

## A BIBLICAL CHRISTIAN FRAMEWORK FOR EARTH HISTORY RESEARCH PART III—CONSTRAINING GEOLOGIC MODELS

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### Abstract

*Previous parts of this series have demonstrated the superiority of the biblical Christian system to the naturalist-uniformitarian system in providing metaphysical and epistemological frameworks for Earth history research. Following a logical progression towards deriving geologic models, the next step is the use of information from sources other than geology to constrain and direct model formulation. To begin the process, special revelation will be applied as a primary constraint. As the most reliable source of historical information, the Bible provides both general and specific constraints. General constraints include: Limited time; catastrophic process; an event-oriented perspective; and the possibility of a more complete geologic record than is recognized by uniformitarians. Specific constraints include the outline of historical events presented in the biblical text. Although many constraints from other disciplines (e.g., history, archeology) could be explored, a rigorous examination of these areas is beyond the scope of this paper.*

### Introduction

This series is presented as a logical progression aimed at the development of geologic models of Earth history within the context of biblical Christianity. Understanding that science is not an independent venture, but rather a facet of human intellectual endeavor, the progression began at an axiomatic level instead of an evidentiary one. Part I demonstrated by formal tests that the naturalist-uniformitarian system is invalid because of axiomatic contradictions between its basic assumptions and conclusions, and therefore cannot be the basis for successful geologic models of Earth history. Part II demonstrated, in contrast, that the biblical Christian system passes the same formal tests, and is a system within which successful geologic models of Earth history can be developed and tested. Part II also introduced a method for Earth history research. Biblical Christianity affirms the ultimate unity of truth in God, and therefore applies the "university" paradigm to human knowledge, and its derivative mixed question approach. The "university" paradigm is the belief that all truth is connected, coherent, and consistent, even if human knowledge has not yet progressed to the point of understanding all the connections. The mixed question approach recognizes the connectivity of truth and subsequently accepts the concept of multidisciplinary problems and solutions. In the context of investigating Earth history, this type of approach would recognize that 'facts' outside of geology must be evaluated for completeness of any conclusion.

Developing geologic models of Earth history is analogous to moving inward through the ever-narrowing concentric circles of a target. Each outer circle adds

increasing constraints to the final geologic model, and only within the inner circle is geologic data considered. In the outer circles, we have shown that the biblical Christian system is logically superior to the currently-accepted naturalist-uniformitarian system by virtue of its axiomatic consistency. Moving inward, a transition is made into the area of developing positive programs of investigation into Earth history, restricted by the outer circle of the logical consistency of the biblical Christian system. Since the biblical Christian worldview accepts the mixed question approach, the next circle in the target is the further constraint of potential geologic models with factual information from other disciplines outside of geology.

Each of the previous steps is required because the rock record is not a prepackaged presentation of Earth history, since multiple conflicting interpretations are possible. The benefit of the rock record is rather that it offers the basis for comparing competing geologic models. In concentrically narrowing spheres of validity, conclusions from these models are first constrained by the metaphysical and epistemological framework, and then by data from other relevant disciplines. It is already clear from Parts I and II that any interpretation of the rock record must be directed away from the naturalist-uniformitarian framework and into the biblical Christian framework because the latter passes formal tests of axiomatic consistency that the former does not. The challenge to scientists operating within the biblical Christian system is to develop empirical models, consistent with the entire system, that stand or fall on their ability to interpret field data. If a particular model fails empirical tests only, then the model must be revised, but only within defined limits. If a particular model fails axiomatic tests within its parent system, it must be more drastically revised or abandoned. Geo-

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logic models must include criteria by which the model can be judged, revised, and/or rejected with respect to both categories.

