British Scriptural Geologists in the First Half of the Nineteenth Century: Part 1. Historical Setting

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ABSTRACT

Largely overlooked by modern historians, the Scriptural geologists in Britain in the first half of the nineteenth century tenaciously defended Genesis 1-11 as a reliable historical account, including the Noachian Flood as a unique global catastrophe, against the many compromises with old-Earth geological theories. This was the era of Smith, Buckland, Sedgwick, Lyell and Cuvier. To understand and appreciate the Scriptural geologists, their historical context is discussed, beginning with the intellectual and religious background, and the historical developments in geology, palaeontology and cosmology that shaped the social and religious milieu *of the early nineteenth century. Also relevant is the approach to biblical interpretation through the preceding centuries and amongst their contemporaries. Finally, what credentials were needed then to be a geologist are examined, so that the geological competence of these Scriptural geologists to expound and defend Genesis geology may be established.*

INTRODUCTION

Geologist H. H. Read prefaced his book on the granite controversy a few decades ago with these words:

> *'Geology, as the science of earth-history, is prone to controversy. The study of history of any kind depends upon documents and records. For the history of the earth's crust, these documents are the rocks and their reading and interpretation are often difficult operations.'*[1]

During one such controversy in the first half of the nineteenth century in Britain, a tenacious and denominationally-eclectic band of naturalists and clergyman (and some were both) opposed the new geological theories being developed at the time, which said that the Earth was millions of years old. These men became known as Scriptural geologists, Mosaic geologists or Biblical literalists.

The label, Scriptural geologists, is preferred because three of their book titles used this language, and it was the most common label used by contemporaries and later historians. However, we need to be aware of the label's liabilities. It has not always been used carefully, resulting in confusion and inaccurate analysis. Calling them Scriptural geologists obscures the fact that some of them were competent geologists and some were not (and did not claim to be). Conversely, it sometimes is and was used by opponents to imply, erroneously, that these men all developed their objections to old-Earth geological theories solely on the basis of Scripture.

These Scriptural geologists held to the dominant Christian view within church history and in their own time,[2]

namely, that Moses wrote Genesis 1-11 (along with the rest of Genesis) under divine inspiration and that these chapters ought to be interpreted literally[3] as a reliable, fully historical account.[4] This conviction led them to believe, like many contemporary and earlier Christians, that the Noachian Flood was a unique global catastrophe, which produced much, or most, of the fossil-bearing sedimentary rock formations, and that the Earth was roughly 6,000 years old.

From this position they opposed with equal vigour both the uniformitarian theory of Earth history propounded by James Hutton and Charles Lyell, and the catastrophist theory of Georges Cuvier, William Buckland, William Conybeare, Adam Sedgwick, etc. They also rejected, as compromises of Scripture, the gap theory,[5] the day-age theory,[6] the tranquil flood theory,[7] the local flood theory,[8] and the myth theory.[9] Though all but the myth theory were advocated by Christians who believed in the divine inspiration and historicity of Genesis 1-11, the Scriptural geologists believed their opponents' theories were unconvincing interpretations of Scripture based on unproven old-Earth theories of geology.

Science historian Martin Rudwick wrote in 1985 that they deserve more study, as they were

> *'an important irritant and a serious disturbing factor in the scientific geologists' campaign to establish and maintain their own public image as a source of reliable and authoritative knowledge'.*[10]

The fact is that modern historians have largely overlooked the Scriptural geologists — they have been generally misunderstood and often mischaracterised both by their contemporaries and by later historians.

Charles Lyell, the leading uniformitarian geologist, described them in 1827 as *'wholly destitute of geological knowledge'* and unacquainted *'with the elements of any one branch of natural history which bears on the science'.* He said that they were *'incapable of appreciating the force of objections, or of discerning the weight of inductions from numerous physical facts*'. Instead he complained that

> *'they endeavour to point out the accordance of the Mosaic history with phenomena which they have never studied'* and *'every page of their writings proves their consummate incompetence'.*[11]

Thomas Chalmers, an evangelical pastor and leader in the 1843 disruption of the Scottish Church, regretted in 1835 that

> *'Penn, or Gisborne, or any other of our Scriptural Geologists* (had) *entered upon this controversy without a sufficient preparation in natural science'.*[12]

The Roman Catholic cardinal, Nicholas Wiseman, asserted that the Scriptural geologists *'reject all geological facts and principles'* and *'severely reprove geologists for framing any theories in their science'.*[13] An anonymous letter to the editor of the **Christian Observer** in 1839 described them as 'anti-geologist' Christians.[14] They were considered good, but 'ignorant' people by the reviewer of John Pye Smith's book **Relation Between Holy Scripture and Geological Science** (1839).[15] Buckland's daughter wrote in her biography of him that his opponents in the 1820s were men *'who feared the study of God's earth would shake the foundations of Christianity'.* Later she cited Baron Bunsen's complaint (in a letter to his wife in 1839) that *'Buckland is persecuted by bigots'.*[16]

In 1896 Andrew White, whose views had enormous influence on the next generation of historians, referred only to clerical Scriptural geologists, such as James Mellor Brown. Quoting Brown and others out of context, White said that these Scriptural geologists believed that geology was *'not a subject of lawful inquiry', 'a dark art', 'dangerous and disreputable', and 'a forbidden province'}*[7] Also in 1896, William Williamson, Professor of Botany in Manchester, described the work of George Young, the most geologically competent Scriptural geologist, as *'prejudiced rubbish'.*[18]

Moving into the twentieth century, the Scriptural geologists have been described as *'scientifically worthless'}*[9] *'scientifically illiterate Bibliolaters'* and *'obscurantists'.*[20-23] And they were *'vociferous',* negative and defensive in their reaction to geology.[24]

Particularly pertinent to the forthcoming analysis of George Fairholme, John Murray, William Rhind and George Young are comments by Harvard University geologist, Stephen Gould:

> *'By 1830, no serious scientific catastrophist believed that cataclysms had a supernatural cause or that the earth was 6,000 years old. Yet, these notions were held by many laymen, and they were advocated by some quasi-scientific theologians'.*[25]

Davis Young, a Christian theistic evolutionary geologist and prominent writer on the creation/evolution debate in America, has implied a similar view — these Scriptural geologists had no real geological knowledge.

> *A torrent of books and pamphlets were published on "Scriptural" geology and Flood geology, all designed to uphold the traditional point of view on the age and history of the world.'*[26]
>
> *'The "heretical" and "infidel" tendencies of geology were roundly condemned by some churchmen, few of whom had any real knowledge of geology. Those who had geological knowledge were now largely convinced that the Earth was very old.'*[27]

Charles Gillispie, one of the most influential recent historians of nineteenth century geology, was even more stinging in his general evaluation of the Scriptural geologists when he stated that they were *'men of the lunatic fringe',* who published *'their own fantastic geologies and natural histories',* none of which *'marked any advance on Kirwan',* who wrote at the turn of the nineteenth century. In fact their ideas were all *'too absurd to disinter'.*[28] He later continued,

> *'the productions of men like George Fairholme, Andrew Ure and John Pye Smith set forth sillier, less well-informed systems (than Vestiges*[29]*) reconciling the*

Mosaic record with empirically misconceived fact. Their errors cannot have seemed sufficiently damaging to science to merit professional refutation because no one bothered to refute them '.[30]

In commenting on their significance, Gillispie concluded,

'Although too neat a generalization would be erroneous, the arguments of one generation of purely theological disputants more or less reflected the interpretations of the obstructionist side in the discussions among scientists of the preceding generation. Granville Penn, for example, Dean Cockburn of York, and George Fairholme to name three of the opponents of geology in Bucklands time levelled against the whole of the science — catastrophist as well as uniformitarian — arguments very similar to those with which Deluc and Kirwan had attacked the Huttonians 25 years earlier . . . After Kirwan, no responsible scientist contended for the literal credibility of the Mosaic account of creation'.[31]

Millhauser similarly described them as *foes of science'* who were woefully ignorant of science and especially geology.[32] Referring to these Scriptural geologists, Haber asserted that *'geological science and the advancement of scientific truth* [were] *pilloried and stoned by the ignorant literalists'* who vainly fought against *'the heroic warriors in the army of science* '.[33] More recently, James Moore has expressed an equally negative view of these Scriptural geologists.

'Thus their typical ploy of ransacking geological works for contradictory assertions, for passages of which no real understanding is shown but which serve admirably to exercise and display the interpreter's own proficiency in logic and linguistics.'[sic][34]

Quite unlike most other contemporary historians, Nicolaas Rupke was somewhat positive in describing some of the Scriptural geologists as competent naturalists. In his view even some of the clergy were quite expert in the local geology around their parishes.[35] Paul Marston acknowledged that they were not anti-geology, but only opposed to the old-Earth geological theories.[36] Nevertheless, these are very much a minority view among historians.

Whenever a group of people is so severely castigated by contemporaries and later historians, the student of history can be excused for being just a little suspicious that maybe there could be another side to the story. So it is important to investigate the evidence more closely and carefully, and as objectively as possible.

Another reason for studying these men is a fact closely related to the last point, namely, that very recent historians of science have written a number of articles and books giving reinterpretations of the historic relation of science to religious belief.[37-43] In this area, the 'warfare' thesis of White and Draper dominated scholarly thinking for far too long. According to them, science and Christianity were constantly in conflict and science won every battle.[44,45] Brooke points out that this warfare thesis was flawed because

(1) White and Draper only considered the extreme positions and neglected those who saw religion and science as complementary, and
(2) they evaluated past scientific achievements on the basis of later, rather than contemporary, knowledge.[46]

Rudwick summarised the need for such fresh reinterpretations of the past when he stated,

'This kind of scientific triumphalism is long overdue for critical reappraisal. Its claims to serious attention have been thoroughly demolished in other areas of the history of science, but it survives as an anomaly in the historical treatment of the relation of science to religious belief. This may be because the historians' own attitudes are conditioned by the immature age at which religious beliefs and practices are abandoned by many, though not all, intellectuals in modern Western societies. This common experience may explain why many historians of science seem incapable of giving the religious beliefs of past cultures the same intelligent and empathic respect that they now routinely accord to even the strangest scientific beliefs of the past.'[41]

This difficulty in giving a fair treatment of scientists who held strong religious beliefs, especially orthodox Christian beliefs, calls for a more careful assessment of the Scriptural geologists, to whom the warfare myth continues to be applied.

A final reason for studying them is the recent renaissance of geological catastrophism. In the last twenty years or more there has been a growing criticism of Lyellian uniformitarianism and a return by some geologists to a kind of catastrophism reminiscent of the early nineteenth century views of Cuvier and Buckland (though definitely without any belief in the Noachian Flood).[48] Many geologists would no longer accept the statement given in 1972 under the entry, 'catastrophism', in **The Penguin Dictionary of Geology:**

'The hypothesis, now more or less completely discarded, that changes in the Earth occur as a result of isolated giant catastrophes of relatively short duration, as opposed to the idea, implicit in uniformitarianism, that small changes are taking place continuously.'[49]

Derek Ager, a highly respected geologist and, until his recent death, one of the leading voices in the neocatastrophist camp, listed in his last book, **The New Catastrophism** (1993), a number of recent works which argue for a catastrophic view of Earth history.[50] One of Ager's reviewers wrote, *'Now all has changed. We are rewriting geohistory . . . We live in an age of neocatastrophism*'.[51] In addition to these books, numerous journal articles have been calling for either a rejection of uniformitarianism or a clearer definition of its influence on the interpretation of geological phenomena.[52] In this new geological context the Scriptural geologists could be reconsidered from different perspectives than those held earlier.

INTELLECTUAL AND RELIGIOUS BACKGROUND

The controversies in early nineteenth century Britain regarding the relationship of the early chapters of Genesis to the geological discoveries and theories did not, of course, take place in a vacuum. They were part of a complex movement of thought with philosophical, theological, social, political and ecclesiastical dimensions, which pulsed through the educated minds of Europeans in general and of Britons in particular. The following highlights some of the most important people, events and currents of thought leading up to and contributing to a revolution in worldview which profoundly affected the nineteenth century Genesis-geology debate.

The Galileo Affair

Shortly before his death in 1543 and with some hesitation, Nicholas Copernicus (1473-1543), the Polish mathematician and astronomer, published **On the Revolutions of the Heavenly Spheres,** in which he argued that the Earth was not the centre of the Universe, as generally believed, but rotated on its axis and revolved with the other known planets around the stationary Sun. Over the subsequent decades opposition to his theory (as a description of physical reality, rather than merely as an alternative mathematical description) arose because it seemed contrary to common sense, was opposed to Aristotelian physics, lacked convincing astronomical evidence, and appeared contrary to a literal interpretation of various Scriptures. Approximately 150 years passed before his theory was generally accepted. But it was soon embraced by Johannes Kepler (1571-1630) and Galileo Galilei (1564-1642), though the latter was at first reluctant to publicise his views.

In 1613 Galileo finally came out in the open in his **Letters on Sunspots.** He argued that his observations of the heavens by means of the recently invented telescope were consistent with what Copernicus had proposed was the actual relationship and movement of the Earth and heavenly bodies. Initially, the Catholic authorities accepted Galileo's assertions as compatible with the teachings of the Church. Eventually, however, Jesuit university professors (who were ultra-orthodox defenders of Catholic dogma and embraced the geocentric theory) were sufficiently provoked by Galileo's further writings so that they pressured the Pope in 1633 to require Galileo to recant the heliocentric theory on the threat of excommunication.[53] He did publicly recant (though he remained a Copernican in his heart), but was still placed under house arrest the remainder of his life.

Largely as a result of the influence of Thomas Aquinas (1224-1274), the Roman Church in Galileo's day, and for many previous centuries, had absorbed and 'baptized' the geocentric cosmological philosophy of Aristotle and Ptolemy.[54] The seventeenth century church leaders who opposed Galileo had not developed a cosmology simply by studying the Bible and 'taking everything literally', as is sometimes implied.

