Toppling the Timescale
Part III: Madness in the Methods

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Abstract

The chronology of the geologic timescale's stratigraphic units has been defined by a variety of methods. Over the decades many have waxed and waned in popularity, but at present the most important ones are: (1) radiometric dating, (2) astronomical "tuning," (3) magnetostratigraphy, and (4) biostratigraphy. Each of these methods assumes deep time and uniformitarianism rather than demonstrating them. Each also exhibits other specific flaws. These are commonly masked by the "shotgun approach" or the selective use of individual methods. But contrary to popular perception, the "shotgun approach" does not demonstrate the strength of overlapping independent, scientific methods, but instead exhibits a critical weakness—after decades of searching, no single absolute chronometer has been found. The frequent selective shuffling of methods, therefore, demonstrates the failure to attain a real chronology. Thus the absolute timescale (and its stages) rests on quicksand. It is not the concrete empirical history commonly presented; it is instead the unverified historical saga of the worldview of Naturalism, supported more by the faith of its adherents than by factual demonstration.

Introduction

As noted earlier in this series (Reed, 2008a), the geologic timescale is the attempt in the field of earth science to use the rock record as a weapon of the worldview of Naturalism. This often leads to confusion. For example, geologists often talk about two parts of the timescale: (1) the chronostratigraphic order of the rock record, and (2) the geochronologic dates of each unit. How are these two parts of the timescale validated?

> The chronostratigraphic scale is an agreed convention, whereas its calibration to linear time is a matter for discovery or estimation (Gradstein, 2004, p. 3).

This admission is contrary to what most geologists—creationist or uniformitarian—believe. They would see the arrangement of the chronostratigraphic scale as an empirical quest, not an "agreed convention." This wording is crucial, however, for it dovetails precisely with a thesis of this series—that the rocks were arranged according to a deductive template, not by decades of inductive compilation. As we have seen, that template rests on the flawed assumption that rock units represent globally correlative synchronous time units (Reed, 2008b). Furthermore, as we will see, the "discovery" and "estima-

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tion" of the dating of each stage are a far cry from genuine measurement, something required for any truly scientific demonstration.

In other words, we have just unmasked the great weakness of the timescale. *There is no absolute chronometer*. Without exception, all of the dating methods exhibit uncertainty, and they all assume rather than prove deep time.

Before examining the specific flaws, several general problems are worth noting. First, the multiplicity of methods is often presented as a strength of the timescale—multiple independent, overlapping lines of evidence. That appraisal is overly optimistic. Instead, the need to bounce back and forth from one method to another reveals the fundamental lack of a consistent "clock" against which the rocks can be calibrated. A factual summary of history should include a reliable "clock." But the path across the past two centuries is littered with a steady stream of discarded methods; each vigorously proclaimed in their day as scientific gospel. Yet over time, flaws and shortcomings were uncovered in each "infallible" method. Those repeated failures should have led geologists to question the timescale; instead, new methods were churned out to replace the old while their confidence in uniformitarian history and Naturalism never wavered. Critics of the timescale thus found their efforts to be much like punching Jell-O.

Over time this multiplicity of methods created another problem. Different parts of the timescale are now "validated" by different methods (Figure 1). But how can a unified history be derived from this patchwork? If deep time is so obvious, why is there not a single chronometer that proves it? This leads to another problem—one that most geologists downplay, especially with the public.