Following this logical progression through the target simultaneously restricts the scope of any potential model and increases the level of detail demanded, thus increasing the potential for variety in each model. Every model developed within the biblical Christian system will share certain features in common, but will also have the potential for significant variety. This progression will proceed as follows:

- (1) All geologic models of Earth history should be identically constrained by the metaphysical and epistemological frameworks of the parent (biblical Christian) system;
- (2) All such models will be similarly constrained by data external to the scientific model under the mixed question approach. Differences between models at this level will result from differences in the interpretation of external data (e.g., the inferred geologic significance of a particular historical event recorded in the Bible such as the breakup of the "fountains of the great deep" (Genesis 7:11));
- (3) Each geologic model will attempt to explain field data sets. At this level models may vary dramatically, depending on the selection of the data set, and the interpreter.

The explanation and application of the second step is the subject of this paper. Its scope precludes a comprehensive development of that step, and for that reason, and in keeping with the concept of the dimensional hierarchy in knowledge described in Part II of this series, factual constraints discussed below will be derived only from the Bible.

#### **Biblical Constraints on Earth History Models**

Factual constraints on geologic models coming from disciplines other than geology are recognized because of the multidisciplinary (mixed question) approach to historical analysis that emphasizes contributions from areas of knowledge outside of science. The challenge for creationists lies in the paradox that the most reliable (based on God's trustworthiness) information about Earth history lacks significant detail. This aspect of biblical revelation simultaneously increases the opportunity for human creative thought and the level of uncertainty in investigations into Earth history. In other words, the Bible broadly defines an outline of Earth history, but is insufficient in historical detail for formulating detailed geologic historical models. It does describe certain events in Earth history that are geologically significant, but does not say very much about them from the point of view of modern geosciences professions. Previous authors (e.g., Whitcomb and Morris, 1961; Oard, 1990) have discussed these events and their geologic significance, but with a large degree of uncertainty at the level of interpretation. Thus the

tradeoff for creationists is between the axiomatic inconsistency of uniformitarianism and the interpretational uncertainties of biblical Christian historical analysis to date. When placed in these terms, the superiority of the biblical Christian approach becomes clear, however, most scientists do not choose to think in those terms.

Biblical input can be divided into two areas, general and specific. General information consists of broad principles explicitly presented, or reasonably inferred from clear passages that are of significance to scientific models. Specific information is found in the record of specific events that individually may be of significance to geologic models. There are a number of general principles derived from the biblical historical record that are significant to any geologic model. Four of the most important are presented below, and include: (1) a relatively limited timeframe; (2) importance of catastrophic process; (3) an event-oriented perspective; and (4) the relative completeness of the rock record. These principles are interrelated, and these relationships provide additional internal evidence of the consistency of the biblical record.

#### **Time**

Time is the feature most commonly associated with the uniformitarian geologic column, but paradoxically, uniformitarian interpretation is relatively unconstrained temporally, since time necessary for most hypothesized events is presumed to be available. This reservoir of time allows more freedom of interpretation by dismissing limits potentially imposed by adjacent strata. This is done through the use of projected intervals of missing section; i.e., a given sedimentary section can be designated as a deep-marine deposit even if a vertically adjacent section is considered continental fluvial, since intervening deposits predicted by Walther's Law (regarding the lateral and vertical associations of facies) could have been removed by erosion over a depositional hiatus over millions of years potentially represented by the boundary between the two units. However, the biblical record does not provide an extended time framework. Therefore, historical geologic models in the biblical system must accommodate relatively limited time intervals for geologic events, and emphasis is shifted to understanding geologic processes that would generate observed strata in that limited timeframe.

