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DEVELOPMENTAL PARADIGMS

ROBERT A. HERRMANN*

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Abstract

This is the third article in the series entitled Nature: The Supreme Logician. *In this article the supermind processes associated with the deductive-world model are discussed. The specific scientific object called the developmental paradigm is defined and its unique behavior is investigated. It is shown how this object and supermind processes deterministically generate the entire universe in which we dwell as well as the fundamental constituents of all material microphysical, macrophysical and large scale structures. It is shown that the deductive-world model is a nontrivial grand unification. Two simple models are described that indicate some of the difficulties with uniformitarianism. Using the concepts of supermind choice and superuniform alterations it is proved that the linguistic concepts of random behavior and random cause are theory (i.e. discipline language) dependent and are not absolute in character.*

1. Introduction

Thus far in this series of articles, I have not specifically defined the term "science" except as implied by the most general dictionary definition that: "it is a coordinated and systemized collection of knowledge associated with some one subject." I shall continue to refrain from presenting such a personal definition since it would surely lead to protracted and "heated" arguments from individuals who are intent upon classifying their endeavors as "scientific" while claiming that scholarly efforts put forth by others—efforts that do not meet their personal definition—are somehow or other not scientific in character. I have even discovered that the very bland Cohen and Nagel contribution to such a definition is not accepted by all "scientists." Indeed, individuals who have never published any really creative scientific work seem to be the most critical of definitions given by active scientists. To continue, Cohen and Nagel are interested in giving a *very* brief account of the notion of "coordinated and systemized" as expressed in such a dictionary definition and as it is generally reflected within the most basic requirements of the "scientific method." They state that:

> We reserve the term 'science' for knowledge which is general and systematic, that is, in which specific propositions are all deduced from a few general principles. . . . If we look at all the sciences not only as they differ among each other but also as each changes and grows in the course of time, we find that the constant and universal feature of science is its general method . . . (the) Scientific method is thus the persistent application of logic as the common feature of all reasoned knowledge.[1]

Our concern will continue to stress the end result of any assumed scientific endeavour—the rationally presented and communicated documentation. As an illustration consider the "science" of mathematics. Rather than attempt to describe in a relatively complete manner the research methods of such a highly intuitive subject, I will analyze some properties of my publications and give a brief account of how the results are obtained. Each of the hundreds of stated "theorems" and "applications" is presented for the first time within these documents. The abstract conclusions are presented in a special analytical form that scientists consider to be ordered by the most logical and systematic method known to mankind. However, the majority of these results were NOT discovered nor conceived of in this harmonious manner. Experientially, I conceived of the majority of them in a totally *intuitive* manner. I "feel" and somehow or other "know" that based upon a given set of hypotheses a conclusion is true mathematically or that a certain description from another discipline language L can be mathematically modeled. But, I usually have no specific idea of exactly how to properly establish the result or—in the case of modeling—how to verbally express the correspondence between the mathematical structure and various primary entities from L.

* *Robert A. Herrmann, Ph.D., Mathematics Department, U.S. Naval Academy, Annapolis MD 21402.*

For pure abstract results, it is only *after* a result has been formulated and verbally presented that the long and exhausting search begins for a logical sequence of statements that will adequately establish its validity. I am convinced that these statements were not present mentally prior to the conjecture. It is this mental search for "just the right" combination of specialized word-forms that is the major aspect of abstract mathematical research. These efforts are related to the methods that have been inculcated into an individual by experience, training and tradition. Within abstract mathematics, no matter how "obvious" your intuition may appear, the abstract results are not accepted formally until the majority of mathematicians agree, as if they were a jury, that you have indeed established your conclusions properly.

Mathematical modeling of natural or philosophical systems appears to be much more difficult since you "intuitively" know that such a modeling is possible, but you must *discover* the correct combination of descriptive terms within a metalanguage that will develop a comprehensible correspondence between portions of the discipline language L and an abstract mathematical structure. Moreover, the correspondence must be consistent and must, usually, preserve some of the logical "hypothesis $\rightarrow$ conclusion" sequences previously established within the language L itself. Once this correspondence is obtained then new concepts that tend to parallel the mathematical structure present themselves and an extension of the discipline language to L' is appropriate. However, you often express a description from L' and your mind indicates literally that these word combinations or even pictorial information do "not quite" delineate correctly the "new concept." This obviously indicates that the *new* concept being considered was neither verbally nor pictorially presented originally since not only are new descriptive terms required but their meanings are not in complete accordance with what appears to be some nonverbal and nonpictorial mental impression. You must transfer what I believe are such "feelings" or "intuition" into a comprehensible verbal description or pictorial display. Personally, I am almost never satisfied with the adequacy of such descriptions and for this reason I am searching continually for refinements that will convey a deeper conceptual meaning to the reader. Of course, this remarkable process of transferring new creative concepts into descriptions within a new language permeates all significant and creative science.

Now according to Cohen and Nagel it is the logical order and harmony—the logical sequence—of transferring hypotheses into conclusions within a discipline language and combining their descriptions into noncontradictory harmonious collections as prescribed by the discipline itself that is the common feature of all reasoned science. Of course, it is self-evident that such sequences are the mainstay for the predictive aspects of numerous theories, especially if they correspond to a parallel mathematical structure. Please notice, however, that depending upon L' certain mathematical terms are also utilized to express an orderly behavior. Such terms as "continuous" or "continuum" and the like are descriptively employed and as shown elsewhere[2] these terms have no meaning relative to systematic behavior unless an individual has *additional intuitive* comprehension produced by experience with these particular mathematical concepts. Also note what I have not written. As discussed in the second article in this series[3] if a conclusion F_1 is a logical consequence of hypotheses Γ_1, and F_2 a consequence from Γ_2, then even though F_1, F_2, Γ_1, Γ_2 are all portions of the same "scientific theory" it may not, as yet, be possible to logically obtain F_1 and F_2 as conclusions from a third *acceptable* set of premises Γ. A vast amount of mental effort has been expended by theoretical scientists in their attempts to produce such unifying premises Γ. It appears to be the concept that I have previously defined as "psychological uniformity" that is the driving force behind the belief that such unification should be possible.