> However, the geologic record is discontinuous, and these stratotype-

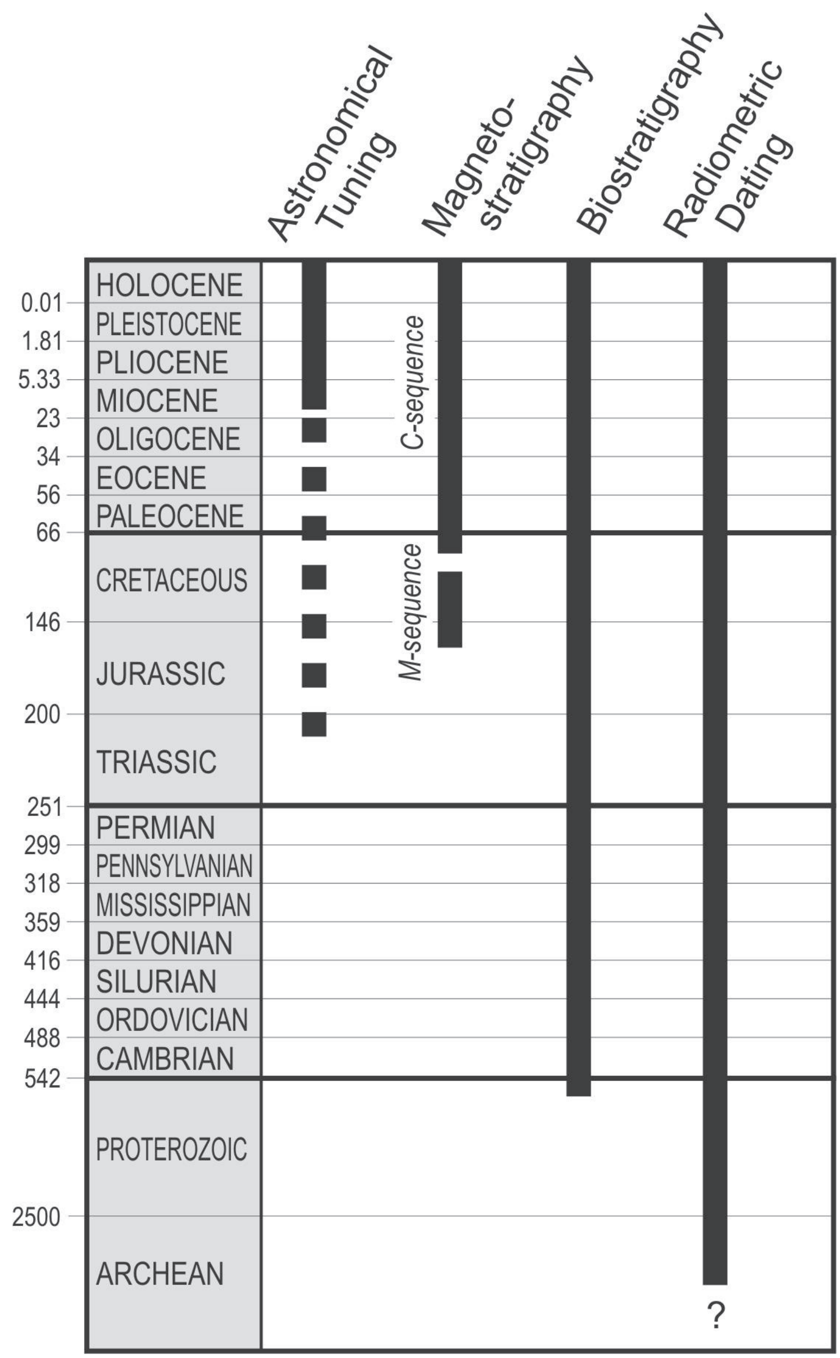

Figure 1. The current geologic timescale uses a variety of methods to validate its history. Radiometric dating and astronomical tuning are the only two possible methods that can provide absolute dates. However, the latter extends only a short distance back into "deep time." Radiometric dating fails on several counts (see text). Magnetostratigraphy only offers partial coverage and must be calibrated to radiometric dates and hypothetical sea floor spreading rates. Biostratigraphy, once the "queen of the methods," has suffered many setbacks in conjunction with the falling fortunes of evolution.

> based chronostratigraphic units are an imperfect record of the continuum of geologic time (Gradstein et al., 2004b, p. 20).

When geologists admit this discontinuity, they continue quickly on as if it were of little import. But it is a critical admission, *given the constraints of their worldview*. For the pure empiricist, the absence of tangible evidence is a huge problem. Since uniformitarian natural history rests on the empirical description of the past, *any* empirical discontinuity in the rock record presents a challenge. And it is not simply a few missing pieces of the puzzle; the vast majority of rocks ever hypothetically deposited in the uniformitarian scenario are missing. A careful reading of any local stratigraphic description will note large chunks of missing time. Even worse, a detailed analysis will show that the actual time of deposition for a given formation is much less than the total time for its stage, even if the accompanying stratigraphic chart colors in the entire stage with that rock unit! This "scale masking" (Reed, 2000) occurs because the scale on any stratigraphic chart is so large that a single line thickness can often equal thousands of years.

If rocks do not form layers that measure isochronous discrete time periods, and if they cannot be correlated globally, then the spotty record cannot be pieced together unless the assemblers know the result in advance, much like having the picture on the puzzle box to guide your efforts. Since the rocks are not complete in and of themselves, a template is needed. Creationists use biblical history as that template and can thus accommodate discontinuities in the rock record. But adherents of the naturalist worldview do not have that luxury since they claim a purely empirical basis for their knowledge of history. For all they know, little green men could have landed on Earth and influenced the course of evolution—as long as it happened during a "hiatus" in the rocks. An incomplete rock record is an incomplete history, and an incomplete history is an uncertain history (though you would never guess that from the public confidence expressed by stratigraphers).

In addition to these conceptual problems, stratigraphers face many others with specific geochronologic methods. We will first examine those currently popular and then look at others—once at the forefront of "science" but since relegated to semiretirement. The former are like the starting rotation on a baseball team. Those not currently in vogue are kept in the "bullpen" in case one of the "starters" gets into trouble.

The "Starting Rotation"

At present, there are four primary methods that are used to validate different parts of the timescale. From the basement up, these include radiometric dating for the Precambrian, biostratigraphy for the Paleozoic and parts of the Mesozoic, magnetostratigraphy for parts of the Mesozoic and Cenozoic, and "tuning" to astronomical cycles for most of the Cenozoic.

> Aspects of the GTS89 compilation began a trend in which different portions of the geologic time scale were calibrated by different methods. The Paleozoic and early Mesozoic portions continued to be dominated by refinement of integrating biostratigraphy with radiometric tie points, whereas the late Mesozoic and Cenozoic also utilized oceanic magnetic anomaly patterns and astronomical tuning (Gradstein, 2004, p. 10).

In addition, there are secondary methods, including calibration by various isotopic ratios. This will be discussed after the "starting four."

Radiometric Dating

The "ace" of the staff is radiometric dating because it provides the only theoretical way to directly obtain absolute dates for virtually all of the rock record. Since the early twentieth century, geologists have relied on radiometric methods to specify and validate the deep time demanded by evolution. Though recent efforts have been made to correlate strata to dates derived from astronomical cycles, radiometric dates have provided the bulk of the absolute dates that have calibrated the timescale.

> The chronometric calibration of stratigraphic boundaries underpins the geologic time scale…. In particular, there is now a heavy reliance on results from the analytically precise 40Ar/39Ar and U-Pb methods at the expense of K-Ar and Rb-Sr dates, which were the mainstay of older time scales (Villeneuve, 2004, p. 87).

