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Emergence, Evolution, and the Geometry of Logic: Causal Leaps and the Myth of Historical Development

Stephen Palmquist
Department of Religion and Philosophy, Hong Kong Baptist University, stevepq@hkbu.edu.hk

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I. Emergence and the Problem of Emergent Properties

At what stage in its development does a foetus become a *living human being*? When is it proper to refer to a network of pulsating neurons as a "thought"? At what point does an accumulation of insightful thoughts deserve to be called a "new idea"? To what depth and breadth must a particular person's ideas and other creative works extend before he or she comes to be recognized as "great"? Such questions, despite their apparent diversity, are all instances of the same underlying question: How is it possible to discern when (i.e., at what point in its historical development) an "emerging" property *becomes* what it can be observed to be, once it has fully emerged? This question has wide-ranging implications not only for science and the philosophy of science, but also for disciplines as diverse as logic, history, and even theology. Answering such an ambitious question in the limited space of a single essay will be impossible without strictly narrowing the scope of our discussion through several limiting assumptions.

Before discussing these interpretive assumptions, a brief overview of how the term "emergence" came to be used as a philosophical concept will provide an essential focus for our subsequent analysis.[1] Although various theories of emergence can be identified throughout the history of philosophy, the *word* "emergence" was first introduced as a technical philosophical concept in George Henry Lewes' 1875 book, *Problems of Life and Mind*, where it referred to the evolutionary processes whereby non-living matter came to take on life and non-mental beings came to have mental properties. Early twentieth century philosophers such as and C.L. Morgan,[2] Samuel Alexander,[3] and C.D. Broad[4] were influenced by Lewes as they brought the concept of emergence into the mainstream of philosophical debate. Since then, especially during the last quarter of the twentieth century, the literature on emergence and emergent properties has been immense. Essentially, something (e.g., an object, property, or idea) can be said to "emerge" out of another thing (or level of reality) when the former somehow originates or is grounded in the latter, but displays such unique and unexpected characteristics that it takes on a "life" (i.e., a mutually interacting set of new properties) of its own. The issue of whether emergent properties (e.g., conscious thoughts) can be *reduced* to their underlying physical ground (e.g., certain brain states) remains one of most hotly-debated topics related to emergence.[5] Probably the most widely accepted contemporary position on emergence is that known as "non-reductive materialism" (see note 3), the view that emergent properties originate wholly within the physical domain, yet the qualities that manifest themselves cannot be explained merely in terms of their underlying physical interactions.[6] That is, once a higher-level property has emerged, we must treat the object (or at least its emergent property) as if it were more than just the sum of its lower-level parts.[7] In this paper, I shall argue that a careful analysis of how emergence functions in *logical* relations can shed important light on how this "more than" actually arises.

Four assumptions will serve to narrow the scope of our study in such a way as to avoid the need to deal with most of the philosophical issues that typically arise in discussions of emergent properties. First, I assume that properties do exist. While this assumption is controversial, the onus of proof in this case is on those who take the counter-intuitive position that they do not exist; thus I shall not deal with it any further here.[8] My second assumption is that some properties must emerge from their underlying objects or propositions in a way that contrasts with other properties that do not emerge. If this were not the case, if *all* properties were emergent (or if all were non-emergent), then our question would never arise, for there would be no background enabling us to detect an emergent property. I shall clarify this distinction shortly, though without attempting to present a full justification.[9] Third, I assume that the difference between emergent and non-emergent properties is *knowable*—i.e., that properties exhibit identifying marks that conform to some logical pattern. Once again, this assumption is necessary, for without it our question would be unanswerable, if not meaningless. One purpose of this essay will be to provide a limited defense of this assumption by presenting a systematic, logical way of distinguishing between different types of properties. In the end, however, this point will retain the status of an assumption, so the most we will be able to conclude is that, *if* an emergent property is knowable, then its emergence should exhibit patterns like that of the logical emergence to be illustrated below.

My fourth assumption—perhaps the most controversial of all—is that relational patterns in logic often (if not always) can be correlated directly to the spatial relations exhibited by certain simple geometrical figures. I call the systematic analysis of such analogical relations "The Geometry of Logic". This fourth assumption is unlike the other three in two respects. First, it is not a necessary assumption. Questions about the nature and function of emergent properties can (and usually are) addressed quite apart from such a correlation. Nevertheless, I believe the Geometry of Logic can be treated as a *heuristic device* that greatly enhances our ability to construct a clear and meaningful response to such questions. As we shall see, the usefulness of this device is that it exhibits a hierarchy of "levels" that can be directly compared with the levels of scientific explanation that are a core feature of any emergentist theory.[10] The second difference is that in this case I have already defended the assumption at great length elsewhere and have found it to be useful in stimulating deeper insight into numerous philosophical issues.[11] In §II of this essay I shall therefore present an overview of the essential features of the Geometry of Logic, before going on to apply those features to a few central issues relating to emergence and evolution.

The remainder of this first section will be devoted to the task of clarifying what an emergent property *is*. Perhaps the best way to understand this term is to contrast it with its opposite. For the sake of simplicity of expression, I shall coin the word "mergent" to refer to any properties that are *not emergent*. What, then, is the difference between ordinary (mergent) properties and the special *e*mergent properties that will occupy the main focus of our attention here? A property that is taken by the observer of an object or by the interpreter of a proposition to be a *standard* component of the object/proposition in a given context (usually one that is being viewed at a relatively low level of complexity) can be described as "mergent": the property *merges* with the object and/or with the meaning of the proposition in the eyes of the observer/interpreter.[12] For example, the fact that there are words printed on the pages of this essay is a mergent property of the essay insofar as we describe the essay in terms of its physical properties. Without the appearance of such printed words, we could not identify these pages as constituting a published essay; the fact that words do appear on these pages is therefore entirely predictable, given the known context.

Emergent properties, by contrast, are properties that appear unexpectedly and are not (at least initially) regarded as necessarily connected to the object/proposition when we consider it at the lower level of complexity. To "emerge" is to "rise out of" or "leap away from" something in such a way that a latent possibility is manifested and becomes known. Thus, the fact that the words printed on these pages can be read together in such a way that they convey a *meaning* is, from the point of view of the physical paper and the ink printed on it, an emergent property. Whether or not the ink printed on these pages really *does* convey a meaning depends, of course, on a number of contingent facts about the linguistic skills of the writer and reader. If a meaning is conveyed, then it would not be merely a mergent property because the meaning is something that cannot be explained merely in terms of the paper and ink used to convey it. The meaning could never be discovered merely by analyzing the characteristics of the paper and ink, but only by viewing these objects from a higher level of complexity, as composing words, sentences, and paragraphs. As such, the perception of meaning that justifies a reader in *calling* this collection of papers and ink "an essay" exemplifies one kind of emergent property.