It is often difficult for scientists (including this author) to believe that certain statements F_1 and F_2, due to their apparent similarity, are not reconcilable by some nontrivial set of premises Γ. This leads to a philosophical belief that such efforts are acceptable scholarly activity worthy of personal reward. In contradistinction to past history, within our present scientific environment, such theoretical activities are considered the "highest" form of scholarly effort. (Unfortunately this is not considered acceptable for some other scholarly activities.)

With respect to a developing natural system that is assumed to alter its descriptive or observed behavior with respect to time—is it reasonable to search for some logical unification for two apparently disjoint descriptions F_1 and F_2? Suppose that F_1 describes the system or constituents at time t_1 and F_2 at time t_2, where $t_2 > t_1$. The fact that we have a time ordering tends to lead to the suggestion that some unification is possible. First observe that all significant pictorial or audio representations can be reproduced by a narrative description involving encoded computerized information and subsequently displayed on various types of terminals. Now within a theory certain possibilities exist. (1) The descriptive forms F_1 and F_2 can be predicted from a more fundamental and nontrivial set of premises Γ, where Γ is within an extended theory. (2) You predict that F_2 is the "effect" that will follow in a logical sequence from the "cause" F_1. (3) There is a logical relation between F_1 and F_2 described by a third descriptive form F_3. (4) Neither (1), (2) nor (3) appears to be true, at present. It is when case (4) occurs that the question is asked whether it is reasonable to spend our efforts in an attempt to reduce this case to a type (1), (2) or (3) unification? Philosophically our personal desires for the elimination of case (4) can be traced, at least, to an Aristotelian implication. Aristotle wrote with respect to an ultimate cause that: "a single harmony orders the composition of the whole . . . by mingling of the most contrary principles."[4] We need simply replace the word "whole" by the words "natural system" to restrict his philosophy to that of system development.

We have previously quoted in this series from the personal beliefs of various scientists that the humanly perceived patterns we describe within our "minds," or on various written documents, must not only be rational to the extent of being noncontradictory but they must also be associated with the logical properties of human comprehension. This can be simply stated for a (time) developing natural system as follows: For

the human being to place two statements F_1 and F_2 within a general description for a developing and named natural system S_1—statements that claim to describe by means of a physical language some ordered behavior—it must be *mentally recognized* (i.e. intuitively deduced) that F_2 is related to the natural system being described and does indeed follow statement F_1 with respect to a time sequence. That is to say that some type of mental process is apparently necessary in order to recognize that statements F_1 and F_2 are indeed time ordered members that partially describe a portion of the development itself. On the most simplistic bases, the human being must recognize that a development of the natural system is taking place.

In November 1981, a search began to justify *scientifically* the philosophical belief that type (1), (2) or (3) unification is possible and that the concept of a developing natural system is logical. The scientific methods utilized are those of the science called Mathematical Logic and this article discusses the general methods and results thus far obtained.

2. Developmental Paradigms

In this section the "supermind" concept is discussed, a concept based upon hundreds of years of evidence and first analyzed 2300 years ago,[5] a concept that came to fruition after it was observed that natural systems change in their appearance with respect to cosmic time.[6]

Suppose that using L(D) (i.e. a discipline language) an individual transcribes what is *claimed to be* a consistent and faithful description for the behavior and characteristics for a natural system and its constituents as they would be observed by assumed human or machine sensors at a given moment. As previously mentioned, computer techniques allow the verbal description to contain actual visual or audio "displays." After such a description is formulated then other individuals, who by experience and training intuitively comprehend the technical language contained in L(D), "read" such a description and mentally correlate *portions* of it to what is alleged to be "actual" reality. As discussed in the second paper in this series[7] this correlation to "actual" reality should not be artificially forced upon an individual but is a personal acceptance and is totally within the mind of the reader. Of course, individuals also utilize such things as an educated imagination and indeed this is often the method by which speculative "reality" is made to correspond to a description and conversely.

Is there a simple process that underlies the basic notion for the *development* of a natural system? Viewed externally each description may be considered a specially constructed *single* entity within L(D). The major results in this section are obtained from a strong mathematical model for the logical processes that characterize the exterior procedures that can actually produce a sequence of natural system descriptions—*the development* —when we view such descriptions as single entities. No matter how chaotic adjacent descriptions may appear I will show that there is a "single harmony" that orders the natural system, a basic principle that will yield an actual development for the system. Of course, one of the major goals of the scientist is to describe these "basic principles."

Prior to describing the concept that we have termed the "D-world model" I mention that a D-world (i.e. deductive-world) procedure investigates analytically how distinct descriptions such as F_1 and F_2 may be transformed one into the other logically. Indeed, a D-world technical language that is exterior to L(D) is constructed in order to characterize such transformations. These D-world characteristics are meaningful to modern science since, as will be shown, they indirectly "explain" many known paradoxical states of affairs generated by L(D)'s and that have not yet been otherwise reconciled.

In the first article in this series[8] I gave a general overview of what the term "D-world" signifies. A refinement of this previous discussion appears necessary. The D-world model is one of the general names given to an evolving theory that is expressed both in terms of various discipline languages and *new* associated languages.

In 1961, Abraham Robinson made a significant fundamental discovery relative to what is now called *standard mathematics*, which is composed of almost all of the subject matter taught at both the undergraduate and graduate university level.[9] First Robinson, and then many others, contributed to this new mathematical language and defined such new mathematical terms as the monad, α - monad, θ - monad, *-real numbers, star-real numbers, hyperreal numbers, *-continuous, hypercontinuous, S-continuous, infinitesimals, subtle logics, *-words and hundreds of others. The general discipline that has developed from the methods instituted by Robinson is called *nonstandard analysis* and produces an extension of standard mathematics. One of the most important features of nonstandard analysis is that the mathematical structures utilized not only behave approximately like the standard structures but they possess significant additional properties that are not shared by the standard structures. For example, the three hundred year old "dream" of Leibniz and Euler to rigorously justify the mathematical existence of the infinitesimal or ideal real numbers has been achieved since they mathematically exist within the hyperreal numbers.[10] However these new infinitesimals do not behave in the manner first envisioned.

