

an aperiodic decay with a time constant of 1970 years (1400 year half-life) which has important geochronological implications.

This paper also demonstrates the usefulness of these solutions in studying properties of the core of the earth, by evaluating the conductivity, current distribution, total current, and joule heating in the earth's core.

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THE CHALLENGE OF HISTORICAL GEOLOGY

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Introduction

Over the past decades, no doctrine has so challenged the creationist interpretation of the physical universe, as that viewpoint based on the uniformitarian outlook. This method involves interpretation of past events solely in terms of present day occurrences.

Philosophically, uniformitarianists assume that "Nature" can be satisfactorily explained exclusively in terms of natural causes. Indeed, in an extreme form the teaching states, "there is no vestige of a beginning nor prospect of an end." Thus when consistently applied the doctrine entails the assumption that the Natural Universe is an autonomous (independent and self-existent) system, which exists without a creator God.

The vital truth of a created universe, sustained by the word of God's power, is of pivotal importance today—if man is not to end up as a mere chance collection of atoms. A clear stand for creation is necessary to prevent men rationalizing and accepting this sorry plight of a meaningless universe.

The Danger and the Challenge

If God is relegated to the position of the Unknown and Unknowable, or a "God of the gaps," not only is this false to the Scriptural teaching

and the fact that "the Heavens declare the glory of God," but man is then designated as merely a bio-chemical machine. He grows for a while, declines, and at death returns to the dust. Or put in other words, man would be integrated into the void of nothingness, doomed to chaos and Old Night.

For this reason, creationists must take issue with historical geologists, who are ever seeking to justify their naturalistic interpretation of the Universe, by recourse to the doctrine, "the present is the key to the past." It is in this context especially that the challenge of historical geology should be seen, a challenge involving not only the origin of the Universe and its end, but also of the acme of creation—man himself.

As the facts and the interpretation of those facts cannot be separated, we can agree with Professor Hartshorne that scientific description includes "... both what is known and what can be inferred, both of the phenomena and of the process relations and associations of phenomena."¹ This leaves an amazing span of complex information in the hands of the historical geologist to interpret;

... since the historical geologist is the only scientist who is presented with material for studying the history of the world in remote times, he finds that he must include historical botany, zoology, and human anatomy, and even to some extent historical social anthropology.²

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Has the framework the historical geologist selects been clearly proven? What are the possible alternatives? It is to these matters that we now turn.

Three Areas of Disagreement

Apart from the vast scope of the subject matter of historical geology, there are still three broad fronts on which scientists and theologians disagree:

(1) *World and Life View*: There is firstly the problem of a starting point. All too often, scientists are not aware of the ultimate assumptions they are making, when organizing data. Sometimes, their premises come from a supernaturalistic or naturalistic viewpoint. Others would argue that "science" and "religion" are two separate spheres.³

As an example, Professor L. C. King, a leading world authority on geomorphology (the study of land forms) states, "In the beginning . . . the earth was void and without form." It was born of a heavenly body about 4,500 million years ago. . . .⁴ This comment is an attempt to recognize the Genesis account of creation, but then goes on to link it with modern scientific extrapolation based on naturalistic assumptions. The question of origins is put firmly by the Scriptures in the area of Divine Revelation.⁵ Yet, Professor King claims to be a neutral observer:

It was necessary for the author to see as much of the earth's surface as possible, yet not to interpret it in terms of preconceived philosophies; often to sit passively upon hills just letting the scenery "soak in" and teach the beholder—when he is sufficiently humble.⁶

Still further, elsewhere, he claims that a uniformitarian interpretation is really the only viable one: ". . . on a uniformitarian earth just as the geological evidence indicates it to have been ever since geologic time began."⁷

However, what sort of logic is it which states one is not committed to a preconceived philosophy, and then goes on to extrapolate the present processes back into the prehistoric past? Can such extrapolations adequately explain the fossil graveyards and massacre of the Siberian mammoths?

(2) *The Geological Data*: When the starting point is settled, a valid interpretation of the data is necessary—including both that which is consistent, or inconsistent, with one's basic framework. This is frequently an area of uncertainty for as the kaleidoscopic pattern of scientific fact, theory and method pass before the researcher, it is not always easy to mark out the significant and permanent—from the ephemeral. Humility is indeed called for!

