A Brief Earth History

A Summary of Creation and Catastrophe Geology

by Barry Setterfield

Introduction

The role that geological and astronomical catastrophes have played in the history of the solar system, and our planet in particular, has become more widely examined over the past 25 years [1]. In this new avenue of research, both astronomers and geologists have become aware of the important part played by impacting comets and/or asteroids [2]. One major segment of current geological inquiry concentrates on life-form extinctions at the geological boundaries, plus the evidence of simultaneous major earth movements [3]. A concise overview of one possible model, among many that may explain some of these events, is given below. It is based on the evidence for changing light-speed as presented in an August 1987 research report for SRI International and Flinders University [4], and *Atomic Quantum States, Light and the Redshift.* [5].

A Clue from Light from Distant Galaxies

These two papers cite observational evidence that indicates light-speed, c, has dropped exponentially from an initial value of the order of 4 x 1011 times its current speed. The evidence comes from light emitted by galaxies near the frontiers of the cosmos, which has a signature in it that reveals the value of c at the moment of emission. This signature allows the behaviour of light-speed over time to be determined astronomically, in addition to the ground-based observations over the last 350 years. These two papers demonstrate that the atomic clock, whereby the age of the rocks, the fossils, the planets and stars have all been determined, ticks at a rate dependent upon c. Thus when c was 10 times its present value, the atomic clock ticked off 10 years in one ordinary orbital year. This process includes all radiometric clocks, which are used to determine the age of the geological strata. (Despite the behaviour of the atomic clock, it is shown in the second paper [5] that chemical reaction rates, and hence primary biological processes, remain basically independent of c.) As the behaviour of c with time has thereby been established from observation, it is then possible to correct the atomic clock to read actual orbital time. When this is done, an interesting scenario emerges.

Another Clue from Meteorites

Some meteorites are taken to represent samples of material from the formation of the solar system and hence the Earth. For example, carbonaceous chondrites, may hold more than 20% water locked up in their mineral structures [6]. More specifically, carbonaceous chondrites of class CI are made up of hydrated silicates as well as the volatile components water, carbon dioxide, oxygen and nitrogen [7]. By way of an earthly example, the beautiful mineral serpentine is a hydrated silicate that contains

12.9% water in its composition [8]. Upon heating, this water is given up and the mineral turns to olivine, thereby reducing its volume [9]. Interestingly, olivine is an important component of the earth's mantle. In a similar way, other hydrated silicates, found in meteorites and on earth, may give up their water content when heated sufficiently, with a consequent reduction in volume. Indeed, the chondrules within the chondrite meteorites themselves are silicate spherules that have been melted and the volatile water component driven off. The remaining minerals in the chondrules contain a prominent amount of olivine [10].

The Role of Radioactive Decay

After creation week, the interior of the earth began to heat up from the rapid decay of short half-life radioactive elements as a result of high light-speed values. This radioactive heating drove the water out of serpentine, and other minerals in the mantle, towards the earth's surface. This water came to the surface as springs and geysers and watered the ground. This is confirmed by the earliest known translation of the Pentateuch, the Septuagint (LXX), that originated about 285 BC [11], and from which the Patriarchal dates in this Summary are taken. The LXX specifically states in Genesis 2:6 that "fountains" sprang up from the ground. These fountains and springs probably watered the whole landmass of the single super-continent that made up the original land surface of the earth. In the surrounding ocean, this continuing water supply was called the "fountains of the deep." On a greatly reduced scale, a similar phenomenon still occurs today with the "black smokers" of the South-East Pacific Rise.

The Asteroidal Planet Break-up

Similar events were happening out in space. For instance, the original parent body (or bodies) of the current asteroids, which primarily inhabit the region between Mars and Jupiter, was undergoing a process paralleling that on earth. This process of short half-life radioactive heating of its interior reached a peak, which reset the radiometric clocks. The time of the advent of this peak was about 4.5 to 4.4 billion atomic years ago. This parent body probably came to be internally structured with something approaching an iron core, stony-iron mantle, chondritic upper mantle or crust, and, perhaps, an ice or frozen carbon dioxide surface layer. As this planet continued to heat up internally, the pressure of super-critical water and expanding rock may well have caused it to explode.