When first introduced, radiometric methods seemed to provide definitive proof of deep time and were used to silence young-earth critics, particularly Lord Kelvin. However, in-depth creationist critiques of radiometric methods have shown significant flaws in individual methods as well as in the assumptions underlying the entire system (Vardiman et al., 2000; 2005; Woodmorappe, 1999). In particular, Woodmorappe (1999) showed a systematic historical cycling from one radiometric method to another as each new process revealed its flaws (as admitted in the above quote), and Austin (2005) and Snelling (2005) demonstrated discordance between various isotopic methods (including isochron methods) by dating the same rocks by a variety of methods. Given the repeated admitted shortcomings of the older methods and the demonstrated discordance of the newer ones, it appears that the rock-solid chronology of radioisotopes has turned into quicksand. A summary of the most common radiometric methods and their many shortcomings is presented in Snelling (in press).

Fundamentally, isotopic dates cannot confirm the stages of the timescale because uncertainty in these methods precludes a certain chronology. This brings the argument back to the original problem: deep time is required by evolution, but since that is the issue in question, evolution itself cannot logically demonstrate deep time. If radiometric dating is uncertain, then geologists continue to argue in a circle. This is because the primary argument about radiometric dating is not whether it is generally correct or generally incorrect but whether or not it is *the reliable chronometer*—the magic hammer that can set the golden spikes of time. A method that is not absolute cannot provide absolute dates. If it can be wrong some of the time, then it can be wrong at any given time, and therefore any given date cannot possess the certainty generally assumed by stratigraphers. For example, note how the argument that current methods are accurate reveals inaccuracies in other methods that once enjoyed equal confidence.

> Few other methods can attain the accuracy or precision of the 40Ar/39AR and U-Pb TIMS methods and, for this reason, key chronostratigraphic calibrations now depend almost exclusively upon them, with minor infill from K-Ar. Rubidium-Strontium (Rb-Sr) decay was once widespread in its use for geochronological purposes, but recognition of the mobility of both Rb and Sr in the presence of aqueous fluids or thermal disturbances has led to the method falling into disfavor as a precision chronometric tool…. Samarium-Neodymium (Sm-Nd) decay is of limited applicability because of relatively low distribution coefficients between the parent and daughter atoms during crustal processes, resulting in relatively little control on generation of isochrons (Villeneuve, 2004, p. 94).

As Snelling (in press) notes,

> There are many problems with each of the radiometric dating methods. These are admitted by the conventional geology community in their own papers and textbooks, yet they fail to draw the commonsense inference that these methods are highly questionable at best. In spite of these known problems, the millions of years demanded by the geologic timescale and evolution are accepted and research continues with these flawed methods because they are consistent with the evolutionary model of earth history. Though reluctantly admitted, the problems are usually ignored because radiometric methods are thought to be at least generally correct, in spite of the fact that these anomalies defy and disprove the very assumptions foundational to the methods…. All these considerations taken together emphatically show that the radiometric dating methods are fatally flawed and cannot yield the valid absolute ages claimed by those who require the millions of years to prop up their belief in long evolutionary ages of earth history.

Thus, while radiometric dating remains the mainstay of the timescale, it does so because the alternative is to admit what creationists have been saying for decades—that the age of the earth has not been demonstrated to be measured in billions of years and that the historical record of the Bible is back on the table.

Biostratigraphy

Biostratigraphy is the use of index fossils to assign ages to the rocks that contain them. As has been noted by many creationists, the argument is circular because the deep time of evolution is a presupposition of the method. Yet, it remains the standard for much of the fossil-bearing strata.

> The larger part of the Phanerozoic time scale…relies on a construction where stages are first scaled "geologically" with biostratigraphic compositing techniques, and then stretched in linear time using key radiometric dates (Gradstein et al., 2004a, p. 49).

As an aside, note that the use of "key" radiometric dates tacitly admits that some are better than others. How can we tell one from the other? But the quote is more interesting in what it says about biostratigraphy. Time periods or stages are "scaled geologically" or assembled in their "proper order" using index fossils. This can happen only if the truth of evolution is known in advance and if its progression is adequately preserved in the fossil record. Neither has been demonstrated. Furthermore, if the timescale has to be stretched in linear time with radiometric dates, does not that imply that the rock record itself does not give the appearance of age determined by radiometric methods—even with the assumption of evolution?

In addition to the circularity problem, biostratigraphy faces other issues.

- Fossilization assumes in situ, low-energy paleoenvironments. Any high-energy catastrophic transport of fossils out of their "home" environment invalidates the scheme.
- Since fossils do not show evolutionary transitions, the dates are purely conceptual. This is demonstrated by comparing the evolutionary "dates" from the nineteenth century with those of the twentieth century.
- Ignorance of the complete fossil record demands empirical uncertainty.
- Living fossils and changing ranges of index fossils highlight that uncertainty.
- The predominance of marine invertebrates as index fossils arbitrarily biases sampling (Mortensen, 2006).

These difficulties have been recognized (or at least admitted) in recent years, resulting in the changes to deriving the timescale noted in this series.

Note the admission of failure in the following quote.

> Even so, the practice continued of treating strata divisions largely as biostratigraphic units, and even today it is an article of faith for many Earth scientists that divisions of the developing international stratigraphic scale are defined by the fossil content of the rocks. To follow this through, however, leads to difficulties: boundaries may change with new fossil discoveries; boundaries defined by particular fossils will tend to be diachronous; there will be disagreement as to which taxa shall be definitive (Gradstein, 2004, p. 21).

