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The Formalization of Hegel's Dialectical Logic

Its Formal Structure, Logical Interpretation and Intuitive Foundation

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> The moving Finger writes, and having writ;
> Moves on; nor all thy piety nor Wit
> Shall lure it back to cancel half a line,
> Nor all thy tears wash out a word of it.
> *Rubaiyat*, LI

1. Dialectic as Reflection

THE FORMALIZATION of Hegel's dialectic logic rests upon the contention that Hegel's intuitively generated system can be represented as a meta-language structure in which a given set of elements on one level are capable of being analyzed from a meta-level which refers to the original elements from a perspective of *reflection*, thereby bringing out and expressing properties *about* that level not capable of being formulated *within* the original level itself. This analysis leads to an inverted pyramid of relations, which increases the complexity and concreteness present by each successive meta-level analysis, instead of contracting a set of given elements into an abstract absolute or unity. By explicating the activity of reflection, it is possible to develop a *formalized* structure representing the unfolding of a unique dialectic *logic* which I believe is inherent in Hegel's *Phenomenology* and *Encyclopedia* as the basic "generating" principle governing the *intuitive* movements of his structure as it evolves increasingly complex levels of interrelation. The usefulness of such an inquiry into dialectic logic lies in the levels of structural relationship it reveals, and which of

necessity have to be accounted for by the activity of conscious reflection, where reflection is initially defined to be the mode of inquiry (questioning) present in a field of conscious activity.

The formal structure evolved, representing these levels of interrelation brought into awareness through reflection, takes the form of an expanding *matrix* of terms in which the number of terms present increases according to a specific principle whenever a new level or perspective of reflection is taken. The generating principle, called the principle of Non-Identity, acts as a recursive formula producing a sequence of *self*-expanding terms. The sequence begins with a singular indeterminate primitive element e standing for any type of entity capable of being reflected upon (i.e. any object, structure, relation, or more generally, any event present to a field of consciousness). The process of reflection, R, is an operation transforming e into e′—i.e. (R)e = e′. Reflection of e into e′ will produce three terms for the first reflection or level. Repeating this operation *on e′*, i.e. (R)e′ or (R)(R)e for a second reflection, will give three times three or a matrix of nine terms called e″. The nine term structure has *qualitatively* different modes of interrelation present than in the initial three term sequence.

In the limit, the R process produces an infinite sequence of terms —1, 3, 9, 27, 81 etc. according to the power expansion 3^n, where n stands for the successive reflections taken, representing a continual expansion of perspective moving from level to meta-level, and taking on the values of the positive integers varying from zero to infinity.[1] The fundamental recursive formula is, therefore, $(R)e^n = e^{n+1}$, defining, as yet without interpretation, the operation of *reflection.*

It is possible to give a non-contradictory account of the process of reflection. Being called the Principle of Non-Identity, it serves to determine and delineate the first universe of discourse *out of* the originally indeterminate posit called "e," and at the same time set up the conditions for the *negation* and transcendence of the very universe generated. In a sense, the process of reflection transforms a *pre*-formal indeterminate posit e into a *formal* determinate universe, such that a *meta*-formal perspective of the formal universe called e′ appears. Reflection is thus a shift from a pre-formal to post-formal situation, wherein a well-formed universe appears as an intermediate

[1] In the limit, the number of terms are non-denumerable, i.e. as n approaches infinity step by step having the order of the natural numbers and hence being denumerable, the *content* of the orders of reflection approaches the indenumerable order of the continuum.

stage. The second reflection then regards this meta-formal e′ as a *new* pre-formal posit, ready for further determination, producing new relations within an expanded universe of discourse. Reflection is therefore a generating process in which an initially unformed element *becomes* formed, making reference to the element impossible without reference to the act of reflection. The activity of reflection becomes an integral aspect of the element reflected, and a process of continual reflection amounts to *self*-reflection—the initial element embodying reflection as its form.

2. Logic: Reflection and the Principle of Non-Identity

The initial step of reflection (R)e is called the *Assertion of* e, written (e) or +e, which *announces* (affirms) something present in the field of consciousness, the parenthesis or plus sign indicating the *act* of reflection. However, the very fact that (e) or +e is different from e (as, e.g., the positive integer +4 is different from the natural number 4) implies that something *other* than +e must exist, *from which* +e is distinguished by being only the *positive* or *assertive* form of e, otherwise there would be no point in regarding +e and e distinctly. This "other-than-positive" is defined as its co-relative contrary –e (minus e), or, in opposition to (e), we can call this the logical *Negation of* e, written (-e) and called "not e," the parentheses about both e and -e indicating that a reflection has been taken, producing *two* terms as a result.[2] This means that unlike e, -e does not explicitly appear as an immediate pre-reflected given, but only makes its appearance *through* reflection, appearing *as* a reflected term (-e) *after* a reflection on e, producing (e), has implied that something *other than e* must exist *permitting* e to appear as a mediated term. Indeed, the notion of negation is regarded as the essence of reflection and mediation (and the act of questioning), since to mediate or reflect is to remove (negate) oneself from a situation of immediacy. The immediacy of -e is implicit, for by definition that which *is* immediate, and therefore *starting* our analysis, has been called e.

Thus the very act of *affirming* an immediacy, asserting or announcing a given, or recognizing what *is* present, is to set up the *condition* for its negation, since to affirm is to reflect, and allow for the *possibility of its negation.* Both +e and –e, or the assertion *of* and negation *of* e, are functions of e, which is to say that the *content* or reference-base e of assertion and negation is the same, expressed,

[2] The short dash in -e means "not e," while the longer dash in –e means "minus e" such that +e = (e) and –e = (-e).

however, in contrary forms. That which is initially given can be *referred to* positively as that which *is present* (called "positive presence") and negatively as that which is *lacking* (called "negative presence," since the given makes *itself* evident as a *lack*). The concept of negation viewed dialectically as a type of "negative presence" is therefore qualitatively different from the standard notion of logical negation. Given a term A, its negation not-A is usually interpreted to be a positive presence of something other than A, "-A," called, e.g., "B," such that A and B are not only distinct but *separable* "truth values." However the form "other than A" is actually a referal *to A* since no *content* different from A has been posited: to simply *deny* A is *not to assert* anything *else* in its place. Not A is *in*determinate as to *what* is asserted positively, referring only to the *denial of that which was intended.* A genuine negation is a negative presence which cannot without transformation be replaced by an affirming presence. If asked, "Where are you going?" and you respond: "I am *not* going to the theatre," this is a reference *to* the theatre in the mode of rejection.

Reflection on e polarizes e into two modes, distinct in form but inseparable and co-relative in content, since positive and negative as notions are not immediate givens, but mediated relations: each is itself only by virtue of excluding (and therefore having a reference to) its contrary notion: to assert e implies that e *could* have been negated, and vice versa. The *notions* of assertion and negation, mutually implying each other *as possibilities*, must *both* appear in a single act. Reflection is a questioning process producing determination by setting an element in opposition with *itself*: +A is seeing the element "from within" or "in-itself" as Hegel would put it, while –A is seeing the element "from without" or "for-itself." +A is a given *object* or system and –A is *its co*-determinate context or *space*, existing "*for*" the object, defining the object negatively.

Thus there is *one* content (the original e), *two* forms, and *three* phases present in the initial act of reflection (R)e: (e); (e) → (-e); (e) ↔ (-e), or *Assertion* of what is (Ae or +e), Assertion implying *Negation* (Ne or –e), and Negation in turn implying Assertion, making *both* co-relative, such that the negation of e is still a reference to *its* assertion, something which we shall call the *Self-Negation* of e (Se or +–e). Reflection, in attempting to determine or assert e, produces a self-negation of e, involving a coupling of contraries: the *original* pre-formal *non*-positive and *non*-negative e becomes transformed into a formed self-relation between *it*self (now appearing as +e) and *its* other –e, which as a whole is written +–e, i.e.

something which is *neither* +e *nor* –e as such—neither "within" nor "without," but their mutual "boundary" state of mutual implication as possibilities. This now makes Se or +–e a *meta*-formed relation *about* the co-relativity *between* +e and –e, which cannot consistently be expressed by +e or –e themselves, regarding them as separable distinctions. Se or +–e thus expresses *explicitly* that which the original e was only *implicitly*, namely something *neither* positive nor negative, but rather *both* "in and for-itself" *as possibilities*. Reflection brings out (expresses) the original *ambiguity* of the pre-formal element, but can only remain true to this ambiguity by expressing the formed + and – aspects on a meta-formal, self-negative level, wherein the original immediacy or e now appears self-mediated through its co-relative mediation with its negation. (e) is the *assertion* of *immediacy*, which, however, because assertion is a reflection, gives us (e) → (-e), which *mediates* the immediacy, but, since mediation is doublefaced, (e) ↔ (-e) expresses the condition that while e is a function of (implies and therefore is mediated by) -e, -e is in turn a function of e, such that e becomes a function *of itself through* -e: e becomes *self-mediated* or self-negated. A cyclic triad of assertion, negation and self-negation, or immediacy, mediation and self-mediation, is produced through a *single* act of reflection: i.e. the so called thesis, antithesis and "synthesis" of Hegelian dialectic. The movement is directly from a pre-reflected, pre-formal thesis e, to a reflected, meta-formal synthesis +–e, producing a formed or reflected thesis +e and reflected antithesis –e along the way. The synthesis term then serves as a new pre-reflected thesis e′ for higher reflections.

The mutual implication which results, (e) ↔ (-e), is called the principle of Non-Identity, which is not necessarily contradictory since the form "p ↔ q" has *two* possible modes: either p and q are *both* (positively) *present* in one and the same notion, or p and q are *both lacking* (negatively present) in a single notion. If (e) and (-e) are both positively present, then this would violate the law of contradiction. However, if (e) and (-e) are mutually in a state of negative presence (regarding +–e as the boundary state between +e and –e which is *neither* as such) —i.e. if it is the case that "not(e) and not(-e)" or "-(e) and -(-e)" exists, then the law of contradiction is not violated, but the law of the excluded middle is. Put in this form, the principle of Non-Identity says that it is impossible to have both the law of contradiction *and* the law of the excluded middle, or it is impossible to be both consistent and complete at the same time

since (as Quine points out) the notion of consistency demands that an element and its negation cannot *both* be present, while the notion of completeness demands that an element and its negation cannot *both* be absent. The law of Non-Identity hence states that it is not possible to regard (e) and (-e) as strict contradictories as initially intended, due to the coupling relation discovered *between* (e) and(-e) producing a term, which, while having a (negative) reference to (e) and (-e), is nevertheless different from either: they are either contraries or sub-contraries. The law of Non-Identity couples an element and its negation together in such a way that it is not possible for a completely determined system to appear—i.e. a system in which reference to *either* an element *or* its negation, but not both, can be made: ambiguity in some form must be present because no final distinction into *separable compartments* such as A and -A, "true" and "false," or present and absent, can be achieved.