Can an emergent property ever lose its emergent character and somehow become a mergent property? Likewise, can a mergent property lose its status and somehow become emergent? To answer such questions, a secondary distinction must be made: both mergent and emergent properties can be either intrinsic or extrinsic.[13] Extrinsic properties are properties whose association with their object (whether necessary or contingent) has a nonlinguistic source. They may only *seem* to be what we expect them to be, due to cultural conditioning; or they may be what they are as a matter of physical necessity. Intrinsic properties, by contrast, are properties whose necessary or contingent status depends entirely on the assumed meaning of the words (i.e., on purely *linguistic* conventions).[14] Thus, the fact that a published essay has the property of having words on a printed page is an intrinsic property: only if we use the word "essay" in a way that radically departs from the standard definition would we be able to conceive of an essay that did *not* exhibit the property of having readable words. But the *blackness* of the ink conventionally used to print a scholarly essay is an extrinsic property. It is *mergent* in the sense that we have become so accustomed to seeing black words on the printed page that anything else would seem "inappropriate" to a scholarly essay, though only contingently. If it were printed in red ink, for example, this property might make some readers (e.g., scholars) question whether it really deserves to be regarded as an essay at all.

This secondary distinction suggests that extrinsic properties can change from being mergent to being emergent (or vice versa), when viewed from different contexts, whereas intrinsic properties cannot. For instance, although "printed with black ink on white paper" is a mergent property of "scholarly essay", it is extrinsic insofar as our cultural conventions could change with time. If the editors and publishers of a few renegade academic journals decided to publish all scholarly essays in red ink, the practice might gradually catch on; as soon as all (or at least most) such journals began to follow this new convention—say, 100 years from now—red ink will have become a mergent property of published scholarly essays. People would just assume that if the essay is scholarly it will be printed in red ink. However, the same cannot be said for the more basic property of *having words*. An essay is still an essay whether it is printed in black or red ink; but if in 100 years we begin using the word "essay" to refer to blank sheets of paper, then the *meaning of the word* will itself have changed. Having words is thus an intrinsic mergent property of scholarly essays, as we currently understand them.

Emergent properties are related to this secondary distinction in a similar way. The most interesting type of property, as we shall see, is intrinsic emergence. This refers to a new property that arises unexpectedly when an old situation is viewed from a level of higher complexity (or when the situation somehow actually *becomes* more complex), yet the new property is necessary to the *identity* of the object under consideration. The four questions raised at the very beginning of this essay—concerning when *life* begins, when neural firings become a *thought*, when thoughts become a new *idea*, and when a person with ideas becomes *great*—all refer to examples of intrinsic emergence. A whole list of other examples, such as when two people who were formerly "just friends" come to be "united in love", would not be difficult to compile. As we shall see in §III, however, this fourth type of property is so different from the others that serious doubts can be raised as to whether it represents a real possibility at all. I shall therefore forego any further discussion of it until that point.

After briefly introducing the Geometry of Logic in the next section of this essay, I shall use it to illustrate some of the basic features of how emergence operates. I shall then apply it in §III to the task of clarifying the fourfold distinction made above, between different types of properties. The relationship between the logic of emergence and certain assumptions often made about the nature of evolution will be the main focus of our attention in that section. I shall conclude the essay in §IV by arguing that the proposed way of understanding the similarities and differences between the four types of mergent/emergent change calls into question a myth that has dominated academia—philosophers as much as scientists and other academics—for nearly two centuries. The myth, in a nutshell, is that the best (if not the only proper) way to examine the origins of an idea is to trace its historical development, uncovering the empirically discernable causes that led, step by step, to the point where a new idea, or "insight" (as I prefer to call it), was bound to emerge. Questioning this myth on the basis of the logic of emergence opens up a potential (though not a compelling need) for theological explanation to fill an explanatory gap that appears to remain in a state of inevitable mystery if we appeal to scientific explanation alone.

II. Patterns of Emergence in Geometrical Relations

Let us look now at how the Geometry of Logic can shed light on the nature and function of emergent processes in general. After briefly introducing the four main logico-geometric figures used to depict systematic relations, I shall point out several interesting patterns of emergence that can be observed by viewing the diagrams as a series. This will demonstrate that emergence *is* possible, at least in a logico-geometrical context. It will also prepare us for attempting in §III to clarify the distinction made in §I between types of mergent and emergent properties and for examining a special problem associated with evolutionary emergence.

The Geometry of Logic is divided into two main parts, based on what I call "analytic logic" and "synthetic logic". For our purposes, we can think of the former as relating to any logical distinction between *two* opposites (i.e., to any dyadic opposition) and the latter, to any logical distinction between *three* terms (i.e., to any triadic opposition), where two terms are analytic opposites and the third somehow combines or "synthesizes" the others.[15] The most obvious geometrical maps for the simplest (or "first-level") forms of analytic and synthetic relations are the line segment (with its two opposite endpoints) and the triangle (with its three vertices), respectively. Figure 1 uses the "+" and "-" symbols to denote the simple conceptual opposition in a first-level analytic relation (1LAR), while Figure 2 adds a third term, "x", to denote the simple synthesis of opposites in a first-level synthetic relation (1LSR).

Figure 1: The Line Segment as a 1LAR Map

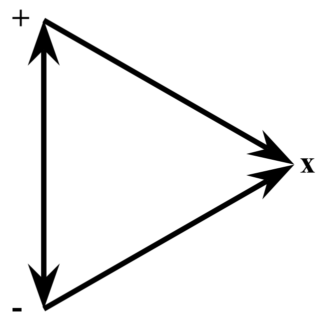

Figure 2: The Triangle as a ILSR Map

The diagrams used in the Geometry of Logic are labeled with mathematical symbols

("+", "-", or "x") in order to represent purely formal-logical relations, which can then later be filled with some content. Any one symbol, when viewed individually, is called a "term". A term or combination of terms (as in Figures 3 and 4, below) that stands in a logical relationship to one or more other (combination of) term(s) is called a "component", especially when used as a label for one distinct part of a diagram. The arrows on the diagrams represent different sorts of opposition. Double-headed arrows represent contradictory opposition (i.e., opposition between two components that do not share any of the same terms), whereas single-headed arrows represent polar opposition (i.e., opposition between two components that have at least one common term and at least one different term). For more detailed discussions of these mapping rules and the logical apparatus used to label the maps, see the references listed in note 11.

Both simple forms of relation, the 1LAR and the 1LSR, give rise to a hierarchy of more complex "levels". In emergentist terms, we could say these simple forms constitute the "basal conditions" that enable all higher levels to "emerge". By comparing the different levels of analytic relations with each other, we can discover that the formula determining their structure is:

$$2^L = N$$

where "L" stands for the *level* of the distinction (i.e., how many pairs of opposites are being interrelated) and "N" stands for the *number* of different combinations. For instance, the most common type of analytic relation, the second-level analytic relation (or 2LAR), consists of *two* pairs of opposites that combine to produce *four* interrelated concepts (2 x 2 = 4). As such, it is best mapped onto the four endpoints of a cross (i.e., two line segments intersecting at their midpoints, with each segment representing the distinction between one pair of opposites), as shown in Figure 3.