In the first section of this article, I gave an outline of how a mathematical structure is correlated to another scientific discipline language L and that it might be necessary to extend L to a new language L'. When nonstandard structures are corresponded to certain disciplines such as Physics, the theory of Natural Systems and Logic it is necessary to construct such an extension L'. In general, for disciplines dealing with natural phenomena, if "N" denotes the name for the discipline, then descriptions using new terms from L' are called *nonstandard N paradigms* or nonstandard N reality, the new terms form a *nonstandard N language* and L' is a *nonstandard* N, while the original language L — *the standard language* —corresponds to a standard mathematical structure.

As an example of this extension process we consider Logic and Economics. When the discipline L(L) that we term Logic is interpreted within a standard structure and this standard structure is embedded inside of a nonstandard structure then certain operators are called "subtle logical operators" and other objects

"hyperwords." This produces the extension L(L)'. Now for the D-world description these nonstandard terms in L(L)' are reinterpreted and called "supermind processes" and "superwords" due to their application. Within mathematical structures associated with Economics L(E)[11] an "infinite star-finite set T" is called a "set of (nonstandard) traders or agents."

It is within this series of articles that I attempt to produce an intuitive understanding of the behavior of these new concepts by showing mainly how they compare to well-known standard language concepts. I am completely aware of the difficulty in comprehending the forthcoming descriptions. They do not parallel our everyday experiences. However, I am confident that substantial understanding will be achieved if the following material is reflected upon, and some of the references are consulted. Some confusions that might be experienced in attempts to grasp some of the "deeper" features of the D-world model should be eradicated by the last article in this series where I interpret portions of the D-world model in terms of a theological language.

One of the basic requirements for this analysis is a "time partitioning" of an assumed description for a developing natural system. A time interval [a, b] ($a \neq b$) is partitioned into at least a denumberably infinite set of subintervals. The reason that we have chosen an infinite partition is so that our modeling process does not have a built in bias. Many models of natural system behavior assume a "continuous" predicted alteration in behavior over a finite time period. Indeed, we even have Bohm's alternative interpretation of Quantum Theory—an interpretation that predicts the same behavior as does Quantum Theory—but permits: "the representation of quantum mechanical effects as arising out of an objectively real [natural] sub-stratum of continuous motion, existing at a lower level . . ."[12] Now for each such subinterval [t_{i-1}, t_i] a finite string of symbols F_i a word) is assumed to be a consistent description for *the behavior and characteristics of a named natural system* S_1 *as well as the behavior and characteristics of named constituents contained within* S_1 *at time* t_i.

Within the definition for F_i the meaning for the terms "behavior" and "characteristics" are entirely intuitive and remain the selection of the individual that constructs F_i. The object F_i may include any subsidiary information one chooses, such as applied mathematical models Cn(M), predictive methods and the like; we only assume that F_i is consistent. Indeed, we shall consider various "subdescriptions" and theories in a later part of our analysis. Further, special variations between distinct F_i and F_{i+1} may be accounted for within the descriptions themselves and, of course, F_i need not be totally narrative in character but may include computer encodings. We are only interested in a possible logic for a development. Notwithstanding these additional features, each F_i is a finite set of symbols that can be modeled by means of a strong mathematical structure for logical processes—the Grundlegend Structure. Each F_i is called a *frozen segment.* In many instances, each F_i may be assumed intuitively to represent the sensory appearance of the natural system at instant t_i. Moreover, *potentials* P_i may be included that describe within a subinterval i the predicted behavior that may occur within *some other* developmental time interval. Any collection of frozen segments, one for each i, is called a *developmental paradigm* (a D.P.). I will show later that even though a human can only select finitely many such frozen segments, the D-world itself can select the possibly infinitely many F_i needed for the entire partition. For those models that require only finitely many partition points $a = t_0' < t_1' < \ldots < t_n' = b$ for the time interval [a, b] and thus finitely many frozen segments for a developmental paradigm the following is an appropriate procedure. Assume that a subinterval [t_{i-1}', t_i'] contains infinitely many partition points from our first subdivision of [a, b]. Now simply allow all of the frozen segments associated with each of the infinitely many subintervals of [t_{i-1}', t_i'] to be identical strings of symbols and denote them by the single symbol F_i'.

If the interval [a, b] is one second long (i.e. b - a = 1) and we consider it subdivided into say $m = 10^{10^{10}}$ or infinitely many subintervals, then the m or infinitely many frozen segments would yield a D.P. that when "played back," by an ultrafast machine would yield by the persistence of mental "vision" a description of exactly one second of the development of a natural system or its constituents. Notice that for any instant t_i there exists infinitely many distinct frozen segments from which to choose. The entire set of all frozen segments that can be used for the instant t_i is called a *totality,* T_i. Distinctly different D.P.s are obtained by allowable choice processes from the set T of all totalities.

Additional analysis is possible when D.P.s are encoded and embedded into a structure called the Extended Grundlegend Structure (EGS).[13] This structure is used to model the 2200 year old concept of infinitesimal reasoning. For these strong mathematical models for logical processes the interpretation method will utilize the following customary technique. First, such phrases as "a description of" or "a description for" are changed to "a representation for." The final step is to drop the phrases "a representation . . ." and the like. This produces statements written in a pure discipline language such as a physical language or what is sometimes termed "physical reality" or "realism." Keep in mind the correct process for N-world behavioral modeling. A mathematical language corresponds to a discipline language. The discipline language then may or may not correlate to actual reality. As discussed in the second paper in this series[14] that portion of the discipline language description that corresponds to *actual* reality is often unknown and its acceptance or rejection as an actual real world description for real world behavior is a philosophical stance.

