

A New, 'Algorithmic-Heuristic', Cognitive and Pedagogical Tool [«Organon»] --

Highlights of the Contra-Boolean 'First Arithmetic/Algebra for Dialectical Logic', and Its Sequel.

Leibniz: “For if praise is given to the men who have determined the number of regular bodies – which is of no use, except in so far as it is pleasant to contemplate – and if it is thought to be an exercise worthy of a mathematical genius to have brought to light the more elegant properties of a conchoid or cissoid, or some other figure which rarely has any use, **how much better will it be to bring under mathematical laws human reasoning, which is the most excellent and useful thing that we have.**”

[Leibniz: *Logical Papers*, transl. G. H. R. Parkinson, Oxford University Press [NY: 1966, 2002], p. 105, *emphases added*].

I. New «Organon».

The second ‘arithmetic/algebra for dialectics’ in the Seldonian series of such, the first explicitly dialectical algebraic logic in that series, is an ‘algorithmic heuristic’, a *computational* thought-guide, for analyzing and organizing the subject-matter, or the ontological [kind-of-being] content, of a given subject-matter domain or sub-universe[-of-discourse], or even of the known universe as a whole, categorially [i.e., via [ontological] categories].

For wholly-present content [i.e., for ontological content viewed synchronically], this ‘algorithmic-heuristic’ organizes domain content, or subject-matter, systematically, taxonomically, for pedagogically-advantaged presentation, i.e., ordered from the simplest category of the domain, step-by-step, by a method of ‘categorical [self-]combinatorics’, to the domain’s most complex ontological category, given that the modeler correctly selects the simplest category of the domain as starting category [«arché»].

For past-historical content -- for ‘content histories’ [i.e., for ontological content viewed diachronically] -- this dialectical ‘algorithmic heuristic’ organizes domain ontological content chronologically, but also in a way which reveals the often obscured ‘meta-genealogy’, the [non-chromosomal] descent of the content of each historical successor ontological category from its predecessors, all ultimately tracing back to a single ‘ultimate ancestor’ category [«arché»]. Such ‘models of history’ can also be iterated forward, beyond representing their presently-extant categories, to ‘pre-construct’, or “predict”, possible future categorial content of their domain.

There is a key principle here, one that enables both the synchronic and the diachronic applications of this ‘algorithmic heuristic’. That principle can be stated thusly: the “squaring” -- the nonlinear self-interaction -- of a category-symbol signifies, yes, the self-reproduction of the content represented by that symbol, but it also signifies the arrival of new, higher categorial ontology, typically through new combinations, or “‘fusions’”, of the units, or “‘logical individuals’”, that constitute the inner, implicit content represented by the category-symbol that was “squared”. This principle is a contrary principle to the Boolean “class” principle, that of the automatic and instantaneous reduction of nonlinearity back down to linearity, of “second degree” back down to “first degree”, Boole’s “fundamental law”, that, for a Boolean “class”, $\mathbf{x}, \mathbf{x}^2 = \mathbf{x}^1 = \mathbf{x}$. Self-interaction of a class symbol results in nothing but the “simple reproduction” of that class symbol. $\mathbf{1} \times \mathbf{1} = \mathbf{1}$. $\mathbf{0} \times \mathbf{0} = \mathbf{0}$.

The ‘contra-Boolean’ principle of this ‘categorial dialectical algebra’, for any ontological category-symbol, call it \mathbf{x} or \mathbf{x}^1 , is, stated algebraically, $\mathbf{x}^2 = \mathbf{x}^1 + \Delta\mathbf{x}^1$, s.t. the term $\Delta\mathbf{x}^1 = \Delta\mathbf{x}$ symbolizes a new ontological category, whose implicit content, of a new kind of units, is built out of the units-content represented by the category-symbol \mathbf{x} , by its units’ “‘collision-fusion’” into higher units, making $\Delta\mathbf{x}$ a symbol for a category that is qualitatively unequal [‘ $\frac{1}{2}$ ’], ontologically different, different in kind, from the category signed by \mathbf{x} : $\Delta\mathbf{x} \frac{1}{2} \mathbf{x}$. [Note how this ‘contra-Boolean’ “law”, $\mathbf{x}^2 = \mathbf{x} + \Delta\mathbf{x}$, dialectically «aufheben»-contains / «aufheben»-conserves the Boolean “law”, $\mathbf{x}^2 = \mathbf{x}$, but also «aufheben»-negates & «aufheben»-elevates it, by, precisely, that qualitative, ontological, categorial increment, ‘+ $\Delta\mathbf{x}$ ’].

Subsequent “squarings” of the results of earlier such “squarings” add further new category-symbols, for new such ‘auto-hybridization self-combinations’ of the ‘units-content’ symbolized by earlier-produced ‘category-symbols’, as well as for ‘mere hybrids’, category-symbols representing ‘allo-hybridization combinations’ of **2+**, qualitatively, i.e., ontologically different category-symbols, symbolizing actual, i.e. physically real “mere” hybridizations as well as physical ‘self-hybridizations’ of the actual ontological ‘units-contents’ so symbolized.