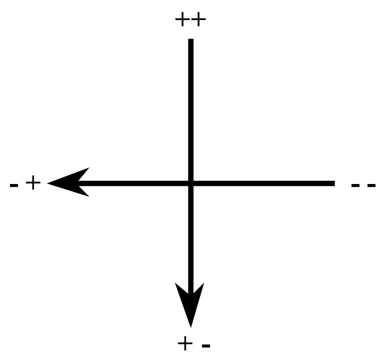

Figure 3: The Cross as a 2LAR Map

The formula determining the structure of all synthetic relations is similar to the one for analytic relations, the only difference being that the "2" is replaced by a "3":

$$3^L = N$$

Thus the second-level synthetic relation (2LSR) has nine combinations (3 x 3 = 9) and would need to be mapped onto a geometrical figure with nine distinct points. A good example of a figure with this logical form is the "Enneagram", a term taken from the Greek words meaning "nine" and "line". This logico-geometrical figure, constructed out of a circle with nine lines passing through it, was originally used by early Muslim mystics as a tool for distinguishing between personality types. After passing into virtual oblivion for several centuries, it has recently been revived by a growing number of writers interested in using it to encourage spirituality and personal growth.[16] Whatever one may think of such theories, one fact cannot be denied: merely by advancing from a first-level relation to a second-level relation, numerous new and unexpected features of the whole emerge. These features exist between the logical components of the higher-level system on their own; the diagrams merely serve as visual tools that make such features easier to detect.

From the two basic applications of the Geometry of Logic (analysis and synthesis) emerges a third application, involving various *combinations* of analytic and synthetic relations. For our purposes the most significant of these "compound relations" (as I call them) is the *twelvefold compound relation* (12CR). This consists of a 2LAR with each of its four components divided into a 1LSR (4 x 3 = 12). Apparently accidental examples of this form of conceptual relation abound in daily life (e.g., the twelve hours on our clock dials, the twelve months on our zodiacal calendars, the twelve tribes of Israel, etc.), with more systematically predetermined examples sometimes playing an important role in philosophy (e.g., Kant's twelve categories[17]), social sciences (e.g., Jung's system of psychological types[18]), and even natural science (e.g., the system of twelve sub-atomic particles[19]). What is important to note here is that, in order to be a genuine 12CR, these relations must be regarded not merely as a haphazard collection of any twelve items, but as an integrated whole made up of four sets of three, where the four is a 2LAR and each set of three is a 1LSR. Of the various ways of mapping a 12CR, I prefer to use a circle divided by a cross into four quadrants, with each quadrant having two additional points equidistant between the two poles of the cross (like a clock dial), as shown in Figure 4.

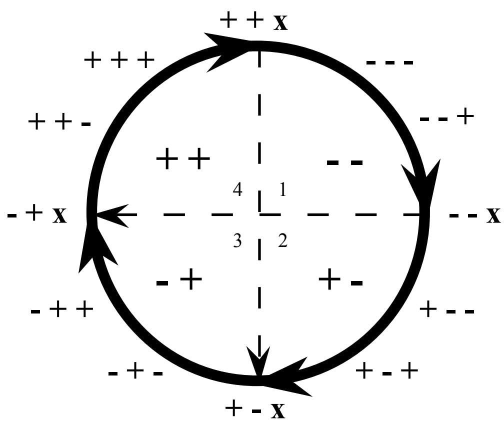

Figure 4: The Crossed Circle as a 12CR Map

Rather than examining various other, more complex aspects of the Geometry of Logic, I shall now show how certain features even of the simple diagrams introduced above can serve as instructive illustrations of how emergence operates. First, note that the two opposites in Figure 1 *arise out of* a prior unity that could be represented as a point.[20] Before carrying out the initial analytic division, nobody could have been sure that the point (as a representation of the original unity) would be divisible into opposites. But once the 1LAR emerges, this property seems obvious. Likewise, the potential for these opposites to be reunited, as shown in Figure 2, is an emergent property that no amount of prior analysis could have enabled us to predict. It simply has to *happen*; then it seems obvious.[21]

With Figure 3 the emergence of intrinsic properties becomes more complex. Patterns arise that were somehow already implied in Figure 1, yet could never have become explicit until they emerged in the 2LAR. For example, by moving clockwise around the diagram from the 3 o'clock position, we now see for the first time a development that passes from the most negative component (--), through the two mixed components (+- and -+), to the most positive component (++)—a logical pattern that becomes even more complex in Figure 4. The most obvious example of the new properties that emerge as a result of the added complexity in Figure 3 is that we now find *three* distinct types of opposition: primary polarity (-- vs. +- and ++ vs. -+), secondary polarity (-- vs. -+ and ++ vs. +-), and contradiction (++ vs. -- and +- vs. -+). The 1LAR, by contrast, exhibits only simple contradictory opposition (+ vs. -). As we shall see in §III, the two types of 2LAR polarity correspond to the intrinsic-extrinsic and emergent-mergent distinctions, respectively (cf. Figure 5, below), while the contradictory opposites represent a third set of formal relationships, not noted in the foregoing discussion. In this way, the Geometry of Logic will provide an ideal (i.e., a priori) method of clarifying the logic of emergent properties.

Each higher level of logico-geometrical relation produces more and more complex patterns of emergence.[22] In Figure 4, for example, we see not only a more detailed version of the movement from the component with the most negative value (---), through a series of gradual permutations, to the component with the most positive value (+++), but also a complex array of interrelationships between the twelve components. This includes not only a new form of polarity, defined by the relations between the third term in each component, but also various forms of "bipolarity", where two terms are the same and only one differs. Moreover, numerous patterns of triads and quaternities emerge once we begin to analyze the relationships between the various components.

At its most extreme levels of complexity, where forms of relation can no longer be depicted by simple geometrical figures, the Geometry of Logic could make use of something like Mandelbrot's Fractal Geometry instead. Fractal Geometry could provide an quasi-systematic (indeed, chaotic) alternative to standard (Euclidean) geometry; yet in the end it would lead to the same conclusion we have reached here, that geometric forms can provide us with deep insights into the astonishing ways emergent properties operate.[23] My purpose here, however, is not to draw any conclusions about the merits or demerits of the Geometry of Logic (this being one of the *assumptions* of this paper put forward in §I), but only to illustrate how emergent properties can lie dormant within lower levels and *leap* out at us when we examine the higher levels. The question this raises is whether what is true in this logical realm is also true in the ontological realm of our experience of objects in everyday life. To this question we shall now turn our attention.

III. Evolutionary Emergence: Causal Leaps in Natural Processes

Keeping in mind the essential features of the Geometry of Logic introduced in §II, we shall now turn our attention back to the basic distinctions made in §I. The first and most important point to note is that the two dyadic distinctions discussed there seem to form a perfect[24] 2LAR. By mapping the intrinsic-extrinsic distinction onto the vertical and horizontal axes of a cross (i.e., associating it with the first term of each dyadic component), with the emergent-mergent distinction defining the polar opposition on each axis (i.e., the second term of each component),[25] we can construct a map relating these distinctions to four basic manifestations of change, as shown in Figure 5.