Prior to embedding the developmental paradigm entities into the EGS and constructing the exterior D-world physical language an example is given of how mathematical structures are interpreted in a physical language where actual reality may be in doubt. In Quantum Measure Theory a certain finite set of symbols representing an infinite process occurs and is considered as a basic component. The customary interpretation has been to assume that this set of symbols did not correlate directly to a physical language description. You might call such mathematical or L(Q) entries *catalysts* in that they are necessary

within the theory in order to predict a physical statement but they may not correlate directly to a physical language phrase or actual reality, respectively. One very serious, widely reported and analyzed solution to this catalyst "problem," if one assumes that it is indeed a problem, is the Everett-Wheeler-Graham (EWG) interpretation for this particular portion of the Hilbert Space formalism:

> The theory holds that (1) [the infinite process] must be interpreted as literally as it can be; namely, as expressing the *splitting of the universe* into many branches. . . . We as human observers who are not external but are also described by a state vector, are also split into many copies. Each copy interacts only with his branch . . . and so is aware only of what goes on in his branch. It seems to him that only one of the possible outcomes has occurred . . . that the observer is himself part of a superposition in which all the outcomes are linearly combined just as predicted by quantum mechanics. Each time a measurement is made, anywhere in the universe, another occurs.[15]

The question is, is this splitting of the universe into various distinctly different copies simply a physical language description or do some consider it a real and actual event? Bryce DeWitt writes:

> I shall focus on one that pictures the Universe as continually splitting into a multiplicity of mutually unobserved but equally real worlds in each one of which a measurement does give a definite result. . . . This is constantly splitting into a stupendous number of branches, all resulting from the measurement-like interactions between its myriads of components, moreover, every quantum transition [change] taking place on every star, in every galaxy, in every remote corner of the universe is splitting our local world on earth into myriads of copies of itself . . . the laws of quantum mechanics do not allow us to feel the splits . . . the splitting of the universe is unobservable. . . . This concept is alien to experimental physics because it involves many elements of the superposition at once, and hence many simultaneous worlds, that are supposed to be unaware of one another. . . . All the worlds are there, even those in which everything goes wrong and all the statistical laws break down. If the initial conditions were right, the universe-as-we-see-it could be a place in which heat sometimes flows from cold to hot . . . it can never receive operational support in the laboratory . . . the view from where Everett, Wheeler and Graham sit is truly impressive.[16]

Notice that DeWitt appears to consider these multiple universes "equally real worlds" and further he claims that their existence can never be supported by laboratory experiment. Nevertheless, he claims that this work is "truly impressive."

In contrast to the EWG interpretation for a mathematical expression where certain phrases such as "a splitting universe" were not part of the original physical language but are in an extended language, all of the physically orientated terms employed in the next paragraphs correlate directly to mathematical objects within our strong mathematical structure—they are not simply selected from some exterior language. As far as the humanly comprehensible portion of a developmental paradigm is concerned we follow the usual assumption that to each time subinterval there would exist a frozen segment that yields (partially describes) the behavior and characteristics of the natural system under investigation and that *natural* human logic is restricted to entries that are finitely long strings of symbols. In what follows the phrase "humanly unknowable" means there is no *standard* language that can be used to communicate information about the entity under consideration. The term "humanly incomprehensible" means that the logic that produces the entity under consideration cannot be reproduced by any logic within our standard model for natural human reasoning. Recall that we are able to describe partially the behavior of these humanly unknowable or incomprehensible entities by using a special nonstandard language that is exterior to the standard language of discourse we associate with applied logic and communication.

What follows are direct translations or interpretations from a strong mathematical model for logical processes into our nonstandard physical language. These are but a few of the hundreds of such statements that can be generated logically by the applied mathematical structure. Not all of the numbered statements that we present need to be included within a descriptive D-world model. Following a numbered statement we give a brief but in depth explanation of some of its more salient features as viewed from the D-world model.

(2.1) *There exists a D-world process, a uni-word process* $\star\mathbf{S}(\{w\})$, *that in a superuniform manner produces the behavior and characteristics of a named natural system as well as the behavior and characteristics of named constituents contained within the named natural system as it develops with respect to cosmic time.*

The object w in (2.1) is a single pure D-world object. It cannot be explicitly written down as an expression from any human language standard or not and hence there can be no natural process applied to w that will yield N-world (i.e. natural or standard world) behavior. However, if we assume that logical combinations of members from L(D) yield N-world behavior, then w can be characterized as yielding D-world behavior. Also there is no finite set of statements X from any L(D) such that S(X) generates a developmental paradigm. The concept of "superuniform" means approximately that when the pure D-world operator $\star\mathbf{S}$ is applied, then all results such as F_i, among others, are obtained throughout the entire process by means of an extremely refined and "small" step-by-step procedure. The mathematical definition of a "superuniform logic" is within abstract topology and, in this case, it is not numerically describable except in terms of comparable behavior. If you conceive of human deduction as a sequence of steps from an hypothesis to a conclusion and this sequence is represented by distinct positive real numbers where the difference between two successive numbers yields a measure of the step size, then from the D-world viewpoint a superuniform logic has step sizes that are infinitesimal. Hence, the steps are infinitesimally more refined than any of the logical steps in any logical sequence produced by the natural mind.[17]

(2.2) *The D-process yields, at certain moments, a system development for which the behavior and characteristics are humanly unknowable or humanly incomprehensible.*

Statement (2.2) follows from the proposition that for various D-world moments of time that occur within any natural time interval there are characterizing objects G_i produced by *S that are not members of any L(D) and no natural logic exists that can produce such objects as G_i. Further each G_i necessarily exists in this model and following the interpretation scheme each G_i may be interpreted as yielding, at present, unknown D-world behavior.[18]

(2.3) *The superuniform D-process yields for certain time interval a system development that is humanly knowable, predictable and humanly comprehensible while over other time intervals a system development that is humanly unknowable, or humanly incomprehensible.*

When you restrict the outcomes of *S({w}), to members of any standard language then only the specific members of the developmental paradigm (i.e. the D.P.) and their simple logical consequences are produced in their proper time ordering. This shows that the operator *S is not trivial since no other N-world behavior is exhibited except that displayed logically by the D.P.[19] The set of logical consequences can be reduced while still retaining the original D.P. by application of a very unusual logical operator called "strong reasoning from the perfect."[20] The "humanly comprehensible portion of this statement will be discussed after statement (2.5) is analyzed. The "unknowable" portion of the development is an extension of (2.2) to an entire natural subinterval.