It is acknowledged that radioactive heating from the short half-life elements could structure the interior of bodies larger than 10 km in this fashion, and then, following disruption, give rise to the meteorites [12]. Indeed, *"it is now thought that the majority of meteorites come from the asteroids whose diversity amply covers all classes of meteorites. The achondrites could come from the 'crust' or 'mantle,' the siderites from the cores, and the lithosiderites from the mantle/core interface [of the original parent body/bodies]"* [13]. In addition, recent work has indicated that leftover ice and rock from the region of Neptune's orbit may also have been responsible for some short-period comets and other debris [14]. A series of impacts by this variety of objects has been noted on the Earth, Moon, Mercury, Mars, and elsewhere in the solar system.

Forming the Stable Shield Areas

Radioactive heating also continued on earth, with the first signs of molten rock intruded in the near-surface region about 4.4 to 4.3 billion atomic years ago. On the light-speed correction, this probably occurred shortly after the birth of Methuselah, which is dated around 4505 BC by the LXX chronology adopted here. Importantly, there is evidence from zircon grains that water was associated with this activity in some way [15]. Indeed, as the heating continued, more and more super-critical water built up beneath the crust. The increased heating partly liquefied some sub-crustal rock, which moved towards the surface through interconnected pores. This eventually resulted in the intrusion of granitic massifs and associated metamorphic complexes that formed many of the stable craton or shield areas worldwide around 2800 ? 2400 million atomic years ago [16]. The presence of large quantities of water in these magmas may well have allowed the kind of low-temperature metamorphism investigated by Prof. R. L. Stanton [17], Dr. A. Snelling [18], and others [19]. As a result, the metamorphism associated with these intrusions may not have penetrated the original sedimentary cover, even though the cratons and complexes were major crustal features. On the light-speed correction, the formation of these shield areas, which peaked near the Archaean/Proterozoic boundary 2500 million atomic years ago, roughly corresponds with the birth of Noah in 4136 BC.

Forming the Incipient Tectonic Plates

As serpentine changed to olivine, and other hydrated silicates lost their water content, there was a reduction in mineral volume. Consequently, the crust above the source areas for the water and magma would be weakened relative to the stable cratonic areas that had been solidly emplaced. This would be a major contributing factor to the predominantly vertical tectonic activity that generally dominated the Precambrian, instead of the horizontal forces of plate tectonics that predominated in the Mesozoic-Cenozoic history of the earth [20, 21]. These strong vertical movements in these weakened regions of the crust would result in intercratonic basins. In the case of South Australia, the Adelaide Geosyncline downwarped some 10 km, while the major faults and other structural features controlling these events extended to some 20 km depth [22]. On a worldwide scale, the downwarping formed a network of intercratonic basins that became mobile belts. Read and Watson point out a striking fact: *"The network of mobile belts is closely followed by the margins of the present-day continental fragments. This aspect of the orogenic pattern suggests that when disruption of [the super-continent] began, fracturing followed the lines of the recently consolidated mobile belts"* [23]. In other words, the stable cratons formed the core areas of what today are the continental fragments. By contrast, the weakened, downwarped areas were the regions that formed the boundaries of what was to later become the tectonic plates.

The Geology of Catastrophe 1.

The initiation of a series of geologically mobile belts bordering the shield areas of the super-continent can be approximately dated as 800 ? 900 million atomic years. At that time, the weakened crustal regions began to either downwarp or sink into fault-controlled basins. The activity continued to build up from that point and reached a climax at the time of the Flood. Interestingly, Noah was given the command to build the Ark around 3656 BC, corresponding to 870 million years atomically, which was just the time that this activity began. As the heating continued in the earth's interior, the pressure increased and eventually fractured the crust and the water explosively out-gassed to the surface. The pressure of the overlying crust may well have jetted the mixture of water and chewed-out debris as high as 20 km in a series of massive explosive eruptions circling the earth. As such, it would be an eruption on a worldwide scale similar to the local eruption of Krakatoa in 1883 AD where dense volcanic clouds reached a height of 27 km [24], compared with the 19 km of Mount St. Helens in 1980 AD [25]. Studies by Dr. Walter Brown suggest that about half the present volume of the oceans may have been explosively out-gassed from the earth's interior in that episode [26]. As the surge of water intensified, the sediments on top of the cratons were stripped off and swept into the rapidly deepening troughs. Water-lubricated fault systems assisted this process that formed a worldwide network of mobile belts. Some time after the Flood event concluded, these troughs stabilised and many were uplifted.