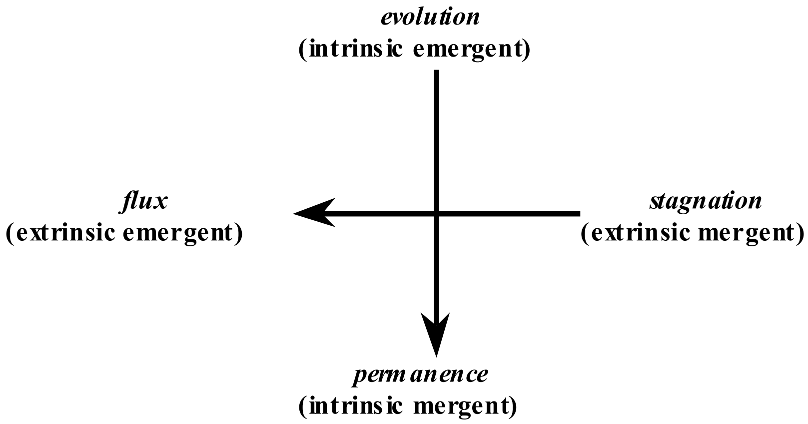

Figure 5: Four Manifestations of Change

As we saw in §I, extrinsic mergent properties, such as the blackness of the words on this page, *could* change but are generally assumed to remain the same. I have chosen the term "stagnation" to describe this kind of *potential* change, because a property that changes in this way is analogous to a pool of water that is stagnant but could become fresh if it ever began to move. Being the absence of change, stagnation is appropriately mapped onto the "--" position of the cross (cf. Figure 3). The polar opposite of stagnation is "flux": a continuous flow of changes that never seems to settle on one form or content. Extrinsic emergence, as in the rather odd example of this essay being printed with red ink, typically has this characteristic. But this is only an appropriate example to the extent that such a change comes as a surprise. An extrinsic emergent property must continuously change if it is to maintain the element of surprise and resist becoming mergent. A better example, therefore, is speech itself; for every language is constantly changing. Indeed, the very possibility of communication arises out of the tension between stagnation and flux, the interaction between mergent and emergent types of extrinsic properties.

This tension would never be able to maintain its balance if it were not for the fact that some properties simply do not change, but remain constant. Intrinsic mergent properties have a permanence that grounds our ability to communicate and enables us to detect something genuinely new when it arises. If we could not count on an essay containing words, then the question of whether the words are printed in black or red ink would never arise. Yet like stagnation, permanence is itself balanced by a polar opposition to a manifestation of change that is both like it (intrinsic) and unlike it (emergent). The change that gives rise to such intrinsic emergent properties is best called "evolution", for evolutionary changes help us *identify* a particular concept or object (e.g., an organism) and distinguish it from others like it. Such changes, like those relating to geometric emergence (see §II), arise out of a potential that was permanently present in the prior state, but did not manifest itself until a particular moment in time.

Just as stagnation and permanence are somewhat similar (both lacking signs of change) yet also different (only the former has the *potential* to change without destroying the identity of the object itself, or its property), so also flux and evolution represent fundamentally different types of change. "Flux" refers to a continuous development that advances according to clearly determined increments, though it may have proceeded differently. The process that caused the red ink to replace the black ink would presumably be easy to determine; but the new color might just as well have been green. "Evolution", by contrast, refers to a sudden change that could not have been foreseen, and whose causes (if any) may remain hidden, even though it seems necessary when viewed in retrospect. Biologists believe life evolved from non-living material; yet how this could have happened remains a matter of speculation that cannot be repeated in a laboratory. Likewise, every human being was once a tiny foetus, totally dependent on another organism (i.e., its mother); yet at some point it evolves a distinct life of its own. Although empirical observation may enable us to make educated guesses, we cannot know for certain when or in what manner such emergent properties will arise until they actually emerge.

The foregoing distinction between "flux" and "evolution" can be clarified by relating it to a corresponding distinction made by Kant. In his *Opus Postumum*, he contrasts two types of "transition": a "step" is a change from one position to an immediately adjacent position, whereas a "leap" is a change that skips over one or more intermediate position(s).[26] The former describes the type of transition characteristic of *flux*, while the latter corresponds to that of *evolution*. Take an object, A, that has a mergent property, X, at time t_1, and imagine it comes to have an emergent property, Z, at time t_3. Property Z is intrinsic if there is no third property that mediates between properties X and Z. It is extrinsic if the path from X at t_1 to Z at t_3 passes through another property, Y, at t_2. In the former case A evolves, whereas in the latter it undergoes the kind of change characteristic of flux.

Kant's distinction foreshadows Kierkegaard's later treatment of faith as an irrational "leap" across the abyss of one's own existence. That Kierkegaard's "stages of life" (the aesthetic, the ethical, and the religious) are to be regarded as evolving out of each other, rather than as causally determined by what goes before, is evident from the stress he puts on their paradoxical character. Without going into the details of Kierkegaard's theory, we can take note of the challenging question this raises: if evolution (understood as the emergence of a new *intrinsic* property) requires something like a "leap of faith", then is it even *possible* for it to play a constitutive role in science? Answering this question will be our main concern for the remainder of this section.

We saw in §II that intrinsic emergence does occur in the highly abstract (i.e., conceptual) realm of mathematics, as illustrated by the Geometry of Logic. But does this mean it is a real possibility in the natural world? I believe a detailed analysis of the phenomena of natural evolution would show that it is, though its epistemological status is highly paradoxical (see note 31, below). Classical (Darwinian) evolutionary theory claims that organisms tend to pass on from generation to generation those properties that are more likely to help them adapt to their environment, that the organisms carrying out this selection process most efficiently will survive the longest, and that organisms will tend to find gaps in the natural world in order to evolve in ways that are not already exhausted by existing organisms. In terms of the framework given in Figure 5, this means *individual organisms* tend to inherit the most advantageous extrinsic mergent (--) properties, yet "somehow" the *species* has the ability to supplement these, over a long period of time, with intrinsic emergent (++) properties. Once the latter emerge, they (being intrinsic) become integrally related to the very identity of the species in question, so that they too are passed on genetically to each individual.

But how is this possible? Where does this "somehow" come from? All too often evolutionary theorists, failing to distinguish between the four types of change introduced above, attempt to explain evolutionary transformations in entirely causal terms. That is, they hypothesize complicated accounts of how a given species might have developed, step-by-step, from having property X, through the intermediate stage of having property Y, to the current stage of having property Z—though in practice such accounts usually involve more than one intermediate step. Such a theory of smoothly flowing development admittedly describes how many simple causal phenomena undergo observable changes; yet when applied to long-term evolutionary changes, it quickly becomes absurd. For as long as there is no *new input* into a system, mere flux cannot produce anything *fundamentally* new. Evolution proper cannot take place merely as a series of minute increments that eventually manages to span the gap from one side of an abyss to the other. It will normally *involve* such causal fluctuations in some way; but what makes it evolution, as opposed to mere environmental adaptation, is the ability to disclose an unrealized potential that already existed in the original (pre-evolutionary) state.