It is ironic that in spite of the more stringent limits placed on interpretation in the biblical Christian system; philosophically, time is much less significant for the theist than for the non-theist. This is because time and historical progression assume metaphysical significance for the naturalist, since time is a major cause of change. Time and history lose this almost mystical significance in the biblical Christian system, since time and history are created and directed by God. This results in two

important distinctions in the theist system: (1) the assumption of "pre-history" is not made, since records of all natural history are included in revelation; and (2) the biblical system supports the significance of discontinuous events rather than the mere passage of time in a particular sequence (Cullmann, 1964; p. 20) by emphasizing God's interactions with man and nature through time. Since information outside science (appropriate in a mixed question analysis) describes significant discontinuous and novel events (i.e., creation, curse, flood, etc.), a derivative geologic model must also embrace discontinuity. Time, which integrates the observed physical discontinuity in nature into a historical progression, itself had a beginning point, and will likewise have an endpoint. Thus time is not the ultimate integrating factor of physical reality as supposed by the uniformitarian, but instead points to God as the provider of continuity.

Another distinction addresses the issue of the application of science to historical analysis. Since these events are outside of human experience in the sense of repeatable scientific investigation, the scientific method is not directly applicable, and the principle of causality must be employed to indirectly derive modern analogies to historical events by discovering an event-process relationship. Please note that this is another important distinction between the uniformitarian and the biblical method. The uniformitarian approach to interpretation of the rock record is univocal; it demands a direct relationship between observable modern process and unobservable historical geological process (e.g., sedimentation, volcanism, fossilization, etc.). Therefore, field data should be almost identical in all geologic ages and open to interpretation based on observed modern processes (see any discussion of the derivation of facies models). Obvious failures have been explained away superficially without addressing the failure of the methodology and the implied failure of the parent naturalist system (see Ager 1993a; 1993b). In contrast, the biblical Christian system includes potential differences in past geological processes, although the underlying physical-chemical processes are probably constant.

This clear demarcation between models from the two systems on the basis of time opens three additional areas in which biblical Christian models can be clearly distinguished from those of the naturalist system. These areas include: Catastrophism, the extent of missing section in the rock record, and the contrasting significance of discrete events as a paradigm for interpretation, as opposed to that of a continuous chronology.

#### **Catastrophic Process**

The biblical record of time combined with the observed magnitude of the rock record demands catastrophic (i.e., at least greater in rate and magnitude) conditions during certain periods of Earth history. An open question for further investigation is the nature of qualitative change in geologic process brought on by

a quantitative increase in rate and magnitude. While it is likely that a process-product interpretive approach to field data may demand processes not presently observed, it is also possible that these processes can be modeled by investigations of the underlying quantitative variations in the rate and magnitude of constant physical/chemical processes. This concept is currently being approximated by uniformitarian researchers under the label of "Event Stratigraphy." Additionally, it is being developed and used within the framework of Sequence Stratigraphy (Sloss, 1988; Frazier and Schwimmer, 1987). For a discussion of Sequence Stratigraphy from a young-earth perspective, see Froede (1994).

Although it is not commonly noted as such, the explicit biblical record of catastrophic process in the Genesis Flood demonstrates internal consistency with the biblical record of limited time, which implies catastrophic processes by reference to the massive volume of the existing rock record. Any theological position that incorporates both an old earth (4596 Ma) and the Genesis Flood is not demanded by the rock record, and is thus less consistent because of the principle of parsimony (Occam's Razor). Geologic field data, especially when analyzed on a global scale, also appear to require catastrophism. Individual sections imply processes different from those observed at present, and geologic preservation of large-scale sections (e.g., Cretaceous chalk deposits) is itself extraordinary in modern terms, since preservation depends on the rapid deposition and burial of the constituent strata in episodic, high-energy events (see Ager, 1993a; 1993b; Einsele, Ricken, and Seilacher, 1991; Seilacher, 1984; Dott, 1983).

Accounts in historical texts of past events of geologic significance do not describe geologic processes with the same detail and from the same perspective as would geologic models. Therefore, field evidence is required to best describe in detail the extent and nature of particular geologic events. Sections of the rock record may provide evidence of physical processes similar in nature and scale to those operating at the present, as well as those unexplainable by modern example. An advantage of any biblical model is that it can accommodate either conclusion prior to the examination of the field data, since in addition to recorded catastrophic processes, the majority of recorded time in the biblical historical record does not demand a catastrophic interpretation of a given stratigraphic unit (i.e., the Flood was a worldwide event of tremendous geologic import, but was also short-lived).