The expression -(e) is not the same as (-e), nor is -(-e) the same as (e): if either or both were the case, a contradiction would result in the form "-(e) and -(-e)." Regarding (e) and (-e) as contraries we can then say that (e) $\rightarrow$ -(-e) or "the presence of (e) implies the lack or negative presence of (-e)" and (-e) $\rightarrow$ -(e) or "the presence of (-e) implies the lack or negative presence of (e)." It cannot then be the case that the converse is true, namely -(-e) $\rightarrow$ (e) and -(e) $\rightarrow$ (-e). Since -(e) is distinct from (-e), dialectic logic cannot dispense with parentheses in the formulation of negation operations.

In classical logic, parentheses can be dispensed with since an expression such as -(e) contracts into (-e) or -e, and -(-e) contracts into (e) or e. In intuitionalistic systems of logic we do not obtain a symmetric two value system of e and -e since -(e) contracts into -e, but -(-e) does not yield e: it is simply written as --e, and hence is asymmetric since both contracts do not occur. However, dialectic logic is doubly asymmetric since neither contraction is permissible and hence we are left with a new form of symmetry: a modified two-value logic which displays *levels* of negation. Initially on the first level there is (e) and (-e), but in addition this entire level is negated, giving -(e) and -(-e), which are distinct from the elements of the initial level, but negatively dependent upon them as (-e) was negatively dependent upon (e) *within* the original (first) level as the negation of e, the primitive "zero" level posit. The law of Non-Identity (e) $\leftrightarrow$ (-e) can thus express both consistency (positively) and completeness (negatively) in that (e) and (-e), while positively absent, are still negatively present.

Analyzing the coupling relation +–e in this way indicates that we have already begun a reflection *on* our initial reflection (R)e. For regarding the meta-formal relation +–e as e′, a new pre-formal posit, (R)e′ produces two new expressions, (e′) and (-e′). But since e′ already represents the inseparable relation between (e) and (-e), the new reflection (R)e′ generates *four* terms: (e′) involves a relation between ((e)) and ((-e)) and (-e′) a relation between (-(e)) and (-(-e)). It should be noted that the first *parenthesis* about e was an indication that e *co-exists with its negation* -e, *each* term therefore appearing with a parenthesis, i.e. (e) and (-e), since each co-exists with the other. Similarly *two* parentheses about e, i.e. ((e)), indicates that not only do (e) and (-e) co-exist, but *their* negations -(e) and -(-e) exist, all *four* of which co-exist, producing the four terms ((e)), ((-e)), (-(e)) and (-(-e)). Thus a second reflection on e gives us the four expressions (e), (-e), -(e) and -(-e) originally implicit in the self-negation relation (e) ↔ (-e) except that now a second parenthesis appears indicating a *completed* second order reflection. A self-negation thus represents a *transition* state from one level of reflection to another. For example, the *formed* (e) and (-e) elements of the first reflection produced a universe of discourse which included a *non-determinate* relation (e) ↔ (-e) within it, which, however, could only *consistently* be expressed on a second level, where not only the (e) and (-e) terms appear (now as ((e)) and ((-e))) but also their *negations* (-(e)) and (-(-e)) *implicit* in (e) ↔ (-e).

On a second level, for example, ((-e)) can be called the second level assertion of an original first level negation, while (-(e)) in turn would be the second level negation of a first level assertion. The former, could, for example, be interpreted to mean that a certain X "is not moral" in the sense that X (is (not-moral)) while the latter might be interpreted to mean that the X which is not moral implies that X (is not (moral)). Hence the expression "X is not moral" can appear as an assertion or negation: i.e. we can say that "X *is* not-moral" (which could mean "X *is* immoral," equating immoral with not-moral) or "X *is not* moral," and it becomes meaningful to distinguish these otherwise obscure alternatives, for to state that X *is not* moral does not make a commitment: X could be *neither* moral *nor* not-moral (immoral)—being rather a-moral or in doubt as to the resolution of a certain issue.

A second level (n = 2) reflection, expressed in terms of plus and minus, becomes:

$$\begin{array}{lllll} \text{e: (R)e} & = & (+\text{e}\rightarrow -\text{e}: +-\text{e}) & = & \text{e}'\text{: (R)e}' \\ \text{1 term:} & & \text{3 terms:} & & \\ \text{n} = 0 & & \text{n} = 1 & & \end{array} \quad = \quad \left\{ \begin{array}{l} +\,(+\,\text{e}\rightarrow -\text{e}: +-\text{e}) \\ \downarrow \\ -\,(+\text{e}\rightarrow -\text{e}: +-\text{e}) \\ \cdot\cdot \\ +\,-(+\text{e}\rightarrow -\text{e}: +-\text{e}) \end{array} \right\} = \begin{array}{l} \text{e}'' \\ \text{9 terms:} \\ \text{n} = 3 \end{array}$$

It is obvious that a continued reflection process will generate a hierarchy of plus and minus terms, which together with their plus-minus coupling relations, represent levels of assertion, negation and self-negation, each new level marked off by a new parenthesis, and having a referral to the level it is a reflection of. Reflection, producing levels of relation n, thus yields a total of 3^n terms, including *both* the singular plus or minus terms, *and* their plus-minus co-relative terms. The single plus or minus terms, *generating* each level, however, form a sub-set of 2^n terms, indicating that a dialectic logic generalizes a two-value (+ and −) logic for n dimensions. From this point of view, dialectic logic has an indenumerably infinite number of "truth" values, as n approaches infinity.

Actually, however, dialectic logic is *fundamentally* a *uni*-valued logic (the original e), producing levels of self-opposition (+ and − e) and self-relation (+−e) resulting in an infinite number of levels of distinct yet inseparable forms. In this leveling process any particular *formed* (determined) level of relations is continually subject, by means of the coupling relation, to higher order indeterminacies, out of which higher order sets of determined relations are formed—as for example, the initial coupling of (e) ↔ (-e) gave rise, relative to the *first* level, to the indeterminate expression "-(e) and -(-e)," and then, on the next level, the determined forms (-(e)) and (-(-e)) in opposition to ((e)) and ((-e)). The appearance of an indeterminacy due to the coupling of contraries according to the law of Non-Identity indicates that a new level is in the process of formation—a level which becomes explicit in a higher order reflection, and which contains the previous level within it as a reference-base.

To illustrate that the above formulation generalizes the process of dialectic opposition, let us examine the second order reflection in a process of generating the third order reflection. (R)e′ = e″ and this gives us (e′) and (-e′) or a relation between the four terms: ((e)), ((-e)), (-(e)) and (-(-e)). However, the coupling term (e′) ↔ (-e′) = e″ has as its initial result either "(e′) and (-e′)" or "-(e′) and -(-e′)." Thus a reflection on e″ ought to explicate the positive (e′) and (-e′) terms and negative -(e′) and -(-e′) terms *implicit* in the meaning of e″. Now (R)e″ = e‴ implies that a

third reflection has *eight* terms: the third level *assertion* of the four given terms inherent in e'' and the third level *negation* of the same four terms inherent in e'' such that (R)e'' = e''' expresses a relation between (e'') and (-e''). Assertion thus brings out the initial terms (e') and (-e') of e'', and Negation -e'' brings out the implied negations -(e') and -(-e'), giving us (((e))), (((-e))), ((-(e))) and ((-(-e))) for (e'') and (-((e))), (-((-e))), (-(-(e))) and (-(-(-e))) for (-e''). Reasoning back to the original reflection (R)e = e' = (e) ↔ (-e), this implies that e' brings out the *implied* opposition inherent in the initial e, namely e and -e, giving us (e) and (-e) for its explication. The initial immediate e, as a *single* term, is in itself an implicit contradiction, which becomes negated into -e: e is originally potentially both itself and its other, a contradiction resolved by reflection into two *distinct* forms (e) and (-e), giving us e' = (e) ↔ (-e). Reflection therefore explicates the inherent opposition within any immediate, indeterminate element, such as e, producing in the process a determined (mutually distinguished) set of oppositions (e) and (-e), which, however, due to the *coupling* of these determined forms demanded by the original e, collapses into a *new* mode of indeterminacy e', requiring an *additional* reflection into e'' to distinguish the *higher* modes of potential opposition, produced by the previous reflection, and *now* appearing as possibilities (i.e. (e') and (-e')).

Everything indeterminate and immediate (such as e, e', e'') is unstable, becoming negated and mediated by its own opposition, only to yield a higher mode of immediacy, having negatively present the previous modes of opposition it has negated. Only through a process of *continual* reflection are all oppositions and contradictions negatable, but this process cannot be completed at any *single* stage for new indeterminacies always appear. The e' as (e) ↔ (-e) would be a *complete* resolution, but expressed as merely the positive terms "(e) and (-e)" e' is a contradiction. To cancel the contradiction demands the negation of the co-relative terms, giving "-(e) and -(-e)," but now, while consistent, the expression e' is incomplete. For now a new level has been started, namely (-e') in opposition to (e'), requiring a new resolution e'' = (e') ↔ (-e') which repeats the above condition. The movement of reflection is therefore a continual movement of self-cancelling self-contradictions. Reflection is an infinite movement of self-realization that can never resolve itself in the form of a completed *product*: the whole *as a process* is incomplete; only the process *as a whole* or an infinite totality and *not* a product is complete. In this infinite process, no particular term

remains as a non-negative term, each expression appearing only as a transitory step in a continual process of negation. Arresting the process at any point will result in a finite sub-set of opposites, the resultant term of which can only consistently express its component parts as negatively present due to the coupling of all contraries.