How merely sentient life-forms (i.e., life-forms with pre-conscious awareness capable of perception) emerged from the lifeless cosmic "soup", how animal consciousness emerged from these simpler sentient life-forms, and how human self-consciousness emerged from the lower-level consciousness of our animal cousins are all questions that cannot possibly be answered by theories of incremental change alone.[27] Consciousness may be *rooted* in a pre-conscious level of awareness, but it is also something fundamentally new. Self-consciousness and rationality are likewise dependent on an evolutionary progression from the kind of conscious life we observe in the animal kingdom; but to *reduce* the former to the latter would be to ignore the mysterious origin of language itself. This view of evolutionary biology has been developed in considerable detail in Teilhard de Chardin's many books,[28] so I shall not attempt to defend it any further at this point. Of the many other, more recent theories that have been developed along lines that are compatible with the position advanced here, two that are particularly worthy of mention are Catastrophe Theory, initially expounded by René Thom and Christopher Zeeman,[29] and the now standard theory of the triune brain.[30]

The myth assumed by so many (though increasingly few) evolutionists is that, if we could only observe the evolutionary process as it happened, then we could locate the proverbial "missing link" that would enable us to give a complete, step-by-step explanation of the transition from one level to the next. Our study of emergent properties, however, has shown this to be a category mistake. Such an assumption fails to distinguish between evolutionary change and the causal processes that guide the extrinsic flux studied by ordinary science. Genuine evolution refers to *intrinsic* emergence, and this proceeds (whether in purely conceptual contexts such as the Geometry of Logic or in the empirical context of natural sciences such as biology) by sudden leaps—"emergencies", as it were—rather than by a step-by-step progression.

IV. Evolutionary Emergence, Insight, and the Myth of Historical Development

In the foregoing discussion of natural evolution we noted a common tendency to interpret evolutionary change as a continuous flux, rather than in terms of the discontinuity characterized by intrinsic emergent properties. A good way to counteract this common assumption is to observe the interesting parallels that exist between evolution on the grandest scale and other, smaller-scale forms of evolution. Recall the opening question of this essay. Just as we cannot observe any "magic moment" in the development of a foetus when it suddenly ceases to be merely a lump of dependent tissue and becomes an independent human being, so also genuinely evolutionary changes in general cannot be localized as happening at any given point in time. The reason bio-ethicists have such difficulty determining when life "begins" is essentially the same as the reason archaeologists cannot find the "missing link" that would take the mystery out of evolutionary leaps. Step-by-step growth is nowhere more apparent, and our knowledge of the stages nowhere more carefully studied, than in the transformation of a tiny sperm-approaching-an-egg into a newborn baby; video cameras have captured virtually the entire process on film, yet none have ever been able to detect the moment when human life as such begins. We simply do not know if it is present until after it has already clearly emerged. The onset of life, like *all* evolutionary change, is recognizable only *a posteriori*—i.e., only after the change has taken place.[31]

With this in mind, let us return now to the common assumption mentioned briefly near the end of §I, that new ideas emerge through a step-by-step process of cause and effect, not unlike the kind of process that is often assumed to take place in natural evolution. Understanding a great thinker's development—how he or she *arrived at* a new idea—is often regarded as a prerequisite for (and sometimes even as more important than) understanding the ideas themselves. The effects of this typically unquestioned assumption on scholarship can range from a very legitimate conviction that such historical knowledge will *assist* one in forming a good interpretation, to an illegitimate belief that the latter is impossible without (and can perhaps even be replaced altogether by) the former. Obviously, gaining insight into the historical factors that gave rise to a given idea can *help* us understand the idea. But if a new idea arises (as I believe great ideas typically do) as an intrinsic emergent property in relation to its historical roots (i.e., as a leap rather than as a step), then a detailed knowledge of its historical background (though unquestionably helpful) is not as *essential* as it is often assumed to be.[32]

Our study of the logic of emergence reveals that this "myth" (i.e., unquestioned assumption) can be applied properly only to properties (in this case, ideas) that arise through an *extrinsic* emergent process. The far more interesting, *intrinsic* emergent properties (such as insights, in the case of human thought processes) always manage to elude the grasp of those who seek to tie them down in this way. Once this distinction is recognized, scholars in all disciplines will be empowered to make more accurate assessments of the way old ideas pass away and new ideas emerge. An example from the history of philosophy may help to clarify how important this can be for anyone involved in the task of interpreting another person's ideas.

The old "patchwork" interpretation of Kant's *Critique of Pure Reason,* advanced during the first half of the twentieth century by Erich Adickes in Germany and Norman Kemp Smith in the U.K., is a case in point. These scholars and those who followed their lead assumed that by carefully estimating the date when Kant wrote each of his various arguments they could reconstruct a step-by-step account of how Kant developed his ideas; they then attempted to explain apparent inconsistencies as due merely to Kant's tendency to forget what he had previously written as his ideas evolved. One paragraph may be judged to be a late addition, while the next may be regarded as a leftover from an earlier way of thinking. In some cases, such an analysis may succeed in recovering the actual *flow* of Kant's (or any other scholar's) thinking, in its chronological development (i.e., its flux); but it will never reveal the *evolutionary* source of his new insights. By completely ignoring Kant's own emphasis on the systematic coherence of his philosophy, this historical approach provides an easy excuse for the interpreter to avoid the difficult task of finding a higher perspective that enables us to fit all Kant's ideas together into a coherent whole. Moreover, it neglects the fact that insights (especially those of a truly great thinker, such as Kant) are more likely to emerge as leaps than as steps.

Where, then, do insights come from? Such a question, as our overview of the Geometry of Logic in §II so clearly illustrates, can only be answered from the perspective of the next higher stage of an evolutionary process. In the case of human rationality, this suggests that the origin of our insights, of the new ideas that characterize the historical development of any creative thinker, is fundamentally inexplicable when viewed from our current evolutionary stage. This leaves us with one of two alternatives: we can simply admit our ignorance and stop trying to answer the question, or we can postulate the existence of a higher level in the evolution of consciousness and try to imagine what it would be like to view human rationality from that perspective.[33]

The second option, for those who are willing to take it—something nobody content with the first option can be forced to do—suggests an interesting way of applying the logic of emergence to the question of God's existence. The study of how intrinsic emergent properties have evolved in life-forms gives rise to the possibility of developing a theological proof "from evolution". Such a proof could take two forms. First, it could argue on the basis of the evolution of consciousness that insights themselves (i.e., the experience of thinking a thought that has an intrinsic emergent character) must come from a higher-level consciousness that somehow transcends human consciousness. The problem here is that the way ideas emerge in the minds of rational beings can also be explained (though I believe only partially) in the fluctuating terms of extrinsic properties—properties that can and often do eventually become mergent, as explained in §I.