#### **Event vs. Continuum**

The length of historical time is important for estimating the rate and associated energy levels of past processes, but as mentioned above, there is another aspect of time that generates significant distinctions between biblical and naturalist models. That aspect is the issue of continuity versus discontinuity in-history and in nature (for more discussion, see Adler, 1967). The natu-

GEOLOGIC TIME SCALE				
ERATHEM	SYSTEMS	SERIES	AGE (Ma)	
CENOZOIC	QUATERNARY	HOLOCENE	0.01	
		PLEISTOCENE	2.0	
		PLIOCENE	5.1	
	TERTIARY	NEOGENE	MIOCENE	24.6
			OLIGOCENE	38.0
		PALEOGENE	EOCENE	54.8
			PALEOCENE	55
			CRETACEOUS	144
MESOZOIC	JURASSIC	213		
	TRIASSIC	248		
	PERMIAN	286		
PALEOZOIC	CARBONIFEROUS	380		
	DEVONIAN	408		
	SILURIAN	438		
	ORDOVICIAN	505		
	CAMBRIAN	570		
	PRECAMBRIAN			

Figure 1. Geologic Time Scale after Lemon (1990).

ralist system must embrace physical continuity to maintain a rational approach to nature because there is no transcendent reality (i.e., God) to provide rational connection and meaning to observed discontinuity. Blurring of this philosophical distinction has caused confusion in past attempts to correlate biblical events with the uniformitarian timescale (Figure 1). But there can be no symmetry between the biblical Christian models and those of the naturalist-uniformitarian system, because the uniformitarian geologic column is biased towards history as a continuum, expressed by its dependence on evolution. Evolution operates as a continuum, producing products that would clearly show continuity if all the data were available. Thus, for the evolutionist, the ability to classify modern and ancient biota is the result of observational gaps, not actual ones. Uniformitarianism shares this assumption by presenting a continuum into the past of all geologic processes. Frequent modern revision to uniformitarian interpretation is a result of the disagreement of observed

data with the concept, and uniformitarianism has not embraced the philosophical rejection of continuity.

The utilization of the continuum paradigm has not survived empirical observation in either evolutionary biology or uniformitarian geology. The ability to separate and classify taxa in biology is mirrored by a twofold similarity in geology: (1) the ability to separate and classify the fossil contents of strata, and (2) the ability to separate and classify the strata themselves. Recognition of observed discontinuity in nature has led to revisions that attempt to accommodate both sides; however resolution on a metaphysical level is not likely within the naturalist system, since its proponents deny metaphysical reality. For example, punctuational constructs of evolutionary progress are only superficially different from gradualist constructs, since quantitative discontinuities in rate do not fundamentally alter the underlying continuity of process and product.

A similar tension between observation and paradigm has been present in the Earth sciences for a number of years. Interpretation of the rock record has historically existed in a tension between a chronological and an environmental focus. Chronological interpretation is exemplified in the traditional practice of biostratigraphy, and environmental interpretation has received increasing emphasis recently in studies of depositional environments by use of the facies concept (Blatt, Middleton, and Murray, 1980; p. 618), and more recently by sequence stratigraphy (Wilgus, Hastings, Kendall, Posamentier, Ross, and Van Wagoner, 1988). This shift in research emphasis may be the result of a belief among professional geologists that the chronological task of stratigraphy is almost complete, and that the remaining interpretive challenges involve environmental reconstruction. However, it could also be that field data from a variety of global settings drives event-oriented interpretation rather than chronological interpretation.

Therefore, there has arisen a philosophical internal tension in the naturalist uniformitarian system between the underlying philosophical concept of history as a continuum and empirical observations that do not support this view. This philosophical tension is being addressed on a scientific level by the advent of neo-catastrophism; however, it must also be resolved on a philosophical level. Philosophic resolution can be accomplished within the biblical Christian system, but it is difficult to see how such resolution can occur within the naturalist-uniformitarian system.