3. Time: The Temporal Nature of Reflection

What makes the above sequence of coupled contraries possible without explicit contradiction is the notion of negative-referral: i.e. realizing that an expression of the form "-(e)" is a referral to the *lack of* (*e*). The notion of negative presence hence involves the presence of a memory process in which something is capable of being referred to in its negated state as a negative-presence. Indeed, the past is referred to through our memory process as that which once *was* and hence *is not*, but yet is capable of being referred to *qua past*. This must not be confused with the *act* of producing a memory, appearing in "the present": the content of the memory, or the memory itself is, however, a negative referral to a previously but now non-existing state. Hence dialectic logic is a type of "temporal" logic involving a memory system in which the negation of an element preserves the negated element as *that from which* the negation appeared. For this reason, not (notA) cannot be the same as A since not (notA) while negating the negation of A nevertheless has preserved within the parenthesis the fact that A *was negated* in the activity of a double negation. Thus negations are "non-conservative," since an attempted *re*turn or *re*petition from the initial A to notA and back to the initial A by means of a double negation retains within its representing structure the activity of movement that has *generated* the A which appears as a *result* of negation: one cannot return unmodified to the *original* state. In this way negated elements are preserved within the parentheses as *re*ference points for all future activity.

Unlike an "atemporal" logic, dialectic logic is asymmetric in that negation and reflection in general is a process of cancellation—a process of *aufheben* which retains any previous state as a perspective of orientation. An absolute or all-embracing negation would be equivalent to a total loss of memory, something which cannot be formulated within a memory system itself. It is hence impossible to "move backwards" through time in this analysis for this would involve an eradication of memory, an *event* not capable of *appearing*

within the memory structure. (One can of course be aware of the loss of *something* which at one time served a certain function, but then we are not aware *of* that something itself, but only its contextual relatedness.) The significance of the quotation from the Rubaiyat appearing at the beginning lies in its poetic expression of this relentless irreversibility of time.

It is important to recognize that the indeterminate nature of negation (i.e. notA is a referral to the *absence of A* and is indeterminate as to what *is* present) has as its intuitional foundation the notion of time. Since we are considering the process of reflection to be an asymmetric process appearing through time (and indeed, as we shall see, defining the very nature of time) this implies that the various elements to be generated cannot at any stage all be present. Hence we are not dealing with an already form*ed* and determin*ed* universe of discourse, but with one that is in the process of *being formed*, and therefore the system is intrinsically incomplete and must exhibit this incompleteness through the indeterminacy of its variables. Only within a completed system (and hence one that is essentially finite *in description*) is it possible to state that the negation of a given element x is all that which is "left over," namely an un-ambiguous "not-x" such that *not*-notx is in turn x! Since we are dealing with a continually expanding universe of discourse, not-x is an *inde*terminate reference to what *is present*, having only a *de*terminate reference to that which has been *excluded*. Once a negation has been determined and de-limited within a given frame of reference (as for example -e appearing as (-e), and thus *binding* or coupling -e in relation to what is excluded, namely e, giving (e) $\leftrightarrow$ (-e), this then implies that the *entire universe of discourse* (now called e′) can be negated, producing higher order negations that initially are likewise indeterminate (i.e. giving us -e′ or -(e) and -(-e). It is thus important to distinguish between the genuine indeterminate negation, *opening* a system up to elements *beyond* those already formed, and a determined negation expressing a *previous act* of negation, and which co-exists *with* and is thus bound *to* its co-relative assertion *within* an already formulated universe. Thus -(A) is open, and (-A) is closed: the former states that an x does *not have* a property A, while the latter states that an x *has* a property notA. In sequence, the negation of an element A as *not*A gives the indeterminate form -A, but *re*cognizing that reflection yields not*A* determines the negation as (-A), permitting *not* (-A) or -(-A) to appear *and its* determination not(-*A*)or (-(-A)) etc. The genuine indeterminate negation produces *levels* of negations (and *co-relative*

levels of assertions such as (A), ((A)), ((-A)) etc.), and ignoring this distinguishing nature of dialectic negation reduces negative presence to positive presence, and "spatializes" time: non-dialectic logic is a-temporal, corresponding to a view of the universe as essentially determined and *given* "in space," and merely in need of *description*.

Dialectic logic is asymmetric as the time process is, and ". . . the systematic development of truth in scientific form . . . lies in the form and shape in which the process of time presents the existence of its moments."[3] Also, Hegel informs us in the introduction to his *Logic*, that

> The one and only [*sic*] thing for securing scientific progress is the knowledge of the logical percept that Negation is just as much Affirmation as Negation, or that which is self-contradictory resolves itself not into nullity, into abstract Nothingness, but essentially only into the negation of its *particular* content, that such negation is not an all-embracing negation, but is *the negation of a definite something*, which abolishes itself, and thus is a definite negation; and that thus the result contains in essence that from which it results—which is indeed a tautology, for otherwise it would be something immediate and not a result. Since what results, the negation, is a definite negation, it has a content. It is a new concept, but a higher richer concept than that which preceeded: for it has been enriched by the negation or opposite of that preceding concept, and thus contains it, but contains more than it, and is the unity of it and its opposite. On these lines the system of Concepts [i.e. Hegel's system] has broadly to be constructed, and to go on to completion in a resistless course, free from all foreign elements, admitting nothing from outside.[4]

Thus there is only *one* starting point: the indeterminate e, such that all reflections are indeed *self*-reflections *on* and *about* e (and thereby "free from all foreign elements"). Thus -e is not a mere negation of e, but has a reference *to* e (as "the negation of a definite something"), such that when the non-identity relation uniting e and -e into (e) $\leftrightarrow$ (-e) appears to express the condition that the "richer concept" which results "is the unity of it [the original concept] and its opposite," the possible self-contradiction of positing *both* (e) and (-e) "resolves itself not into nullity," but only into the "ne-

[3] Hegel, *Phenomenology of Spirit*, trans. J. Baillie (2d ed.; New York: Macmillan, 1931), pp. 70-71.

[4] *Science of Logic*, trans. Johnston and Struthers (New York: Macmillan, 1929), I, 64-65.

gation of its *particular* content," i.e. into "-(e) and -(-e)." The "synthesis" of e and -e is hence a *negative unity of opposites* bringing e and -e together into a relation which is "*neither* (e) *nor* (-e)," i.e. into a relation which is defined in terms of that which it is not. Thus the "synthesis" concept of Becoming for Hegel is that "which is not either Being [affirmation] or Nothing [negation],"[5] but rather the indeterminate *state* of transition between that which is and is not: becoming is defined in terms of that which it is not.

Hegel's synthesis of becoming as the coupling of being and nothing —as well as the relation "-(e) and -(-e)" in general—can be regarded as a single "boundary zone," representable as a "line" distinguishing yet connecting two mutually opposed "regions" called (e) and (-e). This boundary line can be regarded as a mathematical *limit* relation between two *distinct although inseparable* spaces, and hence, being a limit relation, it expresses that which the two spaces approach, without having the two spaces *positively* present in the boundary zone. Rather the very notion of a mathematical limit entails the *negative* presence of *that* which is limited: "-(e) and -(-e)" is a boundary *of* (e) and (-e), and being a reference *to* (e) and (-e), it is therefore defined in terms of what it is not. Similarly +–e can be regarded as the "zero" point *limit* of +e and –e.

Unity is therefore the *transcendence* of that which is unified, and transcendence as a *movement* from an initial state (e) to its negation (-e) is a *unity* of both: a negative unity (e) ↔ (-e). In this unity, each opposite is *aufgehoben*, i.e. (a) it is cancelled, yet (b) preserved *as* a negative presence and (c) raised to a higher or "richer" level in that *as* a negative presence each element (e) can be conjoined with its opposite (-e) expressing a state of transition "-(e) and -(-e)" without contradiction.

The synthesis or self-negation of a term, resolving itself into a negative unity of opposites, thus illustrates that the definition of dialectic opposites are "positive contraries which become negative subcontraries upon their mutual implication in a non-identity relation." Thus (e) and (-e) are positive contraries meaning that they cannot both appear together in any one relation. However the very act of writing the denial of inconsistency or contrariness "-(e) and -(-e)" allows us to consider the negative presence of (e) and (-e), wherein they now appear as negative sub-contraries. This means that as *negative* relations, they cannot both be absent in any one relation. Thus, the first term (e) implies -(-e) or the negative re-

[5] *Science of Logic*, I, 95.

feral to its opposite (-e), and the second term (-e) implies -(e) or a negative referal to its contrary (e), while the synthesis term (e) ↔ (-e) is a negative referral to *both*, i.e. it is "-(e) and -(-e)." Being negative sub-contraries is the other side of the coin of being positive contraries, and in this way we guarantee a condition of negative completeness: there will always be a negative reference to either (e), (-e) or both. Hence the dialectic of a synthesis term lies in the fact that it is *both* terms (negatively) yet *neither* (positively) at the same time, spelling out the essence of dialectic opposites: to be inseparable yet distinct.[6] We can now construct a table of opposition, showing how dialectic opposites complete an otherwise incomplete structure. It also illustrates that dialectic opposites, *like contradictories*, are a combination of contraries and sub-contraries but in a different way. Let X stand for impossible, and / for possible:

Type of opposition	Reference to *Both* (e) and (-e)	Reference to *Neither* (e) nor (-e)
Contraries	X	/
Sub-Contraries	/	X
Contradictories	X	X
Dialectic opposites	/	/

4. Logic and Time: The Problem of Identity in General

Regarding the dialectic process intuitively, reflection takes an immediately given entity called e, and "places" this entity e in context with its other called not e or o, implicitly present within itself as the entity's potentiality for being questioned or reflected (i.e. negated as an immediacy), such that the result is now neither e nor o as such but the transcending and unifying *movement* or *relation* eo. *In* this relationship of context, e itself becomes transformed and determined as (e) and not e or o likewise becomes determined as (o), while the *relationship* eo is the co-relativity and hence transcendence of these individual determinations. The basic structure of reflection can now be intuited as a *movement* from a *singular indeterminate term* e, to a *singular metadetermined relationship* eo, the process (R)e = (e → o: eo) being called e′, indicating that reflection has been a self-determining process *of e*.

[6] Speaking about the unity of Being and Nothing, of which Hegel says "all that follows . . . all philosophical concepts, are examples of this unity," the essential point is "that they are absolutely distinct, and yet unseparated and inseparable . . . their truth is . . . this movement of one into the other." *Science of Logic*, I, 97; 95.

