontology change; change within epochs [intra-epochal change] vs. epoch-boundary-forming/traversing, or inter-epochal change. The N and their extensions are best fit to map or 'ordinalize' evolutionary change. The Q are fit to 'ordinalize' 'meta-evolutionary change'.
- §4. <u>Quantifiers and Qualifiers</u>. The "Standard "Natural" Numbers" are interpretable as "pure", unqualified quantifiers, without metrical specificity, and are related to the "monads" of the ancient Greek/Platonic «arithmoi monadikoi», the arithmetic of abstract/idealized' counting units. The { Q } varieties of the NNS are interpretable as "pure", 'unquantifiable qualifiers', related to the Platonic «arithmoi eidetikoi», the "dialectical" arithmetic of ideas/categories/types/kinds. They can model mental operations involving 'ontic units', "qualitative units", or "metrical qualifiers", including "units of continuous measure".
- §5. <u>Pervasion Implies Co-Pervasion</u>. The \mathbb{N} 'pervade' all of mathematics. Wherever $\underline{\mathbb{N}}$ manifests, the $\underline{\mathbb{N}}_{NS}$, including the {Q}, are present too, *noticed or not*. Mathematico-Scientific insights based upon $\underline{\mathbb{N}}$ have long been cultivated. Mathematico-Scientific insights based upon the $\underline{\mathbb{N}}_{NS}$ are normally never noticed in their full universality. Thus, many opportunities for accelerated Mathematico-Scientific conceptual advancement inhere in the cultivation of the hitherto neglected $\underline{\mathbb{N}}_{NS}$ insights, including { $\underline{\mathbb{Q}}$ } insights, throughout contemporary Mathematico-Science.

§6. <u>Quanto-Qualification</u>, *The Paradox of Singularity*, & *The Nonlinearity Barrier*. Syntheses of \mathbb{N} & \mathbb{N}_{NS} , including the $\{ \underline{U} \}$ syntheses of \mathbb{N} & $\{ \underline{Q} \}$, are both *possible* and conceptually advantageous. Another such synthesis, the ${}_{\alpha}\underline{\mu}$ arithmetic of <u>metrical qualifiers</u>, concretizes the arithmetic and algebra of "Dimensional Analysis", yielding a unified, *comprehensively quanto-qualitative mathematics*.

That "non-standard" mathematics 'regularizes' the arithmetic of zero division via $\mathbf{0} \cdot \mathbf{\mu} = \mathbf{\mu}_{0}$

dissolving 'The Singularity Paradox', the "curse of the divergences", the epidemic of unwanted infinities in dynamical models. By this 'restoration of the metrical qualifiers', it leads to a 'metafinite', existential, ontological 'semantification' of the 'self-bifurcation singularities' induced by additive-identity division. It may thus hold seeds of 'The Nonlinearity Breakthrough'.

§7. <u>Formal Operations and Dialectical Operations</u>. <u>N</u> and its extensions paradigmatize the *formal/monetary* operations [st]age of Phenomic, human-species cognitive development. Syntheses of <u>N</u> & <u>N</u>_{NS}, beginning with { <u>U</u> } & _α<u>µ</u>, can provide paradigms for a potentially emergent *dialectical operations* epoch of Terranhuman cognitive and moral 'meta-evolution'. ■