The biblical Christian system resolves that tension because it allows a catastrophic and discontinuous event-driven approach within geology by removing the philosophical issue from geology to philosophy and theology. Geologic units are distinct because they represent discrete historical events with physical processes that may not have any "modern" observable analog. Similarity in geologic units (e.g., worldwide red-beds, chalk deposits, etc.) is based on the more fundamental consistency of physical/chemical pro-

cesses through time (Ager, 1993a). This distinction is important, and must be seen in contrast to the traditional uniformitarian concept of modern processes operating in repeatable patterns throughout history. In the former case, the geologic challenge is to infer unobserved processes based on physical-chemical laws, while in the latter it is to recognize the ancient effects of familiar geologic processes within the context of an extremely sparse data set. Thus, the underlying continuity in catastrophism is one step removed from uniformitarianism, being based on adherence to physical-chemical laws that govern all physical processes.

A biblical model might predict geologic processes different from any modern examples, but linked by analogy to modern physical/chemical process, which are assumed to be constant. The continuity of physical principles of flow dynamics, sedimentation, chemical reactions, etc. is granted based on the presupposition of an orderly cosmos, justified by the theological understanding of divine Providence. However, there is no limit placed on the combination and magnitude of these processes by the parent philosophical framework (as is done by the naturalist-uniformitarian system). Continuity of physical-chemical processes does not ensure the same rigid continuity of geologic processes. It only provides the basis for geologic interpretation via analogy.

#### Missing Section

Another clear distinction between uniformitarian and biblical models resides in the issue of missing section in the rock record. The uniformitarian approach demands present physical processes acting over long periods of time. Since non-preservational (erosion, non-deposition) processes dominate preservational processes in most observed settings, the assumption that large portions of the rock record have been destroyed by erosion is forced by the uniformitarian system (see Ager, 1993a; pp. 43-54; Dott, 1983). This assumption is ubiquitous to all uniformitarian geologic models, and is believed to be supported by the fossil evidence of large gaps, based on the assumption of organic evolution. For additional information on the nature of the rock record see Woodmorappe (1980).

However, the biblical system requires an history of discontinuous catastrophic events. On a global scale, regional depositional processes during these events would probably have exceeded non-preservational processes, and regional depocenters would then contain a relatively complete record of strata deposited during the event interval (event intervals would also contain a record of synchronous erosion and non-deposition, but these could only be delineated based on the assumption that most of the strata deposited were preserved). Thus a biblical Christian geologic model could predict that much of the originally preserved rock record emplaced during the Flood event remains relatively intact. It is likely that the transition from the global event environment of the Flood to a

more localized event environment represented by present geologic processes would reflect a decrease in the preservational potential of the geologic record. A major test of any biblical geologic model would be its ability to supply a reasonable interpretation of discrete geologic events that follow the historical outline supplied by the Bible without major interpretational discontinuity in field data. These same strata may or may not have been determined to contain major gaps within the uniformitarian framework.

#### Specific Constraints in the Historical Outline of Events

In addition to general constraints on biblical geologic models, the nature of the biblical record as a collection of historical narrative, provides specific constraints to interpretation by providing the "answer" prior to the exercise of more indirect scientific or forensic methods. The key to constraining geologic models by the specific narrative of biblical tests lies in the ability to impute geologic significance to a historical record that does not provide geologic detail. For example, the narrative of Abraham's journey to Canaan has intense social, cultural, religious, and theological significance, but cannot be considered a geologically significant event. In contrast, the account of the creation of the earth is tremendously significant to geologists, and strongly constrains historical interpretation.