The *arithmetic* behind this ‘contra-Boolean’, or *dialectical algebra* -- the arithmetic whose generic units, or ‘meta-numerals’, behave so as to make these algebraic generalizations hold true -- turns out to be, in its axiomatization, one of those “*non-standard models*” of the Peano/Dedekind postulates’ “**Natural**” numbers arithmetic, for the numbers-space $\mathbf{N} \equiv \{ \mathbf{1}, \mathbf{2}, \mathbf{3}, \dots \}$, foretold by some of the deepest theorems of modern mathematical logic [Löwenheim-Skolem, and Gödel completeness and incompleteness in conjoint implication at the “first order” level of that logic]. The first four, “first order” axioms of the ‘contra-Boolean’ axioms-system are versions of the first four “Peano Postulates” of the axioms-system for the “standard” “**Natural**” arithmetic. The arrival of the axioms-system of this ‘contra-Boolean’ arithmetic/algebra can also be modeled by it, both syntactically and intuitively, as an instance of the ‘contra-Boolean’ principle, by a ‘contra-Boolean’ “squaring”, or *self*-interaction [in this case, connoting also a *self*-critique, or “immanent critique”], of the “first order” axioms-system of the “standard” “**Natural**” numbers arithmetic, symbolized by \mathbf{N} , via the $\Delta\mathbf{N}$ in $\mathbf{N}^2 = \mathbf{N}^1 + \Delta\mathbf{N}^1$. The $\mathbf{x}^2 \dagger \mathbf{x}^1$ ‘contra-Boolean’ principle is a theorem of this ‘ $\Delta\mathbf{N}$ ’ system, by a simple direct proof from its axioms. [The \mathbf{N} ‘first system’ of this series is itself “‘*dialectical*’” only vestigially, by virtue of the bare «*aufheben*» principle constituted by its core, Peano successor function, $\mathbf{s}(\mathbf{n}) = \mathbf{n} + \mathbf{1}$, which simultaneously *contains / conserves*, *negates*, & *elevates* -- but in quantitative magnitude, & in ‘ordinality’, only -- its argument, \mathbf{n} , by exactly $\mathbf{1}$ unit: ‘+ 1’].

II. Sequel. [*Mathematical Dynamics Enhanced with fully-algorithmic Dimensional Analysis & thereby healed of “infinite” singularities.*]

The ‘second system of arithmetical/algebraic dialectical logic’, described above, is part of a step-by-step, and a system-by-system method of presentation, itself organized as, and modeled by, a synchronic application of that very second system itself in this presentational series of such systems. By the time we reach the **7th** arithmetic in that presentation of this modeled series of arithmetics for dialectics, something *astounding* happens. We arrive at an axioms-system which, in a most natural way, building upon the arithmetics/algebras previously generated by that model, and especially building upon the **2nd**, **3rd**, & **4th** systems, provides the wherewithal for a system of arithmetic which models, for the first time ever, the calculations of “dimensional analysis”.

This arithmetic for “dimensional analysis” mimics the computational behavior of “dimensional units”, e.g., the “cm.” [“syncopation” of “centimeter”], “gm.” [“syncopation” of “gram”], & “sec.” [“syncopation” of “second”] units, as well as of “compound” units of measure, e.g., units of *velocity* [cm^1/sec^1], *acceleration* [cm^1/sec^2], *momentum* [$\text{gm}^1 \times \text{cm}^1/\text{sec}^1$], *force* [$\text{gm}^1 \times \text{cm}^1/\text{sec}^2$], *kinetic energy* [$\text{gm}^1 \times \text{cm}^2/\text{sec}^2$], etc. The notation used for “dimensional analysis” today is still retarded in the primitive, “syncopated”, or ‘word-abbreviative’, state that all of proto-algebra achieved, circa **250** C.E., with the advent of Diophantus’s scroll, *Arithmetica*. Note that $\text{cm}^1 \dagger \text{gm}^1 \dagger \text{sec}^1$, & also that $\text{cm}^1 \dagger \text{cm}^2 \dagger \text{cm}^3$, $\text{sec}^1 \dagger \text{sec}^2 \dagger \text{sec}^3$, etc. Indeed, it is precisely the ‘*auto-«aufheben»s*’ & ‘*allo-«aufheben»s*’; the unified *negation / elevation / conservation* of “fundamental” dimensional units into “compound” such [*meta*-]units, that makes this **7th** arithmetic “‘*dialectical*’”.

This **7th** system of dialectical arithmetic completely “‘arithmeticizes’”, & ‘de-syncopates’, “dimensional analysis”. It does so with an *initially even more astounding* bonus. *It makes division by zero meaningful*. It thus ‘semantifies’ the “meaningless”, or “infinite”, & thus, ‘infinitely erring’, division-by-zero “singularities” that plague “*non*linear dynamical systems”, and ‘systems dynamics’ in general, in the form of, especially, their *non*linear differential equations. These *non*linear equations include those that express our present fullest & best formulations of the “laws” of Nature, & include no less than Newton’s “law”-equation for gravitational force.