(3) *Clear Exposition*: This same attitude is vital when seeking to establish clear exegetical principles and hermeneutics. There are three major interpretations of scripture regarding the age of the earth, from studies of Genesis One. These are the "Gap" theory; the "Day-Age" theory; and the Diluvialists' Catastrophic viewpoint which sees the earth as far younger than that indicated by the Geological Time-Scale.⁸

Conservative Position Versus Speculation

The late Professor E. J. Young brings out the true force of the passage when he wrote:

Genesis 1 is monumental in character, and exhibits a stately cadence of grandeur as it reveals the sovereign Creator uttering His will, and that will coming to immediate fulfillment. So the narrative proceeds until it reaches its mighty climax. The Lord beholds the finished world, and pronounces it very good.

We are not to regard this chapter as the reworking by the Priestly School of a myth that was common to the ancient tradition. Rather the chapter is sober history. Although Genesis does not purport to be a textbook of science, nevertheless, when it touches upon scientific subjects, it is accurate. Science has never discovered any facts which are in conflict with the statements of Genesis 1. . . .⁹

Against the certainty of this account of creation, one often finds opposed the speculative theories of historical geologists. The latter have a major methodological problem. It is pinpointed by the novelist, Francois Derrey:

The formation of the terrestrial crust, the glacial periods, the extinction of species—the earth has hidden these things from us! Science observes, records, clarifies, and studies, but it cannot proceed with certainty from the effects to the causes. All it can do is to propose tentative hypotheses.¹⁰

Even more illuminating are the comments of Jean Lombard, Vice-president of the International Union of Geological Sciences, who says, after mentioning several theories of geological interest or research:

These examples show the uncertainty which characterizes the examination of the earth, the essential point escapes our observation. *A fortiori*, the history of the earth can be reconstructed only with great caution, for who can know what was happening three billion years ago?

Among sciences, geology allows of an exceptionally high proportion of hypotheses, and these concern the very constitution and structure of its object. It is not surprising that numerous contradictory theories confront one another.¹¹

Professor L. King adds that geologists are often reluctant to give up outdated theories. Under the heading, "Some Deadwood—A Digression," he says:

Hypotheses, once promulgated tend to become dogmas that are sometimes difficult to discard, and it is now our painful duty to reject certain current beliefs of wide acceptance among geologists that have outstayed their leave as working hypotheses.¹²

Choice: Uniformitarianism or Catastrophism

Turning now to the theoretical frameworks which are used in historical geology, Derrey mentions that there are two major frames of reference, either that of Catastrophism or Uniformitarianism. This former framework was highlighted at the start of the nineteenth century when Georges Cuvier announced that elephants, mammoths, and many other animals like crocodiles, turtles, sharks, reindeers, bison, beavers, rhinoceroses, and so on, had been discovered under the city of Paris.

Cuvier, the founder of palaeontology, thought that life on earth had been upset by cataclysmic events. Clear evidence for this came from a study of the frozen fossil mammoths found in Siberia. By their state of preservation, it was clear they underwent a brutal and rapid death by freezing. Some specimens found still had undigested vegetation in their stomachs.¹³

Derrey then goes on to show how proponents of the uniformitarian hypotheses have failed to account for these frozen creatures. He quotes Professor F. C. Hibben, who describes the pits of bones north of Fairbanks, Alaska:

The marks of violence are as flagrant as in German concentration camps. We find proofs of atmospheric disturbances of an unheard of violence. The animals were dismembered and thrown around the countryside like pieces of straw, even though some of them easily weighed several tons. The Quaternary ended with the extermination of life . . . not an ordinary end . . . but a total and catastrophic annihilation.¹⁴

Derrey admits that uniformitarianists have not been able to account for all the geological and paleontological phenomena, which are found buried in the rock strata. Nevertheless he says,

Present-day science has chosen uniformism [Uniformitarianism or Actualism] and the actualist postulate by an immense majority. "If we limit ourselves to inorganic phenomena alone, we can be actualist with a maximum of certainty," Professors H. and G. Termier have written. This is typical of the modern scientific position.¹⁵

The origin of uniformitarianism can be traced decisively to Sir Charles Lyell who considered, "the source of geological forces: duration."¹⁶ Lyell thought the earth was in a perpetual state of change, and that given enough time the natural forces acting now, could have created mountains, changed the relationship of land and sea; so changing the face of the earth. Derrey shrewdly comments:

All that had to be done was to attribute several million years to the earth to explain its past by means of the present. Lyell had discovered the key to geology: duration transforms the infinitely small into the infinitely big, inches into miles.¹⁷

It is Lyell's concept of time that is dominant now in geological circles. Leonard G. Wilson, professor of the history of medicine, University of Minnesota, quotes from Lyell's own writings:

If in deciphering records relating to many million, perhaps millions of millions of past ages, we discover much that is irreconcilable with all the popular creeds which exist now and all that have ever existed, it is no sign of our being false interpreters for it will not shake what has been common to the greater number of faiths in all ages and among all races, a belief in the Unity of the System. . . .¹⁸

While most secular geologists have succumbed to Lyell's "calm world" and thinking, historical geologists still have to be content with the fact that the data they use are open to varying interpretations and methodological inadequacies. D. G. Hillier, head of geography and geology, Belleville Collegiate Institute and Vocational School, Ontario, has said,

Historical Geology is based on pieces of scientific information which are interpreted in a particular way by one observer and in a different manner by another. Moreover, when new evidence is brought to light, old theories have to be revised.¹⁹

Contemporary Problem: Ice Age Controversy

A report in *Nature* in December, 1967 on dating of the Ice Age illustrates how specialists on the same geological system—the Quaternary, came to different conclusions. The evidence for dating the Ice Age came from a study of microfossils and varve deposits. The Times, "Nature-Times News Service," summed up the problem in the following way:

Although the last Ice Age is only 10,000 years or so behind us, uncertainty and even disagreement persist about the sequence of events that preceded the last melting of the ice. How long, for example, did the glaciation continue? How many glaciations were there

altogether? And how long were the comparatively warm intervals in between? There seems to be quite general agreement that the whole period of what is called Pleistocene lasted for rather more than 2 million years. Very little else seems agreed upon.²⁰

This latter statement was optimistic, in view of the fact it was soon announced,

Continuing refinements in the techniques of absolute dating have necessitated a further emendation of the time-scale. The duration of the Quaternary is now considered to be 3 million years, while the Pliocene has been pushed back 11 million to 12 million years ago.²¹

From their research, Dr. N. J. Shackleton and Dr. C. Turner, of the sub-department of Quaternary research, Cambridge University, found that by counting the number of layers in the deposits of boulder clay in a narrow trough at Marks Tey (Essex) the top 450 cm. of undisturbed glazed mud in their core contained 4,486 pairs of differently colored layers. They inferred that the data represent many years of deposition in a glacial lake. The Times report of their research mentioned:

By counting more roughly throughout the length of the core, they conclude that the length of the last glacial period is about 30,000 or 50,000 years. This is much less than the estimate produced by the study of ocean sediments, where it seems that the length of this interglacial period must have been 200,000 years.

How difficulties like these will be eventually resolved cannot at this stage be foreseen. One possibility is that the interpretation of the ocean sediments in terms of surface temperature and climate is inadequate. The uncertainties in estimating temperature from oxygen isotopes are also extremely great. Students of ice ages would dearly like to find a more reliable timescale than there is at present.

Thus after decades of research many problems and speculations about the "Ice Age" remain. This position is equally true of the theory of continental drift. Adherents suggest that the continents, made of lighter "sial" rocks, have drifted relatively to one another. The continents are thought to "float" on the heavier basic igneous rocks (sima). The idea is that since the period designated "Carboniferous," what was one large continental mass (Pangaea) has split up and drifted apart, over the course of the geological past.

Problems Facing Theorists

A. A. Meyerhoff and C. Teichert²² are not convinced this continental drifting could have occurred. If the so-called supercontinents of

"Gondwanaland" and "Laurasia" ever existed, then the evidence for former glaciations (in what geologists term the Proterozoic and the Paleozoic eras) could not have taken place. The evidence for these "glaciations" comes mainly from studying the distribution of a "hardened glacial deposit" (called tillite) although not all geologists are convinced these deposits are of glacial origin.