The Flood Layer in Geology

This event correlates well with the debris layer that is found on all continents, except India, a little below the boundary between the Proterozoic and the Cambrian. This debris layer is composed of pebbles, cobbles and boulders bound together in a cement-like matrix. It is called a conglomerate, or diamictite, or tillite. However, the latter term implies a glacial origin. For this reason, one of the current explanations for this worldwide debris layer invokes a "snowball earth" scenario. This scenario postulates that the whole planet is iced over, including the oceans, with glaciers existing at sea level in the tropics [27, 28, 29]. However, Williams and Schmidt list off 10 solid geological reasons why this scenario must be invalid and a different explanation must be sought [30].

Near Adelaide, in South Australia, this initial debris layer is over 300 metres thick [31], while the following deep-water laminated siltstone is over 2400 metres thick and has a high carbon content [32]. This sequence has its counterpart worldwide. In Scotland, for example, the detrital layer is 750 metres thick [33]. In Zaire and Zambia the *"Grand Conglomerat"* is 300 metres thick and is overlain by about 500 metres of carbonaceous silty shale and black limestone in a manner very similar to the equivalent beds in Adelaide [34]. Geologically, this event dates from the Neo-Proterozoic around 720 million years ago atomically. This closely approximates the time of Noah's Flood, 3536 BC, when the atomic clock is corrected for light-speed variation. A post-Flood tectonic adjustment occurred as the fault systems began to stabilise some 60 orbital years later, which gives an age to the strata laid down then of around 600 million years ago atomically.

The Second Catastrophe

The Palaeozoic Era that followed saw continuing deposition in intra-continental basins or downwarped areas until the rising landforms restricted deposition to the margins of the super-continent. This Era lasted 306 orbital years during which the

Palaeozoic strata were laid down, while intrusives into that strata dated from about 600 million down to 250 million years atomically. During this Era, a portion of the southern part of the super-continent straddled the South Pole. As moisture-laden air swept over the pole, vast amounts of ice and snow were precipitated. This resulted in widespread glacial deposits over that portion of the land surface [35].

Many insects would have survived the Flood on floating vegetation mats, which would have been much larger than, but similar to, the floating mats caused by lesser floods today. These are known to harbour a great deal of life. Even amphibians, while at home in the water, probably found the mats assisted survival. The insects and amphibians would be able to thrive in the moisture-laden atmosphere and the large bodies of warm water left over from the Flood process. These warm, humid conditions would also favour the spore-bearing plants, the algae, mosses and ferns. Consequently, these flora and fauna would be the most rapidly proliferating life forms after the Flood, explaining their predominance in the fossil record at that point. By contrast, other life forms were at a disadvantage and only started the Era in very small numbers.

Meanwhile, the radioactive heating of the earth's interior continued. Eventually the stage was reached when significant portions of the upper mantle became molten. An episode of rampant volcanism would have followed. It produced the Siberian flood basalts, while associated earth movements resulted in massive tidal waves that swept huge quantities of vegetation into fault-controlled troughs, which then formed the major coal measures [36]. This event dates around 250 million atomic years ago, or about 3230 BC on a light-speed correction, approximately the time of the Babel crisis in the second or third generation after the Flood, according to Genesis 10. It is interesting to note that Aboriginal legends in Australia link the origin of different languages (Babel) with the formation of coal [37]. Geologically it is known as the time of the Permian extinction, and recent evidence from Japan and China suggests that an asteroid or comet impact may have played a part also [38]. It is also possible that the Siberian flood basalts may hide another impact crater.