This is an astounding admission, echoing creationist criticisms. For nearly 200 years, naturalists have asserted that evolutionary history is preserved in the rocks and have thrown that rock record into the teeth of Christianity. Yet now we learn that the biostratigraphic interpretation of the rock record is perhaps not so clear after all. This leaves naturalists with a profound dilemma. Evolution is the only logical continuous universal clock available to track "deep time." Without it, the whole house of cards collapses. If we begin with a skeptical eye toward evolution, the problems are much worse. Stratigraphy rests on the hope of a legible fossil progression in the rocks; if that does not work, then the whole edifice is vulnerable.

Correlation to Astronomical Cycles

One of the newer methods involves correlating chemical trends in cyclic sediments (e.g., variations between interbedded carbonate and marl) to the "clock" derived from the orbital oscillations of our solar system. For many years, this method, loosely known as the Milankovitch theory, was the domain of glaciologists. More recently, geologists have begun to believe that resulting climate changes are sufficiently strong to be reflected in sedimentary cycles.

> Over the past century, paleoclimatological research has led to wide acceptance that quasi-periodic oscillations in the Sun-Earth position have induced significant variations in the Earth's past climate. These orbitally forced variations influenced climate-sensitive sedimentation, and thereby came to be fossilized in the Earth's cyclic stratigraphic record (Hinnov, 2004, p. 55).

All such oscillations boil down to variations in solar radiation (the insolation signal) reaching Earth due to differential gravitational effects exerted by celestial bodies. Oscillations include eccentricity (the variation in the elliptical shape of Earth's orbit) with cycles of 95, 125, and 400 Kyr (thousand years); obliquity (the tilt of Earth's axis of spin with respect to the ecliptic) with a cycle of 41 Kyr; and precession (the wobble in Earth's spin) with cycles of 19 and 23 Kyr. The Milankovitch theory states that changes in these parameters cause corresponding changes in sunlight reaching Earth and thus long-term climate change (c.f. Oard, 1984). Although initially used to explain the ice ages, the theory has been more widely applied in recent years to sedimentary cycles (Oard, 1997), especially those from pelagic environments.

> Cycle stratigraphy has calibrated the time scales for most of the Neogene Period (i.e. for the past 23 million years), and for portions of the Paleogene Period (from 65 to 23 Ma) and Mesozoic Era (from 251 to 65 Ma) (Gradstein, 2004, p. 4).

This tuning of sedimentation to astronomical cycles requires at least three important assumptions. These are: (1) cause and effect between oscillations and sedimentation to the extent that this "signal" overrides terrestrial influences, (2) cyclicity and continuity in sedimentation driven predominantly by climate, and (3) uniformity of rates and preservation that enable the "signature" to be manifested. Stratigraphers assume that sediments present a linear "signal" through time that can be differentiated from any nonlinear "noise." But this assumption itself presents problems, and the preferences of the researchers drive conclusions.

> Despite the view that non-linear approaches might explain more of the data than the linear methods, the latter are currently best understood mathematically and are *the most frequently used* (Weedon, 2003, p. 2, emphasis added).

In short, the astronomical data coupled with the assumption of deep time result in a theoretical plot of solar radiation versus time. Geologists then fit paleoclimatic information (e.g., glacial and interglacial periods) to this curve, but move beyond that into fitting chemical variation in cyclic sediments presumed to have been deposited over millions of years.

> True orbital time calibration is possible only for cycle stratigraphy that can be connected to the "canonical" orbital variations, i.e., those quantitatively predicted by orbital theory. In GTS2004, this involves cycle stratigraphy back to the Miocene-Oligocene boundary only (0-23.0 Ma). Calibration of a sequence of cyclic strata begins with the assumption of a target orbital curve. This may take the form of an orbitally forced insolation signal, which most likely affected climate and was subsequently recorded by sedimentation…, or it can be as simple as the sum of the standardized orbital parameters…. This initial assumption, however, introduces a basic source of error, because the true nature of the orbital forcing of the sediment is not known exactly (Hinnov, 2004, p. 61).

The attraction of the method is that it potentially provides a timescale to reinforce that provided by radiometric dating. But the method is not without its problems. Primary among them are:

- It cannot be applied to "old" sediments, and so cannot calibrate the entire timescale.

  > It should be noted that cycle stratigraphy much older than ~20 Ma may never successfully be correlated directly to the orbital cycles but only indirectly through comparison of average signal characteristics between data and orbital theory (Hinnov, 2004, p. 60).

- It is difficult to apply to geographically diverse areas.

  > All Cenozoic standard stages are originally based on European stratotypes, with the Neogene Mediterranean ones more difficult to correlate worldwide as a function of increasing provincialism and diachronism in faunal and floral events in the face of high latitude climactic cooling (Gradstein, 2004, p. 16).

- It presupposes uniformitarianism.

  > Floating orbital time scales (i.e. time scales that are disconnected from canonical orbital variations) are based upon the assumption that frequency components observed in cycle stratigraphy can be related to one or several frequencies predicted by orbital theory. This requires an additional, provisional, assumption that planetary motions were stable back to the geological time represented by the data, and that current models of tidal dissipation and dynamical ellipticity which predict progressively shorter orbital periodicities back through time…are accurate. This assumption, however, remains largely untested for times prior to the Oligocene (Hinnov, 2004, p. 62).