1. The Water Problem

However, the problem arises for these two uniformitarian geologists because the regions where tillite occurs would have been deep in the interiors of these supercontinents. Today, rain and especially snowfall (precipitation) rarely penetrates deep into the arid interiors of continents. The same difficulty applies to the coal deposits, how can forests grow deep within the supercontinent when water supply is inadequate? Meyerhoff and Teichert admit,

Nor could the major Carboniferous, Permian and younger coalfields of eastern North and South America, and of the eastern Africa and India have formed. The presence of major late Paleozoic ice centres in western Australia, central India and northern west Pakistan, Africa, eastern India, Brazil and eastern North America indicates that large water supplies actually were present close to the places where the glaciations took place, and where coalfields formed. This in turn suggests that currently popular reconstructions of Gondwanaland and Laurasia are wrong.²³

2. The Fossil Problem

Other evidence used to show that the continents might have been joined comes from a study of fossil distributions. Here however, the authors state, "For each Paleozoic and Mesozoic faunal similarity 'explained' by joining the continents several dissimilarities are left unexplained. This is particularly evident among the vertebrate faunas."²⁴

3. Misconceptions and Mythology

These former problems are not aided by the development among geologists of what the authors term "misconceptions" especially in connection with the supposed former glaciations.

Although the actual causes of worldwide glacial climates are unknown, many facts about glaciation are known. Despite the increasing knowledge of glaciation, a mythology has grown steadily for 100 years or more—a mythology composed of misconceptions, erroneous beliefs, and misunderstandings.²⁵

One such misconception, according to the authors, is the notion that because ancient tillites are present at the equator, this automatically means that polar wanderings and/or continental

drift have occurred. Another misconception caused by the tillite occurrences at such low latitudes, is that "the geologist finds it difficult to accept the fact that mountain valleys and their associated glacial deposits can be, and have been, preserved—without erosion—for 280 m.y."²⁶ This is indeed an amazing thought, perhaps after all, the geological epochs can be telescoped into a much shorter time span?

The authors then list over half a dozen further examples of this phenomenon of mountains existing for 250-275 million years after the last folding. They add:

An unexpected fact [on uniformitarian principles] is that surprisingly little of the original sedimentary cover of these ranges has been removed by erosion. . . . Therefore, it would seem that the geologist has assumed for too long that his knowledge of erosion and erosion rates is complete; the facts mentioned here show that his knowledge is far from complete and as Jeffreys . . . wrote *something is wrong and it is necessary to re-examine our premises*.²⁷

The former misconceptions must be recognized if progress is to be made in deciphering the past, think the authors. They conclude that

. . . until advocates of the new global tectonics find an alternate explanation for coal distribution, the spreading sea-floor, mobile plate, and polar wandering hypotheses will have to be regarded as interesting speculations which are supported by only a fraction of the known geological, palaeontological, and palaeoclimatological data.²⁸

Other geologists however use the theory to bolster their conception of mountain building (orogenic activity). F. Ahmad says of the theory while discussing the mechanism for mountain-building:

. . . the theory of continental drift has been in existence for over half a century. Recent work on palaeomagnetism strongly indicates that widespread crustal movement has taken place. Such movement of crustal segments could result in compression if two blocks happened to be moving towards each other, crushing between 2 giant jaws any sediments on the continental shelves, and, perhaps accidentally, some on the ocean floor in between. This is believed to have been true of the Himalayas and the Alps. Thus Continental Drift—or crustal sliding as Daly puts it—could also result in the formation of a mountain chain. . . .²⁹

F. Ahmad says, "Daly . . . accordingly concluded that 'after wrestling with the orogenic problem for two centuries, geologists are still

comparing *speculations* about it'. Now holding the field are the classic contraction theory. . . . To these theories may be added the 'oscillation' theory of Haarmann (1930) recently restated by Belousov (1962) and the regurgitation theory of Carey (1958). . . ."³⁰ He continues, "Admittedly most of these theories have been inspired by the tectonics of present mountain ranges, projected back in the imagination through geological history on the basis of uniformitarianism."³¹

This emphasizes the importance of one's underlying philosophic basis, in interpreting past events. Professor L. King claimed that he more or less lets the present processes explain the past. But can one prove that this is a valid projection, especially when uniformitarian geologists claim that the time man has been on earth is comparable to the thickness of a postage stamp on Cleopatra's needle? How typical, or atypical, can we be sure this period is, of former times? What philosophy of landscape development is prevalent at the present time?

Modern Geomorphology

Over the first half of the twentieth century, thinking on the development of landscapes, was dominated by the American geomorphologist, the late W. M. Davis. His approach to the subject is epitomized in the saying, "Landscape is a function of structure, process and stage."