The negating o term represents the *expansion* brought about by the *explicating* reflection process, and is not something alien to e. To reflect on something is to view that element and not some other element from a plane of perspective and hence a *reflection is a double negation whereby the original immediate posit dissappears and reappears in context with the implicit negation inherent in the process of reflection*, i.e. with the questioning of the given. If we did not have a temporal logic, a reflection on e would simply be e itself. But a temporal logic regards reflection as an *activity* in which the very questioning of an initial posit changes the nature of the posit present. Thus we have a conceptual counterpart to the indeterminacy principle in physics, which states that the very activity of a subject measuring an object modifies the object (and also subject) involved. For example, reflection on or thinking about a conceptual object changes the *way* in which the object appears to the field of consciousness, and reflection or thought about an emotional state itself transforms that state from one of bare immediacy to reflective mediation, bringing to bear implicit associated feelings. Reflection on a perceptual object will alter the frame of reference with which the object is viewed and hence will alter the relevant information that the subject takes as essential for the perceived object, since perception involves not only seeing, but also the operation of *looking-for*, i.e. discovering "in" that object an example of some conceptualized relation forming part of the evaluative perspective negatively present in the field of viewing consciousness. Experiments indicate that an altered perceptual mode even transforms what is seen.

The principle of Non-Identity holds that entities appear as *events* within a field of consciousness and are basically neither determined nor not-determined, but rather in a process of *being*-determined: e.g. e is being determined to be e′. This implies that the problem of Identity or defining "what is" must include the negation of reflection as an *integral* aspect: *what* is defined cannot be severed from the *act* of definition. In a non-temporal structure, the principle of Identity would hold: once something is given, e.g. an object A, *re*ference can be made to the *same* A despite modifications of context. Thus it would be possible to write "A is A" or "A $\leftrightarrow$ A." However, to *say* that "A is A" is to give an answer to an implied question, namely "A is ?" since the statement "A *is* A" is a *re*flection on the *immediately* given A and in effect becomes "A is (A)." Reflection, *reveals* A co-existing with -A, such that (A) $\rightarrow$ -(-A): "A is A" means that A is A and *not* something else. *Re*cognition of immediacy or a *re*ference to it, *transforms* it into mediation. Within a temporal

context, the very fact that A *re*appears (i.e. appears *twice* in "A is A") means that the *unquestioned* immediacy of an original A has been modified by the questioning process: it appears as something mediated (i.e. it appears a *second* time, now *in relation to* -A) and not immediate (appearing only a *first* time). The dialectic of something appearing a second time is therefore based upon the dialectic of the notion "to reappear." For something to re*appear* means on one level that it indeed does *appear* again, but in that it *re*appears, means that the *mode* of appearance *transforms* the object present and appearing into something mediated and not immediate: *all repetition is therefore transformation* since a repeated state has negatively present in its memory structure the fact that it has already happened in the past. The law of Identity is not false: it is simply empty since "A *is* A" is not definable within a temporal context.

We could of course say that "A *was* A" meaning that the present state of *what is* is being bracketed, and the temporal aspect introduced by taking into consideration the effects of an observ*ing* and persist*ing* field of consciousness is ignored. In that case, with the suspension of the on-going temporal process, we have a hypothesized past which *qua-being-past* remains unchanged. Thus the law of Identity operates for a system whose members are taken to be *already fixed by definition*: it operates within a system in which the ambiguity of definition is eliminated by fiat. Thus, every element is well-form*ed in-itself*, and is not influenced by *contextual* relatedness: the A within a formula "x + A = y" is the "same" A as within a formula "z + A = w," since "A $\leftrightarrow$ A" rejects any coupling A may have with a contextual "-A." Thus the law of Identity can be regarded as a type of sub-set within a law of Non-Identity, referring to the *past* aspect of the time process. This can be formally stated in the form of a meta-principle of Non-Identity called -I′: calling the principle of Identity I (e $\leftrightarrow$ e or (e) $\leftrightarrow$ (e)) and the principle of Non-Identity -I (-(e $\leftrightarrow$ e) or (e $\leftrightarrow$ -e) or ((e) $\leftrightarrow$ (-e)), a meta-principle of Non-Identity would read -I′ = (I) $\leftrightarrow$ (-I). Therefore Identity can be expressed as a function of some higher order Non-Identity; being appears as a function of time and becoming, and the past appears as a function of an enlarged temporal structure which includes the negating present. Indeed, the very attempt to show that a law of Non-Identity negates *itself* by a self-reflection reestablishes a higher form of Non-Identity. Calling the law of Non-Identity N, a coupling of N with its negation -N gives us N′ = (N)$\leftrightarrow$(-N). Unlike a law of Identity, the law of Non-Identity expresses itself through its opposite, and ceases to express itself if it is not related to its opposite.

Regarding logical structures explicitly in terms of temporal development permits a reformulation of certain basic concepts, which would otherwise seem foreign to the region of logic. First of all, the problem of Identity is no longer merely "formal," in that the *process* of formation, itself non-formal, is seen underlying the *act* for formation. Therefore, there is a dialectic between formal and non-formal: i.e. "content" reappears in the guise of the activity of formation—a content which is dynamic and reflective in nature. Thus, as we have seen, the *element* formed and the *process* of formation called reflection are inseparable, which means that dialectic logic expresses a philosophy of *phenomenology*. The element present is any object or *event*, and the *field* it is present to is the field of *consciousness*, which reflects on the event. We are thus conceiving consciousness as *a persisting field of presence to events* (either conceptual or perceptual) and hence since it persists, an accumulating memory field develops, reflective of its continuity of presence. Therefore, consciousness is defined phenomenologically as a subject (field of presence)—object (event) interrelation in which neither field nor event, subject nor object have meaning independent of their state of interaction. Consciousness is thus a co-relativity between the contraries S and O (subject and object) giving rise to the form (S) $\leftrightarrow$ (O) and, as we shall see later, capable of expressing *levels* of subject-object relation, S′, O′, S″, O″ etc. Dialectics, phenomenologically based, avoids being either a subject-centered idealism or an object-centered materialism. The subject-object relation of phenomenology is the *content* of the dialectic process, which as a structure in turn is the very *form* of the subject-object phenomenology of consciousness: *Dialectic Phenomenology* is what results.

However, besides being descriptive of consciousness, Hegelian dialectic explicates the very structure of time itself. The triadic movement (e $\rightarrow$ o: eo) is no other than a triadic movement between past, present and future. The initial indeterminate element e is, as such, pre-temporal, before reflection. Without an act of reflection upon the intuitively given there would be no recognizable differentiation between the intuitively present events and the field of conscious presence, reflectively distinct from the occurring events. There would merely be the continual presence of "events-within-a-field," the continual presence of whatever (state, process, relation) is given, and no notion of differentiation or temporality could be *explicated*: the pre-reflective present is a type of "eternal" or "continual" *indeterminate* presence of what-is. *Re*cognition of differentiation

implies the existence of *negating* events (events that take on a *determining*, negating characteristic) within a field of presence such that a meaningful *contrast* appears between something given and something *not*-given; between a sustaining and *persisting* field of conscious presence preserving what has already been given within its memory field (reflective of its *continuity* of presence), and a non-persisting and hence "fleeting" or negating set of events as something not-given but "happening" and therefore in contrast to the persistency of the field. This can then be shown to yield the triadic relation: (the *negated* yet preserved given) → (the *negating* not-given) : (the process of the given *being negated* by the not-given) as (e → o: eo).

The *act* of reflection will now be defined *phenomenologically* to *be* the negating event (the not-given) within the interacting subject-object (field-event) system which "fixes" or "focuses" upon something intuitively given, transforming the given into the *past* as something determin*ed*, and hence *removed* from the indeterminate flux of sheer presence, becoming part of the persisting memory field, such that the reflective act itself at the same time becomes the *present-act* of negation and determination, and such that past and present as contrary differentiations mutually imply each other as opposites. Being phenomenologically defined, the act of reflection must not be thought of as a merely "mental" state; it is rather a function of the combined field-event or subject-object process of interaction: reflection depends upon the object as well as the subject.

The act of reflection negates the immediacy of the initial e, giving us (e) as that which *has been determined* as given, and equally *determines* the present as a *specific* not-given or (-e). The net result is an a symmetric temporal process of the *past* being established through a negating *present*, defining in this transition, and co-relatively between past and present, or (e) and (-e), the notion of the *future* as that which is *neither* the given and past, *nor* the specific negating not-given or present, but the past-to-present act of transition : the future is the transcending *movement* of negative unity—the *act* of becoming, transcendence or determination itself; it is the process of something *being-given* and is bound neither by the given nor by the not-given. The future "exists" not as something already predetermined, yet not manifest; the future is a "transcending presence" between two temporal states, expressing the given past in a process of continually becoming *transformed* by a negating present. The future is the mode of self-transformation—the mode of the given seen as a *process* of being-given which is neither positive nor negative, but self-negative. Seen as self-transformation, the future of a given

is a "*pro*ject" or *goal of becoming*, and must not be seen as a *separate* presence, disjointed from the past as another separate presence neither of which are thereby capable of appearing in an immediate present. Actually all three modes of past, present and future appear in a *single* act of reflection in which an *indeterminate* presence (the original e) becomes transformed into a *transcending* presence (the reflected e called e′), coupling the *positive* presence of the past, as the alredy establish*ed* and determined, and the *negative* presence of the present as the negation of the given. The past is the negat*ed*, the present is the negat*ing*, and the future is the process or *state* of nega*tion* of something be*ing* negat*ed*, i.e. a state of self-negation and transcendence which as a state is *completely open*: it is *neither* positive *nor* negative but explicates the original *in*determinate presence it is a reflection of; the essence of the future is freedom.

Logic, time, phenomenology and onology are therefore all interwoven in one overall concept of dialectic and the principle of Non-Identity: indeed, with logic we have assertion +e, negation –e and self-negation +–e; with time we have past, present and future; with phenomenology we have subject (the persisting field of presence), object (the negating events) and the subject-object relation; and with ontology we have being, nothing and becoming.