Also, as noted by Oard (1984; 1985) and Vardiman (1996), short-term terrestrial influences are likely to swamp the astronomical signal. For example, unpredictable volcanic eruptions and sunspot activity have been correlated to climatic changes, and those signals have a higher "frequency" and "amplitude" relative to any orbital parameters. Like varves or ice layers, geologists simplistically assume that the target sediments were deposited slowly, uniformly, and in response to regular climatic variables. Remove those assumptions and the whole theory crumbles, as has been shown for both ice layers (Oard, 2005) and varves (Oard, in press).

Also, any rapid or catastrophic style of sedimentation would render this style of dating meaningless. Sedimentation is influenced by source, by tectonics, and by preservation potential. All of these must be ideally uniform to generate a legible astronomical signature in the sediments. This would be difficult, even in an old-earth setting. For example, diagenesis could easily alter carbonate sequences enough to mask the signal (Westphal et al., 2004). It is also not clear how this very slow climatic signal can be realistically applied to sediments; in other words, does this regular astronomical cyclicity provide a sufficiently strong signal to overcome all others? A large submarine slump would generate turbidites that hypothetically could show a regular cycle of interbedded lithologies. Yet deposition would happen instantaneously. What would a plot of the various chemical ratios up through such a deposit show?

In any forensic study, subjectivity and uncertainty cannot be eliminated. Weedon (2003) noted,

> Hilgen…and Shackleton…independently derived orbital cycle chronologies based on matching sedimentary cycles and oxygen isotope curves to the calculated history of insolation changes…. The results were at odds with the widely accepted radiometric ages that had been obtained using potassium-argon dating. Subsequently, improved radiometric dating and studies of sea-floor spreading rates confirmed the validity and utility of the so-called astronomical time scale approach. (p. 3)

Note that the basic data were initially in conflict—a conflict resolved in favor of the preferred "new" approach and then "validated" once the answer was "known." Although Weedon presented this example to illustrate the strength of astronomical tuning, it really demonstrates the arbitrary use of radiometric methods and the subjectivity of the researchers.

Finally, a history that includes the Flood cannot be compared to the strict uniformitarianism assumed by cyclostratigraphers. For example, the early and late stages of the Flood were marked by dramatic volcanism. The local increases of ions and temperature in seawater would have dramatically overridden any potential insolation changes and would in fact have been responsible for variations in solar radiation at Earth's surface far in excess of any orbital variation. Similarly, meteoric bombardment would have affected the insolation signal much more dramatically than any orbital variation. Ultimately, these methods presuppose the very thing they purport to prove.

Magnetostratigraphy

The introduction of plate tectonic theory in the 1960s was closely tied to burgeoning studies of the magnetic signatures of various rocks, particularly the alternating normal and reversed "stripes" parallel to the midocean ridges. Many historians of science date the plate tectonic revolution to the famous paper of Vine and Matthews (1963), which described the "symmetrical" magnetic stripes on either side of the Mid-Atlantic Ridge. Dating of the component rocks provided a rate for plate spreading that was extrapolated into the magnetic time scale.

> Oceanic magnetic anomalies are calibrated with spreading models to produce a powerful correlation tool for sediments deposited during the past 160 million years. These calibrated C-sequence [Late Cretaceous–Neogene] and M-sequence

> [Late Jurassic–Early Cretaceous] polarity time scales enable assignment of ages to stage boundaries and to biostratigraphic and other stratigraphic events through much of that interval (Gradstein, 2004, pp. 4-5, brackets added).

Note that this assumes plate tectonic theory and measurable spreading rates. But if the rocks can be dated well enough to supply those rates, then why is there a need for magnetostratigraphy? As with the other methods, none are really independent, but an illusion of strength is supplied by the inference that they are all mutually supporting.

> The patterns of marine magnetic anomalies…have been calibrated by magnetostratigraphic studies to biostratigraphy, cyclostratigraphy, and a few radiometrically dated levels (Ogg and Smith, 2004, p. 63).

There are a number of problems with magnetostratigraphy, and many have been discussed by creationists (e.g., Oard, 1985). First, although there is good evidence for the historic reversal of Earth's magnetic field, the process of magnetic reversal is unexplained and the mechanism unsubstantiated. If we do not know how the magnetic field changes through time, the presence of ancient signatures remains somewhat of a mystery and we cannot accurately decrypt their relationship to history. The origin of the magnetic fluctuations that actually cause the seafloor "stripes" is also unknown. Barnes (1971; 1973) showed many years ago that the observed decay of Earth's magnetic field fits a young-earth framework and that the evolutionary dynamo theories could not explain the data. This work was later reinforced by Humphreys (1986; 1988), who noted that rapid reversals documented in the rock record support a catastrophic interpretation of magnetic polarity changes rather than the uniformitarian model. These creationist critiques pose large problems for uniformitarian magnetostratigraphy.

However the most significant weakness of magnetostratigraphy is its inherent inability to provide an unambiguous chronometer. That is because the magnetic signature (granting its accuracy) is either normal or reversed. It is like a simple switch; alternating between "on" and "off." Since this happens repeatedly over time, we cannot possibly know what interval of history is represented by any given "on" or "off" signal unless we already know the approximate age of the rock.

Furthermore, magnetostratigraphy can be misleading in this respect because the assembled timescale of magnetic chrons shows a distinct pattern of thick and thin intervals of normal and reversed segments. It appears at first glance that it should be easy to correlate the overall pattern, similar to correlating well logs. However, that pattern is measured in the domain of *time*, and time must be inferred or imputed into the rock record. A thick section of rock might represent a thin polarity chron, while a thin section of rock might represent a thick chron. Until the rock is independently dated, no magnetic verification or "fine tuning" of the stratigraphy can occur. Thus, even though clear correlation appears possible at first glance, it is not.