In any case this incident added considerable support to Galileo, and to others at the same time and later, who insisted on a complete bifurcation between the study of the creation and the study of Scripture.[55] The Bible was written to teach people theology and morality, not a system of natural philosophy, it was argued. Or as Galileo said, the intention of Scripture is *'to teach us how one goes to heaven, not how heaven goes'*.[56] Therefore Galileo concluded that

> *'nothing physical which sense-experience sets before our eyes, or which necessary demonstrations prove to us, ought to be called in question (much less condemned) upon the testimony of biblical passages which may have some different meaning beneath their words ... On the contrary, having arrived at any certainties in physics, we ought to utilize these as the most appropriate aids in the true exposition of the Bible'*.[57]

With frequent reference to Galileo, this approach to the relation of science to the interpretation of Scripture was demanded by all the opponents of the British Scriptural geologists of the early nineteenth century.[58] The old-Earth proponents believed that, prior to the work of Copernicus, Kepler and Galileo, it was quite natural for Christians to take various verses in the Bible to imply an immovable Earth surrounded by the revolving heavenly bodies because they had no philosophical or observational reasons to think otherwise. But once the new mathematical descriptions and telescopic observations had been made known, they were forced to reinterpret those verses so as to remove the apparent contradiction between the truth revealed by Scripture and that revealed by God's creation. In exactly the same way, the old-Earth proponents reasoned, geology has brought forward observational proof that the Earth is much older than previously thought and so Christians must interpret Genesis 1 and Genesis 6-9 differently, so as to harmonise Scripture with this newly discovered teaching of creation.[59]

It should be noted now that the Galileo affair was focussed exclusively on the present structure and operation of the Universe, rather than on how it came into being and attained its present arrangement.[60]

Francis Bacon

The famous English politician and philosopher, Francis Bacon (1561-1626), also had an enormous influence on the subsequent development of science and on the views of later Christians regarding the relationship of Scripture to science. He too promoted the separation of Scripture from scientific study of the physical world, although like Galileo and Copernicus he was not in any way denigrating the study of Scripture. Bacon put forth his ideas in the notion of the two books of God: the book of Scripture and the book of nature. In **Advancement of Learning** (1605) he made his well-known statement of the relationship of Scripture to

nature:

> *Tor our Saviour saith, "You err, not knowing the Scriptures, nor the power of God"; laying before us two books or volumes to study, if we will be secured from error; first the Scriptures, revealing the will of God, and then the creatures expressing his power; whereof the latter is a key unto the former: not only opening our understanding to conceive the true sense of the Scriptures, by the general notions of reason and rules of speech; but chiefly opening our belief, in drawing us into a due meditation of the omnipotency* [sic] *of God, which is chiefly signed and engraven upon his works'.*[61]

Later in the same work he criticised the 'school of Paracelsus'[62] and others for pretending *'to find the truth of all natural philosophy in the Scriptures; scandalizing and traducing all other philosophy as heathenish and profane'.*

Francis Bacon

He continued in general terms,

> *Tor to seek heaven and earth in the word of God, whereof it is said, "Heaven and earth shall pass, but my word shall not pass," is to seek temporary things amongst eternal; and as to seek divinity in philosophy is to seek the living amongst the dead, so to seek philosophy in divinity is to seek the dead amongst the living. . . . And again, the scope or purpose of the spirit of God is not to express matters of nature in the scriptures, otherwise than in passage, and for application to man's capacity and to matters moral and divine'.*[63]

Fifteen years later, Bacon developed these ideas further in **Novum Organum** (1620), where in condemning the mixture of superstition and theology in the works of Greeks, such as Pythagoras and Plato, he argued that it was foolish to attempt to found *'a system of natural philosophy'* on the basis of the first chapter of Genesis, Job or other sections of the Bible, because such an *'unsound admixture of things divine and human'* would produce not only an erroneous philosophy, but also a heretical religion.[64] In particular, Bacon chastised the scholastic theologians of his day for this unwise mingling of *'the disputations and thorny philosophy of Aristotle with the body of Religion in an inordinate degree'.*[65]

Bacon also insisted that accurate knowledge of the physical world could only expand on the basis of inductive reasoning from a wealth of data collected by observation and experimentation. These two ideas (that is, the separation of the study of Scripture and creation, and the scientific method of inductive reasoning from observational data) were fundamental to the objectives of the Geological Society of London, founded in 1807, and many old-Earth geologists repeatedly highlighted their dependence on Bacon.[6667]

But for this study, it will also become important to consider a little-noted passage relating to Bacon's influence on geology. Just a few pages before the first quotation above from **The Advancement of Learning,** Bacon noted that the Levitical laws of leprosy teach:

> *'a principle of nature, that putrefaction is more contagious before maturity than after. . . So in this and very many other places in that law, there is to be found, besides the theological sense, much aspersion of philosophy So likewise in that excellent book of Job, if it be revolved with diligence, it will be found pregnant and swelling with natural philosophy; as for example cosmography and the roundness of the earth;* [here he quoted the Latin of Job 26:7] *wherein the pensileness of the earth, the pole of the north, and the finiteness or convexity of heaven are manifestly touched. So again matter of astronomy;* [here he quoted the Latin of Job 38:31-32] *where the fixing of the stars ever standing at equal distance is with great elegance noted. And in another place,* [here he quoted the Latin of Job 9:9] *where again he takes knowledge of the depression of the southern pole, calling it the secrets of the south, because the southern stars were in that climate unseen. Matter of generation* [here he quoted the Latin of Job 10:10] *etc. Matter of minerals* [here was another partial quote of Job in Latin] *and so forwards in that chapter. So likewise in the person of Salomon* [sic] *the King, we see the gift and endowment of wisdom and learning . . . Salomon became enabled not only to write those excellent parables or aphorisms concerning divine and moral philosophy, but also to compile a natural history of all verdure, from the cedar upon the mountain to the moss upon the wall (which is but a rudiment between putrefaction and an herb), and also of all things that breathe and move'.*[68]

Earlier he had briefly expressed his belief in a literal six-day creation, after which the creation was complete. He also believed that the Flood and the confusion of the languages at the Tower of Babel were judgments of God.[69] Some of these beliefs were expressed in more detail in his **Confession of Faith,** first published posthumously in his **Remains** (1648), but written some unknown time before

the summer of 1603.[70] This 8-page confession[71] reads like a detailed, orthodox creed.

Of particular relevance to this study, he stated that during the six days of creation God *'made all things in their first estate good*', each day's work being a *'perfection*', but that *'heaven and earth, which were made for man's use, were subdued to corruption by his fall '*. Further, he believed that although God ceased his creation work on the first sabbath and never resumed it, He has continued ever since His providential work of sustaining His creation. Also, after the Fall, He has been doing His redemptive work. Furthermore, according to Bacon,

> *'the laws of nature, which now remain and govern inviolably till the end of the world, began to be in force when God first rested from his works, and ceased to create; but received a revocation, in part, by the curse, since which time they change not'*.[72]

So clearly in Bacon's mind, the laws of nature which scientists should endeavour to discover by observation and experimentation were not the means by which God created the fully-functioning Universe and Earth with its variety of plants, animals and man.

These various remarks by Bacon about creation, the commencement of the laws of nature, Scripture and the study of nature might seem at first sight to be inconsistent or contradictory, and we might surmise that his remarks in **Novum Organum** represent a recantation of earlier statements. But there is no clear evidence that this was so.[73] All his remarks are important for understanding the nineteenth century Genesis-geology debate, in which old-Earth geologists and many Scriptural geologists disagreed over what it meant to be Baconian in one's reasoning about the created world. It will be shown that one Scriptural geologist, Granville Perm, argued (and some other Scriptural geologists explicitly agreed with him) that Bacon's beliefs, based on Scriptural revelation, about the nature of the original creation and about when the present laws of nature came into operation, were as much a part of Bacon's philosophic principles as his belief that the study of Scripture and the study of the natural world should not be unwisely mixed. In other words, the Scriptural geologists believed that the former principles of Bacon qualified the meaning of his latter principle. Scriptural geologists also contended that it was unBaconian to be dogmatic about an old-Earth general theory of the Earth, when so little of the Earth's surface had been geologically studied in the early nineteenth century. So while the old-Earth geologists claimed to be Baconian in a strict sense, the Scriptural geologists considered that they too were following Bacon in important respects.

The Enlightenment

The Enlightenment or 'age of reason' in the seventeenth and eighteenth centuries was a time when reason was elevated to the place of supreme authority for determining truth. Some, such as Rene Descartes (1596-1650) and John Locke (1632-1704), sought to use reason to defend the Christian faith, but others used reason to discard all other forms of authority, especially tradition, religious experience, ecclesiastical leadership, and the revelation of Scripture. Ironically, they often relied heavily on the writings of Locke and Descartes to do so. Hazard wrote,

> *Was there ever a more singular example of the way in which after a while a doctrine may develop ideas completely at variance with those with which it started? . . . To the cause of religion, the Cartesian philosophy came bringing what seemed a most valuable support, to begin with. But that same philosophy bore within it a germ of irreligion which time was to bring to light, and which acts and works and is made deliberate use of to sap and undermine the foundations of belief'*.[74]

Descartes used the tools of examination, free inquiry and criticism to attempt to establish with certitude issues such as the existence of God and the immortality of the soul. Sceptics used those same tools to overthrow those beliefs.

One of those sceptics was the Dutch Jew, Benedict de Spinoza (1632-1677), who began his writing career in 1663 with a favourable, yet critical, account of the Cartesian system: **Parts I and II of Descartes's Principles of Philosophy, Demonstrated in the Geometric Manner.** But his most damaging book was **Tractatus Theologico-Politicus,** which was anonymously published in 1670. Before this appeared he had published nothing *'which could shock the susceptibilities of Christians* ',[75] but this surely did. The authorities tolerated it for four years before the Dutch State formally censored it and the Roman Catholic Church placed it on its Index of banned books.

In it Spinoza swept away all the traditional Christian beliefs, seeing Christianity as only a manner of external obedience to priests. He rejected the Scriptures as the prophetic revelation of God and like many later Biblical critics he made a distinction between the Scriptures and the Word of God. Spinoza believed that the Word of God had been crusted over with errors and ancient culture by the human authors who produced the Scriptures. Not surprisingly, Spinoza strongly rejected the miracles in the Bible; miracles are impossible, he argued, because they contradict the universal laws of nature, which not even God can violate. Instead, miracles are simply events that primitive people, who were ignorant of such laws, cannot explain. He also denied the Mosaic authorship of the Pentateuch and assigned the books Genesis to II Kings to the post-exilic scribe, Ezra. His primary concern in **Tractatus** was to establish a scientific method of hermeneutics. Spinoza attempted to interpret the Bible impartially without any presuppositions. His rejection of the supernatural nature of Scripture, however, was bound to be controversial for those who found both fulfilled prophecy and miracles recorded in it.

The ideas of Spinoza, though strongly opposed at the time, made their impact on the early nineteenth century in two ways: through the teaching of the English deists and

the German and French Biblical critics, many of whom were also deists.

In many regards Spinoza lived a calm and virtuous life. This was a significant reason that the Deists were so attracted to him at a time when there was so much strife, often violent, in Europe between people of differing theological and philosophical viewpoints.[76] A late nineteenth century English historian and expert on deistic writings, Sir Leslie Stephen, said, *'It is enough to remark that the whole essence of the deist position may be found in Spinoza's* ***Tractatus'.***[77]

The essential theological beliefs or worldview of the deists can be readily seen in Spinoza (though his views had some marks of pantheism): the existence of a providential (and non-intervening), benevolent supreme Being, the obligation of man to worship this Being and to behave ethically, the need for repentance, the reality of divine rewards and punishment in this life and the next, and the supreme value of religious tolerance (because all religions are essentially the same). Deists also viewed the Creator God as a great watchmaker, who, once he had wound up the world, allowed it to run without interference according to the laws of nature. As a result, miracles were denied along with fulfilled prophecy and divine revelation. Deists sought to remove what they believed were the remaining vestiges of superstition and obscure, difficult doctrines in Christianity to make it more palatable to reasoning people of the scientific age. Major works included John Toland's **Christianity not Mysterious** (1696), Anthony Collins' **Discourse of Free Thinking** (1713), Thomas Woolston's **Discourses on the Miracles of our Saviour** (1727-1729) and Matthew Tindal's **Christianity as Old as the Creation** (1730), which became known as the 'deists' Bible'.[78]

These deists received a firm response from orthodox churchmen such as Bishops Thomas Sherlock and Joseph Butler so that by the 1750s openly deistic writers had essentially died out in England. Nevertheless, deistic ideas took root and spread into the nineteenth century, often hidden in works on natural theology, which were so prevalent in the early decades. Brooke has written,

> *'Without additional clarification, it is not always clear to the historian (and was not always clear to contemporaries) whether proponents of design were arguing a Christian or deistic thesis. The ambiguity itself could be useful By cloaking potentially subversive discoveries in the language of natural theology, scientists could appear more orthodox than they were, but without the discomfort of duplicity if their inclinations were more in line with deism '.*[79]

Nevertheless, in the early nineteenth century a number of books appeared in response to these covert deistic ideas. These writers said that although professing deists were few, those who were deists in practice under the guise of Christianity were very numerous. For example, in 1836 William J. Irons, an Anglican clergyman, wrote **On the Whole Doctrine of Final Causes,** in chapter one of which he complained of the ambiguous natural theology and German neology infecting the Church and that as a result *'a large portion of what passes as Christianity is but Deism in disguise!'* (p. 13).[80]

In Germany and France deism flourished, especially in Biblical scholarship. Immanuel Kant (1724-1804), whose influence on all subsequent European thought has been describe as a 'watershed', increasingly followed Spinoza's pantheism in the latter years of his life.[81] Spinoza made *'the first significant contribution to the modern discipline of Biblical criticism'.*[82] Gotthold Lessing (1729-1781), a leading founder of the modern German theatre and publisher of Hermann Reimarus'(1694-1768) **Fragments** (which attacked the veracity of the Old Testament and the New Testament resurrection accounts), openly professed to be a Spinozist near the end of his life. The romanticist theologian, Schleiermacher (1768-1834), spoke of *'the holy, rejected Spinoza',* who was pervaded by *'the high World-Spirit'.*[83] Many in the romanticist movement viewed him as their intellectual forefather.[84] Both Reimarus and Lessing very likely were introduced to Spinoza through the writings of the English deists. Reimarus had been in England at the height of the deistic controversy and his personal library was full of their writings.[85] Reventlow concludes his thorough study by saying that

> *'we cannot overestimate the influence exercised by Deistic thought, and by the principles of the Humanist world-view which the Deists made the criterion of their biblical criticism, on the historical-critical exegesis of the nineteenth century; the consequences extend right down to the present. At that time a series of almost unshakeable presuppositions were decisively shifted in a different direction'.*[86]

In this environment Biblical criticism steadily developed in the eighteenth and early nineteenth centuries, through the efforts of such authors (mainly French and German) as Richard Simon (1638-1712), Jean Astruc (1684-1766), J. D. Michaelis (1717-1791), J. S. Semler (1725-1791), J. G. von Herder (1744-1803), J. G. Eichorn (1752-1827), Alexander Geddes (1737-1802), and W. M. L. de Wette 1780-1849). The effect of their collective work was to challenge the divine inspiration and authority of the Bible by convincing much of the Church (especially on the continent) that many of the books of the Old Testament (in particular the Pentateuch) were written later and by different authors than Jewish and Christian tradition taught, and that each book was a compilation of many written and oral (often contradictory) sources, which contained historical inaccuracies and myths about miracles.[87-89]

As critical Biblical scholarship gained the upper hand on the continent in the late eighteenth and early nineteenth centuries, its penetration into the British Church was hindered, no doubt partly because of lasting effects of the evangelical revival led by the Wesleys and Whitefield. But there were also strong defenders of orthodoxy among high churchmen, such as Bishops Samuel Horsley (1733-1806)

and William Van Mildert (1765-1836).