A detailed discussion of all of the events recorded in the biblical texts that are potentially of geologic significance is beyond the scope of this paper, and such discussion is common throughout creationist literature. From the geological perspective, the two most important recorded historical events are Creation and the Genesis Flood. A variety of distinct processes can be inferred from both of these narratives, and applied to geologic interpretation. For example, geologic processes associated with the Flood event have been described by numerous authors, and include: Tectonic events at the onset of the Flood; catastrophic marine transgression; physical and chemical phenomena associated with maximum Flood levels; major tectonic readjustment in the late Flood stages and the resulting global regression; decreasing energy levels in deposition; post-Flood re-equilibration; and the resumption of lower energy geologic processes. Because the purpose of the biblical record is not to supply geologic models, the authors recognize that "geologically significant" events have occurred which are reflected by their products in the rock record absent of any explicit biblical (or other) historical reference. These include widespread glaciation (an "ice age") [see Oard, 1986; 1990], meteorite impacts (Froede and DeYoung, 1996), volcanic eruptions, etc. Extrascientific factual constraints (such as historical narrative from the Bible) are unidirectional, but are limited. They are unidirectional in the sense that they constrain interpretation of the rock record, but they themselves are not changed by the rock record. They are limited because the

complete interpretation of the rock record will not be contained in those constraints.

### **Assessing the Uniformitarian Geologic Column**

In addition to the positive factual input from revelation, history, philosophy, etc., biblical Christian geologic models can be constrained by the results of an assessment of uniformitarian geology. The university concept presupposes a mixture of truth and error in a wide range of knowledge, and the resulting potential for additive truth being developed through the efforts of many people. Aristotle (in McKeon, 1941; p. 712; 993a30) recognized this fundamental potential of human intellect when he stated that:

The investigation of the truth is in one way hard, in another easy. An indication of this is found in the fact that no one is able to attain the truth adequately, while, on the other hand, we do not collectively fail, but everyone says something true about the nature of things . . .

Thus, any attempt to reformulate geologic models in the biblical Christian framework will be significantly enhanced by an investigative, rather than a polemic approach to the uniformitarian geologic column.

Formal tests demonstrate that the naturalist-uniformitarian system is invalid on a metaphysical level (see Part I of this series). However, many years of heavily funded research by legions of intelligent and highly trained workers have contributed vast quantities of geologic data interpreted within the framework of uniformitarianism. It is worthwhile to assess the success and failure of those efforts to facilitate the development of models within alternative systems, and creationists should be willing to utilize factual truth and proven methodology that is present in current geologic literature.

Any assessment of the naturalist-uniformitarian contribution must recognize both positive and negative features. Positive features include:

- Skills in organizing and directing research;
- Quantity and quality of data;
- Field and laboratory research experience;
- Highly-developed and sophisticated methods for research, and the ability to apply new technologies to existing problems.

Negative features include:

- The over-emphasis on chronology as the basis for historical analysis resulting in a potential under-investigation of field data as phenomena are "pigeonholed" to fit models;
- Dependence on the process of organic evolution to provide the pivots around which the column is fashioned;
- Paleoenvironmental reconstruction predicated upon observable geologic processes acting over long periods of time, even when field data do not appear to support that premise.

The positive features can be summarized under the umbrella of professionalism by most geologists. Large quantities of high-quality geologic data are available today. These data include large areas of the surface and subsurface of the earth that have been mapped based on field observations, well logs, seismic profiles, paleontologic (including micropaleontologic and palynologic) studies, petrographic studies, and numerous other types of information, integrated within the naturalist-uniformitarian system. Recent application of plate tectonic and depositional sequence concepts have not yet fundamentally altered the basic structure and methodology of classical uniformitarianism. Frequently geologic work is performed under the pressure to achieve economic success in the oil or mining industry; and thus, concepts are tested by additional data acquisition (although this work often remains confidential for a period of time).