Dialectic logic can therefore be regarded as a systematization of the mode in which elements, appearing within a consciousness that persists through time, *become* determined, and indeed it can be said that the structural nature of an element generated becomes a reflection of its history: space (structure) and time (history) become inseparable. However, this does not prevent a formalization of dialectic, given as a mapping of the ongoing temporal process within a persisting structure that is being generated, and which, once generated, *remains* present. It becomes important, however, not to confuse that which is *being* determined with the *elements* determined, which *once* set down qua-determined (including the determination that a certain element is indeterminate) are regarded *independently* of the generating process that produced them and transforms them by continually *re*producing them within newer contexts. From the intuitive perspective, the various stages e, e′, e′′ are all part of a *continual* expansion of the *one* original indeterminate e, whereas from the formal perspective, *each singled out* stage such as e′ appears as an *independent* member having qualitatively different relations from the other stages since they obey the sub-ordinate law of identity—something which of course can and must be expressed since identity and the persisting past is a part of the temporal process.

Therefore, the development of the dialectic matrix, representing the form in which *levels* of reflection appear, will be presented as a *formal* structure of A (Assertion), N (Negation) and S (Self-Negation) operators, a *logical* interpretation as assertion, (e) or +e, negation, (-e) or -e, and self-negation, (e) ↔ (-e) or +–e, and an *intuitive* process using the e, o and eo symbols. As intuitive symbols, e and o are to be regarded as elements-in-continual-transformation, capable of having a reference to formal counterparts, but essentially symbolizing that which is in a state of continual temporal self-transformation.

5. The Relationship between Ordinary Logic and Dialectic Logic

From the perspective of a principle of Non-Identity, dialectic logic can be taken as a way of generalizing Goedel's theorem, and instead of regarding it merely as a *limitation* to the expression of consistent systems in ordinary logical structures, it now becomes the *starting point* for a dialectic logic, which regards these limitations as the essence of its structure. According to Goedel's theorem, our present mathematical-logic system is so constituted that consistency and completeness appear as contraries: given one, the other cannot necessarily be shown. But as we have seen, the principle of Non-Identity equally presents us with that contrariness. Indeed, it is significant that the formula giving rise to Goedel's result is similar in form to the principle of Non-Identity: i.e. it is possible to construct a true formula G such that its demonstration is implied by and implies the demonstration of its negation. This is symbolized by Dem (G) ↔ Dem (-G), which results in the conclusion that while true the formula G cannot consistently be expressed *within the given* formal system without expansion, which would then only produce higher order incompleteness, namely another formula G′ having a fate similar to G.[7]

The above situation appears as a limitation of expression only if we view formal structures merely from the perspective of the law of Identity, wherein we regard the essence of a given term as already fixed and formed, independent of the activity of reflection. Reflection, however, opens up any given X to an indeterminate -X,

[7] It is interesting to note that G represents the statement "G is not demonstrable," i.e. G says *of itself* that it is not derivable from the axioms. Goedel's theorem hence formalizes a self-negative and self-reflective condition, which, while true, cannot be *derived* without contradiction.

placing the given thus in a new context, *within* which both the given X and the -X become transformed due to the mutually limiting nature of the coupling relation expressing the *co*-existance of X and -X. Hence X appears determined as (X) in relation to an equally mediated (-X), productive however, of a *transformed* X called X′ representing the coupling (X) ↔ (-X). The coupling relation thus acts to *delimit* and form both *X and* -X by a relation of mediation (i.e. X mediated by -X gives (X) and -X mediated by X gives (-X)), yet is *itself* a transcendence of that *which* it forms, standing as it does for the *act* of formation. Thus, of necessity, reflection will always produce potential contradictions, for a contradiction is always a contradiction *in terms*, and the terms formed by the coupling relation, while delimited by a mutual limiting relation and thus *excluding* ambiguity *in themselves*, have nevertheless only *achieved* this determination by a coupling relation which as a meta-determination to the determined forms *itself* exhibits the ambiguity it has eliminated from the formed terms. Thus the only way out of the contradiction of terms resulting from *delimited* terms *exhibiting* the ambiguity of the act that produced them, namely the co-relativity relation (X) ↔ (-X), is a *redefinition* of terms, allowing for an *expansion* of the universe of discourse: instead of merely (X) and (-X), we have ((X)), ((-X)), (-(X)) and (-(-X)).

Numbers were originally regarded merely as rationals, i.e. in the form p/q. The operation of squaring a rational would always give another rational. Now the *inverse* operation of square-rooting, while a meaningful *property* of a number, *could* produce a non-rational, and hence *not* a number as initially conceived. However, an expansion of the number concept to real numbers, including both rationals and irrationals, resulted in a widening of context, within which the older notion of number, otherwise subject to contradiction, appeared in modified form. But irrationals turned out not to be identical with non-rationals, since further expansion into imaginary, complex and hyper-complex numbers could also be achieved. In mathematics, the transition from natural numbers to integers, rationals, real, complex, hyper-complex etc. represents a continual process of redefinition of number, to allow for expansion of context needed to overcome potential contradictions resulting from generalizations of already formed concepts. Contradictions are therefore *not* to be regarded as a catastrophy, but rather as a sign that the delimited universe of discourse *needs* a redefinition of identity to allow for the appearance of the ambiguity and indeterminacy *previously eliminated* by fiat. Any *formed* expression is

by definition (!) incomplete in that it is thereby taken out of the *process* of formation—a process which is itself not formed.

Thus if we regard the *process* of formation—the dialectic of reflection—as the foundation of formal structures, then it is possible to reintroduce the notion of *completeness* with the notion of consistency, in that the act of redefinition is now regarded not as an *ad hoc* intervention from without merely to preserve consistency or distinctness, but rather redefinition is regarded as expressing the nature of the ever-present formation process and as an *expansion* of the *given* terms, having the original given terms *negatively present* as part of an accumulating memory structure which preserves and hence is complete with respect to *all* that it transforms and negates as *part* of a grow*ing* structure. We thus evolve a stratified theory of types or levels X, X′, X″ etc., which, unlike the Russell theory of types, does not appear as an *extra*-logical device introduced to preserve consistency, but is rather an integral aspect of the *logic* itself.

From the law of Identity perspective, Goedel's theorem would regard an expression such as Dem(G) ↔ Dem(-G) or (X) ↔ (-X) as giving rise to only *two* alternatives: (a) either we get "(X) and (-X)", expressing a contradiction in that while inseparable, (X) and (-X) are also indistinct, or (b) "-(X) and -(-X)" expressing incompleteness in that, while distinct, (X) and (-X) are also separable, productive of a formed relation that is *neither* (X) nor (-X), but a *third* alternative. This alternative goes *beyond* (X) and (-X) and has *no* reference to them, since they have been rejected. This type of reasoning leads to a meta-level analysis in which there is no *continuity* of content from level to level: each new level becomes a completely distinct *and* separable formed expression which does not retain a reference base to that which has been transcended.

However, with the notion of negative-referral, the expression (X) ↔ (-X) in the form "-(X) and -(-X)" expresses a coupling relation which says that the opposites are both distinct *and* inseparable, i.e. while positively absent, they are negatively present, and positive contraries are transformed into negative sub-contraries. This means that there will *always* be reference to (X) and (-X) negatively: the condition for positive consistency is equivalent to a condition of negative completeness. (Also, while we do not have positive completeness, neither do we have negative consistency, meaning that *both* (X) and (-X) can be conjoined as negative referrals in a boundary condition expressing a state of transition and transcendence.) Thus, when a new level is revealed, enlarging the universe of dis-

course by redefinition, from single to multiple parentheses structures, the enlarged structure is a development of the previous level and and does not appear as an *ad hoc* enlargement. Dialectic logic, therefore, does not concentrate on the problem of consistency *versus* completeness as such. Rather it considers the basic problem to be that of *Identity* and indeed considers the notions of consistency and completeness (as well as the parallel notions of the law of contradiction and the law of the excluded middle) to be imbedded *within* the formulation of the concept of identity. Calling A by the symbol p, and notA by q, we can construct, according to the standard meaning of operations in classical logic, the following relations:

[– (p & q) and		(p or q)]	↔	(p ↔ -q) ↔ (p ↔ - -p)	→	(p ↔ p)
Law of Contradiction	+	Law of Excluded Middle	=	Law of Double Negation	→	Law of Identity, I
Consistency	+	Completeness	=	Well-determined System	→	Identity
p and q are contraries	+	p and q are sub-contraries	=	p and q are Contradictories	→	p is self-identical: no relation to q

However, if we deny the law of Identity, holding that p is not self-identical (because reflection relates p to q), or deny the condition of *strict* Contradiction we get -I → -(p ↔ - -p) ↔ [-(-(p & q)) or - (p or q)]. In other words, the possibilities open are either inconsistency or incompleteness: the law of Identity is not only a necessary condition for a well determined system, but its negation leaves us right in the beginning with the notions of consistency and completeness set against one another.

Dialectic logic, *starting* with a law of Non-Identity, hence regards as its basic essence the opposition between consistency and completeness, but because it formulates Non-Identity in terms of a temporal logic involving negative-referral, the opposition is transcended by becoming an expression of the fact that entities reflected upon are in a continual state of *becoming* and self-transformation, and are therefore *being*-determined, and thus neither determin*ed* nor not-determin*ed* as such. Underlying the essence of Goedel's theorem is the need to reformulate *Identity*, permitting it to express Non-Identity and self-generation.