(2.4) *This D-world D-process has many of the characteristics we associate with the simplest form of human deduction and many characteristics that cannot correspond to human deductive processes in any form.*

This statement follows from the fact that all of the mathematically modeled properties of ordinary simple propositional (sentential) deduction hold true for *S logic when they are properly interpreted with respect to the D-word model. However, *S applies to behavior in the D-world that internally resembles finite N-world behavior even though, technically, it *may* be infinite in character. Such processes are called "hyperfinite." When this logical process is viewed from a logical sequence point of view, a similar phenomenon occurs. A consequence requires hyperfinitely many steps to obtain.[21] It has recently been shown that the theory of propositional deduction is undecidable.[22] Thus if we embed it into the EGS then we would obtain infinitely many pure D-world expressions that technically give information and properties about the logic *S, properties that do not hold true for standard propositional deduction.

(2.5) *The D-world deductive process that yields all of the above results produces infinitely many results not obtainable from any form of natural human deduction, but when restricted to humanly knowable objects it completely parallels one of the simplest forms* of *human deduction. For these and other reasons to be delineated, this D-world uni-word process is called a "superdeduction" or a "supermind" process.*

Statement (2.5) follows from the above discussion since infinitely many consequences of *S({w}) are not equivalent to any behavioral statement for any natural human language. Thus they cannot be the logically produced consequences of any natural form of human deduction and would not be humanly comprehensible as representatives for natural system behavior even though they are D-world comprehensible. On the other hand, whenever *S is restricted to the simplest propositional language—the sentence language we all use in our everyday discourse—then *S has all of the properties of one of the simplest forms of natural human deduction, the propositional deduction.[23] Relative to the term "supermind" it will become obvious that a large portion of the D-world model is an interpretation of the extreme differences between results that are obtainable by human reasoning processes and those obtainable by supermind processes.

To see how *S also preserves *all* forms of "predictable and humanly comprehensible" logical sequences consider each frozen segment as subdivided into subfrozen segments. Since each F_i is composed of "sentences" then we let each subfrozen segment H_i contained in F_i be composed of "sentences" taken from F_i. This produces a *subdevelopmental paradigm* d_1, such that each member of d_1 is an H_i. Assume that H_i logically predicts H_{i+1} (a member of d_1) that characterizes a portion of F_{i+1} for an adjacent time interval. Then there exists a superword w_1 such that once again *S applied to $\{w_1\}$ yields each and every member of d_1 including, H_i and H_{i+1}. Morever, regardless of how many subdevelopmental paradigms, d_j, are obtained from the original D.P., there exist superwords w_j for each d_j. However, there is also an ultimate superword w that not only generates the original D.P. but also has, as its consequences, each of the superwords w_j for each of the subdevelopmental paradigms. Thus application of *S to the superword $\{w_1\}$ not only yields the original D.P. but the *results* of any acceptable predictive theory as we11.[24] This obviously indicates that supermind operators and superwords are more "fundamental" in character than any of the *assumed* fundamental natural or standard objects discussed within your favorite "standard" theory.

Another significant feature of these conclusions is that the exact same supermind operator *S generates the theory of subparticles—objects that may be considered as fundamental building blocks for the possible natural microphysical world.[25] If we assume that there is a developmental paradigm that yields the entire N-world universe in which we dwell, then *S and the D-world model yields an ultimate unification. It not only generates the entire universe, and all comprehensible refined behavior, but also the very fundamental constituents of all material microphysical, macrophysical and large scale structures. Observe that the D-world mode is a complete "grand unification" of type (1).

3. Supermind Choice

Is it possible that every actual developmental or subdevelopmental paradigm can be deterministically selected "prior" to the application of *S?

(3.1) *From the viewpoint of the D-world model, there are infinitely many possible behaviors and characteristics for any developing natural system or its constituents.*

Any L(D) has infinitely many different representations for developments. The same must hold for the D-world.

(3.2) *Within the D-world there exists a D-process that selects a complete and unique development for any natural system and its constituents in a manner that is not absolutely statistically random.*

It is a well-known experimental fact that no human can make a finite choice from a potentially infinite set of objects in an absolutely random manner.[26] All of science as practiced by mankind is based upon finite choice. We appear to "finitely choose" what to observe sensorially, the conclusions of our deductive reasonings, theoretically obtained predictions, statements to verify, and the like, from potentially infinitely many entities. Even though we may not, at present, be able to predict successfully many of our finite human choices beforehand, science does not consider such choice methods as absolutely random. Indeed, for machines as well there are very strong and obvious arguments by Bohm,[27] and others, that such machines can not produce an absolutely random choice and for this reason we often term machine choice as "pseudo-random."

When consequences of deductive processes are examined, individuals often select certain portions as part of their arguments and reject the remainder as extraneous. When finite choice and such restricting procedures are modeled within the D-world, it is discovered that there is a specific deterministic and a D-world nonabsolutely statistically random procedure (hyperfinite choice) that yields each and every D.P. and no other N-world behavior.[28]

(3.3) *Within the N-world there can be absolutely no direct nor indirect observation or measurement that will reveal that such a very special deterministic process is being applied.*

The above process is what is called an "external" process and the interpretation of such processes within the D-world model is taken to have these characteristics. Notice that this interpretive aspect of the D-world model has exactly the same property as the Everett-Wheeler-Graham theory in that the EWG theory cannot be "operational supported in the [N-world] laboratory."

(3.4) *There may exist from the point of view of the D-world a set of rules utilizing a pure D-world language that yields the selection of these unique developments. These rules are humanly unknowable.*

On the one hand, we model within the D-world the psychologists claim that such "rules" may exist. Then on the other hand we also model Gödel's incompleteness conclusion that implies, from one of the most recent treatments, that the intuitive methods utilized for any scholarly discipline that employs the basic notions of the natural numbers cannot be specifically described by means of one fixed set of rules taken from any L(D).[29] These intuitive methods include the processes that one uses to obtain intuitive conclusions and intuitive choices.