From 1800 there was much resistance to German criticism in establishment circles in Britain, where it became known as 'neology', as people perceived a link between the critical scholarship and political radicalism and therefore saw it as a threat to both historic Christianity and the stability of British society. Several books appeared in response to the German ideas coming into England, including John Pye Smith's **Scripture Testimony to the Messiah** (1821), Hugh J. Rose's **The State of Protestant Religion in Germany** (1825) and Edward B. Pusey's **Historical Enquiry into the Probable Causes of the Rationalist character lately predominant in the Theology of Germany** (1828).[90] In 1832 Rev. Thomas Boys published **A Word for the Bible,** in which he defended the 'verbal and plenary' inspiration (though not oral or mechanical dictation) of every word of Scripture insuring its 'infallibility'. He defended this doctrine as the historic faith of the Church and perceived that a rapid declension of the Church was in process, as German neology undermined this belief.[91]

It should be noted here that in the late eighteenth and nineteenth centuries two leading British geologists, James Hutton and Charles Lyell, and the widely influential German geologist, Abraham Werner, all of whom were influential in the development of the theory of an old Earth, were deistic in thought.[92-94] Also, concerning those generally recognised as orthodox Christians, Rudwick has remarked that:

> *'Rather surprisingly, Hooykaas classes Buckland, Sedgwick and others, who are usually regarded as the orthodox opposition to uniformitarianism and evolution, as "semi-deists". But this seems justified, for they divided the world into two compartments: a virtually deistic part in which physical law reigned supreme, and an "interventionalist" part which was the sphere of action of the God of theism. . . . Feeling that Newtonian science had eliminated the Christian God of action from all but the personal sphere, they welcomed the geological evidence that His action had wider scope. But by this solution they implicitly accepted a deistic interpretation for all other events, and exposed their vestigial theism to gradual annihilation by the progress of the science'.*[95]

Marston's more recent work has shown that 'semi-deist' is not a legitimate label for Sedgwick, because he held many beliefs that can only be described as evangelical.[96] It is probably equally misleading to call Buckland a semi-deist. Admittedly, it is difficult to be entirely sure what ideas have influenced someone, unless he or she openly declares it. But, Sedgwick, Buckland and other geologists moved within circles in which theologically liberal ideas and the critical hermenuetics being developed by continental Biblical scholars were being introduced to England.

So a revolution in theological and philosophical worldview was in full bloom by the early nineteenth century. Its development can also be traced in the history of geology and cosmogony.

HISTORICAL DEVELOPMENTS IN GEOLOGY, PALAEONTOLOGY AND COSMOLOGY

The fundamental features of geological study (namely, field work, collection of rocks and fossils, and theory construction) were not developed until the sixteenth to eighteenth centuries. Previously, back to ancient Greek times, many scholars believed that fossils were the remains of former living things and many Christians (including Tertullian, Chrysostom and Augustine) attributed them to the Noachian Flood. But other scholars rejected these ideas and regarded fossils as either jokes of nature, the products of rocks endowed with life in some sense, the creative works of God, or perhaps even the deceptions of Satan. In the sixteenth and seventeenth centuries the debate among naturalists intensified. One of the prominent opponents of the organic origin of fossils was Martin Lister (1638-1712). John Ray (1627-1705) favoured organic origin but respected Lister's objections. But from his microscopic analysis of fossil wood Robert Hooke (1635-1703) confirmed that fossils had once lived, though he did not believe they were the result of the Flood.

Prior to 1750 one of the most important thinkers was Niels Steensen (1638-1686), or Steno, a Dutch anatomist and geologist who established the principle of superposition: sedimentary rock layers are deposited in a successive, essentially horizontal fashion. In his **Forerunner** (1669) he expressed belief in a 6,000-year old Earth and that organic fossils and the rock strata were laid down by the Flood.[97] Shortly after Steno, Thomas Burnet (1635-1715), a theologian, published his influential **Sacred Theory of the Earth** (1681) in which he argued from Scripture, rather than geology, for a global Flood. He made no mention of fossils and though he believed in a young Earth he took each day in Genesis 1 to be a year or longer. Following him, the physician and geologist John Woodward (1665—1722) invoked the Flood to explain stratification and fossilisation, in **An Essay Toward a Natural History of the Earth** (1695). In **A New Theory of the Earth** (1696) William Whiston (1667-1752), Newton's successor at Cambridge in Mathematics, shared similar views to the above. But he offered a cometary explanation of the mechanism of the Flood and he added six years to Archbishop Ussher's date of creation by his argument that each day of Genesis 1 was one year in duration. Some of his points were later used by those who favoured the day-age theory for Genesis 1. In his **Treatise on the Deluge** (1768) the geologist Alexander Catcott (1725-1779) used geological arguments to defend the Genesis account of a recent creation and global Flood which produced the geological record. On the other hand, another geologist, John Whitehurst (1713-1788), contended in his **Inquiry into the Original State and Formation of the Earth** (1778) that the Earth was much older than man and though the Noachian Flood was a global catastrophe it was not responsible for most of the geological record. On the

continent Johann Lehmann (d. 1767) studied German mountain strata and believed the primary, non-fossil-bearing rocks were from creation week, whereas the secondary rocks were attributed to the Flood. Other geologists like Jean Elienne Guettard (1715-1786), Nicholas Desmarest (1735-1815) and Giovanne Arduino (1714-1795) denied the Flood and advocated a much older Earth.[98]

In France three prominent writers developed philosophically naturalistic explanations related to Earth history (that is, explaining the origin of everything by the present laws of nature). In his **Epochs of Nature** (1778), Comte de Buffon (1708-1788) espoused the theory that the Earth had originated from the collision of a comet and the Sun. Extrapolating from experiments involving the cooling of various hot materials, he postulated that in about 78,000 years the Earth had passed through seven epochs to reach its present state. He believed in spontaneous generation, rather than gradualistic evolution, to explain the origin of living species. In an apparent attempt to avert religious opposition, he interpreted the days of Genesis 1 to be long ages, an idea which dated back to Augustine and became popular among some nineteenth century British Christians. The astronomer Pierre Laplace (1749-1827) was strongly motivated to eliminate the idea of design or purpose from scientific investigations. As a precursor to modern cosmic evolution, he proposed the nebular hypothesis to explain why the planets revolved around the Sun in the same direction and in roughly the same plane. According to this theory, published in his **Exposition of the System of the Universe** (1796), prior to the present state there was a solar atmosphere which by purely natural progressive condensation had produced rings, like Saturn's, which eventually coalesced to form planets. This theory made the age of creation even greater than that which Buffon had suggested. Jean Lamarck (1744-1829) was a naturalist specialising in the study of fossil and living shells. Riding the fence between deism and atheism, he had a strong aversion to any notion of global catastrophe. He proposed to explain the similarities and differences between living and fossil creatures by four laws of gradual evolutionary transformation commonly summarised as the inheritance of acquired characteristics. He believed in spontaneous generation, rejected the notion of extinctions, and became a fierce opponent of Georges Cuvier."

So by the latter part of the eighteenth century a number of factors were preparing the ground for the geological revolution of the coming century. Though most Christians believed in a straight-forward literal reading of the creation and Flood narratives, some were suggesting that the Earth was much older than Ussher had calculated. In addition the deists, materialists and atheists were proposing alternative cosmologies to the one found in Genesis. The idea of an initial fully-functioning creation, much like today's, was beginning to be replaced by the notion of created or uncreated, initially-simple matter, which gradually, by the laws of nature operating over untold ages, was transformed into the present state of the universe. A major shift in worldview, involving the existence and nature of God, the nature of His relationship to the creation, and the nature of the relationship of science to Biblical interpretation, was under way.

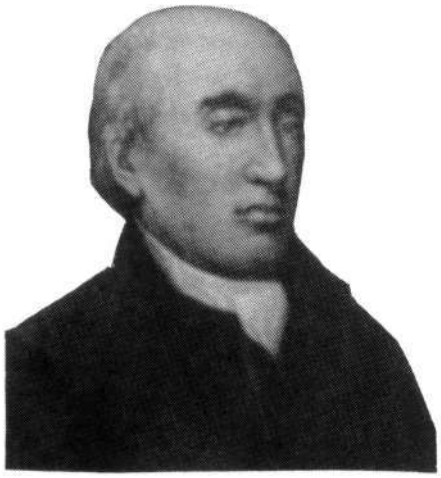
The years 1790-1820 have been called the 'heroic age' of geology. During this time geology truly became established as a separate field of scientific study. More extensive geological observations began to be made, new methods were developed for systematically arranging the rock formations, and the Geological Society of London, the first society fully devoted to geology, was born. But it was also during this period that geology became embroiled in the so-called neptunist-vulcanist debate.[100101] The founders of the two positions were respectively, Abraham Werner (1749-1817) of Germany and James Hutton (1726-1797) of Scotland.

Werner was one of the most influential geologists of his time, even though his theory was eventually overthrown.[102] As a result of intense study of the succession of strata in his home area of Saxony, which were clearly water-deposited, he developed the theory that most of the crust of the Earth had been precipitated chemically or mechanically by a slowly-receding primeval global ocean. The strata were then ordered by their mineral content. Werner did acknowledge volcanic activity but put this as the last stage of his theory, after the primeval ocean had receded to its present state.

Many objections were soon raised against his theory, but it was an attractively simple system. Furthermore, as an excellent mineralogist, Werner was an inspirational teacher for 40 years at the University of Freiberg, where he attracted the great loyalty of his students, many of whom came from foreign countries. He was not a prolific writer, but recent studies of private correspondence and lecture notes have shown that he believed and taught his students that Earth history lasted at least a million years. He felt that the Earth's crust provided more reliable historical information than any written documents. As a deist he also felt no need to harmonise his theory with the Bible.[103] Nevertheless, some writers, such as Richard Kirwan and Andre Deluc, used Werner's theory in support of the Genesis Flood.

Hutton's geological views, published in his **Theory of the Earth** (1795), were significantly different from Werner's. He did most of his geological work in and around Edinburgh, which is set on volcanic rocks, and he argued that the primary geological agent was fire, not water. Rocks were of two origins, igneous and aqueous. The latter were the result of detrital matter being slowly deposited in the ocean bottoms, which was gradually transformed into rock by the Earth's internal heat.

The distinctive characteristic of Hutton's view was its uniformitarianism: everything in the rock record must and can be explained by present-day gradual processes of erosion, sedimentation, volcanoes and earthquakes.[104] Earth



James Hutton

history was cyclical — a long process of denudation of the continents into the seas and the gradual raising of the sea floors to make new continents, which in turn would be eroded to the sea later to rise again. This theory was inspired, in part at least, by his deism: God's wise government of the rock cycle was for the benefit of all creatures.[105] It obviously expanded the age of the Earth almost limitlessly. In fact, Hutton denied that geology should be concerned with origins. He asserted instead that he saw *'no vestige of a beginning or prospect of an end'*, which apparently was not meant to deny either, but only meant that Hutton saw no geological evidence for them. His view was a clear denial of any global catastrophe, such as Noah's Flood, which was for him a geological non-event.

Hutton received harsh criticism from two prominent naturalists. Richard Kirwan was an Irish mineralogist and chemist who viewed Hutton's views as atheistic. In Geological Essays (1799) he objected that Hutton's theory was based on false evidence and was contrary to the literal interpretation of Genesis. Andre Deluc, a geologist and French-born resident of England, gave a gentler, but still negative, critique of Hutton. He took a fairly literal view of Genesis, but he was severely criticised by Kirwan for believing that the days of Genesis 1 were 'periods of time' and that the Flood was not entirely universal, but left some of the mountain tops unscathed as island refuges for vegetable and animal life.

In his **Illustrations of the Huttonian Theory of the Earth** (1802) John Playfair (1748-1819), mathematician and Scottish clergyman, republished Hutton's ideas in a more comprehensible and less overtly deistic style. He defended Hutton against Kirwan's charge of atheism by arguing that Hutton was just following the path of natural theology by observing the beautiful design in the systems of the Earth: Hutton's ceaseless cycles of geological processes were like Newton's laws of regular planetary motion. Although Playfair made no attempt to harmonise Hutton with Scripture, he did defend Hutton's notion of the Earth's great antiquity by saying that the Bible only addresses the time-scale of human history, which Hutton did not deny was relatively short, as a literal interpretation of the Bible indicated. Like Hutton, Playfair also argued that the Flood was tranquil, not a violent catastrophe.