Thus the essence of dialectic analysis lies in the fact that it forces reformulations and transformations of presently accepted and artificially fixed conceptualizations. It is opposed to any type of fixed-substance notion, whether the concepts apply to the self, world

or self-world interaction. Identity is not something *given* or defined: it is something that has to be continually achieved and reaffirmed, involving the anxiety of non-identity and self-negation. The *act* of *de*finition itself, i.e. that X *is* A, which underlies the basic structure of formal systems, is what must be transformed: upon *reflection* X is also A′ or (A) ↔ (-A). When a predicate X such as "is in motion" in analyzed from a formal perspective, it is important to introduce levels (meta-levels) wherein it is necessary to distinguish motion taken in different senses, i.e. motion_1, motion_2, motion_3, etc. in order to avoid contradiction. However, this is but another form of the consistency-completeness conflict, since one is forced either to (a) consider *one* expression such as motion_1 as complete and including all its variations within its scope with the result that *inconsistencies* occur, or (b) consider any one expression such as motion_1 as well defined and *incomplete* regarding other senses of the term in order to maintain consistency. However, all the various senses of motion are nevertheless still references to an overall *idea* of motion (otherwise we would not refer to them as *motion* with *sub*scripts), which as an idea undergoes self-transformation in its identity as further reflections are made.[8]

In dialectic logic, the various terms e, e′, e″ are so regarded as referring to only *one* content, namely e, seen in a mode of continual redefinition—a redefinition that is part of the implicit definition of the original e. Dialectic logic, dealing directly with the problem of identity within difference, regards notions as vehicles of *conscious expression* that have continually to expand their delimited boundaries in order to be true to the indeterminate temporal nature of consciousness. For this reason dialectic logic would be a fruitful ingredient in the area of conceptual model-building since it addresses itself not to the primary data of a particular science as such, but to the developed or quasi-developed theoretical structures *of* the sciences. Dialectic ought therefore to be an integral part of *meta-science*, i.e. that discipline which has as its task the problem of ascertaining criteria for choosing *which* plausible hypotheses or conceptions—out of a whole set of possibilities *each* one of which could equally well apply to the requirements of primary data—would be in better

[8] Such self-transformations of concepts reflect the dialectic nature of consciousness or the Self, i.e. an activity that manifests itself by becoming transformed through self-consciousness: i.e. (R)S = S′ or a reflection on Self produces a higher order notion of self that includes itself in relation to the not-self or the objects of consciousness. Hence S′ is the dialectic unity S ↔ O, where S is Self, subject or field, and O is World, object or events.

form for *expressing insight and predicability* that leads beyond the *given* data: the subject matter of meta-science is the *history* of theoretical structures and thus involves the *temporal* development of scientific *consciousness*. Meta-science analysis is thus open to empirical validation since the effectiveness of theory can be judged in time. In this way dialectic is intended as a bridge between science and phenomenology, making the subject-object structure of consciousness, viewed as a field-event complex productive of dialectic opposition, the *criterion* of meta-science analysis. Conceptions must be *both* objective and subjective, displaying oppositions as distinct *and* inseparable, and any theoretical structure showing a tendency to express its elements in a one-sided (abstract) way would require reformulations transcending these reductionisms to reified self-identical absolutes: *ultimate* particles, *absolute* velocities, *complete* unity or duality, *rigid* bodies, *total* vacuums, *complete* indeterminacies, etc. would have to be transcended. The aim of dialectic analysis would be one of investigating primary formulations, reformulating conceptions which lead either to incompleteness or inconsistencies due to claims of rigid *identity*.

Recognizing, therefore, that the law of Identity is a subset to a larger and more encompassing law of Non-Identity is tantamount to recognizing that negation and contradiction, far from opposing affirmation and identity, are rather an integral aspect of identity seen now as the identity *of* non-identity, or the being *of* becoming, i.e. seeing that to be is to become and face the anxiety of non-being.

> But the life of spirit is not one that shuns death, and keeps clear of destruction; it endures death and in death maintains its being. It only wins to its truth when it finds itself utterly torn asunder. It is this mighty power, not by being a positive which turns away from the negative . . . on the contrary, spirit is this power only by looking the negative in the face and dwelling with it. This dwelling beside it is the magic power which converts the negative into being. That power is just what we spoke of above as subject [consciousness], which by giving determinateness [negation] a place in its substance, cancels abstract immediacy [i.e. that which is void of being concrete and related to its opposite] i.e. immediacy which merely *is*, and by so doing becomes the true substance, becomes being or immediacy that does not have mediation [negativity-determination] outside it, but is this mediation itself.[9]

[9] *Phenomenology of Spirit*, p. 93-94.

6. Expansion of Dialectic Logic into Higher Order Reflections

We will now briefly indicate, given the principle of Non-Identity, how higher order levels of reflection manifest themselves as dialectic matrices displaying triadic movement in several dimensions simultaneously. Calling the self-negation term (e) ↔ (-e) by the symbol (--e), thus reflecting the double-implication and double-negation structure of the self-negation operation (negating *both* e and -e), the *initial* triad obtained through (R)e involves the terms (e); (-e) and (--e). The expression (--e) also indicates that the synthesis term +−e is a negation of the negation of the original e, in that it is a *return* to the non-positive and non-negative nature of the original e, seen however on a more developed plane.[10] We can now write: (R)e = (A → N: S)e = (Ae → Ne: Se) = ((e) → (-e): (--e)) = e′, where A, N and S stand for the assertion, negation and self-negation operators.

The problem remains as to what the second order reflection e″ = (R)e′ = (R) (R) e = (A → N: S) (A → N: S)e entails. Let us write (R)e′ = (Ae′ → Ne′: Se′), and since e′ = (A → N: S)e, we get the following: e″ = (R)e′ = (A(A → N: S)e → N (A → N: S)e : S (A → N: S)e). This can be better seen as a two-dimensional structure or matrix:

$$\begin{Bmatrix} Ae' \\ \downarrow \\ Ne' \\ \cdot\cdot \\ Se' \end{Bmatrix} = \begin{Bmatrix} A(A\to N{:}S)e \\ \downarrow \\ N(A\to N{:}S)e \\ \cdot\cdot \\ S(A\to N{:}S)e \end{Bmatrix} = \begin{Bmatrix} AAe\to ANe{:}\ ASe \\ \downarrow \quad\ \downarrow \quad\ \downarrow \\ NAe\to NNe{:}\ NSe \\ \cdot\cdot \quad\ \cdot\cdot \quad\ \cdot\cdot \\ SAe\to SNe{:}\ SSe \end{Bmatrix} = \begin{Bmatrix} (\,(e)\to\ (\,(-e)\,){:}\ (\,(--e)\,) \\ \downarrow \quad\ \downarrow \quad\ \downarrow \\ (\,(-e)\to\ (\,(-(-e)\,){:}\ (\,(-(--e)\,) \\ \cdot\cdot \quad\ \cdot\cdot \quad\ \cdot\cdot \\ (\,(--e)\to(\,(-(-e)\,){:}(\,(-(--e)\,) \end{Bmatrix} = \begin{Bmatrix} (e') \\ \downarrow \\ (-e') \\ \cdot\cdot \\ (--e') \end{Bmatrix}$$

(formal matrix) (logical interpretation)

Thus levels of assertion, negation and self-negation correspond to writing levels of e, -e and --e within ordered parentheses. The immediate observation is that nine terms appear, involving four non-synthesis terms (AA, AN, NA, NN), four partial syntheses (AS, SA, NS, SN) and one complete synthesis SS. The diagonal of the matrix AA, NN, SS represents the complete second level Thesis, Antithesis and Synthesis.

[10] The *immediate* form of self-negation, seen as a direct union of e and -e, would be -- e, which, like -e, can only be *implicit*: -e and -- e *appear* only through reflection, and thus in the *form* (-e) and (--e).

In order to obtain an *intuitive* grasp of the above two level triad of nine terms, it must be remembered that *dia*lectic logic is essentially a two-valued (two-formed) logic, involving a continual cyclic feedback relation between the e and o or assertion and negation inherent in the original eo or (e) ↔ (-e) term. This means that upon reflection, the presence *of e* is a reference to the absence *of o*, and the presence *of o* is a reference to the absence *of e*. Now the function of the Assertion operator has been to *leave-present* that which *is* present. Hence Ae is a reference to the presence of e, and Ao is a reference to the presence of o. On the other hand, Negation has been conceived of as a reference to that which is not-present or *absent*. Now with e present, o is absent, while with o present, e is absent. Thus it follows that Ne must be a reference to the presence of o, and No must be a reference to the presence of e. But if we set Ne equal to o, then No or NNe must be a reference to the presence of e: a negation of the *negation of e* must reflect the presence of that which the *negation of* e says is absent, namely e. From this point of view, a continual negation process on e, such as NNNN. . . . . e gives rise to a *cyclic* series: e, o, e, o etc., reflecting the co-relativity of mutual implication between e and o—between e *itself*, or "in-itself," and e as *its other* or "for-itself." However, at the same time, each operation must preserve as a negative presence the previous stages it has negated. Hence a sequence such as e o e coming from NNe should be written as e, o(e), e(o(e)) indicating that the second e of the sequence appears from a previous o, which in turn appeared from a previous e. Thus the act of cyclic repetition is actually an asymmetric process of transformation, since no complete *return* to the initial condition of *pre*-reflective immediacy is possible: it is ever present as a negative context.

Thus a double negation of e (NNe or (-(-e)) is not purely *cyclic* (i.e. where NNe is the *same* e), nor is it purely *linear* (i.e. where NNe is not e, but a third element *different* from e or o), which standard classical and intuitionalistic logics are respectively. A dialectic double negation is a combination of both, i.e. it is *spiralic*, meaning that it returns to the same element on a new level, a higher level in that (-(-e)) must have a reference to the original e that has been *negated* and which must of necessity be negatively present.