4. Superuniform Alterations

(4.1) *Within the D-world model there exists a superuniform, supercontinuous, supersmooth alterating D-process that transforms the behavior and characteristics of natural system* S_1 *as well as the behavior and characteristics of constituents contained within* S_1 *at time* t_i *into the behavior and characteristics of system* S_1 *or system* S_2 *as well as the behavior and characteristics of constituents contained within* S_1 *or system* S_2 *respectively at time* t_{i+1}.[30]

Statement (4.1) refers to a much stronger type of superaltering process than expressed by statement (2.2) which only refers to the consequence operator itself. The D-world agents for such inter-related alterations may be subparticles.[31] The mathematical techniques used to establish (4.1) are somewhat complex; however, a more easily grasped model for material alteration has been constructed for a possible N-world discrete change (β-decay)—a model that apparently solves the discreteness paradox.[32] Notice that the above D-process may be restricted to sub-developmental paradigms that reproduce refined behavior.

In order to justify the statements in (4.1) in a more meaningful manner, consider the following additional statements relative to the interior logical construction for systems S_1 and S_2.

(4.2) *Let* r_i *be a mathematical measure (real, complex, vector) that yields a characteristic for system* S_1 *or a constituent within* S_1 *at time* t_i. *Let* r_{i+1} *be a mathematical measure for the same characteristic for system* S_1 *(or* S_2*) or a constituent within* S_1 *(or* S_2*) at time* t_{i+1}. *Then there exists a supercontinuous, supersmooth, superuniform functional D-process that changes* r_i *into* r_{i+1}. *If there exists a continuous or smooth or uniform humanly comprehensible functional process that changes* r_i *into* r_{i+1}, *then there exists a supercontinuous, supersmooth, superuniform functional D-process that changes* r_i *into* r_{i+1} *and the restriction of this D-process to the N-world is the above aforementioned functional process.*[33]

Recall that an applied mathematical process that changes r_i into r_{i+1} is usually interpreted in the language L(D) as a physical process that actually alters the characteristics being measured. We may continue interpreting the statements in (4.2) by writing that from the D-world viewpoint all of the measurable properties for natural systems and their constituents are considered to be inner-related and they are dependent upon D-world supercontinuous, superuniform, supersmooth processes even though these processes may be humanly unknowable or incomprehensible. Notice that this yields a type (3) description in that there exist logically generated relations between various characterizing representations or measures for system behavior in terms of these new D-world concepts.

When the supercontinuous, supersmooth or superuniform concepts mentioned in statements (4.1) and (4.2) are investigated then it is discovered that these types of D-uniformities are beyond any of the ordinary types of uniformities employed throughout humanly knowable N-world descriptions for the regular or ordered behavior of a natural system (i.e. uniform continuity, differentiability, etc.). These D-processes are more uniform than anything that the human mind has previously either perceived or conceived. Moreover, many of these D-processes are highly complex and infinite in character when they are described from

the *exterior* D-world viewpoint. However, from the viewpoint of the internal D-world they can be described as behaving in the same simplistic manner as *finite* processes behave from the human viewpoint. (One of the significant features of the D-world is that there exist three viewpoints: the standard, the internal and external.)

5. Long Term Developmental Processes

We previously discussed the doctrines of the local and universal uniformity of nature;[34] however, a slightly deeper investigation appears necessary. Let F_i represent the behavior and characteristics of a natural system S_1 and its constituents at time t_i. Let F_i contain statements (subwords) W_1 that represent assumed first-principles (i.e. "laws of Nature") and "universal constants" as well as predictor statements P_i. We assume that the W_1 can be directly verified only within an immediate space-time neighborhood of t_i.

Much of modern science proceeds with the following extrapolation process. The W_1 representations are assumed to be space and time independent. Then the predictive operator P_i is applied and within the theory language it is claimed, based upon the ad hoc doctrine of the universal uniformity of nature, that the predicted statement F_j is "true in reality" at time t_j. Obviously, depending upon the value of t_j, the statement F_j may not be verifiable directly. On the other hand, the F_i are consequences of the F_j, W_1 and predictive methods and the F_i may yield, if verified, *indirect* evidence for the acceptance of F_j. However, there exist many alternative representations F_j' taken from L(D) that also predict the same statement F_i.[35] Interestingly enough, it appears that a highly regarded theoretical explanation or certain cosmologically orientated F_j now requires that the W_1 statements be *slightly altered.*[36] The existence of such alternatives implies that the doctrine of the universal uniformity of nature is neither directly nor indirectly verifiable since it is a statement exterior to the physical language L(D) and is *about* theories or models. Relative to induction John Stuart Mill also made this same observation in 1843.[37]

Developmental paradigms give a second illustration of the difficulties encountered in assuming the universal uniformity of nature. Suppose that for S_1, F_{i+1} represents the behavior and characteristics of S_1 and its constituents during a cosmic time interval denoted by i + 1. The frozen segment F_{i+1} may include mathematical models, theories, interpretations, experimental methods and the like as well as assumed first-principle statements and assumed universal constants. Let F_i represent the behavior for a prior cosmic time interval denoted by i. Assume that F_i is consistent and differs from F_{i+1} in that it contains some distinctly different first-principles or universal constants from those that appear in F_{i+1}. We assume that the prior interval is so far in the past that there is no experimental documentation available that might tend to verify the W_1. Statements (4.1) and (4.2) show that from the viewpoint of the D-world model there are various superuniform processes that change behavior F_i into the behavior F_{i+1}, altering the so-called first principles or universal constants W_1. It is very important to note that these changes occur along a time boundary (i.e. say along a hypersphere in the sense of Riemannian geometry). Thus they occur throughout the entire system S_1 at that particular moment. (System S_1 need not be the entire universe in which we dwell, but is any natural system.) Observe that there is an apparent D-world mechanism that can yield such changes. If the N-world changes appear to be discrete, then *pure* supercontinuous, superuniform processes manifest themselves when they superharmoniously bind together what may appear from the N-world point of view to be discrete behavioral alterations.