Neither the Vulcanists nor Neptunists paid much attention to the fossils. In contrast, William Smith (1769—1839), an English drainage engineer and surveyor, worked on canals for transporting coal all over Britain. After many years of studying strata (revealed in the canal and road cuttings he helped design) and the fossils in those strata, he published three works from 1815 to 1817, containing the first geological map of England and Wales and explaining the order and relative chronology of the stratigraphic formations as defined by certain characteristic fossils rather than the mineralogical character of the rocks.[106-108] He became known as the 'father of English stratigraphy' because he gave geology a descriptive methodology, which became critical for the establishment of the theory of an old Earth. Though Smith believed that a global flood was responsible for producing the loose gravel deposits scattered over the Earth's surface, he never explicitly linked this with the Noachian Flood and believed that all of the sedimentary strata were deposited many long ages before this flood by a long series of supernatural catastrophes and recreations of new forms of life.[109]

Another important development at this time in Britain was the establishment of the Geological Society of London in 1807. The thirteen founding members were wealthy cultured gentlemen, who were lacking much in geological knowledge but made up for it by their enthusiasm to learn. They met monthly at the Freemason's Tavern (until the Society outgrew it) and after an expensive dinner discussed the advancements of geology. The cost of membership and the initial restriction of membership to London residents were two reasons why most practical geologists associated with mining and road and canal building, such as William Smith, John Farey and Robert Bakewell, did not become members.[110] The stated purpose of the society was to gather and disseminate geological information, help standardise geological nomenclature and facilitate cooperative geological work, though in fact it also sought, without much success, to be a stabilising and regenerating socio-economic influence in the face of potential and actual French-style unrest in Britain.[111] From its inception it was dominated by men who held the old-Earth view (the relation of Genesis to geology was never discussed in its public communications), though it did not overtly favour either uniformitarianism or catastrophism, as its first president and influential member, George Greenough, believed on Bacon's principles that in the 1810s and 1820s it was too early in the data collection process to formulate theories of the Earth.

By the end of the 1820s the major divisions of the geological record were quite well defined. The **primary** rocks were the lowest and supposedly oldest and were mostly igneous or metamorphic rocks devoid of fossils. The secondary rocks were next and were predominantly

sedimentary strata that were fossiliferous. The **tertiary** formations were above these, also containing many fossils, but which more closely resembled existing species. Lastly, were the most recent **alluvial** deposits of gravel, sands and boulders topped by the soils.

In the early 1800s Georges Cuvier (1768-1832), the famous French comparative anatomist and vertebrate palaeontologist, developed his theory of catastrophism[112] as expressed in his **Theory of the Earth** (1813). This went through several English editions over the next twenty years, with an appendix (revised in each later edition) written by Robert Jameson, the leading Scottish geologist. The son of a Lutheran soldier, Cuvier sought to show a general concordance between science and religion.[113] In his **Theory** he seems to have treated post-Flood Biblical history fairly literally, but did not interact with the text of the Scriptural accounts of the creation and Flood at all. He reacted sharply against Lamarck's evolutionary theory of the inheritance of acquired characteristics and his denial of extinctions. From his study of the fossils of large quadrupeds found in the strata of the Paris Basin, Cuvier concluded that there had indeed been many extinctions, but not all at once. Rather, he theorised that in the past there had been many catastrophes, the last of which had been the Noachian Flood. Like William Smith he believed that each of the strata was characterised by wholly unique fauna. The fauna had appeared for a time and then were catastrophically destroyed and new life forms arose. In opposing Lamarckian evolution Cuvier presumably believed these new species were separate divine acts of special creation, but he did not explicitly explain this. He believed that Earth history was very much longer than the traditional 6,000 years, but that the Flood had occurred only a few thousand years ago, just as the Bible indicated. These violent catastrophes were vast inundations of the land by the sea, but not always global so that whole species were not always eliminated. According to Cuvier, Man had first appeared sometime between the last two catastrophes.

William Buckland (1784-1856) was the leading geologist in England in the 1820s and followed Cuvier in making catastrophism popular. Like many scientists of his day, he was an Anglican clergyman. He obtained readerships at Oxford University in mineralogy (1813) and geology (1818), and was a very popular lecturer. Two of his students, Charles Lyell and Roderick Murchison, went on to become leading geologists in the 1830s and 1840s. In his efforts to get science, and especially geology, incorporated into university education (which was designed at the time to train Christian ministers) Buckland published **Vindiciae Geologicae** (1820). Here he argued that geology was consistent with Genesis, confirmed natural religion by providing evidence of creation and God's continued providence, and proved virtually beyond refutation the fact of the global, catastrophic Noachian Flood. The geological evidence for the Flood was, in Buckland's view, only in the upper formations and surface features of the continents;

Georges Cuvier

the secondary formations of sedimentary rocks were antediluvian by untold thousands of years or longer. To harmonise his theory with Genesis he considered the possibility of the day-age theory but favoured the gap theory. Like Cuvier, he held to the theory of multiple supernatural creations and the recency of the appearance of man and the Flood.

As a result of further field research, especially in Kirkdale Cave in Yorkshire, he published in 1823 his widely read **Reliquiae Diluvianae,** providing a further defence of the Flood. However, the uniformitarian criticisms of John Fleming and Charles Lyell eventually led Buckland to abandon this interpretation of the geological evidence. He publicised this change of mind in his famous two-volume **Bridgewater Treatise** in 1836, where in only two brief comments he described the Flood as tranquil and geologically insignificant.[114] Buckland showed in personal correspondence in the 1820s that for him geological evidence had a superior quality and reliability over textual evidence (for example, the Bible) in reconstructing the Earth's history.[115] In his view, this was because written records were susceptible to deception or error, whereas the rocks were truthful and cannot be altered by man.

Adam Sedgwick was Buckland's counterpart at Cambridge University. Through the influence of these two and others (for example, George Greenough, William Conybeare, Roderick Murchison and Henry De la Beche), old-Earth catastrophist (or diluvial) geology was widely accepted in the 1820s by most geologists and academic theologians.

The reasons most geologists believed the Earth was much older than 6,000 years and the Noachian Flood was not the cause of the secondary and tertiary formations were several.[116-118] First, the **primitive** rocks were covered by at least two miles of secondary and tertiary strata, in which was seen evidence of slow gradual deposition during successive periods of calm and catastrophe. Second, some strata were clearly formed from the violent destruction of older strata. Third, different strata contained different fossils; it was especially noted that strata with terrestrial and fresh-

Adam Sedgwick

water shells alternate with those containing marine shells, and that strata nearest the surface contained land animals mixed with marine creatures. Fourth, generally speaking, the lower the strata were, the greater was the difference between fossil and living species, which to old-Earth geologists implied many extinctions as a result of a series of revolutions over a long time. Fifth, the evidence that faults and dislocations occurred after the deposition and induration of many strata implied a lapse of time between the formation of the various strata. Finally, there was the fact that man was apparently only found fossilised in the most recent strata. From this evidence the Earth was believed to be tens of thousands, if not millions, of years old and the relatively recent Noachian Flood was considered to be the cause only of the rounded valleys and hills carved into consolidated strata and of the loose gravels and boulders scattered worldwide over the surface of those strata.[119]

A massive blow to catastrophism came during the years 1830 to 1833, when Charles Lyell (1797-1875), a lawyer by training as well as a former student of Buckland, published his masterful three-volume work, **Principles of Geology.** Reviving the ideas of Hutton and stimulated by the writings of John Fleming, the Scottish minister and zoologist, and George Scrope, the MP and volcano expert, Lyell's **Principles** set forth how he thought geology should be done. His theory was a radical uniformitarianism in which he insisted that only present-day processes at present-day rates of intensity should be used to interpret the rock record of past geological activity. The uniformity of rates was an addition to Hutton's theory but was the essential, distinctive feature of Lyell's view.

Although the catastrophist theory had greatly reduced the geological significance of the Noachian Deluge and expanded Earth history well beyond the traditional Biblical view, Lyell's work was the *coup de grace* for belief in the Flood,[120] in that it explained the whole rock record by slow gradual processes, (which included very localised catastrophes such as volcanoes and earthquakes at their present frequency of occurrence around the world), thereby reducing the Flood to a geological non-event. His theory also expanded the time of Earth history even more than Cuvier or Buckland had done. Lyell saw himself as *'the spiritual saviour of geology, freeing the science from the old dispensation of Moses'.*[121] However, catastrophism did not die out immediately, although by the late 1830s few old-Earth catastrophists in the UK, America or Europe believed in a geologically significant Noachian Deluge.

Lyell's uniformitarianism applied not only to geology, but to biology as well. Initially he had held to a sense of direction in the fossil record, but in 1827 after reading Lamarck's work he had chosen the steady-state theory that species had appeared and disappeared in a piecemeal fashion (though he did not explain how). Lamarck's notion that man was simply a glorified orangutan was an affront to human dignity, thought Lyell. He held man alone to be a recent creation, and even after finally accepting Darwinism he believed that the human mind could not be the result of natural selection.

From the mid-1820s, geology was rapidly maturing as a science. Smith's stratigraphic methodology (using fossils to correlate the strata) was applied more widely by a growing body of geologists to produce more detailed descriptions and maps of the geological record. There was still debate over the nature and origin of granite, and although Cuvier's interpretation of the Paris Basin was widely accepted, it also was being challenged. By the early 1830s all the main elements of stratigraphic geology were established, and maps and journal articles became more technical as geology was making the transition from an amateur avocation to a professional vocation. The 1830s and 1840s saw much debate about the classification of the lowest fossiliferous formations (the Devonian to Cambrian), and the glacial theory began emerging to explain what the earlier catastrophists had attributed to the Flood. By the mid-1850s all the main strata were identified and the nomenclature was standardised. However, none of these developments added any fundamentally new reasons for believing in a very old Earth. So whether the Scriptural geologists were arguing against the old-Earth theory before or after Lyell's **Principles of Geology,** they were dealing with the same basic arguments that had been dominant since around the turn of the century.

In response to these different old-Earth theories, Christians were confronted with the choice of various ways of harmonising them with Genesis. As stated earlier, many of these old-Earth proponents believed in the inspiration, infallibility and historical accuracy of Genesis, but disagreed with the Scriptural geologists about the correct interpretation, in some cases even the correct **literal** interpretation, of the text.

In a sermon to his church in 1804, the gap theory began to be propounded by the young pastor, Rev. Thomas Chalmers (1780-1847), who soon became one of the leading Scottish evangelicals. His views reached a wider audience when in 1814 he wrote a review of Cuvier's theory.[122,123] This became the most popular old-Earth view among Christians for about the next half century. From 1816

onwards Bishop John Bird Sumner, who later became the Archbishop of Canterbury, also favoured the gap theory.[124] The high church Old Testament professor at Oxford, E.B. Pusey, likewise endorsed this interpretation of Genesis 1 in the 1830s.[125]

The respected Anglican clergyman, George Stanley Faber (1773-1854), began advocating the day-age theory in his **Treatise on the Genius and Object of the Patriarchal, the Levitical, and the Christian Dispensations** (1823).[126,127] This figurative interpretation of the days of Genesis 1 was not widely accepted by Christians until Hugh Miller (1802-1856), the prominent Scottish geologist and evangelical friend of Chalmers, revived it in the 1850s.[128,129]

Also in the 1820s the evangelical Scottish zoologist, Rev. John Fleming, began arguing for a tranquil Noachian Deluge, and in the late 1830s the evangelical Congregationalist theologian, John Pye Smith (1774-1851), advocated a local creation and a local Flood both of which occurred in Mesopotamia.[130-132]

Another approach was taken by the Anglican clergyman and Oxford geometry professor Baden Powell and other liberal 'Christians'. Following a few churchmen of former generations and in company with many continental Biblical scholars, they treated Genesis as a myth which conveyed theological and moral truths, and which one should not attempt to harmonise with geology at all.[133]

Nevertheless, many evangelicals and high churchmen still clung to the literal view of Genesis (that is, a recent creation and global geologically-significant Noachian Flood).

Besides these revolutions of thought transpiring in theology and science, there were other upheavals in the nineteenth century which contributed to a major change in European and North American society.

THE EARLY NINETEENTH CENTURY SOCIAL AND RELIGIOUS *MILIEU*

A Time of Revolution

Two revolutions had a significant effect on life in Britain (and in the wider Western world) in the early nineteenth century: the socially disruptive Industrial Revolution and the physically violent French Revolution.

The Industrial Revolution (roughly 1760-1840) was a time of great transformation from a society based on agriculture and craft industries to one based on industrial factory structure and urban living. The population had begun to grow rapidly in the eighteenth century as a result of increasing life expectancy, which was precipitated by improvements in diet, medical care, sanitation and housing. This provided the industrialisation process with a larger work-force, a significant portion being women and children which brought many changes to family life. As the process of enclosing and privatising common land continued from the previous century, farms became larger and, combined

Charles Lyell

with improved farming practices, more productive. As a result many agricultural workers moved to the cities to find work in factories. Transportation and communication were greatly improved during the period through the building of canals, better roads, bigger ports and more railway lines. And of course it was a time of exciting invention. New products for both industrial and domestic application were developed, and new markets were opened at home and abroad as Britain became the leading economic power of the world. The Industrial Revolution generally expanded the middle class and raised the standard of living for most people. However, it also increased the disparity between the very rich and the very poor and many found life extremely harsh, both in urban living and factory working conditions, which was a source of class friction.[134135]

The French Revolution of 1789-1799 was a violent revolt of the peasants, working class and middle class against the oppressive rule of the King. Though democracy was not achieved, the Revolution spread democratic ideas of liberty and equality all over Europe, which tended to restrict the power of monarchs. It demonstrated the power of the lower and middle classes, when organised, to cause violent political change. Napoleon came to power as dictator in 1799, ending the French Revolution, and began the building of his empire all over Europe, which involved Britain in war for much of the next fifteen years. He was finally defeated in 1815. This turmoil in France affected Britain in at least three ways. Along with other wars in the late eighteenth and early nineteenth centuries, it helped fuel the Industrial Revolution as the British army and navy consumed large quantities of agricultural and industrial products. It stimulated political reform by providing a model for the poor lower classes to seek political change through violence, while at the same time motivating the ruling upper classes to compromise in reforming parliament out of fear of social chaos. And while for some it symbolised the destruction of despotism in the church and state, most Britons saw French atheism as the root cause of much-feared political anarchy and public immorality, and so wanted England to remain a Christian nation.[136-139]

Among the political and social changes in the early

nineteenth century were the abolition of the slave trade in 1807 and slavery altogether in the British Empire in the 1830s, as well as the child labour laws of 1802 and 1819. Additionally, Catholics and non-Anglican Protestants were increasingly voicing their complaints about the social and political inequalities and injustices produced by an established church. In 1828 the Test and Corporation Acts repealed discriminatory laws against Protestant dissenters, and the Roman Catholics were finally given the right to hold public office by the Relief Act of 1829. Under a Whig government, further changes were made by the Reform Act of 1832 in the area of political representation. These and other changes contributed to a more democratic Parliament, a more powerful House of Commons, and greater national stability under Queen Victoria's reign (1837-1901).[140-142]