The Age of the Dinosaurs

During the Mesozoic Era that followed, active deposition of sediments took place around the rim of the super-continent over a period of 225 orbital years. The change in atmospheric conditions brought about by volcanism produced a dry and windy climate generally. This resulted in the great wind-blown sand deposits that typify this Era. The semi-desert climate would have decimated the amphibians, and spore-bearing plants, and favoured the increasing numbers of reptiles that lived in broad, luxuriant river valleys. The plants best adapted to this climate were those that propagate by wind-blown pollen, namely the gymnosperms, which include the palms and pines. These were the dominant life-forms during the Mesozoic Era, and thus they are the primary forms that we find fossilised in this Era.

Much human and animal migration must have taken place during the two centuries of orbital time that this Era occupied before the worst phases of continental drift occurred. As the heating of the mantle continued, the mantle itself became increasingly mobile, Furthermore, a significant water content would have built up in the asthenosphere, a plastic layer at the base of the lithosphere that starts about 40 km below the surface [39]. The asthenosphere is, perhaps, the primary region involved in continental drift [39, 40], although some maintain that other parts of the mantle are involved as well [40]. This lubrication and mobility in the asthenosphere would have allowed the first movements of the tectonic plates, and the Mid-Atlantic ridge began to unzip.

The Continents Divide

On earth several asteroid impacts closed the Mesozoic Era, about 65 million atomic years ago at the Cretaceous/Tertiary boundary. The dinosaurs would have been decimated. Wild fires destroyed much vegetation. The layer of iridium from asteroid impacts and soot from the wild fires is virtually global. This was the time of Peleg in the fifth generation after the Flood (Luke 3:35-36) when the continents were divided (Genesis 10:25). When the light-speed correction is applied, the atomic date for this event closely approximates to 3005 BC. The basaltic Deccan Traps in India, whose origin may have been either through an igneous event or impact related, were also outpoured at the time of this disaster [41]. If an impact origin for the Deccan Traps is discounted, the major impact at this time was in the Yucatan (near the mid-Atlantic rift) leaving a crater at least 150 km wide. Other impacts at this time also formed the Manson, Karn, Kamensk and Gusev craters [42]. The significant Lunar crater Tycho also dates from the late Cretaceous [43]. It is thus possible that this event was contemporaneous with the formation of these other craters, as the light-speed correction brings it very close to the BC date for Peleg on the LXX chronology.

The Beginnings of the Cenozoic Era

The large impact near the mid-Atlantic rift may have accelerated the rate of continental drift. Tectonic plate movement and rifting would also have been enhanced by very low mantle/asthenosphere viscosities, which were themselves due to peak temperatures, significant water content, and high, but rapidly dropping, light-speed values. Separating continents may have generated a series of tsunamis. Mountains were also being upthrust by recently activated tectonic forces. This might also imply chronic earthquake activity and persistent volcanism. The impacts as well as the changing distribution of masses both on and in the earth may have increased the axis tilt to something of the order of 28 degrees or more according to the observational data [44].

The high axis tilt, mountain building and volcanism would all contribute to annual extremes of climate. The mammals with their stable body temperatures were most able to cope with these conditions. Among the plants, the angiosperms became predominant with their seasonal flowering and fruit bearing. These plants include most deciduous trees, which are more able to withstand seasonal extremes. Continental drift would have resulted in isolated populations, which in turn would have brought about localised dominances. As the Era progressed, most giant forms would have died out due to new extremes of climate. From a study of oxygen isotope ratios in shells from the Atlantic, we know that ocean temperatures dropped progressively from the close of the Mesozoic throughout the Cenozoic Era that followed [45]. Once surface temperatures dropped below freezing, the initial stage of the ice-age began.