> It is essential to have some biostratigraphic constraints on the polarity zone pattern resolved from any given section in order to propose a non-ambiguous correlation to the reference geomagnetic polarity time scale (Ogg and Smith, 2004, p. 64).

In other words, rocks are dated by fossil succession and "verified" by magnetic measurement. Or, rocks are dated by isotopic methods and then calibrated to a magnetic time scale by various manipulations.

> A composite C-sequence magnetic anomaly pattern for the latest Cretaceous and Cenozoic was assembled by Cande and Kent (1992a, 1995) from a composite of South Atlantic profiles with additional resolution from selected Pacific surveys. An absolute age model for this synthetic "CK92" magnetic anomaly pattern was calculated by applying a cubic-spline fit to selected radiometric age controls…. Berggren et al. (1995a) calibrated a vast array of biostratigraphic and chronostratigraphic events to a revision ("CK95") of this geomagnetic polarity time scale to construct a detailed Cenozoic chronostratigraphic time scale (Ogg and Smith, 2004, p. 73).

Like cyclostratigraphy, magnetostratigraphy often boils down to pattern matching of derived curves—a process that can be quite subjective. There are also inherent problems, such as secondary magnetization.

> In practice, secondary magnetizations are acquired by sediments or lavas upon compaction, lithification, diagenesis, long-term exposure to other magnetic field directions, and other processes. Therefore, various methods of demagnetization are required to separate the later secondary components from the primary magnetization directions, if such an unambiguous result is possible (Ogg and Smith, 2004, p. 64).

What about the magnetic timescale of the ocean floors? Is it not calibrated by the alternating stripes moving away from the present-day spreading center at the mid-ocean ridges? First, the idealized alternating normal and reversed stripes shown in cartoon figures are much less ideal in the real world. In many places on the ocean floor, the lateral arrangement of polarities is quite ambiguous. A quantitative assessment of anomalies along the Reykjanes Ridge, the location touted as the ideal example of marine magnetic anomaly patterns, showed a better correlation coefficient between magnetic intensity and topography than along strike in a single anomaly, while both of these had higher correlation coefficients than "same-age" anomalies across the ridge (Agocs et al., 1992). Polarity "stripes" have been found to vary vertically with depth as well as horizontally. Beloussov (1980) correlated marine anomalies dated at 8 Ma to much "younger" volcanic rocks on Iceland. Furthermore, where "stripes" do appear near mid-ocean ridges, their thickness variations are at odds with predicted spreading rates (Pratt, 2000).

Isotope Stratigraphy

In addition to the "big four" methods discussed above, geologists also rely on the secondary method of calibrating age dates by isotopic ratios, primarily those of strontium. Just as unstable isotopes are used to date rocks via decay chains, stable isotopes are used to do the same, based on the assumption that isotopic ratios vary predictably through time.

> The $^{87}Sr/^{86}Sr$ value of Sr dissolved in the world's oceans has varied through time, which allows one to date and correlate sediments (McArthur and Howarth, 2004, p. 96).

The problem with this type of method is that once again there is no fixed variation through time. There is just a curve that varies up and down. Thus, a single value would be repeated many times and cannot be time determinative. That means that a particular isotopic ratio cannot provide a definitive age, since many different ages could be derived from an isotope ratio (Figure 2). The method also makes assumptions about the past chemistry of the ocean that require a strict uniformitarian approach.

> The method works only for marine minerals. Practitioners assume that the oceans are homogeneous with respect to $^{87}Sr/^{86}Sr$ and always were so (McArthur and Howarth, 2004, p. 98).

Like most other methods, the "age" must be known in advance because the uncertainties are numerous.

> The calibration curve…is based on measurement of $^{87}Sr/^{86}Sr$ in samples dated by biostratigraphy, magnetostratigraphy, and astrochronology (mostly the first two). The difficulty of assigning numerical ages to sedimentary rocks by the first two methods is well known. Users of the calibration curve, and the equivalent look-up tables derived from it that enable rapid conversion of $^{87}Sr/^{86}Sr$ to age and vice versa…must recognize that the original numerical ages on which the curve is based may include uncertainties derived from interpolation, extrapolation, and indirect stratigraphic correlations and may suffer from problems of boundary recognition (both bio- and magnetostratigraphic), diachroneity, and assumptions concerning sedimentation rate, all of which contribute uncertainly [sic] to the age models used to generate the calibration line. Furthermore, age models are ultimately based (mostly) on radiometric dates and are as accurate as those dates. Interpolation of ages between tie points, however, may be more precise, although necessarily systematically inaccurate (McArthur and Howarth, 2004, p. 100).