A second form of the theological proof from evolution could start not from insight (i.e., the peculiarly human ability to think new thoughts), but from the inexplicable fact that natural phenomena other than life-forms also emerge. The principle of continuous development postulated by the theory of Natural Selection can explain only *extrinsic* mergence and emergence, not their intrinsic counterparts. For as suggested above, such properties can change and develop only by combining old properties of existing objects in new ways. "There is nothing new under the sun" is a basic principle of extrinsic properties. Any surprise that may characterize our experience of extrinsic emergence is due not to the property being genuinely *new*, but merely to our cultural conditioning. If red ink is used to print this essay, this fact will not imply that red-inked-essays have in any way *evolved*; such a possibility has obviously been here all along, waiting to surprise us—and could even become a mergent property of scholarly essays, should the process of flux yield to stagnation at some point. But if, by contrast, genuinely new properties emerge instead—that is, if evolution (defined in terms of intrinsic emergence) happens—and if the origin of such changes cannot be attributed to human rationality (as in the case of new *ideas*), then a gaping hole is left in our explanatory scheme. That hole could be filled, at least potentially, by God.

In this essay I have not even begun to construct a formal argument for God's existence based on the discovery of intrinsic emergent properties in evolutionary processes. At most, I have merely established a framework for constructing such an argument. The argument could be two-pronged: beginning from the nature of emergence in the Geometry of Logic (as outlined in §II), it would demonstrate that intrinsic emergence requires a higher-level perspective in order for the source of a lower-level property to be fully identified; the argument would proceed to examine particular examples of natural evolution, arguing that the only way the emergence of such intrinsic properties could ever be adequately explained (if an explanation is desired) would be to trace them to a Being who is somehow at a higher-level of evolution than human consciousness on the one hand and at a higher level of evolution than the material world on the other. That is, just as the evolution of human rationality (with its capacity for insight) can be explained only by referring to the emergence of a higher-level mental reality, so also the evolution of physical properties in nature can be explained only by regarding them as rooted in the emergence of a higher-level physical reality. Although such teleological explanations are far from being generally accepted by philosophers and scientists these days, they do find significant *prima facie* support from our study of how emergence functions in the Geometry of Logic.

The foregoing answer to the question of how evolutionary changes emerge remains admittedly tentative at this point. However, I believe it is the only answer possible, given the limitations imposed upon us by the logic of emergence. The illustration of how emergence functions with *logical necessity* in the Geometry of Logic provides irrefutable evidence that intrinsic properties do emerge, at least in a purely mathematical context; and evolutionary biology supplements this with numerous examples of such emergent leaps in nature. Unfortunately, taken on its own terms, the possibility of such intrinsic emergence is unexplainable. It simply *happens*.[34] Those who are dissatisfied with such a conclusion do have recourse to a way out of the dilemma, but the way of escape remains as hypothetical as the proposed solution—until the day when human rationality itself evolves in such a way that our own higher level of understanding emerges.

FOOTNOTES

[1] I would like to thank three anonymous reviewers of a previous draft of this essay for providing criticisms and suggestions that prompted numerous improvements, such as the addition of the present paragraph providing historical contextualization. However, in keeping with my argument in §IV, this contextualization should not be regarded as exercising a direct causal influence on the ideas I present in this paper.

[2] C.L. Morgan, *Emergent Evolution* (New York: Holt, 1923). Morgan was a biologist more than a philosopher, but he appealed explicitly to Lewes in countering the reductionist trend in early twentieth century psychology with the claim that a gradation of different levels of mentality exists across different animal species.

[3] In *Space, Time, and Deity* (London: Macmillan, 1920), Alexander (influenced by Morgan) develops a theory of emergence that is probably the closest of all these early defenders of emergence to that of contemporary non-reductive materialism: even though the neuro-chemical level of reality is the ultimate foundation of all conscious life, the latter level emerges from the former in such a way that explanations at this higher level cannot be reduced to those at the lower level. Nevertheless, Alexander, like standard non-reductive materialists today, regards this emergence as causally linked in such a way that (all physical factors being known) prediction *could* take place between levels. Emergence, according to Alexander, only reveals new *qualities*, not fundamentally new realities.

[4] C.D. Broad, *The Mind and Its Place in Nature* (London: Routledge & Kegan Paul, 1925). Broad expands the application of emergent thinking beyond the issues of the origin of life and mind, applying it to the question of whether any given science (such as chemistry) is reducible to another (such as physics). For Broad emergence is the chief alternative to a mechanistic view of nature whereby all sciences ultimately reduce to one. In Broad's view, the laws and principles of each specific science *cannot* be predicted from knowledge (even a complete knowledge) of the lower, more general levels of science alone. Instead, "we must wait till we meet with an actual instance of an object of the higher order before we can discover such a law" (p.79). What emerges, on this view, really is something new.

[5] Scientists often merely assume that such emergence takes place. See, for example, *Higher Brain Functions: Recent explorations of the brain's emergent properties*, ed. Steven P. Wise (New York: John Wiley & Sons, 1987); none of the contributors shows any awareness that there might be philosophical problems arising out of the very notion of emergence. Probably the most important writer on emergence during the middle half of the twentieth century was the chemist-philosopher, Michael Polanyi, though his work is often neglected by mainstream philosophers. For an exception to this trend, see the special issue on emergence in *Tradition and Discovery* XXIX.3 (2003), especially Philip Clayton's article, "Emergence, Supervenience, and Personal Knowledge", pp.8-19.

[6] Non-reductive materialism remains popular despite the serious criticisms advanced by Jaegwon Kim, especially in his influential article, "Making Sense of Emergence", *Philosophical Studies* 95 (1999), pp.3-36; hereafter abbreviated "MSE". The most important of Kim's numerous earlier essays on this and related subjects are compiled in his book, *Supervenience and Mind: Selected philosophical essays* (Cambridge: Cambridge University Press, 1993); see especially chapter 8, "Supervenience as a Philosophical Concept", and

chapter 14, "The Myth of Non-reductive Materialism". Kim develops his position still further in *Mind in a Physical World: An essay on the mind-body problem and mental causation* (Cambridge, Mass.: The MIT Press, 1999). For a good example of a philosopher who has not been put off by Kim's skepticism, see Mario Bunge's *Emergence and Convergence: Qualitative novelty and the unity of knowledge* (Toronto: University of Toronto Press, 2003); hereafter *E&C*. This *tour de force* interprets emergence within the context of systems theory, relating it to a wide range of scientific, philosophical, and cultural (e.g., socio-economic) issues.

[7] Recent works on emergence are far too numerous to list here. For a detailed summary of the history of emergence in philosophy, see "Emergent Properties" in *The Stanford Encyclopedia of Philosophy*, http://plato.stanford.edu/entries/properties-emergent/. Robert Van Gulick surveys the recent literature in "Reduction, Emergence and Other Recent Options on the Mind/Body Problem: A Philosophic Overview", *Journal of Consciousness Studies* 8.9-10 (2001), pp.1-34, the first article in a special issue on emergence. Tim Crane, *Elements of Mind: An introduction to the philosophy of mind* (Oxford: Oxford University Press, 2001**)**, offers a helpful summary and analysis of the key issues (see especially pp.62-66). See also Mark C. Taylor's intriguing book, *The Moment of Complexity: Emerging network culture* (Chicago: University of Chicago Press, 2001). Interest in all aspects of emergence and its applications reached a new peak in 1999, with the founding of the journal *Emergence: Complexity & Organization* (see http://emergence.org).