Starting with e as an unreflected term, the sequence Ae, Ne, Se of the *first* reflection can intuitively be written as e(e), o(e), eo(e) respectively, indicating that the *triple* sequence (e → o:eo) *originated* from an *un*reflected *e* (now appearing within parentheses) by a *single* act

of reflection, giving us (R)e = (e(e) → o(e): eo(e)).[11] Thus, remembering that the A operator leaves present any symbol combination, the N operator replaces any e symbol by an o, and any o by an e, and finally that the S operator *combines* the result of A and N together in the *order* A + N (i.e. Se is the relation eo and *not* oe, indicating that (R)e = (e → o: eo) is a transition *from* e, the initially present, to eo), we are now prepared to interpret the *second* order matrix in terms of the *intuitive* symbols e and o. In order to simplify symbolic appearance, we shall drop the common reference, from the *first* reflection, which *all* terms have to their origin term e:[12]

$$\left\{\begin{array}{ccc} AAe \rightarrow & ANe: & ASe \\ \downarrow & \downarrow & \downarrow \\ NAe \rightarrow & NNe: & NSe \\ .. & .. & .. \\ SAe \rightarrow & SNe: & SSe \end{array}\right\} = \left\{\begin{array}{ccc} Ae \rightarrow & Ao: & Aeo \\ \downarrow & \downarrow & \downarrow \\ Ne \rightarrow & No: & Neo \\ .. & .. & .. \\ Se \rightarrow & So: & Seo \end{array}\right\} = \left\{\begin{array}{ccc} e(e) \rightarrow & o(o): & eo(eo) \\ \downarrow & \downarrow & \downarrow \\ o(e) \rightarrow & e(o): & oe(eo) \\ .. & .. & .. \\ eo(e) \rightarrow & oe(o): & eooe(eo) \end{array}\right\} = \left\{\begin{array}{c} e'(e') \\ \downarrow \\ o'(e') \\ .. \\ e'\ o'(e') \end{array}\right\} (R)e'$$

(Intuitive matrix)

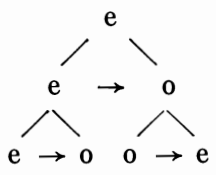
It is clear that the dialectic e o eo process is happening in two dimensions simultaneously. In the original first level triad, eo is the negative unity of e and o, all three of which now become the *given* elements of a second reflection (the given element for a first reflection being the original e). The entire triad is called e′, and a second reflection (R)e′ producing e′ (e′) → o′ (e′): e′ o′ (e′) means that the *result* of the first reflection e′ appears negatively present within parentheses at each stage. This means that each stage of the second triad will itself have reference to the negated first level *triad* e′, giving us a triad of triads or nine terms. The first triad e′ (e′) is none other than e, o, eo itself, now seen as a double structure, both itself as the *past* origin (within parentheses) and itself as *still present*

[11] Thus Ae or the *Assertion of* e means to reflect *on* e, *leaving it* present, yet the very reflection called "leaving e present" implies a change of state: the e *left* present is now a *mediated* e—i.e. an e that exists in juxtaposition with its opposite possibility "*not* to leave present." Hence writing Ae = e(e) indicates that the immediate non-oppositional e is transcended yet preserved *within* a parenthesis, replaced by intself as a mediated e existing *outside* the parenthesis. Ne is naturaly o(e)—e being replaced by o—and Se is eo(e)—e being replaced and seen *as* the transcending movement or relation eo.

[12] The NNe term *would* be e(o(e)) if *both* second *and* first order reflections retained reference to previous terms: for the first reflection NNe would be No(e), and the second No(e) would be e(o(e)). However, we are writing NNe = No = e(o) with the understanding that *all* terms *derive* from e.

(un-negated). The second triad o′(e′) then *inverts* the e o eo or e′ relation, giving us o e oe or o′, i.e. a *counter*-triad, and the final second level triad e′ o′ (e′) *combines* the initial and inverse triads e′ o′, giving us an e and o relative to e (called eo(e)), an inverse e and o relative to o (called oe(o)) and the combined movement eooe relative to eo (called eooe(eo)).

Intuitively, this second order reflection, and all others, can be represented as a tree of continual expansion by mutual interpenetration:



0 R or e written e

1 R or e′ written eo

2 R or e″ written eooe = E

Reflection is an outward movement from the initial e to its contrary o such that every element generated *likewise* mirrors a movement from itself to its contrary. The eo synthesis of the first reflection, being a *negative* unity, means that while e and o are co-relative, they are not identical. Since e and o are *distinct* while united, this can only mean that the unity eo *between* e and o must appear reflected *within* e and o themselves, as indeed any boundary between e and o (i.e. eo is a boundary) must also be a boundary *of* e and a boundary *of* o: a boundary does not "exist" by itself. Hence what appears as an "external" synthesis between e and o on the first reflection now becomes internalized within e and o on a second reflection: e becomes a movement from e to o (i.e. e within-itself reflects as part of *its* meaning the boundary condition eo by reflecting a reference to o) and likewise o becomes a movement from o to e, such that a second reflection is an explicit *self-reflection*: an overall movement from e (within e) *to an externalized e* (within o). The term eooe means that e has been *self-determined through its other*, and this is written E: instead of merely being *other*-bounded as in e → o, we have a condition of *self*-boundedness, *eo* → *oe*. The diagonal of the intuitive matrix e(e), e(o), eooe(eo) spells out the net movement of the second matrix. Clearly the first three terms within the "e column" (e(e), o(e), eo(e)) of the intuitive matrix represent the e, o synthesis relative to e, the "o column" represents the e, o synthesis relative to o, and the "eo column" represents the e, o synthesis relative to itself: eo is now both e to o *and* o to e.

A third order reflection would make every e and o another double term, giving us a movement from e o o e to eo oe oe eo, or a movement from E to O, where O is the self-determination of o: oeeo. Just as the second reflection eooe or E is a negation of the negation of the zero order e, the third reflection EO is a negation of the negation of the first order eo: even number reflections are e-directed and odd numbered ones are o-directed. In the limit, there would not be any level of relation *between* two terms on level n that is not a reflection *within* the terms on level n + 1. The Absolute would represent a state of complete interpenetrability—something not expressible within a finite number of levels. For in any *finite* order, the last sequence of e an o terms would appear *either* inconsistent *or* incomplete. Either the e and o terms on the *last* level appear distinct and separable, preserving their individuality but not expressing their various forms of negative unity within-themselves as further sub-components, or the last level regards each of the e and o terms as expressing their unities within themselves on the *same* level, meaning that, while complete, the system is inconsistent, for now every e is both e and o identically: e and o become inseparable but indistinct. Only with an infinite progress can we express both completeness (inseparability) and consistency (distinctness), for the unity produced by a coupling relation always demands a further and deeper level of possible sub-relations *ad infinitum* such that there is *neither* an ultimate (indistinct) unity producing inconsistencies *nor* an ultimate (separable) duality producing incompleteness. It is as if we had two types of paint, one black, e, and the other white, o, which because they are co-relative, are infinitely mixed such that in *essence* black is distinct from white, but in *existence*, they are inseparable, no *particular* region of white existing without black in it and vice versa. Unity and duality have been transcended by an infinite system of levels: the Absolute is the very process of this continual transformation and redefinition, and does not appear at any *particular* stage as such, expressing rather the *principle* of Non-Identity that to be is to become, and becoming is the foundation of being.

With such a matrix structure, it is possible to give an unambiguous interpretation to the philosophical *structure* of Hegel's system, showing how the *Phenomenology* and the *Encyclopedia* form a single whole. According to a detailed analysis given in my thesis, "The Dialectic of Consciousness in Hegel's *Phenomenology of the Spirit*," the original element e, starting the dialectic, is the *un*reflected subject S, representing the initial state of a given persisting *presence* which is in-itself the potential contradiction of being both itself and its

negating objects or events. The nature of the pure (unreflected) subject lies in its being potential Spirit: a reflection on S gives us the first triad (S → O: SO) or (reflected) subject, object and subject-object experience. This is S′ or what Hegel calls the state of *pure* sensation. Out of sensation or S′, develop S′, O′ and S′O′, called sensation, perception and conception (understanding). Hence sensation or S′ = SO is a movement from subject to object (i.e. the subject revealing its dependency upon a sensed object), perception or O′ = OS is a counter-movement from object back to subject (i.e. the object in turn revealing its dependency upon a perceiving, looking and interpreting subject), and conception is the combined movement from subject to object and object to the now externalized (i.e. non-original) subject—a subject externalized by means of the objects it is dependent upon: conception is SOOS or S″. Instead of S → O: SO, we have now S′ → O′: S′O′ = S″. In conception we have a self-negation or self-mediation of pure sensation: the subject senses or sees its *own* essence within the external world of objects, formulating objects according to trans-objective laws and rules of behaviour. However, it was shown that higher order relations would reveal a continual interpenetration of subject and object, revealing not only modes of external consciousness, but self-consciousness, and *their* combinations, until the Absolute at the end expresses the *state* of infinite subject-object interpenetrability that *has been* for a fact always been expressing itself.

However, once the Absolute is *revealed*, a new level of infinite-valued relations appear. For a reflection on the Absolute itself reveals three component Absolutes within the Absolute, i.e. *each* of the three generating components S, O and SO is *itself* infinite, reflecting the *entire* S, O dialectic *within* itself from its *own* perspective. The nth level of reflection (S, S′, S″ . . . S^n), $S^n \rightarrow O^n$: S^nO^n, will give $S^\infty \rightarrow O^\infty$: $S^\infty O^\infty$, as n goes to infinity (∞). Now the nth level of reflection generates the n+1 level (e.g. e′ → o′: e′o′ is called e″). A reflection (meta-reflection) on S^∞ would thus give $S^{\infty+1}$, which is however still S^∞ since infinity plus one is still infinity. Indeed, the $S^{\infty+1}$ term is formed by combining the three S^∞, O^∞, S^∞ O^∞, terms together (as e.g. the *nine* terms of e″ is the combination of the three *three-termed* e′ o′ and e′o′ elements), but three infinities still give infinity: $3\infty = \infty$. Thus each sub-part is in a one to one correspondence with the whole, which is the defining characteristic of an infinite totality. According to a tentative analysis, it appears that the three sub-infinities correspond to the triadic division of Hegel's *Encyclopedia*: Logic (S^∞), Nature (O^∞), and Spirit ($S^\infty O^\infty$). This means that the

infinite subject S^{∞} is regarded as the Logic or Essence of the *Phenomenology* taken as a whole, wherein all reference to an *external* object has already been mediated in principle *within* an all-pervading and persisting subjective or inner presence. Similarly, the infinite object O^{∞} is regarded as the external or object counter-part to Logic, namely Nature or the Existence of this Logical essence, wherein all reference to a subject appears mediated within the external, negating object. Within Logic, the subject matter becomes the *conceptions* of ontology, namely Being, Becoming etc., and within Nature the subject matter becomes the objectified counter parts to Being, namely a space-time, matter in motion analysis. Thus the *Phenomenology* of Subject-Object analysis represents *Being*, being defined, since Hegel clearly indicates in his *Logic* (p. 84) that ". . . pure Being is the unity into which pure knowledge returns," which is to say that the Absolute of pure knowledge obtained from the *Phenomenology* appears as an overall totality called pure Being—the starting point for Hegel's Metaphysics (*Encyclopedia*). Hence Metaphysics for Hegel is a type of Trans-Phenomenology, and Being is defined solely in terms of the Absolute nature of consciousness: the phenomenological condition of subject-object interaction. There is no Being except that which in its *immediacy* is in essence completely self-mediated. "It is in this respect that Pure Being, the absolutely immediate, is also absolutely mediated."[13]