The Make-Up of the British Church

The established Church of England was also beginning to undergo important changes in the first half of the nineteenth century. It was roughly divided into three ecclesisatical 'camps': the high or orthodox, the low or evangelical, and the broad or liberal churchmen; but of course there were people whose beliefs bridged the boundaries of these categories. The eighteenth century evangelical revival was still having a significant effect, and evangelicals, motivated by Biblical convictions and led by the 'Clapham Sect', were largely responsible for many of the social and political reforms as they fought to end slavery, improve the working conditions of children, supported Roman Catholic political emancipation, started mission and Bible societies, founded schools, libraries and savings banks, built churches, and improved prison conditions.[143] Up until the mid-1830s at least, the real spiritual force in the church came from the evangelicals and to a lesser extent the high churchmen.[144] Although high churchmen were often critical of 'enthusiastic' Methodists and other non-conformists, as well as evangelical Anglicans, they all shared much in common in terms of their views of Scripture, the gospel and the spiritual needs of the church and nation. Two of the most able theologians among the high churchmen were Bishop Samuel Horsley (1733-1806) and Bishop William Van Mildert (1765-1836). Though there were effective evangelical clergy spread all over the country, two high concentrations of leaders were found in Cambridge, where Charles Simeon was most well-known, and in London at the Clapham Anglican church (base of the 'Clapham Sect'), where the anti-slavery MP William Wilberforce and several other prominent men had their base.[145]

The Cambridge Network

The broad church or liberal views were also represented and propogated at Cambridge, through (but not exclusively through) what has been called the 'Cambridge Network'. This was a close-knit group of scientists, historians, university dons and other scholars and church leaders, which originated in the early 1810s and had the greatest influence in university reform and in the development of science, particularly in the British Association for the Advancement of Science (BAAS), the Astronomical Society, the Geological Society and the science department of the Royal Society.[146-148] Not all the people in this network of relationships were theological liberals, but many were, and even the orthodox associated with it may have been influenced to some extent by liberal ideas.[149]

Key men in this network included John Herschel, Charles Babbage and George Peacock, all undergraduates at Cambridge in the years 1811-1813. Herschel soon became one of the world's greatest astronomers, Babbage excelled in mathematics, and Peacock re-founded the Cambridge Observatory, tutored at Trinity College for a time, and eventually became Dean of Ely Cathedral. These men were joined in 1818-1819 by William Whewell, who became master of Trinity College in 1841 and the leading historian and philosopher of science in the early nineteenth century, George Airy, who was later appointed Astronomer Royal, Adam Sedgwick,[150] who in 1818 became Woodwardian Professor of Geology at Cambridge, William Hopkins, prominent physics professor, E. D. Clark, a leading mineralogist, and John Henslow, an important botanist and co-founder with Sedgwick of the Cambridge Philosophical Society.

Added to these scientists were several other men in the network who drank deeply from the wells of German philosophy, Biblical criticism and historiography and passed on their knowledge to others. Julius Hare and Connop Thirlwall were both students at Cambridge in 1812-1814, and even then knew more of German scholarship than their professors. Both tutored for a while at Trinity College. Later, Hare was an ineffective rural rector, but was a successful mentor for his nephew, Arthur Stanley, who later became a liberal canon of Canterbury. Thirlwall became a leading liberal and influential bishop of St. Davids. Together Hare and Thirlwall published in 1827 their translation of B. G. Niebuhr's **History of Rome** (1811-1812), which sold more copies than the German original. This, along with Henry Milman's **History of the Jews** (1829), effectively disseminated the ideas of German sceptical scholarship in the UK.[151] A small discussion group within the Network in the 1820s was the 'Cambridge Apostles'. It was led by E D. Maurice and absorbed and imparted Niebuhr's 'anti-mythical methods to the Bible and to Christian tradition generally'.[152] Probably more than any other group, the Cambridge Network contributed to the theological revolution of the nineteenth century, which saw the traditional orthodox view of Scripture held by evangelicals and high churchmen dwindle into relative insignificance.

The Oxford Movement

A quite different and opposing movement was centred at Oxford University. As noted earlier, in the late 1820s and early 1830s dissenting Protestants were pushing hard for the disestablishment of the Church of England, and

several Acts of Parliament brought changes improving the position of dissenters and Roman Catholics. A few leading Oxford professors connected with Oriel College, such as John Keble, Henry Newman, Edward Pusey and Hurrell Froude, saw this governmental infringement as a threat to the apostolic authority of the Anglican Church and to the stability of the nation. So in 1833 they began to express their opposition publicly in the form of sermons and **Tracts for the Times,** from which they gained the label 'Tractarians'. They spoke out against the critical rationalism, scepticism, spiritual lethargy, liberalism and immorality at the time. They elevated the authority of church tradition over the Scriptures, revived seventeenth century sacramental attitudes towards nature and the world, and paid careful attention to church furnishings and worship services. Ironically, in spite of the anti-popery of many of these tracts, many in the Oxford Movement eventually left the Anglican Church in the mid-1840s and joined the Roman Catholic Church. Those who stayed, such as Pusey, developed the Anglo-Catholic party.[153-155]

Though evangelical Anglicans shared the Tractarians' concern for the continued establishment of the Church of England, they rejected three of their most important beliefs: the supreme authority of tradition (instead of Scripture) for the Church, their Catholic view of justification, and their Catholic views of ministry and the sacraments.[156]

The 'Bridgewater Treatises'

Another strand of the theological tapestry of those days was the emphasis on natural theology. With the Baconian notion of the 'two books' (Scripture and creation) firmly in mind, natural theology began to develop in Britain in the late seventeenth century. Throughout the next century, science was seen by leading Christian scientists, philosophers and theologians as a means of demonstrating the existence and providence of God and so serving as a support for Christian faith. By the time of William Paley's celebrated **Natural Theology** in 1802, scientific knowledge of creation was being used in a design argument that not only 'proved' the existence of God and His providence in creation, but also demonstrated the attributes of God.[157158] One of the last expressions of this kind of writing was the collection of eight **Bridgewater Treatises,** first published in the years 1833 to 1836.[159] Seven prominent scientists and one prominent theologian were commissioned (and paid £1000 each) through the will of the recently deceased Earl of Bridgewater to present from various fields of science the abundant evidence in creation of God's power, wisdom and goodness.[160] The treatises were full of scientific information which illustrated Paley's thesis, but they did not defend the legitimacy of the inference from design in nature to a designer God. Though they referred to Scripture occasionally, they generally did not comment on the relation between science and the Bible.[161] One of the biggest criticisms of the treatises was their overly optimistic handling of the difficult problem of pain, disease, disaster and death in creation. Generally, they either ignored the problem or dealt with it superficially, attributing the evil in a mysterious way to divine beneficence.[162] In this study, the most important treatise was William Buckland's on geology, for it attracted much criticism from the Scriptural geologists.

The BAAS and Other Scientific Organisations

Great technological advancements and more comfortable living, for the middle and upper classes especially, were elevating the importance and influence of science and scientists in society. The BAAS also greatly contributed to this. It was founded in 1831 in York, modelled after the German association, Deutsche Naturforscher Versammlung. The BAAS sought to stimulate friendships among scientists, increase public knowledge and government support of science, coordinate scientific research (especially by what it hoped would be a growing number of amateur scientists) and facilitate intercourse with foreign scientists. As a means of achieving these aims it held its annual meeting in a different provincial city each year, opened its meetings to the public, and opened membership with low dues to those of any other philosophical society. Its constitution embraced the Baconian principles for interpreting nature: to focus on intermediate, rather than final, causes and to avoid dogmatic systems of philosophy by concentrating on the objective gathering of facts. In light of this, the BAAS insisted on broad religious tolerance in order to transcend doctrinal differences and avoid religious controversy. In the early years it faced strong opposition. Charles Dickens, **The Times,** and others criticised it for the pomp, extravagance and self-laudation of its annual meetings. More significantly, Tractarians accused it of religious pluralism and deistic science, which they believed was contributing to the de-Christianising of the universities.[163-166] One Scriptural geologist, William Cockburn, was particularly critical of the BAAS on similar grounds.

The BAAS annual meetings were not the only means of increasing the understanding and influence of scientific knowledge in society. In the 1820s Mechanics Institutes began to form in a number of provincial cities. These were intended to teach artisans and mechanics scientific information that would be practically useful in their trades. For a number of reasons they failed in this objective, though they did help to encourage young people to pursue scientific studies, and some of the Institutes went on to become polytechnics or universities. From an examination of the contents of many of their libraries, it would appear that in the early and mid 1800s little attention was paid to geology, and it is unlikely that the writings of Scriptural geologists were found in those libraries.[167] The Society for the Diffusion of Useful Knowledge began about the same time and sought to produce and distribute cheap and useful books, many of which dealt with science. The middle class also had access to scientific knowledge (along with other

Martin Luther

subjects) through lectures, libraries and museums of the many Literary and Philosophical Societies that sprang up in major cities in the 1810s to 1830s. Many of these contributed significantly to the study of local geology and collection of fossils. In the following decades natural history societies and field clubs also provided amateur science students the opportunity to contribute to the growth of knowledge in botany, zoology and geology.[168]

BIBLICAL INTERPRETATION

To assess properly the Scriptural geologists, one needs also to understand the views of Scripture generally and Genesis 1-11 in particular held by evangelicals and high churchmen, especially the Bible commentators. The following summarises first the views of four of the most influential older commentators (Augustine, Luther, Calvin and Wesley), and then the commentaries in use in the early nineteenth century.

Augustine, Luther, Calvin and Wesley

Augustine of Hippo (354-430) was perhaps the greatest theologian of the early Christian Church, and through his voluminous writings he had a tremendous influence on the thinking of Christians for nearly thirteen centuries.[169170] After two previous attempts at commenting on Genesis, both of which took a decidedly allegorical approach, Augustine published in 415 his last commentary on the first three chapters of Genesis, **The Literal Meaning of Genesis,** which was *'the most significant attempt made during the patristic period'* to clarify the meaning of these chapters.[171] Based on the Latin translation of Genesis,[172] he endeavoured to do what his title indicated — give a literal-historical interpretation to Genesis rather than looking for allegorical meanings, into which however he still often slipped. Concerning the meaning of the six days of creation, he openly struggled in uncertainty and leaned towards an allegorical interpretation.[173] Though insisting that he was interpreting 'day' literally, he tended to regard at least the first three days before the creation of the heavenly bodies to be non-literal, unlike modern days, which are measured by the Sun, Moon and stars.[174] In any case, he considered that the plants and animals were created miraculously and fully formed in an instant on the various days (rather than gradually by present-day processes of nature), and that creation was complete on the seventh day.[175] In rejecting the uniformitarian and catastrophist views of his day,[176] he argued that 6,000 years had not yet passed since the creation of Adam, the first man, and that the antediluvian patriarchs had literally lived some 900 years.[177178] He argued at some length that the Noachian Flood was a historical global catastrophe and that all men were descended from Noah, having been dispersed throughout the Earth after the confusion of languages at the Tower of Babel.[179]

Martin Luther (1483-1546) started his verse-by-verse commentary on the book of Genesis in 1535 and completed it ten years later.[180181] Criticising Augustine in several points for his lapse into allegorical interpretations, Luther frequently insisted that the first eleven chapters were literal history.[182183] He took all the days of creation as literal 24-hour days, with the Sun and other heavenly bodies created on Day 4, and believed that all this took place less than 6,000 years before. Referring to Exodus 20:11, he argued that Genesis 1:1 was the beginning of the first day and was not describing a creation before the first day.[184] He stressed that at the end of the week of creation, everything was perfect and God ceased (and never resumed) His creative work; procreation of life continues under His providence.[185] The animals initially were vegetarian and some only became carnivorous as a result of God's curse at the Fall, which Luther believed affected the whole Earth, not just man.[186] This curse was made more severe at the Flood, which destroyed the whole surface of the Earth, obliterating among other things the Garden of Eden, which, according to Luther, is the reason we cannot now find it. He said the pre-Flood world was like a paradise compared to the Earth afterwards.[187,188]

The other great reformer, John Calvin (1509-1565), also took the early chapters of Genesis as reliable history handed down faithfully and without corruption from Adam to Moses.[189190] Many have remarked on Calvin's notion of accommodation.[191192] He said that Moses sometimes *'accommodated his discourse to the received custom'* of the Jews[193] and *'does not speak with philosophical acuteness'* but *'addresses himself to our senses'* using a *'homely style'*.[194] However, it has often not been noted that Calvin nevertheless contended for a creation of the world in six literal days less than 6,000 years ago.[195196] He emphasised the literal order of the creation events, especially that light was created on Day 1 before the Sun and other celestial bodies on Day 4, and the literal creation of Adam from dust and Eve from the rib of Adam.[197] In his view, the Fall brought a curse on the whole creation, not just on man, and the global Flood, which was *'an interruption in the order of nature'*, destroyed the animals and the surface of

the Earth along with man.[198]

John Wesley (1701-1791) clearly favoured the practical benefits of science and wrote two books to popularise useful knowledge in medicine and electricity. But he was wary of theoretical science because of its potential for leading people towards deism or atheism. In his two-volume **Survey of the Wisdom of God in the Creation** (1763) he relied heavily on the work of others in presenting the traditional arguments from design for God's existence, as was so popular in eighteenth and early nineteenth century Britain.[199] He never wrote extensively on creation or the Flood, but in this work he stated his belief that the various rock strata were *'doubtless formed by the general Deluge'* and that the account of creation, which was about 4,000 years before Christ, was, along with the rest of the Scriptures, *'void of any material error'*.[200-201] In several published sermons he repeatedly emphasised that the original creation was perfect, without any moral or physical evil (such as earthquakes, volcanoes, weeds and animal death), which both came into the world after man sinned.[202-205]

Commentaries in the Early Nineteenth Century

We now turn to the nineteenth century commentaries. Extremely important in this regard is the work of Thomas Hartwell Home (1780-1862), who was an Anglican clergyman, although for much of his working life he also served as assistant librarian in the department of printed books at the British Museum. He did not write a commentary on the Bible, but he was one of the great Biblical scholars of his time. Among his numerous literary productions, his greatest work was the massive **Introduction to the Critical Study of the Holy Scriptures,** first published in 1818 in three volumes (1,700 pages) after 17 years of research. Not finding an adequate resource for his own study of the Bible, Home had read, and in many cases bought, the writings of the most eminent Biblical critics, both British and foreign.[206] Continually revised and expanded, Home's work grew to five volumes by the ninth edition in 1846, with two more editions after that in the United Kingdom and also many editions in America during these years. In spite of its size and cost, these editions sold over 15,000 copies in the United Kingdom and many thousands in the United States of America.[207] From the start it received high reviews from magazines representing all the denominations (and both high church and evangelical Anglican), and was one of the primary textbooks for the study of the Scriptures in all English-speaking Protestant colleges and universities in the British empire.[208209] A one-volume abridged version, designed for the common man, was **A Compendious Introduction to the Study of the Bible,** which was first published in 1827 and eventually reached a tenth edition in 1862.