It is true to say that Davis (sometimes labelled as an "armchair geomorphologist") concentrated most of his efforts on the "stage" of development, that a landscape had reached. Textbooks for decades reflected his emphasis on "youth," "maturity," or "old age," and the "cycle of erosion."

J. T. Hack has rightly pointed out that the ideas of W. M. Davis are based on a "closed" system approach according to which the landscape went through certain irreversible, and predictable forms of erosion. Modern geomorphologists have shifted away from this emphasis, in favor of an "open" system approach.

The reason for the decline in Davisian geomorphology is stated by R. J. Chorley, geography lecturer, University of Cambridge,

. . . it must be stressed . . . that modern objections to the Davisian approach have not developed because the cycle has been found to be a totally inappropriate vehicle for geomorphic thought . . . but because its restrictive and highly specialized built-in characteristics have been high-lighted by recent investigations.³²

The cycle of erosion is thus now being recognized as merely one framework within which geomorphology may be viewed, where—in those aspects of landforms which are susceptible to progressive, sequential and

irreversible change through time are especially stressed. . . .³³

Chorley categorically states,

The cycle is no more a complete and exclusive definition of geomorphic reality than the pronouncement by the proverbial Indian blindman on feeling an elephant's leg that the animal is like a tree. What has happened in the last thirty years or so is that, to continue that metaphor, other blind geomorphologists have been feeling the geomorphological elephant's trunk and sides and are variously describing it as being like a snake or wall. It is understandable that the equally-blind "onlookers" should have been confused. . . .³⁴

Ferment of Ideas: "Open" Versus "Closed" System Frameworks

This new way of thinking has led to the dethroning of such familiar Davisian concepts as "grade" in favor of "quasi-equilibrium" (or "dynamic equilibrium") in fluvial geomorphology; the former concept has been penetratingly analyzed by Professor G. H. Dury.³⁵ The whole ferment of ideas has led to controversies basically between the "open" and "closed" system frameworks.³⁶

This situation led S. A. Schumm and R. W. Lichty to attempt to reconcile the two viewpoints. They argued that it was all really a question of time. In the short term a system can be regarded as "open," that is, available for more energy and rejuvenation, but in the long term it was a "closed" system. They state, "Thus depending on the temporal and spatial dimensions of the system under consideration, landforms can be considered as either a stage in a cycle of erosion or as a system in dynamic equilibrium."³⁷

Dr. R. J. Small thinks that limitations of the Davisian cyclical concept and even the dynamic equilibrium theory should be stressed. "Some types of landforms (streams, slopes and beaches) can be appropriately studied in terms of dynamic equilibrium, but there are others . . . [For example, glaciation] . . . to which the concept seems inappropriate."³⁸

The fact remains that geomorphological research has advanced, with a return to empirical investigation and quantification. It could still be argued that Davisian thinking has not greatly aided the subject. This has been shown by the new "process-form" geomorphology which has been used to combat the stranglehold of Davis' ideas. When we try to look at landscape's development in historical perspective, it must be remembered that although it may be possible to mimic some of these events under present-day

conditions, this does not mean that these events must therefore have taken place in the past. Cuchlaine A. M. King says of the "open" system that it

. . . allows a more realistic concept of the influence of time on geomorphological change, which need not be continuous or in one direction; if a steady state is set up then change will not take place with time. The open system model is also useful in that it allows escape from the historical approach to landscape development, in which facets of earlier stages are recognized but most of the landscape tends to be ignored. These facets are not left out in an open system model, but are treated as parts of the landscape not adjusted to present energy conditions. In the open system way of thinking the whole landscape is considered, and studies on this basis can be carried out in any area, whether there are remnants of earlier stages or not.³⁹

Cuchlaine King's final comment on the historical method of presenting geomorphological studies is,

This approach attempts to describe the landscape in terms of historical development, but unless it is linked to some of the other methods [namely inductive, deductive, analytical, topical or systematic and regional] it is unlikely to be of great value.⁴⁰

Chorley makes an even more radical analysis of the cyclic concept and its reinforcements of denudation chronology, which seeks to explain by study of erosional features, the history of past landscapes. He says of denudation chronology,