Finally, the synthesis of Logic and Nature is the infinite Subject-Object experience called Spirit itself, S^{∞} O^{∞},which represents the Spirit or Reality of the *Phenomenology*, i.e. the combined "inner-outer" subject-object mode of presence in which *no* reference is made to subjects or objects *in-themselves*. Here Hegel deals with such notions that are explicitly objective *and* subjective, namely notions of the animate soul as a mind-body complex serving as the basis for self-world and self-self interaction. The point which is essential to realize, however, is that the regions of Logic, Nature and Spirit entirely overlap: there is no separate logical, natural and spiritual world. Essence, Existence and Reality, Subject, Object and Experience, Logic, Nature and Spirit, being infinite subtotalities of an infinite total, are merely three different *modes* of viewing one and the *same* universe. Each is a *concrete universal* in itself, including all other three within itself: each is both *particular* yet *universal*, i.e. the *universal relation* between the three "parts" S, O, SO called $S \rightarrow O$: SO is reflected within *each part* on every level. Hence there

[13] *Science of Logic*, I, 84.

is no "mysterious jump" from Logic to Nature: they are *co-relative as infinite* totalities. Neither is their a radical jump from the *Phenomenology* to the *Encyclopedia*. Rather the transition is a transition from *finite* subject-object analysis, to *infinite*-leveled subject-object analysis, wherein one takes the perspective of an infinite process *as already completed in essence*. The *Phenomenology* studies the whole *as a process*, and the *Encyclopedia* studies the process *as a whole*, in terms of variables each of which is regarded as essentially infinitely mediated within itself. This gives the *Phenomenology* a temporal character, and the *Encyclopedia* its a-temporal flavor, but they are really two sides of the same coin—of whole-process or whole-part dialectic. The Absolute does not exist "in time," but is rather the process of temporality itself—the eternal presence of continual transcendence, whose parts existing "in-time" each reflect the a-temporal whole of transcendence.

"Triad building" is therefore not a *linear* process, in which one mechanically goes from thesis to synthesis and again from thesis to synthesis. As with all things of subtlety in the modern world, it is non-linear and multi-dimensional, giving rise to triadic movements existing simultanieously on several levels. As an example of what a nine-term matrix would look like, let us look at Hegel's analysis of Becoming. The initial triad of Being (B), Nothing (N) and Becoming (BN), has already been described. The state of becoming or B′ = BN upon reflection becomes internalized within being and nothing, respectively, producing notions called dynamic being BN(B) and dynamic nothing NB(N). Using a simplified "e o eo" type matrix we get:

B	N	*BN*	
Being →	Nothing:	*Becoming*	= B′
↓	↓	↓	
N(B)	B(N) :	NB(BN)	
Passing →	Arising :	Equilibrium	= N′
..	..	..	
BN(B)	NB(N)	*BNNB*(BN)	
Dynamic →	Dynamic:	Dynamic Equilibrium: B′N′=B″	
Being	Nothing	*the Being of Becoming*	

Starting with the zero state of pure Being, the first reflection reveals that Being manifests itself in two forms: Being "in itself" or B and Being "outside of itself" or Nothingness N. Becoming as the synthesis expresses the condition that any immediate notion of presence or

Being B will reveal itself as a state of Becoming BN, in which any mode of B is placed in relation to its contrary N. The triad as a whole is called B′, which upon a second reflection in turn will reveal the negation of Becoming, N′ and the self-negation of Becoming, B′N′. The negation of becoming is a type of "anti-becoming" in that every movement from B to N makes possible a counter movement from N to B: i.e. any negated state of Being will have to reveal Being once again. This inverse state we shall call Equilibrium N′ or NB(BN) indicating that the negated BN becomes balanced by an inverse NB. However, the synthesis of B′ and N′ gives us something which is neither becoming nor in equilibrium as such, but rather a state of dynamic equilibrium in which becoming *self*-negates itself. This means that we have a system in which becoming gives rise to an equilibrium B′ → N′ which still has reference to the *originating* state of becoming N′ → B′ not as something *negated*, as in Equilibrium, but as something co-existing with it. This means that we must have a double movement from B to N and N to B giving BN NB, or a state in which whatever is becomes negated *in order to* reveal itself once again *out* of the state of negation. Being *maintains* itself through a process of becoming, i.e. Being returns to itself not within itself, but by having itself manifested through and from its opposite, Nothingness. As a *whole*, we have a state of Being or equilibrium since B moves into itself in BNNB, but only by virtue of a self-negating activity in which every component *part* is in a state of becoming or anti-becoming. As with the notion of the conservation of momentum, the system as a *whole* is in equilibrium, but each of the *component* elements are subject to change and becoming, such that every positive change is off-set by a negative change. This describes the Being *of* Becoming. Reflection from B to B′ to B″ is a movement from *Being* to *Becoming* to the *Being of Becoming.*

Relative to the variables B and N, a second reflection on Becoming amounts to a crossing of terms, such that each becomes an explicit function of the other, *within* itself. Thus N(B) means Nothingness coming or having come from Being or what Hegel calls "Passing Away," and B(N) means Being having come from Nothingness or "Arising." The synthesis of Passing and Arising is that which is neither as such, i.e. the state of Equilibrium. Thus Being and Nothing combine to give the boundary state of Becoming, which breaks up into two sub-boundaries called Passing and Arising, which in turn combine and transcend themselves into Equilibrium. However, the complete picture demands that both B and N reveal

the entire *triadic* movement of B and N co-relatively *within* themselves—giving us B (or B(B)), N(B) and BN(B) and N, B(N), and NB(N). Here Being is viewed as that which *within* itself has the property of passing into or displaying negation (BN(B)), i.e. Being as dynamic is potential Nothingness, while Nothingness is the potential of arising Being. In modern physics, the essence of a particle is not its mass but its energy from which the particle is seen as that which can be annihilated as a localizable particle. Similarly, the modern vacuum is seen as potential being, displaying field-energy properties which have the ability to *create* particles.

Thus a second order reflection reveals that the opposites are now not simple Being and Nothing, giving simple Becoming, but rather the opposites appear self-mediated into Dynamic Being and Dynamic Nothingness such that a unity *of Being* and *Nothing* already exists *within each* term as a potential unity, meaning that the unity of Being and Nothing BN is really a *double* unity or a unity of unities. When B and N appear as BN, we really express a unity of BN(*B*) and NB(*N*) giving BNNB(*BN*). The Becoming which results is thus a two-level state of becoming expressing the becoming (self-negation) of becoming or the Being of Becoming. The diagonal of the matrix presents the net result: Being moving *into itself* as an externalized Being through the vehicle of its own negation, (and thereby *internalizing* N between itself as B moves into B), written $B \rightarrow B$(N): *B*NN*B*(BN), or more fully as *B*(B) $\rightarrow$ *B*(N): *B*NN*B*(BN).

Having outlined the essential structure of dialectic logic, three main tasks remain. First would be a detailed analysis of Hegel's philosophy, seeing how well the actual structure (of the *Phenomenology* and *Encyclopedia*) and the proposed matrix interrelate. A superficial analysis of the table of contents of Hegel's *Logic*, for example, seems to indicate that it might be possible, with minor changes, to regard the transitions outlined in his triadic structure as equivalent to triadic changes in e, e′, e′′ etc. Being, Nothing, Becoming would be e o eo, which as a whole is labelled Being (Total Being) or e′. The second triad of (Total) Being, Determinate Being and Being-for-self would be e′, o′, e′o′ which is called Quality or e′′. This would make Total Being a type of Becoming, Determinate Being a type of Equibrium, and Being-for-Self a type of Being-of-Becoming according to our previous analysis of B′ N′ B′N′. The third triad is Quality, Quantity and Measure or e′′, o′′, e′′o′′ which is called Being (in General) or e′′′. Quality would have the structure E = eooe and Quantity O = oeeo, indicating that quantity represents *externality* "o" or Negation "N" in a state of self-determination in which N

returns to itself *through an externalized B*: Quality is the *internalization* of Non-Being and Quantity is the *externalization* of Being. Finally the fourth triad is Being EO, Essence OE and Concept EOOE or e′′′, o′′′ e′′′o′′′, giving e′′′′, which is the Logic itself explicated in four steps. It is interesting to note that, from this perspective, EO or Being (in General) is regarded in the mode of becoming, i.e. *Quality* E revealing Quantity O, while Essence, starting from externality regards *Quantity* O in the mode of re-revealing Quality E as its *inner* nature, making the Concept or Logic EOOE the *self*-determination *of Quality*. Thus for EO or Being, the terms Quality and Quantity, E and O or "inner Being" and "outer Being" are simply opposed as *immediates* E vs. O or *EO*; for Essence E and O *mediate* each other giving O(E) and E(O) as the components of Essence or *OE*(EO), and for Concept E and O *self-mediate* themselves, *each* being a function of *both* or EO(E) and OE(O): in Concept, EOOE, inner being reveals *itself* from any externalized being. We have a self-determination of a *whole* in EOOE in which *each element* (i.e. E and O) is *itself* self-determined. The generating principle 3^n, where n = 4, thus gives 3^4 or 81 *basic* categories obtained by only *four* reflections! It would be possible, however, to extend the analysis indefinitely, each time increasing the subtlety and complexity present by a more *detailed* explication in depth of the ever-present Absolute of infinite interpenetrability. Thus Hegel's system would have to be regarded as essentially *open*, subject to continually higher modes of reflection.

A second task remaining is that of subjecting the entire formal and logical treatment of the matrix to a rigorous logical-mathematical analysis especially in relation to Goedel's theorem. Finally, matrix analysis, within the manifested spheres of Nature and Spirit, has the task of interpreting the concrete natural and social sciences from a *meta-science* point of view, hopefully giving structural insight into complex notions such as space, time, matter, motion, organic systems, feedback mechanisms, ego and ego-ego systems, as they appear both objectively and subjectively. Perhaps in this way, the Hegelian structure, viewed now as a modern temporal logic of Non-Identity and levels of negation, can help synthesize and orient modern theories of science by means of a language and form more suitable to the style in which problems are now formulated. In this way, dialectic would become an essential structure of philosophic speculation, grounded upon a firm basis capable of formalization and projecting conceptions open to empirical validation within an historically developing consciousness, dealing with notions that underly the foundations of human and natural existence.