Given Home's great influence on the Church, both its clergy and laity, it is helpful to consider briefly his views on the inspiration of Scripture, the Mosaic authorship of the Pentateuch and the interpretation of Genesis.

Home's view of the nature and extent of the inspiration of Scripture was expressed in the following.

> *'When it is said, that Scripture is divinely inspired, we are not to understand that the Almighty suggested every word, or dictated every expression. From the different styles in which the books are written, and from the different manner in which the same events are related and predicted by different authors, it appears that the sacred penmen were permitted to write as their several tempers, understandings, and habits of life directed. . . Nor is it to be supposed that they were even thus inspired* [by direct revelation] *in every fact which they related, or in every precept which they delivered. They were left to the common use of their faculties, and did not, upon every occasion, stand in need of supernatural communication . . . In some cases, inspiration only produced correctness and accuracy in relating past occurrences, or in reciting the words of others.'*[210]

He then defined four degrees of inspiration: inspiration of direction (for example, Solomon's wise counsel), of superintendency (that is, protecting from error), of elevation (that is, revealing previously unknown ideas), and of suggestion (that is, giving exact words). He continued,

> *'But whatever distinctions are made with respect to the sorts, degrees or modes of inspiration, we may rest assured that one property belongs to every inspired writing, namely, that it is free from error, that is any material error. This property must be considered as extending to the whole of each of those writings, of which, a part only is inspired;*[211] *for it is not to be supposed that God would suffer any such errors, as might tend to mislead our faith or pervert our practice, to be mixed with those truths, which he himself has mercifully revealed to his rational creatures as the means of their eternal salvation. In this restricted sense it may be asserted, that the sacred writers always wrote under the influence, or guidance, or care, of the Holy Spirit, which sufficiently establishes the truth and divine*

John Calvin

authority of all Scripture.

That the authors of the historical books of the Old Testament were occasionally inspired[212] *is certain, since they frequently display an acquaintance with the counsels and designs of God, and often reveal his future dispensations in the clearest predictions. But though it is evident that the sacred historians sometimes wrote under immediate operation of the Holy Spirit, it does not follow that they derived from Revelation the knowledge of those things, which might be collected from the common sources of human intelligence. It is sufficient to believe, that, by the general superintendence of the Holy Spirit, they were directed in the choice of their materials, enlightened to judge the truth and importance of those accounts from which they borrowed their information, and prevented from recording any material error. . . It is enough for us to know, that every writer of the Old Testament was inspired, and that the whole of the history it contains without any exception or reserve, is true'.*[213,214]

This view of the inspiration of Scripture (which kept it free from error, especially in the historical books) was expressed by Home throughout his life as well as by other Biblical scholars.[215] Thomas Scott, in the preface to his commentary on the Bible, wrote that inspiration meant:

'Such a complete and immediate communication, by the Holy Spirit, to the minds of sacred writers, of those things which could not have been otherwise known; and such an effectual superintendency, as to those particulars concerning which they might otherwise obtain information, as sufficed absolutely to preserve them from every degree of error, in all things which could in the least affect any of the doctrines or precepts contained in their writings, or mislead any person who considered them as a divine and infallible standard of truth and duty. Every sentence, in this view, must be considered as "the sure testimony of God," in that sense in which it is proposed as truth. Facts occurred, and words were spoken, as to the import of them, and the instruction contained in them, exactly as they stand here recorded'.[216]

Rev. William Symington, in his introduction to the 1841 edition of Scott's commentary, added,

'The Scriptures are an authoritative, perfect, and infallible rule of faith,. . . embracing every truth which man is to believe, every duty which man is required to perform, every consolation which man can need to enjoy; as to history beginning with creation and ending with the consummation of all things . . .'[217-218]

Referring to the arguments of continental Biblical critics such as Astruc, Eichhorn, Rosenmuller and Bauer (along with Geddes from Scotland), Home vigorously contended for the Mosaic authorship of the Pentateuch and the literal historicity of Genesis, especially the first three chapters, stating that Genesis *'narrates the true origin and history of all created things, in opposition to the erroneous notions entertained by the heathen nations'.*[219] Home also responded to objections for a global Noachian Flood, which he believed was confirmed by fossils, the paucity of the human population, the late inventions and progress of the arts and science, and the flood traditions of other peoples from around the world.[220,221] In 1834 he considered Granville Penn's (one of the Scriptural geologists) **Comparative Estimate of the Mineral and Mosaical Geologies** the best harmonisation of geology and Scripture, whereas in 1839 it was George Fairholme's (another Scriptural geologist) **The Mosaic Deluge.**[222,223] Not until the 1856 edition of his **Introduction** did he accept the gap theory and local flood theory.[224]

To the proper interpretation of Scripture Home devoted about 480 pages. He argued that a word in a given context had only one intended meaning, but that there were two senses: the literal and the spiritual sense. The latter was rooted in the former and was not a transfer of meaning of the words, but the application of them to a different subject (for example, the literal sacrifice of Isaac in Genesis 22 spiritually applies to Christ). Because of the past abuse of the spiritual sense, he cautioned against too much use of it. Instead he said the *'plain, obvious literal meaning'* should be sought, and not abandoned for a figurative interpretation unless there is *'absolute and evident necessity'* in the text or wider Scriptures.[225] Such necessary cases were those in which the literal meaning contradicted doctrinal or moral teachings of other Scriptures or clearer passages on the same subject or in which it resulted in a logical absurdity (though he cautioned against too quickly concluding that there was a real absurdity).[226]

Home also devoted 70 pages to the various kinds of figurative language used in the Bible, but he prefaced it by saying,

'The literal meaning of words must be retained, more in the historical books, than in those which are poetical. For it is the duty of an historian to relate transactions simply as they happened; while a poet has license to ornament his subject by the aid of figures,. . . the style of narration in the historical books is simple and generally devoid of ornament. . . we must not look for a figurative style in the historical books, and still less are historical narratives to be changed into allegories and parables, unless these be obviously apparent. Those expositors therefore violate this rule for the interpretation of the Scriptures, who allegorize the history of the fall of man or that of the prophet of Jonah'.[227]

In 1814 William Van Mildert (1765-1836), Regius Professor of Divinity at Oxford, delivered the Oxford Bampton lectures, in which he discussed the interpretation of Scripture. He affirmed that correct interpretation depended on a due reverence for Scripture as a work of divine inspiration and on a willingness to obey and believe what was learned from Scripture. He insisted on the absolute authority of Scripture over tradition (especially the

NAME[a] (YEAR)[b]	DATE OF CREATION	GENESIS 1:1[c]	'DAY'	GENESIS 1:14 SUN ON DAY 4[d]	FLOOD	JOSHUA 10:12[e]	PSALM 19:5–6[f]	PSALM 96:10[g]
Ainsworth (1639)	4004 BC	Day 1	24 hour	nc	global	nc	nc-a	nc-a
Richardson (1655)	4004 BC	Summary	24 hour	nc	global	1m	rh	nc
Stackhouse/Gleig[a] (1817/1737)	ages ago?[h]	nc	24 hour	nc	global	1m-h	nc	nc
Patrick (1809/1738)	4004 BC?[i]	nc	24 hour	created	global	1m, nc-a	nc	nc
Gill (1809/1763)	4004 BC	Day 1	24 hour	created	global	1m-h	nc-a	nc-a
Purver (1764)	4004 BC	Summary	24 hour	nc	global	1m-h	nc-a	nc-a
Dodd (1765)	4004 BC	Day 1	24 hour	created	global	1m-h	nc-a	nc-a
Henry/Blomfield (1810/1765)	~4000 BC	Day 1	24 hour	created	global	1m, nc-a	nc-a	nc-a
Brown (1816/1777)	4004 BC	Day 1	nc[k]	created	global	nc	nc-a	nc-a
Geddes (1792)	ages ago	Summary	ages	appeared	myth	myth	nc	nc
Priestley (1803)	ages ago	nc	ages	appeared	global?	1m, nc-a	nc	nc
Fuller (1806)	4004 BC?	nc	nc[k]	created	global	nc	nc	nc
D'Oyly/Mant[a] (1817)	4004 BC	Summary	24 hour	created	global	1m-h	nc-a	nc-a
Horne[a] (1818/1856)[j]	4004 BC	nc	nc[k]	nc	global	nc	nc	nc
Clarke[a] (1836)	4004 BC	nc	24 hour	created?	global	1m-h	la	law-unbrok
Scott[a] (1841/1812)	4004 BC	nc	24 hour	created	global	1m-h	nc-a	nc-a, law-unbrok

Notes for Table 1:

a. This indicates that the author consciously defended his position in reference to rival cosmologies, whether pagan or geological.

b. The years are first that of the edition I consulted, followed by the original publication, where known, or the date when the author made his last revisions, whichever is latest. D'Oyly, Mant, Scott, Horne, Dodd, Patrick, Richardson, Stackhouse and Gleig were Anglicans, Gill and Fuller were Baptists, Clarke was a Methodist, Brown was a Presbyterian, Geddes was a Catholic, Henry (edited by Blomfield) was a non-conformist, Priestley was a Unitarian, Purver was a Quaker. According to Horne, Ainsworth was Jewish, but to me he appears Christian in doctrine.

c. 'Summary' means that Genesis 1:1 was taken as a summary statement of the whole Creation Week; 'Day 1' means it referred to the first act of Day 1; 'nc' means the author did not make specific or clear comment.

d. 'Created' means that the Sun was actually created on Day 4; 'appeared' means it only appeared on Day 4, having been created some time before.

e. 'nc' means no comment was made on the passage; '1m' means a literal historical miracle; 'lm-h' means a literal miracle described according to appearance, not the modern astronomical heliocentric view, which the commentator accepted as true; 'nc-a' means no comment was made in relation to astronomy; 'myth' means the passage was taken as a myth, not as history.

f. 'nc' means no comment was made on the passage; 'nc-a' means no comment was made in relation to astronomy; 'rh' means the commentator rejected the heliocentric view; 'la' means the commentator believed that the Biblical writer used literal language of appearance.

g. 'nc' means no comment was made on the passage; 'nc-a' means no comment was made in relation to astronomy; 'law-unbrok' means that the interpretation of 'the Earth cannot be moved' was that the Earth cannot be moved from its relative place compared to the other heavenly bodies, that is, the laws governing the Earth and Universe cannot be broken.

h. Stackhouse believed the Earth and Solar System were created at Genesis 1:1, but the rest of the Universe of celestial bodies may have existed for an immense time before this. Gleig, on the other hand, believed that Genesis 1:1 referred to all the heavenly bodies. Although he believed the text would allow for a gap theory (either of chaotic matter existing for ages or this world being built out of the wreck of another), he was not convinced that this was what actually happened. Both men believed that the events beginning from Genesis 1:3 onwards occurred in 4004 BC.

i. Patrick said that the text would not rule out the possibility of a long time period before Genesis 1:3, when the literal six-day creation occurred about 6,000 years ago. But he conceived the formless and void creation to have been a chaotic mass of muddy matter, which was void of any plants or animals.

j. Horne continued to hold these views on creation and the Flood until the 1856 tenth edition of his work, when he embraced the gap theory.

k. Though Brown, Fuller and Horne made no explicit comment about the length of the creation days, they clearly took them as 24-hour days. This is evident in the fact that Brown and Horne believed the date of creation was 4004 BC, and although Fuller was not explicit about the date of creation, he believed the creation of the Sun was literally on Day 4.

Catholic Church and Pope), human reason, and supposed direct communications from God; Scripture must be interpreted from Scripture. Without this conviction, he argued, Christians would be in danger of being led astray into heresy.[228]

These then were the dominant views of Scripture (and particularly Genesis) at the time of the Genesis-geology debate in the years 1820-1845. Table 1 shows how many of the commentaries in use in the early nineteenth century interpreted key verses in Genesis, as well as a few verses elsewhere which refer to the relation of the Sun to the Earth so as to compare the commentator's view of Copernican astronomy. Most of the works were recommended by Home,[229] and all were in use in the early decades of the nineteenth century, although the most popular were those by Scott, Henry, Clarke, D'Oyly and Mant, Fuller and Gill, about which a brief comment is appropriate.