The former relying often upon highly ambiguous evidence, assumed like the cycle the character of a highly stylized game indulged in by a freemasonry who after committing themselves to certain basic initial steps of faith (e.g. topographical flat means stillstand; higher is older and lower is younger; uplift is generally discontinuous, etc.) reached conclusions which seem often to be *more a product of the means of analysis rather than physical reality*. To adapt an expression of Sauer's ". . . Many studies of denudation chronology look like the products of men set out to 'bag their own decoys'."⁴¹

Dr. R. J. Small simply states, "The denudation chronology approach evidently so popular with British geomorphologists until about the mid 1950's seems to be obsolescent."⁴²

Having seen some of the weaknesses of the historical method, and the attempted reconciliation of the "open" and "closed" systems—as a question of "geological perspective"—one is left

wondering just how important these basic uniformitarian concepts (including cycles) really are, to the subject of geomorphology. The leap forward in the last two decades has come with a welcome return to empiricism.

If Chorley can make a comment about denudation chronology to the effect that a lot of it depends on assumptions and faith approximating to freemasonry, one wonders how much more of historical geology and its reconstructions can be put into the same category: namely, that they are based on assumptions which are either unproved or unprovable.

Comments and Remaining Problems

T. W. Freeman in some general concluding comments on physical geography states that it includes a lot of controversial material. Furthermore, he says that geomorphology must rest on a historical foundation. Secondly, that, "... it is a commonplace that the catastrophic element may be decisively significant in the historical development of landscape."⁴³ Freeman notes that localized floods (such as those of Exmoor) can "do more geomorphological work in a few hours than might normally be done in many decades."⁴⁴

Then, Freeman really gets to the roots of the matter in his summary: "Third, the fascination of geomorphology inevitably rests on its reflection in the landscape of changes that may have taken scores of thousands of years to develop." This is on uniformitarian assumptions. To continue,

The complaint made that W. M. Davis was virtually a crystal-gazer into the past and future may not be without foundation: but modern preoccupation with mathematical measurement, though obviously likely to give fine results as indeed the glaciological work shows, cannot solve all the mysteries of landforms. The statement has been made of the world, there is "no trace of a beginning, no prospect of an end," and for many workers, now as in the past, the interest lies in *the long and visible continuing evolutionary process*. Like so much more in the development of modern geography, [especially geomorphology] *the real impetus came from the Darwinian scientific revolution of the nineteenth century.*⁴⁵

There are indeed many "mysteries of landforms" still unsolved, whilst geologists take refuge in "Lyell's calm world." As Professor H. M. Morris stated, "There are many very important unsolved problems in geology, and it is likely their solution has been delayed by an implicit reliance on uniformity."⁴⁶

We have already mentioned the problems of explaining and dating the Ice Age, the issue of Continental Drift, and the numerous mountain-building hypotheses. The list could be supplemented by the problems connected with: the origin of petroleum; the mechanics of overthrusting; the cause of world-wide warm climates; the nature of vulcanism; the origin of coal; the dry valleys in the chalk; the supposed superimposed rivers on discordant structures; and of accurate, reliable dating methods.

Conclusion

The comment of Freeman underlines Derrey's point that geologists have "chosen" to follow a uniformitarian explanation rather than the nature of the evidence demanding it. Present-day geologists and geomorphologists prefer interpretations in line with the "continuing evolutionary process." Professor G. A. Kerkut's comment regarding biological evolution, seems unhappily true of modern uniformitarian geologists:

He also would take it rather badly when I suggest that he is not being very scientific in his outlook if he swallows the latest scientific dogma and, when questioned just repeats parrot fashion the views of the current Archbishop of Evolution.⁴⁷

It seems that geologists are still unwilling to discard "dogmas . . . that have long overstayed their leaves as working hypotheses." It is to be hoped that the tide will soon turn in favor of a more open-minded approach to geological issues; where ideas are not discarded simply because we have not experienced them in historic time. In view of the continued problems facing geological theorists, it is necessary for geologists to be more flexible in their interpretation of the rock strata.⁴⁸

Modern naturalistic geology is thus shown not to have been proved beyond all reasonable doubt. When scientific theories are elevated to Dogmas, they must be challenged. The words of Jean Lombard ring loud and clear:

Among the sciences, geology allows of an exceptionally high proportion of hypotheses, and they concern the very constitution and structure of its object. It is not surprising that numerous contradictory theories confront one another.⁴⁹