Now any information that could have been transmitted by means of any N-world describable process from cosmic time interval i to the interval i + 1 using processes internal to the developmental paradigm would totally conform, from the viewpoint of an observer internal to the space-time neighborhood associated with i + 1 and system S_1, to the principles, laws, numerical constants and behavior characteristics given by the description F_{i+1}. The consistency and logical implications stated within F_{i+1} are maintained. It is not difficult to construct an analogue model of this effect. Simply assume that we and our local system S_1 are embedded inside an anamorphoscope that takes all N-world informational transmissions that are "distorted" by the unknown first-principles exterior to our local system and conforms them, in a superuniform manner, to the "normal" properties interior to the anamorphoscope. The standard experimental and scientific methods of investigation that are used to infer the "truth" of first-principles or numerical constants since they are restricted to F_{i+1} cannot differentiate between an extrapolated F_j description and F_i. Thus assuming only local uniformity, the hypothesis called the universal uniformity of nature that purports to yield a valid description throughout a system's development is not capable of refuting all rationally generated alternatives such as F_i.

For some reason, it has recently become scientific heresy to reject a humanly knowable or comprehensible set of first-principles or a humanly comprehensible uniformity of nature that is claimed to apply throughout the entire development of a natural system, even though there is no scientific N-world process that can establish the universal uniformity of nature. If one does not accept the universal uniformity of nature that determines the entire development of a natural system completely, then, as has been shown, one need not abandon the concept from another more fundamental viewpoint. Since whether or not such humanly comprehensible universal first-principles exist, it may be rationally assumed that such superuniform processes or D-world first-principles do exist. Unfortunately, the human being seems to have difficulty when he attempts to eliminate completely a doctrine of the uniformity of nature since our daily personal experience depends upon many perceived uniformities within our *local* space-time environment. The "beauty" of this local and internal uniformity sustains our human existence; but, it may be assumed rationally to be a restriction of a more fundamental D-world superuniformity that can produce, even within the local environment, system behavior that is not humanly comprehensible even though it may be humanly observable.[38] We repeat, however, that internal to the system S_1 there is no known scientific

method for determining whether or not W_1 has or has not been so altered.

6. Absolute Randomness

Previously I gave a few *personal* and operative definitions for the concepts of *determinism, causal processes, determinism in the broad sense,*[39] *statistical randomness, random cause,* and the philosphical concepts of *absolute statistical randomness,* and *absolute random cause.*[40] These definitions may not be accepted by some scholars since they are so operative in content.

For the purposes of this article, I accept any reasonable definition for these concepts and point out three D-world consequences. (A) Section 2 indicates that from the viewpoint of the D-world model we may assume that all members of a developmental paradigm, d, are related explicitly and nontrivially one to another by being specifically generated by $\star S(\{w\})$. The mathematical relation is as follows: Let w be one of the superwords such that for each F_i in d, F_i is a member of $\star S(\{w\})$. Then the relation is $\{(x, y)|x, y \in L(D)$ and $x \in \star S(\{w\})$ and $y \in \star S(\{w\})\}$. (B) Sections 2 and 3 indicate that from the viewpoint of the D-world model we may assume that a developing natural system has a "cause" that is partially representable by our new D-world language. This "cause" includes the operative properties expressed within section 2 and the concept of hyperfinite choice as discussed in section 3. (Of course, THE absolute cause could be considered as being described partially by all present or future D-world statements.) (C) Section 4 indicates that from the viewpoint of the D-world we may assume that at each moment t_i in the development of a natural system S_1 the behavior of S_1 and its constituents is strongly related to the behavior of itself or any other system S_2 at an adjacent moment t_{i+1}.

Various terms such as (1) "randomness" or (2) "random cause" are utilized within many mathematically based theories for system development. Can such terms be corresponded to the L(D) related terms "absolute statistical randomness" or "absolutely random cause" respectively? Since the descriptive D-world model exists and yields standard theory predictions then statements (A) (B) and (C) imply that the terms (1) and (2) cannot be replaced operationally by these "absolute" terms.

With our ability to disseminate immense amounts of popularizing and pseudo-scientific information most literate individuals have the opportunity to insert these "scientific" descriptions into their own personal belief-systems. Obviously, these insertions should not yield a contradictory personal philosophy. This author contends that it is when such insertions take place that the correspondence between realistic N-world languages and "actual reality" occurs within an individual's mind. For various *philosophical* reasons, external to most scientific languages and methods, individuals apparently attach to some or all such "realistic" terms the additional notion that they are describing actual reality and are not mere catalysts. Also individuals accept or reject portions of substratum models. The entire D-world model that is external to the N-world may be considered as a catalyst (a partial Positivism)—in which case the terms (1) and (2) may be associated with actual reality. On the other hand, philosophically, various portions of background models such as the D-world—models that predict the same verified N-world consequences—may be personally selected as describing a more fundamental and actual reality. This would force such terms as (1) and (2), among others, to become catalysts.

Since individual belief-systems are not immutable, in general, then it is possible, usually, to influence an individual's acceptance of a belief-system by presenting evidence that a scientific model satisfies the standard criteria for its acceptance as a *working model.* If enough evidence is presented, then individuals *may* by their own "free" choice modify their belief-system in a consistent manner in order to accommodate this new model. Once distinct hypotheses are placed upon a "balance scale" then whether or not one hypothesis takes precedence over another often depends upon its degree of speculation and (indirect) evidence. In the next article in this series actual indirect evidence will be compiled that will tend to shift the balance towards the acceptance of some type of D-world hypothesis. Actual evidence will be presented that will show how the D-world model eliminates some of our most perplexing scientific controversies and may indeed be the most fundamental of all unifying models.

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17. Herrmann, R. A. 1984. NSP-world alphabets, Monograph #155. IMP Press, P. O. Box 3410, Annapolis, MD 21403. This paper is also in Monograph #130. Since there are denumerably many members of a D. P. then theorem 3.1 on page 4 applies. Also see reference 13, theorem 4.4 and discussion on pages 12 and 13. With respect to a numerical comparison the concept of "superuniform" can be technically expressed as follows: A real valued function f defined on a set A is superuniform if and only

if for x, y ϵ *A such that x and y are infinitesimally close it follows that *f(x) and *f(y) are infinitesimally close.