[8] For an example of a typical scholarly exchange relating to this issue, see D. Wiggins, "The Sense and Reference of Predicates: A Running Repair to Frege's Doctrine and a Plea for the Copula", *Philosophical Quarterly* 34 (1984), and P.F. Strawson's response: "Concepts and Properties *or Predication and Copulation*", in P.F. Strawson, *Entity and Identity and Other Essays* (Oxford: Clarendon Press, 1997), pp.85-91.

[9] Kim himself admits that, even if ontological emergence is rejected as an impossibility as a result of the serious problems he raises concerning how "downward causation" could possibly function (see "MSE", pp.28-33), the notion of such causation (and the whole theory of emergence along with it) could be salvaged "by giving it a *conceptual* interpretation" (p.33), as describing "levels within our representational apparatus, rather than levels of properties of phenomena in the world." Such a *conceptual* approach is precisely what I adopt in §II, though I also make some tentative ontological applications in later sections.

[10] Kim rightly observes (in "MSE", p.19) that this feature of emergentism, this "talk of 'levels' … has thoroughly penetrated not only writings about science, including of course the philosophy of science, but also the primary scientific literature of many fields." See note 5, above, for several examples. By demonstrating how the Geometry of Logic illustrates the emergence of new levels in a purely mathematical (a priori) context, I intend to provide a useful mapping tool to those scientists whose empirical research requires them to deal with such levels.

[11] See for example, Palmquist, S.R.: 1992, "Analysis and Synthesis in the Geometry of Logic", *Indian Philosophical Quarterly* 19:1, pp.85-108, and Chapter 5 of Palmquist, S.R.: 2000, *The Tree of Philosophy*4. Hong Kong: Philopsychy Press. My most detailed application of the Geometry of Logic has been in my various writings on Kant, especially Chapter III of Palmquist, S.R.: 1993, *Kant's System of Perspectives: An architectonic interpretation of the Critical philosophy*. Lanham: University Press of America. The full defense of this assumption

regarding the parallels between logic and geometry is contained in my unpublished monograph, *The Geometry of Logic* (draft available at http://www.hkbu.edu.hk/~ppp/gl/toc.html).

[12] Morgan, following Lewes, refers to such non-emergent properties as “resultant” (see note 2). Kim adopts their use of this term in “MSE” (see pp.6-8,21-22), as does Bunge in *E&C* (see chapter 1, especially p.16). The term is misleading, however, inasmuch as emergent properties “result” from the basal conditions at the lower levels of complexity just as much as mergent properties do. As Kim points out, the defining feature of resultant properties, in contrast to emergent properties, is that only the former “are predictable from lower-level information” (21), as provided by “a system’s total microstructural property” (p.7). Neither Kim nor Bunge raise the issue of whether “resultant” is adequate as a technical term, so neither attempts to provide a better one, as I have done here by proposing the use of “mergent”.

[13] Kim also uses both of these words (“MSE”, pp.6,10-11,18,34), yet does not attempt to explain their meaning in any technical way. He does state in passing that “nonintrinsic” properties are “relational with respect to other properties in [the material base]” (pp.10-11); that is, they arise contingently out of one or more mergent properties. As an example of an extrinsic property Kim cites “being 50 miles to the south of Boston” (p.34). Bunge also contrasts “intrinsic” with “relational” in *E&C* 17, but makes minimal use of the distinction.

[14] This distinction is closely related to the traditional analytic-synthetic distinction, where intrinsic properties would be definable as analytic, with extrinsic properties being synthetic. However, I have avoided this terminology throughout this essay because of the many problems associated with it. For a thorough discussion and reinterpretation of this more traditional distinction, see Palmquist: 1993, *Kant’s System of Perspectives*, especially pp.111-120; and Palmquist, S.R.: 1987, “A Priori Knowledge in Perspective: (I) Mathematics, Method and Pure Intuition”, *The Review of Metaphysics* 41:1, pp.3-22.
. Although Kim is correct to say that “the boundary between what’s conceptual and what isn’t is certain to be a vague and shifting one” (“MSE”, p.11), this does not, in my view, render such distinctions useless. Rather, as Bunge recommends, we should always seek to employ both analysis and synthesis as complementary methodological functions (*E&C* 24-25).

[15] I am not here attempting to defend these claims, but merely summarizing the essential features of claims I have defended at great length elsewhere (see note 11).

[16] See for example, Maria Beesing, Robert J. Nogosek, and Patrick H. O”Leary, *The Enneagram: A Journey of Self Discovery* (Denville, New Jersey: Dimension Books, 1984). The relationship between the Enneagram and Jung’s theory of personality types is discussed in Palmquist, S.R.: 1997, *Dreams of Wholeness: A Course of Introductory Lectures on Religion, Psychology, and Personal Growth*. Hong Kong: Philopsychy Press, pp.177-185.

[17] See Immanuel Kant, *Critique of Pure Reason* (1781/1787), Chapter I of the Analytic of Concepts. I demonstrate the precise 12CR structure of Kant’s table of the logical forms of judgment (from which he derives the twelve categories) in Section III.3 of *Kant’s System of Perspectives* (1993).

[18] Most interpreters regard Jung’s types as a 16-fold theory (i.e., a 4LAR); but I have argued in “Perspectives in Counseling: Kant’s Categories and Jung’s Types as Models for

Philopsychic Counseling" (forthcoming; draft available at http://www.hkbu.edu.hk/~ppp/srp/arts/PiC.htm).

that it can also be interpreted as a 12CR. In either case, its highly logical structure is one of its most significant (yet often ignored) features.

[19] Quantum physicists are far from being in agreement over how best to describe the fundamental building-blocks of the physical world; but what is typically called the "standard model" nowadays portrays a system consisting of six quarks and six leptons, for a total of twelve basic sub-atomic particles. Both types of fundamental particle are further divided into three pairs of opposites (i.e., negatively or positively charged). If each triad constitutes a 1LSR (an admittedly debatable assumption), then the whole system would be a 12CR, with the basic 2LAR consisting (as usual) of two twofold distinctions: quark (+) vs. lepton (-); and positively (+) vs. negatively (-) charged. That is, the 2LAR that underlies all material substance is: positively charged quarks (++), positively charged leptons (-+), negatively charged quarks (+-), and negatively charged leptons (--). I discuss various philosophical implications of quantum physics in "Quantum Causality and Kantian Quarks" (forthcoming; draft available at: http://www.hkbu.edu.hk/~ppp/srp/arts/QCKQ.htm).

[20] This feature is explained in more detail in Chapter 5 of Palmquist: 2000, *The Tree of Philosophy*; and in Section 2.1 of Palmquist: *The Geometry of Logic*.

[21] This becomes particularly evident when actual examples of synthetic relations are examined: the synthetic component always contains more than just a combination of the two opposites that went before it. This mysterious and unpredictable feature of synthetic logic, wherein opposites unite in the form of a newly emerging reality, is reflected by the convention of labeling the third term "x".