Our challenge to uniformitarian geologists has well been stated in Shakespeare's Hamlet: "... There are more things in heaven and earth, . . . than are dreamt of in your philosophy." These facts should give many the courage to hold fast to the truth, unchanged, and unchanging.⁵⁰

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- ⁹Young, E. J. 1958. An introduction to the Old Testament. 7th printing. Wm. B. Eerdmans Pub. Co., Grand Rapids, p. 53. In another sense however, the Bible may be considered a "textbook of science" as it alone contains authoritative, unchanging answers about prehistoric times. Furthermore, no scientific errors are to be found, science is after all "thinking God's thoughts after Him."
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- ¹³Derrey says that in 1930 the Academy of Science in Moscow dined on mammoth steak; at other times it was fed to sled dogs.
- ¹⁴Hibben, F. C. 1961. The lost Americans. Apollo Editions, New York.
- ¹⁵Derrey, F. *Op. cit.*, p. 73.
- ¹⁶*Ibid.*, p. 72.
- ¹⁷*Ibid.*, p. 72.
- ¹⁸Wilson, L. G. 1971. Sir Charles Lyell and the species question, *American Scientist* 59(1):43-55 January-February, p. 52.
- ¹⁹Hillier, D. G. 1962. Historical geology of the British isles, Common Ground, London: Filmstrip notes. (CGB 819) p. 5.
- ²⁰Nature-Times News Service. 16/12/67. "Continuing doubt about Ice Ages," The Times, No. 57,126, London, p. 2. This full report was published by Shackleton, N. J. and C. Turner. 1967. Correlation between marine and terrestrial Pleistocene successions, *Nature*, Vol. 216:1079-1082. December.
- ²¹Bull, H. W. 1967. The succession of life through geological time. H.M.S.O. Preface p. v.
- ²²Meyerhoff, A. A., and C. Teichert. 1971. Continental drift III—late Paleozoic glacial centres and Devonian-Eocene coal distribution, *The Journal of Geology*, 79(3):285-321. May.
- ²³*Ibid.*, p. 285.
- ²⁴*Ibid.*, p. 286.
- ²⁵*Ibid.*, pp. 303-304.
- ²⁶*Ibid.*, p. 304.
- ²⁷*Ibid.*, p. 304. Emphasis added.
- ²⁸*Ibid.*, Abstract, p. 285.
- ²⁹Ahmad, F. 1968. Orogeny, geosyncline and continental drift, *Tectonophysics*, 5(3):117-189, p. 178.
- ³⁰Emphasis added.
- ³¹*Ibid.*, p. 178.
- ³²For example three researchers state their mistrust of Davis' cyclical concepts: Leopold, L. B., M. G. Wolman and J. P. Miller. 1964. Fluvial processes in geomorphology. Freeman and Co., San Francisco.
- ³³Chorley, R. J. and P. Haggett, 1965. Frontiers in geographical teaching. Methuen and Co. Ltd., pp. 21-22.
- ³⁴*Ibid.*, p. 21.
- ³⁵Cf. Dury, G. H. Editor. 1966. Essays in geomorphology. Heinemann, London. See "The Concept of Grade," pp. 211-234.
- ³⁶Cf. King, C. M. A. 1966. Techniques in geomorphology. Edward Arnold, London. Also: Small, R. J. 1969. The new geomorphology and the sixth former, *Geography*, pp. 308-318.
- ³⁷Schumm, S. A. and R. W. Litchy. 1965. Time, space and causality in geomorphology, *American Journal of Science*, Vol. 263, February, Abstract, p. 110.
- ³⁸Small, R. J. *Op. cit.*, pp. 317-318. (Ref. #36)
- ³⁹King, C. M. A. *Op. cit.*, p. 20.
- ⁴⁰*Ibid.*, p. 29.
- ⁴¹Chorley, R. J. and P. Haggett, *Op. cit.*, Chapter 2, "A Re-evaluation of the Geomorphic System of W. M. Davis." R. J. Chorley thinks however, Wooldridge and Linton provide the "most convincing" studies of this type. p. 34. Emphasis added.
- ⁴²Small, R. J. *Op. cit.*, p. 308. (Ref. #36)
- ⁴³Freeman, T. W. 1965. A hundred years of geography. Methuen and Co. London, p. 117.
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- ⁴⁶Morris, H. M. 1963. Biblical catastrophism and geology. Presbyterian and Reformed Publishing Co. Philadelphia, p. 9.
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