18. Herrmann. 1984. Reference 17. Consider the proof of theorem 3.1 on page 4. Then for each infinite number $\lambda \epsilon$ *N - N such that $\lambda \leq \eta$; *h(λ) ϵ *S({w}). Since $\lambda \neq k$ for any k ϵ N then these *h(λ) may be interpreted as the C_i. All such *h(λ) are purely subtle objects and are not members of any L(D). Let P be the language generated by the set d as the primitives (atoms) of a propositional language. Also see reference 13, theorems 2.1 and 3.3.
19. *Ibid.* The set P on page 2 is minimized by considering it to be generated by the set of all F_i in the D. P. as primitives. Then only the D. P. and its logical consequences are obtained when *S is restricted to any L(D).
20. Herrmann, R. A. 1985. Mathematics for mathematical philosophy, Monograph #130. IMP Press, P.O. Box 3410, Annapolis, MD 21403, p. 42.
21. *Ibid.* pp. 1-79
22. Mason, I. 1984. The undecidability of the metatheories of propositional calculii. *Abstracts American Mathematical Society* 5(1):130.
23. Herrmann, R. A. Nonstandard consequence operators. *Kobe Journal of Mathematics* (to be published). See lemma 4.1 part (iii). The restriction process is not done by set-theoretical intersection. Indeed S = °(°S) = °(*S). The discrete standard part operator ° must be applied.
24. Herrmann. Reference 13 and 17. Apply theorem 3.4 or 2.1, respectively. Using the idempotent property for *S yields *S({w_j}) $\subset$ *S({w}).
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29. Uspenskii, V. A. 1974. An elementary exposition of Gödel's incompleteness theorem. *Russian Mathematical Surveys* 29(1):63-106. Let a "proof method" in this article be that portion of a "rule" that selects a finite subset of A^∞, which selects a particular member of A^∞. Note that since there is no such rule expressible by means of the algorithms (in this case Markov) presented in this article then, assuming Church's thesis, there is no humanly expressible rule. Since each "rule" is finitely expressible by the objects it selects, its "proofs" as here defined, then this forces the set of all possible rules to be infinite. For otherwise, each rule separated by a disjunction would produce a "proof" of finite length that would yield the entire $T \subset A^\infty$, where T (the set of "true assertations") equals the set of all frozen segments. Thus we can apply the discussion on page 6 of reference 9.
30. Herrmann. Reference 13.
31. Herrmann. 1985. Reference 8.
32. Herrmann. 1983. Reference 2.
33. Herrmann. Reference 13, theorem 5.1 and page 18.
34. Herrmann. 1985. Reference 3.
35. *Ibid.*
36. Wilczek, F. 1980. The cosmic asymmetry between matter and antimatter. *Scientific American* 243(6):89 suggests a theory where baryon numbers are not conserved in an early universe. With respect to cosmological effects of assumed microphysical particles, we also have the well-known procedure within quantum field theory that violates the macroscopic conservation of energy in order to produce virtual particles and the well publicized theory of quarks that gives an internal structure to certain elementary particles that by definition are not supposed to be composed of any other microphysical objects.
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38. Notice that w is humanly unknowable and that *S is humanly incomprehensible. But the consequences F_i, the D.P. and the sub D.P. are humanly knowable.
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BOOK REVIEWS

Creation and Evolution: The Facts and Fallacies by Alan Hayward. 1985. SPCK, Holy Trinity Church, London NW1 4DU. 232 pp. £2.75.

Reviewed by David C. C. Watson*

This is an interesting little book by a physicist who calls himself a Bible-believing ancient-creationist and tries to prove that both theistic evolution and 'recent-creationism' are wrong. It is divided into three parts: I. The Genuine Scientific Objections to Darwinism. II. The Age of the Earth. III. Bible Teaching on Creation. Writing primarily for laymen, Dr. Hayward is easy to read, keeping his chapters short. Documentation is good and notes at the back elaborate important points. He feels he has been guided by Providence to correct the bad impression made by "extremists" (e.g. CRS members!) on the scientific community. Has he succeeded?

With Part I we have no quarrel: Hayward has little difficulty in showing the confusion in the ranks of neo-Darwinians faced with ever-increasing evidences against mega-evolution. Useful extracts are made from Grassé, Willis, Hitching, G. R. Taylor, and other 'doubters.' Part II comprises half the book and carries the main thrust of the argument: that the earth is indeed millions of years old. Those familiar with the writings of D. E. Wonderley and Davis A. Young, will find little new here. As a non-scientist your reviewer will not attempt to evaluate Hayward's critique of the young-earth model, but it is noticeable that he refers only twice to *CRSQ* articles. One would have expected that (e.g.) John Woodmorappe's studies in geology and radiometric dating would have been mentioned—but no, not once! Either Hayward is not up to date in his reading or he has found these articles too difficult to answer. On the other hand he refers no less than *17* times to the stridently anti-creationist journal *Creation/Evolution*, including R. A. Moore's nonsensical caricature of Noah's "impossible" voyage (Winter 1983).

In Part III Hayward follows the well-worn path of attempting to prove that Genesis One does not mean what it says. Like other "Bible-believing" scientists he has his own peculiar theory of how the words can be re-interpreted by inserting parentheses, hypotheses, and false analogies; and, like them, he fails to convince. Not a single eminent Hebrew scholar is quoted in support: the traditional interpretation is dismissed with a wave of the hand because Luther misunderstood Joshua's Long Day. Perhaps the best epitaph on all such theories has been written by Professor James Barr:

> By completely ignoring the literary form of the passage, its emphasis upon the seven-day scheme, and all questions involving the intentions of the writers, this interpretation is as effective a denial of the truth of Genesis as any atheist writer could produce.... These are all transparent devices for *making the Bible appear to be factually accurate by altering its meaning* at the awkward points (*Escaping From Fundamentalism*, 1984, p. 137).

In a personal letter to your reviewer, the author admits he is a Unitarian. It is true that many Trinitarians do not believe in the literal truth of Genesis 1-11, but this unbelief is *inconsistent* with their faith in the literal truth of the New Testament. On the other hand it is absolutely *consistent* for a Unitarian to

*David C. C. Watson receives his mail at 3 St. James Close, Stretham, Ely, Cambridge, England CB6 3ND.