Thomas Scott (1747-1821) was an Anglican clergyman, who befriended and eventually succeeded John Newton as curate of Olney, Buckinghamshire. His commentary was first written between 1788 and 1792. In the United Kingdom it went through four editions in Scott's lifetime and at least two after that, with another eight editions in America, all together totalling more than 37,000 copies. It was also translated into Welsh and Swedish. According to Sir James Stephens, it was *'the greatest theological performance of our age and country'*.[230,231]

George D'Oyly (1778-1846), a notable Anglican theologian and principal promoter of the establishment of King's College in London, and Richard Mant (1776-1848), an Anglican rector and later bishop, were two high churchmen who published a commentary in 1817 for middle class people as an alternative to the most popular evangelical ones by Thomas Scott and Matthew Henry. They consulted 160 authors for their notes. A second edition came out in 1823 and the small paper copies made it the cheapest of all extant commentaries in 1818.[232,233]

Adam Clarke (17627-1832) was a Methodist preacher, a close friend of John Wesley, and his denomination's greatest scholar. In addition to preaching 6,615 different sermons during the years 1782-1808 (and walking over 7,000 miles to the various preaching points in and around London), he mastered the classics, early Christian Fathers and oriental writers, learning Hebrew, Syriac, Arabic, Persian, Sanskrit and other eastern languages to do so. Natural science was also a favourite subject. Over the years he became a fellow of the Antiquarian Society (1813), the Royal Irish Academy (1821), the Geological Society (1823), the Royal Asiatic Society (1823) and other societies. His greatest work was his commentary, which was produced from 1810 to 1826 and appeared in several editions up to 1874.[234-236]

John Gill (1697-1771) was a Baptist pastor and Bible scholar, who received his doctor of divinity at Aberdeen in 1756. According to T. H. Home, he had no equal in rabbinical literature, but he often excessively spiritualised the Biblical text,[237,238] a fact which sheds light on his interpretation of Genesis seen in Table 1. His *magnum opus*, **Exposition of the Holy Scriptures,** was produced between 1746 and 1766. Another Baptist theologian was Andrew Fuller (1754-1815), who was a pastor in Kettering, Northamptonshire, and a friend of the Anglican Scriptural geologist, George Bugg. Fuller had a strong interest in missions and influenced William Carey to become the first missionary with the Baptist Missionary Society, which Fuller helped found and directed. His two-volume **Expository Discourses on the Book of Genesis** appeared in l806.[239,240]

Matthew Henry (1662-1714) was a non-conformist divine and commentator. His remarks on the Pentateuch were published in 1708 and Joshua through Acts came out before his death. His comments on the rest of the Bible were published posthumously by 13 non-conformist divines. His commentary was well-known and valued throughout the eighteenth and nineteenth centuries.[241]

From this analysis it is seen that at the time of the Scriptural geologists the dominant view of the Biblical commentators was that Scripture was infallible and unerring, in matters of history as well as theology and morality. Most of them also believed that Genesis 1-11 was historical narrative describing a creation which was only about 6,000 years old.[242] Though many of them expressed their belief that the Earth rotates on its axis and revolves around the Sun, and that in relation to astronomy the Biblical writers used the common language of appearance (which also fit the astronomical understanding at the time they wrote), they took the account of the long day of Joshua as literal history, just as they did Genesis 1-11.

Although the commentaries in widespread use in the 1820s and 1830s defended the young-Earth view, this did not reflect the views of all evangelicals and high churchmen, as noted earlier. In addition to the prominent old-Earth proponents named earlier, the editors of the high church magazines, **British Critic** and **Christian Remembrancer,** and the evangelical magazine, **Christian Observer,** also generally accepted the old-Earth geological theory, though they did not firmly commit themselves on how it should be harmonised with Scripture (that is, day-age or gap theory on Genesis 1, and local or tranquil Noachian Flood). All these Christians adopted their old-Earth interpretations of Genesis because of the influence of the new geological theories, but they all professed to believe that the Scriptures were divinely inspired, infallible and historically reliable. So for these evangelical and high church old-Earth proponents the issue was not the nature of Scripture, but rather its correct interpretation and the role of science in determining that interpretation.

DEFINING A COMPETENT GEOLOGIST

Having considered some of the historical background and social, intellectual and spiritual context in which the

Scriptural geologists opposed the old-Earth theories, we must look at one more issue to understand the debate properly. Before we can ascertain the level of geological ignorance or acumen of any of the Scriptural geologists, we must define, as best we can, what constituted a competent geologist in the early nineteenth century. How do we distinguish a 'real geologist' from a 'quasi-geological theologian' at this time? What qualified a person to critically evaluate geological arguments for an old Earth?

In his mapping of the field of geological competence, Rudwick broadly defined geological competence as the ability to deliver reliable information or ideas on the subject. But measuring such competence in the 1820s and 1830s was and is difficult, partly because the definition was not static or suprahistorically absolute,[243] but was being progressively refined as geological development approached mid-nineteenth century. Therefore, Rudwick said,

> *'to talk of a geological "community " at the time of the Devonian controversy [1834-1837] is misleading on many counts, not least because it suggests anachronistically a strong-boundaried professional group marked by standardized training and certification, with only the uninitiated lay public outside'.*[244]

He went on to say that therefore *'the formal hierarchies of position and influence are by no means coincident'* with what he termed *'the informal and tacit **gradient of attributed** competence'.*[245] Rudwick described three zones of this gradient of attributed competence in the mid-1830s.

Zone 1 was the small group of '**elite** geologists', who were characterised by a primary commitment to geology (rather than some other science), high activity in the affairs of geological institutions and in practical field work, and very productive in the publication of geological information. Most importantly, they considered themselves, and others consider them, to be the competent arbiters of the most fundamental issues of geological theory and methodology. According to Rudwick, this class included not only the most well-known geologists (Sedgwick, Murchison, De la Beche, Lyell, Greenough, Buckland, Conybeare, Phillips and Darwin), but also Whewell and Humboldt, because of their weighty achievements in other sciences and their appreciable work in geology.

Zone 2 was what Rudwick termed the **'accomplished** geologists'. This zone contained two different groups. One comprised those scientists whose primary commitment was to some other science in which they were regarded among the elite, but their scientific judgment impinged in an auxiliary way on geology. They did little or no geological field work and did not publish much, if anything, on the subject. Men in this category of 'accomplished geologists' included the botanists Lindley and Brongniart, the fish expert Agassiz and the conchologist Sowerby. The other group of 'accomplished geologists' comprised men who were primarily focussed on geology and were expert on a particular geographical region, group of strata or group of fossils. Their geological opinions were highly regarded by the elite geologists, but in matters of theory their judgments were only respected on points where the elite had less expertise.

Zone 3 was the **'amateur** geologists', men and a few women whose geological knowledge was restricted to a very localised area. This group included country gentlemen and ladies, physicians, lawyers and clergymen with intimate knowledge of the area near their homes, as well as government officials, military officers and others whose jobs took them to isolated parts of the world. Their knowledge was trusted by the elite only at the strictly 'factual' level.

Within these zones of attributed competence, the elite geologists regarded only themselves as competent to propose the most fundamental, theoretical or global claims to geological knowledge.[246] Beyond these three zones lay the general public. The geological statements of people in this category (which included quarrymen and miners) were never accepted as reliable until checked and corroborated by those with recognised geological competence.

As enlightening as Rudwick's discussion of these three zones is for understanding geological competence in the mid-1830s during the Devonian controversy, for a number of reasons it is not immediately clear how to apply this analysis to the assessment of the geological competence of the Scriptural geologists to critically evaluate the arguments in favour of an old Earth.

First, though it accurately describes competence relative to the Devonian controversy, it does not enable us to adequately place people who were not involved in that debate, such as William Smith, Robert Bakewell, and leading American geologists, who were recognised by many geologists to have broader and deeper knowledge of geology than the 'accomplished geologists' (and even the 'elite geologist' Whewell), but who were not a part of the elite.

Second, Rudwick pictured diagrammatically the fact that some of the Scriptural geologists were included within the class of 'amateur geologists',[247] those whom the leading geologists at the time of the Devonian controversy *'regarded as at least modestly active and competent in geology'.*[248] However, it would be difficult to prove that in 1822, after the Scriptural geologist, George Young, had published four journal articles on geology and his **Geological Survey of the Yorkshire Coast** (in which he objected to old-Earth theory), he was any less active in geological field work and geological reading, or any less capable of geological theorising than Sedgwick, Buckland or Lyell, especially given the great amount of exposed strata in Yorkshire which represented a major portion of the secondary formations and were right at Young's doorstep.

Third, to say that experts in other scientific fields, with little or no field work or publications in geology, were more competent than Scriptural geologists, who did both activities, is to imply that social standing in the scientific establishment and general scientific reasoning ability were

far more important criteria of geological competence (at least in the minds of the geological elite) than actual first- and second-hand knowledge of geological phenomena. But this is a strange definition. On this basis, the Scriptural geologist, Andrew Ure, should be ranked higher in geological competence than George Young, a conclusion most inconsistent with the facts and actual opinions of the recognised geologists of the time.

Fourth, this definition of competence was determined by a small group of 'elite geologists', some of whom gained their elite status before they had achieved a high level of geological competence. Sedgwick, for instance, attained the prestigious position of Woodwardian Professor of Geology at Cambridge in 1818 when by his own admission he knew very little about the subject and had done virtually no field work.[249,250]

Fifth, the definition does not objectively reflect a person's knowledge of geological literature, and intellectual ability to understand geological arguments and evaluate the logical soundness of induction from agreed upon geological facts.

Finally, and maybe most importantly, the authors of the catastrophist and uniformitarian theories of a very old Earth constructed those theories and presented their geological evidence in defence of their theories long before the Devonian controversy illuminated and developed a more restrictive definition of geological competence. Hutton, Werner and Cuvier (along with Bufifon and Laplace, both non-geologists) were the chief authors of the old-Earth view.[251] But at the time they proposed their theories they were not very competent by the standards of the mid-1830s. Furthermore, while the Devonian controversy involved very technical discussions, it was not introducing or finally establishing the old-Earth theory, but only hammering out details within the old-Earth interpretive framework, and therefore only one or two Scriptural geologists even made mention of the Devonian controversy. In the late 1810s, when the old-Earth view was firmly established in the minds of leading geologists at the universities of Cambridge, Oxford and Edinburgh, other institutions of higher education, the Geological Society of London and many of the provincial philosophical societies, Hutton, Werner and Cuvier would have only met the criteria of 'amateur geologists'.[252]

So in order to assess the geological competence of the Scriptural geologists to critically evaluate the theories of an old-Earth and the evidences presented in favour of those theories, we must also look at geological competence in the light of some additional possible criteria as seen in the lives of those who, all agree, were competent geologists, such as Charles Lyell and William Buckland, two of the greatest British geologists of the nineteenth century, as well as others.

In terms of education, Buckland, son of a clergyman, studied classics at Oxford from 1801-1805 in preparation for his ordained ministry. However, his real interest was in science, particularly geology, and he learned much from the writings and lectures on mineralogy and geology by Dr John Kidd, an Oxford University chemistry professor and a founding member of the London Geological Society.[253-256] Buckland took his first geological tour in 1808 alone in the countryside of Berkshire and Wiltshire, and soon thereafter began to give an annual eight-lecture series on mineralogy (from 1813) and on geology (from 1819). Lyell studied law at Oxford and later at Lincoln's Inn to become a barrister, which was his vocation until 1828. While at Oxford he attended Buckland's eight geology lectures in the springs of 1817 to 1819. Sometime before 1826 he had read Robert Bakewell's **Introduction to Geology**[257] and John Playfair's **Illustrations of the Huttonian Theory,** the latter of which had a significant influence on the development of his own ideas about the history of the Earth.[258]

Some people in Britain had studied mineralogy or chemistry as a background for their geological investigations. This was particularly true of the Scots. They had geological instruction at Edinburgh University much earlier than Oxford and Cambridge, and Robert Jameson, one of their most prominent geologists, was an alumnus of the German institute, Bergakademie Freiberg, where the famous old-Earth mineralogist, Abraham Werner, had taught from 1775 to 1817.[259] But Buckland and Lyell had a more limited educational background in the subject area. Their expertise came predominantly through self-education. It was the same with other leading British geologists of the nineteenth century. George Greenough, the first president of the Geological Society of London, trained in law. Roderick Murchison, who was significant in working out the Devonian and Silurian systems of strata in the 1830s and 1840s, had a military education. In fact, it is said that he chose to study stratigraphical geology because it did not require the academics of mineralogy. Henry De la Beche similarly had a military education. He eventually headed up the geological survey of Britain for the government and led the efforts to found the School of Mines in London.[260] As noted earlier, Adam Sedgwick admitted that he was practically ignorant of geology when in 1818 he was elected to the Geological Society and to be Woodwardian Professor of Geology at Cambridge. What little he did know of geology came from reading, not field experience, though this quickly changed after 1818.

William Fitton, who later became president of the London Geological Society, was rather emphatic on this matter of education, when he defended the Society in 1817 saying:

> *'It has been remarked by critics that the want of education is sometimes of advantage to a man of genius, who is thus free to the suggestions of invention, and is neither biased in favour of erroneous maxims, nor deterred from the trial of his own powers by names of high authority. On this principle it is evident that the members of the Geological Society have derived great benefit from their want of systematic instruction. At*

the time of its formation there was, in fact, no English school of mineralogy where they could imbibe either information or prejudice. They were neither Vulcanists nor Neptunists nor Wernerians nor Huttonians, but plain men, who felt the importance of a subject about which they knew very little in detail; and, guided only by a sincere desire to learn, they have produced, with a rapidity that is truly surprising, publications of the greatest interest and importance upon the subjects to which they have devoted.'[161]

So while university studies in chemistry or mineralogy were seen by some as helpful, they were not necessary to be regarded as a competent geologist in the 1820s and 1830s. In fact, professional training in science generally did not become established until the late 1840s.[262]

Certainly we would expect that a non-negotiable characteristic of a good geologist was his personal first-hand observations of the rocks, fossils and strata of the Earth's crust. Buckland and Lyell both had ample experience here. Buckland regularly went exploring the geological features in the countryside and took students on field-trips. He had an extensive collection of fossils and rocks, which he always used in his lectures. His most famous field work, of course, was related to the fossils found in the Kirkdale Cave in Yorkshire and incorporated into his early defence of the Noachian Flood in **Reliquiae Diluvianae (1823).**

Lyell, though a practising barrister until 1828, spent some considerable time in the field before writing his **Principles of Geology** (1830-1833). In the summer of 1823 he visited Paris and met the catastrophists Humboldt, Cuvier and Brongniart and made some geological excursions in the area. In 1825 he went on geological field-trips in southwest England and later with Buckland in Scotland. And he spent three months in 1828 in the Auvergne region of France with Roderick Murchison studying the river valleys. Many more trips followed as he gave up law and pursued geology on a more full-time basis. However, the original two-volume manuscript of his **Principles** was given to the publisher in late 1827, six months before he made his first major geological tour, which was through France and northern Italy.[263,264]

In addition to geological reading (or education) and field work, other criteria could be suggested which might be assumed to be necessary marks of a competent geologist, but which in a study of the recognised geologists of the 1820s and 1830s prove not to be essential. We will consider several of these briefly.

(1) A competent geologist need not be a member of the Geological Society of London.