The "Bullpen"

In spite of an impressive array of new methods, the structure of the timescale has remained surprisingly unchanged for more than a century. Of course there has been refinement of detail,

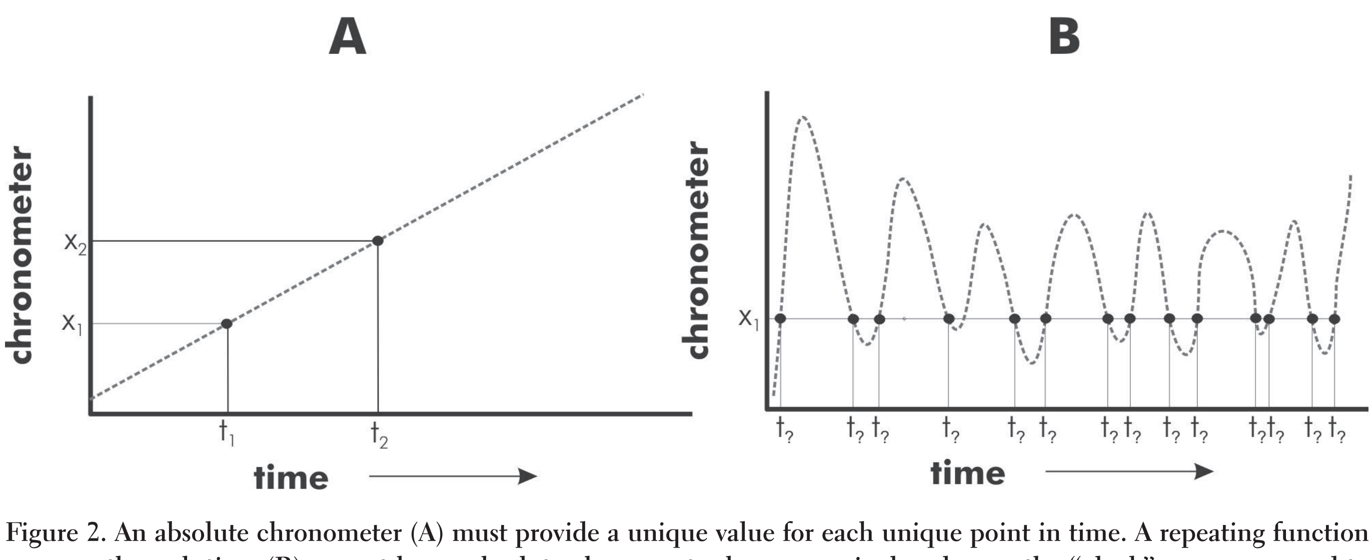

Figure 2. An absolute chronometer (A) must provide a unique value for each unique point in time. A repeating function or curve through time (B) cannot be an absolute chronometer because a single value on the "clock" can correspond to multiple points in time.

new names introduced, subdivision of the sections, and the multiplication of supposedly quantitative timescales. But it seems incredible that the basic structure has not been altered by field research. That can mean one of two things: (1) the rock record is so transparent that early stratigraphic work in England and Western Europe captured its essence almost exactly, or (2) the timescale is a historical template resting on a philosophical worldview rather than empirical science, and data are made to fit the template regardless of methodology.

One of the reasons to suspect the latter is that geologists' confidence in the timescale has never wavered, even when methods that supposedly guaranteed its validity have proven ineffective and have been displaced. Despite acknowledged problems with the various methods, the timescale itself is never in doubt. Although most of the older methods (in their own day thought irrefutable) have been shown to contain flaws, some are still dusted off and used as needed when the current methods are not applicable. These older methods include everything from the assumption that each stratigraphic stage occupied a similar period of time to the assumption of constant plate tectonic spreading rates through time. This "bullpen" of techniques is worth examining, both for their present (although limited) application and for their historical interest. Gradstein (2004, see his figure 1.3) lists a number of these methods. These can be classified by their logical shortcomings.

First are *the assumption of a maximum thickness of sediments per time period* and *the assumption that the temporal duration of a zone is proportional to its thickness*. Both are highly doubtful because they (1) assume a complete sedimentary record, (2) assume a knowledge of sedimentation rates, (3) assume a uniform rate for a given period, and (4) do not discriminate by sedimentary or tectonic environment.

Second are *the assumptions of equal duration of stages* and *the equal duration of zone to scale stages*. Both are purely arbitrary assumptions rooted in extreme uniformitarianism.

Third is *the assumption of constant spreading rates* of ocean floor sections of plates. This of course assumes both the reality of plate tectonic theory and a strict uniformitarianism.

When used today, many of these assumptions are masked by mathematical and statistical methods. Geomathematical and statistical interpolations depend on the quality of the data being assessed, its relevance to the particular method, and uniformitarianism. The same applies to attempts to use a best-fit line of age dates to assign stratigraphic boundaries.

The only valid method used since the development of stratigraphy is what is called "stratigraphic reasoning."

> Radiometric age dating, stratigraphic reasoning, and biostratigraphic/geomagnetic calibrations are three corner stones of time scale building. Stratigraphic reasoning, *though fuzzy*, evaluates the complex web of correlations around stage boundaries or other key levels, and is paramount in the science of stratigraphy (Gradstein, 2004, p. 7, emphasis added).

Stratigraphic reasoning includes assessing the relative position of formations, crosscutting relationships, and superposition. Despite the uncertainties in this approach, it remains the best possible approach and the one most commonly applied by geologists pursuing economic objectives. Other than being restricted to individual basins, its weakness lies in its (inherent) uncertainty in establishing an absolute timescale. Then there is the irrelevance of evolution, uniformitarianism, and deep time to correlation. In other words, stratigraphic reasoning is what field geologists use to correlate and map rock units. Because the establishment and defense of a particular historical template is not the primary focus, the method has fewer pitfalls because it is more closely tied to empirical stratigraphy (Reed et al., 2006).

Discussion

Given Gradstein's (2004) assertion that "the chronostratigraphic scale is an agreed convention, whereas its calibration to linear time is a matter for discovery or estimation," (p. 3) how have stratigraphers done in constructing an absolute timescale?