The quality and quantity of existing interpretations and their supporting data are such that no creationist should dismiss them out of hand. Any attempt to minimize the contribution of Earth scientists is shortsighted and counterproductive. There is a narrow path for any worker desiring to revamp geologic interpretations. On one side is the danger of arrogance and ignorance in a cheap dismissal of the vast work of the geologic profession over the last century and a half. On the other side is the inability to distinguish adequately between data and interpretation, follow constraints imposed by a consistent metaphysical and epistemological framework, and therefore integrate that data into models fully consistent with the biblical Christian system. Only by understanding the necessary links between theology, philosophy, history, and science (as partially presented in Parts I and II of this series) can the latter danger be avoided.

Although existing work should be respected, a major pitfall is the inseparability of the uniformitarian timescale and evolution, and the resulting emphasis in interpretation based on chronology, rather than physical process and significant events. The intricate arrangement of stratigraphic units is based firmly on the flora and fauna contained in it at a "type locale." This biostratigraphic dependence of the rock record is illustrated by the rigidity of the model prior to absolute radiometric dating applications with a relatively limited dataset. Each unit is available for study at a type locale. Correlations of the type section are based on its chronological compatibility in reference to the geologic column, since lithologic changes (due to facies changes) and superposition ambiguity (due to limited preservation) render more traditional methods inapplicable on a regional or global scale. Questionable correlations are supported by stratigraphically adjacent formations with unambiguous ages derived from their evolutionary position. However, application of the uniformitarian timescale is commonly sophisticated, with a variety of

stratigraphic methods integrated into the interpretation of a given group of strata, based on many physical properties of a given unit (lithology, fossil contents, petrography, geometry, relative position to adjacent strata, etc.).

Close examination of all knowable parameters of a given rock unit is necessary for interpretation, especially in a biblical Christian model. Uniformitarian emphasis on chronological relationships provides a measure of built-in interpretation even when the details of a given rock unit are ambiguous, or difficult to observe. However, the biblical Christian emphasis on events/process-product relationships demands more careful interpretation of all units, and should force researchers to suspend judgment and interpretation until sufficient data are available to support such conclusions in their own right.

The collection of large amounts of detailed geologic information, the development of sophisticated research methods, and the integration of large datasets are applauded as aspects of the uniformitarian system which should be emulated by catastrophists. The accompanying metaphysical framework is not acceptable and must not be used. Great care is needed in distinguishing between the data and the interpretations, since that distinction is not always clearly made in most current literature.

### Fashioning a Creationist Geologic Column

Since biblical Christian geologic models will differ from the uniformitarian geologic column in respects other than just the length of time involved, we propose that a "condensed" version of the standard timescale is not adequate as a basis for future creationist field studies (Figure 1). We propose that young earth creationists construct and apply distinct models (e.g., Austin, 1994; Froede, 1995). Each of these models must be constrained methodologically and factually for reasons presented in the first part of this paper. Although the tenets of uniformitarianism are rejected, the excellent datasets compiled by geologists over many years should not be ignored. Valuable information resides in geologic literature regardless of the model applied, and it should be used by creationists as appropriate.

Many Christians have wrestled with the correlation of the uniformitarian geologic timescale within the framework of a young earth model. Many ideas have been proposed in an effort to unite the two scales (Whitcomb and Morris, 1961, p. 276; Hedtke, 1971; Woodmorappe, 1980; Coffin and Brown, 1983 p. 74; Scheven, 1990; Rugg, 1990; Northrup, 1986, 1990a, 1990b). However, none have proved satisfactory for broad based use, possibly because of confusion between the process of formulating models and defining the system within which the models would be formulated. A general timescale has been presented by Froede (1995), and the authors commend the open-ended nature of this scale as a basis for its initial acceptance.