Thus, when **2** mutually-gravitating planets “collide”, since, in the paradigm of Newton’s ‘gravitic force model’, each planet is represented as a “mass-point”, denoting each planet’s center-of-mass, “collision” means that the **2** “point-masses” *coincide*, both occupying *the very same* point-position, in this Newtonian representation of real, physical space. This means, further, that the “distance between” these “two” point-masses becomes zero. This “coincidence” gives the denominator of the Newtonian gravitational force equation a value of exactly zero as of the instant of this “collision”. This division by zero thus predicts an “infinite”-magnitude gravitational force between the “two” planets as of the moment when their “two” “mass-points” “become one”. In actual physical reality, so [*mis*-]represented by this mathematics, *everything remains completely finite* throughout, before, during, & after the real “collision” so [*mis*-]modeled, making the prediction of infinity *infinitely wrong*.

Thus the physical experience/observation, vs. the Newtonian mathematical description, of any such “collision” event, **DIVERGE MAXIMALLY**, at that “instantaneous” moment, & diverge qualitatively/ontologically, forever thereafter, despite the fact that the two had been exceedingly convergent leading up to very close to that collision-“instant”. Newton’s gravity equation is said to “break down” -- to fail utterly, for such “collisions”, in describing empirical reality -- despite the astounding accuracy of its descriptions and predictions before then.

By postulating that ‘**0** times a dimensional unit = **●**’ -- that ‘empty zero’, times any unit of measurement, equals ‘full zero’, i.e., in this “collisional case”, that ‘ $Gm_1m_2/(0)\times[cm.] = Gm_1m_2/● = ●$ ’, we render the Newtonian division by [empty] zero **meaningful**. We do so because the ‘full zero’ value represents, **not** “nothingness”, **not** “absolute annihilation”, nor any kind of such “abstract negation” [cf. Hegel], but a fully **determinate, finite** state of affairs, e.g., the multiple fragmentation/[re]coalescence of the formerly **2** planets, only one that **cannot** be ‘seen into’, that is *opaque* to, that **cannot** be effectively expressed in, the mathematical language, e.g., in the language of mass-bearing “infinitesimal” points, and given also the implicit “‘ontological commitments’”, of the model at hand, e.g., its commitments to the continued existence of a planet with mass **m₁** and of a planet with mass **m₂**, with a distance, e.g., in ‘**cm.s**’, between them sufficient to allow for their continued, separate co-existence. The axiom of the seventh system, holding that, e.g., ‘ $(0)\times[cm.] = ●$ ’, holds that the “nullification” of an ‘**essence**-ial’ dimensional unit of a dynamic-system, ensuing in the course of its dynamics & vicissitudes, signifies that an *ontological change* has occurred, a transformation of that system beyond its former identity, an identity that the model implicitly [**& wrongly**] assumed to be uninterrupted, & even uninterruptible. Instead, a local *ontological extinction* of that system has happened, a local transmogrification/-metamorphosis that leaves behind, **not nothing**, but a **something** that is *qualitatively* new in place of that, thus now former/past/old system. Such an event makes the terms & entities assumed to exist by the mathematical model **obsolete**, renders those entities no longer existent or extant, at & after the moment of division by zero-*times-its-metrological-unit- “qualifier”*, that “‘unit-qualifier’”, here, being “cm.”, e.g., as in ‘ $(0)\times[cm.]$ ’.

This is akin to defining a meta-mathematical value, **●**, to signify an arithmetical, numerical value which does **not** exist **for**, which **cannot** be expressed within, a given axiomatic system/language of arithmetic. This implies **arithmetical in**completeness, related to the “unsolvable diophantine algebraic equations” at the root of the well-known Gödel “incompleteness or inconsistency”, of any such system of arithmetic, & further implies that, in a higher/expanded system of arithmetic, this value will become expressible. For example, within the “**Natural**” numbers system of arithmetic, the equation $1 + x = 1$ is unsolvable [as $0 \notin \mathbf{N} \equiv \{1, 2, 3, \dots\}$]. So, using the new meta-mathematical value, we would assert, meta-mathematically, that this $x = ●$, within **N**. However, in the “next”, successor system to the **N** system, the “**Whole** numbers” system, for $\mathbf{W} \equiv \{0, 1, 2, 3, \dots\}$, $1 + x = 1$ implies $x = 1 - 1$, and we can now legitimately write ‘ $x = 0$ ’ [because $0 \in \mathbf{W}$]. The arithmetic, numerical value ‘**0**’ is part of the ‘ideo-ontology’ of the **W** system, but it is **not** part of that of the **N** system. The dynamical occurrence of the ‘ultra-dominant’, ‘Langolier-like’, **●** value is a **dynamical analogue** of the meta-mathematical occurrence of this **●** value. For more about this dynamical ‘full zero’ concept, see --

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