[22] Here I am assuming that "emergence" refers to the unified whole of a more complex "level" of reality (or logical level, in the case of the Geometry of Logic). Bunge employs a diagram that has a similar logical structure to Figures 1-3, combined (i.e., a system consisting of one element, branching to a system consisting of two elements, and from there to a system with four elements); but he labels the movement *from* the fourfold *to* the unity as "emergence" and the reverse movement (i.e., the movement *toward* the more complex level) as "submergence" (*E&C*, p.15). This is clearly an error—though it is apparently an error only in Bunge's diagramming skills, since elsewhere he recognizes that emergence occurs at levels where *more* complexity is exhibited. The idea Bunge appears to be presenting with his diagram is that when emergence happens all the complexity is unified under a single organizing principle, as when an "organism" (e.g., a human body) unites numerous "organs" (heart, lungs, brain, etc.). But if this is what Bunge had in mind, he should have introduced different terms, such as "*con*vergence" (for the movement toward unity) and "*di*vergence" (for the movement toward complexity), in order to avoid giving the technical term, "emergence" multiple meanings. Bunge rightly assumes throughout his book that emergence happens only within *systems*, where a system is "an object with a bonding structure" (p.20). On this definition, the Geometry of Logic qualifies as one such system and can therefore exhibit the characteristics of emergence. Bunge later proposes a more complex, four-fold definition of a system, in terms of "composition", environment", "structure", and "mechanism" (p.35)— characteristics that together constitute a perfect 2LAR.

[23] See Benoit B. Mandelbrot, *The Fractal Geometry of Nature* (New York: W.H. Freeman, 1983). Fractal geometry, the geometry of spaces presumed to have fractional dimensionality, was among the earliest forms of chaos theory; as such, it is at the opposite end of the spectrum of geometrical complexity as the Euclidean system. Fractals have the paradoxical feature that properties appearing at first to be emerging chaotically, as random changes following no predetermined pattern, eventually develop into patterns that repeat themselves in a clearly discernable way over and over again. In other words, extrinsic emergent properties come to be regarded as extrinsic mergent properties as the geometrical pattern (the "fractal") is viewed at higher and higher levels of complexity.

[24] A "perfect" relation in the Geometry of Logic is one that is "complete"—i.e., one wherein all components represent real possibilities. By contrast, any relation wherein one or more components are either logically impossible or empirically unrealizable is "imperfect".

[25] The decision as to how to correlate each concept with a specific part of the map is to some extent arbitrary. Because the map is symmetrical, it can be rotated or flipped at will without changing the *logical* relations between its parts. What is far more important is to establish the relative relationships between each term, so that any alternative way of mapping the same 2LAR could be rendered identical to any other simply by changing the orientation of the diagram. I have outlined and defended the mapping conventions I use in *The Geometry of Logic* (see especially Section 2.2) and in the various other publications listed in note 11, above.

[26] Immanuel Kant, *Opus Postumum*, tr. Eckart Förster (Cambridge: Cambridge University Press, 1993); see e.g., pp.13,37.

[27] This problem tends to be glossed over by scientists who employ the concept of emergence in the course of explaining such evolutionary changes. See, for example, Jon H. Kaas, "The Organization and Evolution of Neocortex", in Wise (ed.), *Recent Explorations* (see note 5, above), pp.347-378. Kaas states, matter-of-factly: "Mammals emerged from reptiles about 250 million years ago" (p.359); he even provides a table showing the various branches in this "phylogenetic tree" (p.360), though he does admit that "[t]here are many uncertainties about the branch points and time course of this radiation" (p.359). Nowhere does he explain where the *new elements* come from, nor even acknowledge this as a problem.

[28] See especially Pierre Teilhard De Chardin, *The Phenomenon of Man* (New York: Harper & Row, 1959).

[29] This theory's distinction between continuous and discontinuous change is roughly equivalent to the distinction I have made between flux and evolution. For a good introduction, see *Catastrophe Theory: A Revolutionary Way of Understanding How Things Change* (London: Penguin, 1978).

[30] See e.g., Paul D. MacLean, *The Triune Brain in Evolution: Role in Paleocerebral Functions* (New York: Plenum Press, 1990). MacLean persuasively argues that the brain has three layers that correspond directly to the three major evolutionary changes that have affected life on earth: the Reptilian Brain governs sentience; the Mammalian Brain governs our conscious awareness; and the Neocortex governs the higher processes of rationality.

[31] This strongly suggests that intrinsic emergence has the epistemological status of analytic a posteriori: the fact that an evolving property is intrinsic makes it *analytic*; the fact that it

emerges makes it *a posteriori*. I have examined various other applications of this paradoxical epistemological form in Palmquist, S.R.: 1987, "A Priori Knowledge in Perspective: Naming, Necessity and the Analytic A Posteriori", *The Review of Metaphysics* 41:2, pp.255-282; see also *Kant's System of Perspectives*, pp.134-139, 237-239, 367-368. However, as pointed out in note 14, I shall not develop such a possibility in this essay.

[32] After noting the emphasis placed by the early emergentists (e.g., Lewes and Morgan) on understanding the historical development that led to the appearance of the different "levels" of the world as we now know it, Kim cautions (in "MSE", p.20): "Contemporary interest in emergence and the hierarchical model is focused not on this kind of quasi-scientific and quasi-metaphysical history of the world, but rather on what it says about the synchronic structure of the world—how things and phenomenon at different levels hang together in a temporal cross section of the world, or over small time intervals." Here Kim seems to be referring to the interest contemporary *philosophers* have in theories of emergence, for scientists (some scientists, that is) are still as interested as ever in understanding the history of evolutionary changes. Kim goes on to discuss what he takes to be the key philosophical issue relating to emergence: the possibility of supervenience or "downward causation", whereby emergent properties (e.g., conscious thoughts) are believed to have a causal influence on lower-level (e.g., physical) states or events. But as Kim persuasively argues (p.25), the non-existence of downward causation would render emergentism identical to epiphenomenalism, thus effectively implying that there are no *genuinely* emergent properties at all. The issue of downward causation, however, is beyond the scope of this paper because my second assumption (in §I) was that emergent properties *do* exist. Instead of dwelling on downward causation, my comments in the remainder of this paper can be regarded as an attempt to revitalize philosophical and theological interest in exploring the implications of this "quasi-scientific and quasi-metaphysical history". Perhaps the *reason* it is not, and cannot be, genuinely scientific and genuinely metaphysical is that it is genuinely *theological*.

[33] As Kim points out (in "MSE", pp.20-21): "A characteristically emergentist doctrine … [is] that some of the properties of … complex systems, though physically grounded, are nonphysical, and belong outside the physical domain." The concluding paragraphs of this essay will seem to be out of place unless this fact about emergentist theories is kept firmly in mind. By waxing theological, I am merely pressing emergentism to one of its potentially fruitful extremes. That such reflections are far from being devoid of scientific grounding and philosophical significance is demonstrated by studies such as John D. Barrow and Frank J. Tipler, *The Anthropic Cosmological Principle* (Oxford: Clarendon Press, 1986).

[34] Kim concurs with this understanding of emergence. In "MSE" he explains that the unpredictability of a property's emergence "may be the result of our not even having the *concept* of *E* [the emergent property]" before the emergence takes place; "we may have no idea what *E* is like before we experience it."