The Ice-Age and Jobab

Because of the destruction caused by these events, and the new rigorous weather conditions, numbers of people were probably forced to seek shelter in caves. They would have to get sustenance where they could find it, hunting animals, digging up roots and getting what food they could. Suitably shaped rocks would have had to suffice for weapons, even before wood and/or bone were used. After conditions had stabilised, and basic needs had been met, there would be time to re-establish civilisation, work with metals, plant corn, and build homes. This trend is simply the recovery sequence from a series of huge natural disasters. The book of Job was probably written at this time, as a study of its contents reveals familiarity with many of the processes mentioned above. Indeed, Job is probably an abbreviated form of Jobab who is listed as a nephew of Peleg in Genesis 10:29. From a linguistics point of view, Jobab and Job in the Hebrew texts of Genesis and Job can be the same name in different families of the same language group [46]. Therefore, with Peleg as his uncle, it seems that Jobab probably lived during those traumatic times.

As those times were coming to a close, the 1st Dynasty in Egypt probably commenced. The discussion in *"Creation and Catastrophe"* [47] suggests that this event probably took place during the period 2783 BC to 2767 BC. About the same time, roughly 2765 BC, the main function governing light-speed behaviour had almost reached the limit of its decay pattern. However, the secondary function that is apparent in the astronomical and archaeological data is an oscillation, which is still damping out. This oscillation governed the position of the first light-speed minimum, which occurred around 2375 BC. The most recent minimum seemed to occur around 1980 AD [48].

One More Global Catastrophe and Abraham

As the effects of the ice-age began to taper off, another global event assisted that process. This event changed the earth's axis tilt from more than 28 degrees, back to the present 23.5 degrees. This event, too, may have been an asteroid or comet impact, though other viable mechanisms have been discussed [49]. Whatever the cause, the improved climatic conditions allowed the eventual re-establishment of major cultures. Studies of this event by the late Government Astronomer for South Australia, George Dodwell [50], and USA researcher M. M. Mandelkehr [51] lead to the conclusion that the date was close to 2345 BC, with climatic, archaeological, and geological changes occurring globally. At this same time, the movement of the earth's virtual geomagnetic pole position showed a sudden change in direction, which was also an indication that an important global event happened then [52]. Although the matter is still open for discussion, it appears that this event may well have marked the close of the 5th Dynasty in Egypt, at least according to some likely chronologies [53].

This brings us down to the less turbulent days of Abraham, who lived from 2304 to

2129 BC on the chronology adopted here. An archaeologist, Prof. D. N. Freedman of the University of Michigan made some important comments on this matter. As a result of the discovery of the Ebla tablets, written during the 23rd century BC, he commented: *"It is now my belief that the story [about Abraham] in Genesis 14 not only corresponds in content to the Ebla Tablet, but that the Genesis account derives from the same period. Briefly put, the account in Genesis 14, and also in Chapters 18-19, does not belong to the second millennium BC, still less to the first millennium BC, but rather to the third millennium BC"* [54]. This evidence thus lends credibility to the dating for Abraham adopted here, as does the chronology accepted by the Church Fathers as outlined by Theophilus of Antioch [55]. This, then, would indicate that Abraham's visit to Egypt occurred around 2229 BC, which was in the reign of Pharaoh Pepy II, if some recent studies are accepted [53]. By this time, the sequence of global catastrophes was over, although we have records of continuing local catastrophes over the time since then.

Summary

According to the astronomical data, light-speed has undergone an essentially smooth decay, which would have been mirrored in the behaviour of the atomic clock. These astronomical data indicate that the geological column may well have been laid down progressively over a period of about 2000 orbital years, punctuated by a series of catastrophes that caused the major extinctions noted in the fossil record [56].

Essentially, the fossil record is a creation/catastrophe new-dominance sequence. Timewise, the build-up of Precambrian (Cryptozoic) strata took about 1000 orbital years, while nearly 1000 further years elapsed during which much of the Phanerozoic strata were deposited. The demarcation between the Cryptozoic and Phanerozoic strata was probably Noah's Flood if this model is accepted.

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7th June, 2001.

Posted June 7, 2002
Barry Setterfield's Home Page: www.setterfield.org
email Barry Setterfield: barry@setterfield.org