### Conclusions

1. Geologic models of Earth history can be constructed within the biblical Christian system. These models are first constrained by the metaphysical and epistemological conclusions drawn from that system. Such models are also constrained by the introduction of complementary factual data from extrascientific sources. Although the Bible is the most reliable source of information, it was not intended to supply detailed geological information for this type of research. Therefore, it limits, but does not fully define geological models of Earth history.
2. Biblical limits are imposed by general information regarding time, catastrophic deposition, discontinuity in historical process, and the inferred extent of missing section in the rock record. Specific information in the form of historical narrative that may contain information of geological significance is another source of limits to any models defined.
3. An investigative, rather than polemic approach to the work of uniformitarian geologists benefits any worker desiring to construct historical models. Benefits are derived from the vast quantity and superior quality of datasets, the professional approach to research problems by many uniformitarian researchers, and their utilization of a variety of field and laboratory methods to solve problems.

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## LETTER TO THE EDITOR

### **Zuiyo-maru Carcass Revisited: Plesiosaur or Basking Shark?**

In a recent review of LeBlond and Blousfield's *Cadborosaurus—Survivor from the Deep*, Scoggan refers to a carcass recovered by the crew of the Japanese fishing trawler, *Zuiyo-maru*. He writes: "No mention is made of the plesiosaur carcass snagged off the coast of New Zealand in 1977" (Scoggan, 1996). The reason LeBlond and Blousfield do not mention that particular carcass is simple: LeBlond does not believe it is a plesiosaur (LeBlond, 1992). He was kind enough to provide this author with a copy of a series of papers written by Japanese scientists concerning the identification of this carcass. Scoggan's review is certainly not the first time this carcass has been identified as a plesiosaur by hopeful creationists and cryptozoologists alike (Niermann, 1994; Taylor, 1987); unfortunately, a close examination of available evidence summarized in the Japanese papers does not favor that identification.

In the spring of 1977, the *Zuiyo-maru*, captained by Akira Tanaka, was trawling for fish in the southern Pacific, east of New Zealand. On the morning of April 25, the *Zuiyo-maru* was at the Chatham Rise, about 30 miles east of Christchurch (43°57'S, 173°48'E). While the vessel was trawling at 300 m, the carcass became entangled in the net. It was drawn near the boat and was assumed to be a dead whale. Following standard procedure, Captain Tanaka ordered the men to pull in the carcass for release outside of the net area. A rope was bound around the trunk, and the carcass was lifted over the deck. At this point, the rope tightened and the body slipped. While the body was suspended in this position, Michihiko Yano borrowed a camera to photograph the carcass (Figures 1 and 2). Michihiko Yano was 39 years old at the time and was employed by the Taiyo Fishery Company as an Assistant Production

Manager. He was a graduate of the Yamaguchi Oceanological High School and an amateur photographer. As Acting Section Chief aboard the *Zuiyo-maru*, he made most of the observations that later would dominate the Japanese newspapers (Koster, 1977).

The carcass was laid on the deck, and Yano took a set of measurements. He also removed 42 pieces of "horny fiber" from an anterior fin. These were washed with water, soaked for about 12 hours in a solution of approximately 0.04% sodium hypochlorite, and air dried (Kimura, Fujii, Sato, Seta, and Kubota, 1978). After about one hour, the carcass was thrown overboard. A total of 18 different men observed the carcass and five different photographs were taken. It was only after the carcass was disposed of that Yano made his sketch (Obata and Tomoda, 1978; Figure 3).

From the start, this find was a mystery. The captain originally thought it was a whale; the crew thought that it might have been a turtle with its shell stripped off; Yano could not identify it. He took the pictures with the hope that someone else might. Two of the pictures show something very similar in appearance to a plesiosaur-like animal (Figure 1a and 1b). The scientific opinion was that the carcass was that of a species of shark known as the basking shark in an advanced state of decay.

After Yano returned to Japan, he had the film developed, and prints were given to Dr. Fujio Yasuda, professor of ichthyology at Tokyo University of Fisheries, for identification. Taiyo Fishery Company (today known as the Maruha Corporation) held a press conference on July 20, 1977, announcing the discovery to the world. This was before any identification had been made. Needless to say, several Japanese newspapers published sensational stories about living plesiosaurs, and the carcass quickly became a "hot" news item in