It seems that recent years have shown a weakening in that construct, rather than improvement. Despite all the theoretical stratigraphic methods, the vast majority of stratigraphy has utilized the tried and true method of evolutionary fossil succession. Radiometric dates tie the framework to "real history," even though many of the methods deriving these dates have subsequently been shown to be in error. But the convenience of having a real timescale has overridden the strict empiricism one usually associates with science.

First, it is clear that there is no single absolute chronometer. In fact, there is only one possible candidate: radiometric dating. Biostratigraphy inherently cannot provide absolute dating and magnetostratigraphy and stable isotopic methods must be calibrated by radiometric dates. Most people quite logically conclude that radiometric dating provides the gold standard for dating, but that misapprehension is revealed by the simple logic of any contradiction between it and other methods. The mere necessity for the other methods shows what professional stratigraphers think about isotopic techniques. Whenever a paleontologist strikes down an isotopic date because it does not "fit" the fossil data, he is demonstrating the failure of radiometric dating as an absolute standard.

If none of the methods can individually supply an absolute chronometer, then can various combinations of methods fill the gap? That is the common wisdom of the day. However, there are at least two logical requirements for such an arrangement to be valid (much less true). The first is the independence of the component methods, and the second would be a set of realistic assumptions underlying each part.

The combination of any of these methods fails the first test immediately. As noted already, biostratigraphy, stable isotope stratigraphy, and magnetostratigraphy cannot provide absolute dates without the calibration by radiometric dating. Furthermore, only radiometric dating is consistently applied to the Precambrian, which constitutes nearly 90% of the historical record. So the "combined methods" approach is not even attempted for the first 4,000,000,000 years of Earth's supposed history. Biostratigraphy is extended back into the late Precambrian but cannot provide absolute dates. Magnetic reversals must be calibrated by radiometric dates, and are not considered reliable beyond the Mesozoic. Astronomical tuning has even a shorter zone of application. Furthermore, biostratigraphy (which cannot do absolute dating) is often used to overturn otherwise "reliable" results from methods that can.

None these methods meet the second criterion either. Rather than demonstrating deep time, all of the methods underlying the timescale assume it to be true. Creationists have demonstrated numerous flaws in the concept of motes-to-man evolution, yet evolutionary fossil succession remains a mainstay of the timescale. Over time, geologists have quietly abandoned a number of radiometric methods as obvious problems came to light (Woodmorappe, 1999). Furthermore, creationists have shown similar problems and profound inconsistencies with "modern" methods of isotopic dating. They have demonstrated plausible alternatives to the old-age interpretations of isotopic ratios in rocks (Vardiman et al., 2000; 2005). The currently accepted interpretations of magnetic signatures depend on: (1) a very unlikely uniformitarian dynamo theory of Earth's core, (2) the indemonstrable historical fact of plate tectonic motions, and (3) the necessity of knowing the approximate age of the rock to calibrate the magnetic normal or reversed signature. Like stable isotopic ratios, a repeating pattern of results through the rock record cannot provide an absolute date when the same point occurs at repeated intervals through time.

So what is the basis of assigning a historical date to a particular rock, unconformity, or tectonic feature? At this point we must remember that if no historical reality can be demonstrated for the numerous stage boundaries within the timescale, then the historical reality of the stages themselves is quite suspect and may very well be a product of human imagination rather than human science. How do modern stratigraphers handle these problems? For the most part, they cannot abandon the tried and true tradition of the past two centuries. They assume the truth of the timescale a priori and thus assume that the methods supporting it will provide real historical results despite their clear flaws.

Conclusion

The displacement of biblical history by natural science relied on the perception that scientific methods provided greater historical certainty than the long-accepted historical accounts of the Bible. To that end, the methods undergirding the geological timescale have always been sold to the public as hard science, in contrast to "blind faith" in the biblical accounts. Yet it seems that the hard science is not so firm after all. The current stable of "scientific" methods is riddled by uncertainty, and a very large element of faith is needed to believe that they constitute a valid and verifiable chronometer of Earth's supposed 4.5 billion-year past. In reality, there is no "silver bullet," no single absolute clock that has measured uniformitarian history.

However, the timescale is presented with all the confidence of last year's calendar. All the flawed methods are collected and presented in a "shotgun approach," as if the combination of flawed individual methods could somehow magically combine to form an unflawed chronometer. This is no different than taking a broken crystal, a bent casing, and a cracked mainspring; and assembling them and presenting the final product as a Rolex!

The motivation for this erroneous approach lies in the desperation that secularists are beginning to feel. Weaknesses in evolutionary theory have left uniformitarian deep time as the most stalwart fortress against a resurging interest in biblical history. The supposed "scientific" timescale has fooled countless people for two centuries, including (unfortunately) many Christians. Therefore, if the timescale is a house of cards built on quicksand, the arguments of Enlightenment secularism against the reality of biblical history are in reality no more than chaff ready to be scattered by the first strong gust of reason. Thus, the fundamental weaknesses of the contemporary timescale provide a powerful argument that Enlightenment geology has sold us an erroneous version of the past. It is high time to turn abandon this flawed approach and return to the reliable history of the Bible.

But if these weaknesses are so obvious, why are they not more readily admitted by geologists? As the next installment in this series will show, the problems with the timescale *are* beginning to be appreciated—at least by the high priests of stratigraphy. As a result, they are taking radical and dramatic steps to insulate the timescale from any future criticism by removing it completely from the empirical realm. The so-called "empirical" history is becoming nothing more than a fiat decree of secular dogmatists, as will be described in Part IV of this series.

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