William Smith, considered to be one of the best practical geologists in early nineteenth century Britain, was never a member of the Geological Society. In fact, many of the leading practical geologists,[265] such as John Farey and Robert Bakewell, were not members and many of the early members and officers of the Society were not geologists, even well into the late 1820's after its birth in 1807. Furthermore, Rudwick has estimated that at the time of the Devonian controversy (1834-1837) only two-thirds of the competent geologists in Britain were members of the Society.[266]

(2) Being well-travelled, especially internationally, or having first-hand knowledge of the geology and geography of an area was not essential to write competently on geology.

John Macculloch was praised by Lyell as an excellent geologist, who had a lasting and powerful influence on geology and even on Lyell's own thinking, even though Macculloch was a catastrophist geologist and his two-volume **System of Geology** (1831) had many imperfections, including out-dated information.[267,268] Yet in defence of the fact that Macculloch based his **System of Geology** mainly on what he observed in Britain, he stated,

'Geologists have been acused [sic] *of founding theories upon single and favoured districts; yet have I drawn my chief illustrations from Britain? It is true: but there is no resemblance in the applications: as I can also justify this proceeding. Geological facts have no relation to geography: the earth is everywhere of the same general structure. And I need not hesitate to say, that excepting volcanoes, and little more, this little island contains every fact in the world, with much that is almost peculiar to itself; and that more knowledge can be acquired from a careful examination of it, than from all the writings of all those who have prided themselves on the extent of their travels.'*[269]

Like the Scriptural geologist George Fairholme, Lyell wrote on the causes and age of Niagara Falls in his **Principles of Geology** based on the writings of other reliable observers, long before he himself visited America (including the Falls) in 1841-1842.[270] Nevertheless, Lyell discredited the great German mineralogist and author of the Neptunist theory, Abraham Werner, because Werner made a universal theory of the Earth based on very little personal knowledge of the geology of areas outside his native Saxony. Ospovat has pointed out, however, that James Hutton, author of the Vulcanist theory of Earth history and forefather of Lyell's own uniformitarian ideas, likewise travelled little outside his native Scotland.[271,272] In fact, Hutton first published his cyclical theory of the Earth in 1785 before he had studied any rocks in the field.[273]

Similarly, Georges Cuvier, who travelled very little outside of the environs of Paris, based his **Theory of the Earth** (1813) exclusively on a study of the Paris Basin, or rather a study of the fossils found there by others, for he himself relied on others, primarily Alexandre Brongniart, for the geological information.[274,275]

(3) A person need not be gainfully employed as a geologist in order to be a competent geologist in the 1820s and 1830s.

Murchison was an independently wealthy, retired military man, who did not take a job as a geologist until he

replaced De la Beche in the 1840s in the governmental Department of Geological Survey. De la Beche himself initially did his geological work living off funds from his father, a plantation owner in the West Indies, before becoming a government geologist in the mid-1830s. Lyell was initially a barrister by profession. Then for a short time he earned a little from geological lectures presented to a paying public. But for most of his life he lived off the royalties of his successful geological writings. George P. Scrope married into wealth, which funded his early geological research on volcanoes and valleys in France, and he spent most of his professional life as an MP from Stroud (for 35 years) before resuming geological work in his retirement. George Greenough, the first president of the Geological Society and active in geology for many years after that, was likewise independently wealthy.[276-278] In fact, it was not until the late 1840s, in large measure because of the 'Devonian controversy', that we see the rise of the professional specialist (as opposed to the independently wealthy gentleman) in geology.[279]

(4) A competent geologist in the early nineteenth century did not necessarily have a good knowledge of conchology.

One might think that this would be absolutely essential, since shells were by far the most common fossils found in the geological record and the most important fossils used to identify, correlate and relatively date the strata in various locations. However, William Smith, 'the Father of English Geology', who was recognised for having developed this technique for classifying the strata, said the following in 1817 about his **Stratigraphical System of Organised Fossils:**

> *'errors in [my] stratified arrangement can be corrected by those only who are locally acquainted with the strata, and the numerous organized Fossils they contain. On this principle I have ventured, without much knowledge of Conchology, and with weak aids in that science to give the outlines of a systematic arrangement* [of the geological record] '.[280]

Similarly, Lyell based his uniformitarian theory largely on the fossil shells of the Tertiary, but he did not start learning conchology until 1830, the year Volume I of his **Principles of Geology** was published and two years after the theory was firmly fixed in his mind.[281]

(5) A person did not need to publish geological articles in scientific journals in order to be regarded as a competent geologist.

William Smith is an example of this. His geological publications were limited to his important geological maps and six works which explained his system of stratigraphy based on fossils.

(6) A competent geologist's interpretations of the rocks were not unaffected by non-scientific considerations.

Nicholaas Rupke has argued persuasively that Buckland's catastrophist geology was significantly influenced by his involvement in university and social reform. Speaking of the reform going on in Britain at the time, Rupke wrote,

> *'The geological notion of progressive earth history can not be separated from this historical* milieu. *The progressivism of the English school* [of geology, of which Buckland was a leader] *was formulated at a time when the idea of progress was becoming a major determinant of cultural expectation in English society.'*[282]

In other words, the progressive nature of the geological record was used as a basis for and was, to some extent, shaped by the idea that man and society were improving.

Lyell likewise was not a purely objective observer of the geological facts. A number of recent historians of science and geologists have shown that politics, economics and deistic or unitarian theology had a significant bearing on the interpretation of geological formations given by Lyell (and Scrope, upon whom Lyell heavily relied).[283-290] In his discussion of Lyell and the uniformitarian-catastrophist debate in the 1820s and 1830s, geologist Derek Ager, a leader in the twentieth century renaissance of geological catastrophism, has remarked:

> *'My excuse for this lengthy and amateur digression into history is that I have been trying to show how I think geology got into the hands of the theoreticians who were conditioned by the social and political history of their day more than by observations in the field.'*[291]

American old-Earth geologist, Edward Hitchcock, argued that both the French geologists and Lyell had a hostility against the Bible, which very much affected their interpretation of the Noachian Flood and the geological evidence.[292] And as noted earlier in the discussion on deism, both Hutton and Werner were strongly influenced in their geological theories of Earth history by their deistic convictions.

(7) To be considered geologically competent (even highly so) a person did not need to agree with the dominant theory.

This is obvious, but it is worth stating. Lyell was considered geologically competent when his extreme uniformitarian theory was presented in opposition to the mainstream view of the catastrophists. Therefore, a Scriptural geologist could not legitimately be considered geologically incompetent simply because he opposed the old-Earth interpretations of the rocks. In the 1820s and 1830s it would have been inconsistent to say that in order to be considered as geologically competent a person could not question the time and natural processes responsible for the production of the whole geological record (as the Scriptural geologists did), when catastrophists and uniformitarians were debating over the time and processes involved in producing particular formations or strata within that record. This is especially seen in the case of William Smith, who unlike any other catastrophists and the uniformitarians believed in multiple supernatural catastrophes, each followed by supernatural creation.[293] Yet in 1829 Phillips wrote of him,

*'Mr. Smith is no **theorist** in the ordinary sense of the word. His whole life has been spent in practical researches, to prove the truth, and extend the benefit, of those general laws of structure which he was the first to promulgate in England. Besides discovering, at nearly the same period as Werner, the principle of the arrangement of secondary strata, he added the important doctrine, that organic fossils are distributed in the earth according to regular laws, and may be employed to discriminate and identify the rocks. Werner and Smith are, therefore, the leaders of the modern school of geology, and whilst every fresh investigation illustrates the truth of their general principles, their names will be honoured with increasing respect, though every "theory" should be forgotten.'*[294]

Conclusion on Competence

The definition of geological competence was not fixed in the 1820s and 1830s as geology matured as a science, and certainly, as Rudwick has shown, there was a gradient of competence. But the level of competence needed to propose or debate a detailed stratigraphy of a particular region within the old-Earth framework (such as in the Devonian controversy of the mid-1830s) was much higher than that needed to propose the old-Earth framework and to state its supporting evidences (in the years 1790-1815), or to criticise those theories and arguments, as the Scriptural geologists did. Upon consideration of further criteria than those proposed by Rudwick, it may be argued that a competent geologist in the 1820s and 1830s was one who devoted a significant portion of his time to first-hand observation of the geological formations in the field and was knowledgably conversant with current geological literature, facts and theories. If, added to these, his field observations were not just regional, but national or international in extent, if he published his research in reputable scientific journals and/or books, if he was a member of one or more scientific societies, if he had personal contact with recognised geologists, if he added new facts to the pool of geological knowledge, if he earned his living from his geological work, etc., then so much the better. But these latter attributes were not necessary in the 1820s and 1830s to qualify as a competent geologist who was able to critically evaluate the theories of an old-Earth and the geological evidences adduced as proof of those theories.

These considerations assist in the evaluation of the Genesis-geology debate and the part which the Scriptural geologists played in it. In subsequent papers it will be argued that Young, Murray, Rhind and Fairholme were quite competent in geology (possessing even some of the extra characteristics mentioned above) and had as much or more first- and second-hand geological knowledge than some of those categorised by Rudwick as accomplished, or even elite, geologists. It will also be shown that some of the other Scriptural geologists were better informed geologically than was (or is) generally acknowledged by their critics.

SUMMARY

In this paper we have considered the historical context of the British Scriptural geologists. They wrote at a time of incredible change. Politically, monarchial government was moving in the direction of representative democracy. The Industrial Revolution was bringing an explosion of new technology, shifting the population into the cities, helping to elevate the social status of science, and improving the standard of living for many but accentuating the poverty of some. Reason was being raised to the place of supreme authority in determining truth, and deists and atheists were openly or subtly challenging the Christian worldview. This had an effect not only on scientific assumptions and methodology, but also on Biblical scholarship and faith in the Scriptures. In the early nineteenth century, science and scientists were just beginning to become specialised in the way that we know them to be today, and the study of geology was still very much in its infancy, more as a 'gentleman's avocation' than as a profession. Though in early nineteenth century Britain there were strong defenders of Christian orthodoxy among both high churchmen and evangelicals, liberal theology was slowly penetrating and transforming the churches. And after several centuries of close ties between geology and Scripture, the study of the rocks and fossils was being divorced from the study of the Bible, resulting in a departure from the dominant traditional interpretation of the early chapters of Genesis.

We are now prepared to consider individually a number of the Scriptural geologists. They will be presented roughly in chronological order. After we have looked at each of these men and his arguments, we will then be in a position to make overall comparisons, summarise their common objections to the old-Earth theories, and draw general conclusions about the nature of the debate in which they were engaged.

REFERENCES AND ENDNOTES

1. Read, H. H., 1957. **The Granite Controversy,** Thomas Murby, London, p. xi.
2. This will be shown in the later section on Biblical interpretation.
3. As will be shown in the course of subsequent papers, they did not always take a literal interpretation in every detail of Genesis 1-11, however.
4. Some of their evangelical and high church opponents held the same view of Genesis, but they differed with the Scriptural geologists over what they believed to be the literal interpretation, as will be seen later.
5. The vast geological ages occurred before Genesis 1:3 and the rest of Genesis 1 is an account of recreation in six literal days on the geological ruins of the previously destroyed Earth.
6. The 'days' of Genesis 1 are figurative, representing the vast geological ages.
7. The Noachian Flood was a global historical event, but it was such a peaceful event that it left no significant and lasting geological effects.
8. The Flood was catastrophic but affected only the Mesopotamian valley.
9. Genesis 1-11 is myth, which contains theological truths, but has little or no historical accuracy.

10. Rudwick, M. J. S., 1985. **The Great Devonian Controversy: The Shaping of Scientific Knowledge among Gentlemanly Specialists,** University of Chicago Press, Chicago, p. 43.
11. Lyell, C, 1827. Review of **Memoir on the Geology of Central France,** by G. P. Scrope. **Quarterly Review,** XXXVI(72):482. Lyell likely had in mind, among others, Granville Perm, George Bugg and George Young, who all wrote substantial works on the subject before 1827.
12. F. F, 1837. Dr Chalmers on Scriptural geology. **Christian Observer, XXXVII:447-448.**
    This anonymous article summarised and quoted from:
    Chalmers, T, 1835. **On Natural Theology,** Glasgow, pp. 250-256.
    Though precise page numbers for this quotation were not given by F F, **On Natural Theology** was an expanded version of Chalmers' **Bridgewater Treatise** (1833).
13. Wiseman, N. P. S., 1859. **Twelve Lectures on the Connection between Science and Revealed Religion,** London, Vol. I, p. 268.
    This was the sixth unedited printing of the original 1836 edition. Wiseman was probably the leading Catholic voice on the relation between science and the Bible. He held to the gap theory, and possibly also the day-age theory, while still defending a global Flood (Vol. I, pp. 280-354).
14. **Christian Observer, 39:403-405 (1**839).
15. **Evangelical Register,** N.S. **XII** (June):255 (1840).
16. Gordon, E. O., 1894. **The Life and Correspondence of William Buckland, DD, FRS,**, John Murray, London, pp. 26, 136.
17. White, A. D., 1896. **A History of the Warfare of Science with Theology in Christendom,** Appleton, New York, Vol. I, p. 223.
18. Williamson, W. C., 1896. **Reminiscences of a Yorkshire Naturalist,** London, p. 56.
19. Rudwick, M. J. S., 1975. Charles Lyell, F.R.S. (1797-1875) and his London lectures on geology, 1832-33. **Notes and Records of the Royal Society of London,** XXIX(2):237.
    The same remark appears in Rudwick's 'Introduction' to the 1990 edition of Charles Lyell's **Principles of Geology, p.** xi (footnote 3), and p. xvii. In his 1986 essay 'The shape and meaning of Earth history', *in:* **God and Nature: Historical Essays on the Encounter between Christianity and Science,** D. C. Lindberg and R. L. Numbers (eds), University of California, Berkeley, p. 312, Rudwick makes the passing comment that some of the Scriptural geologists supported their ideas *'by at least some empirical fieldwork'*, but he mentions no names.
20. Cannon, W. F., 1961. The impact of uniformitarianism. **Proceedings of the American Philosophical Society,** 105(3):302.
21. Cannon, W F, 1961. The problem of miracles in the 1830's. **Victorian Studies, IV:15,**22-23.
22. Cannon, W F, 1964. Scientists and broad churchmen: an early Victorian intellectual network. **Journal for British Studies, IV:** 82.
23. A similar view is expressed by:
    Chadwick, O., 1971. **The Victorian Church,** London, Vol. I, pp. 559-561.
24. Yule, J. D., 1976. **The Impact of Science on British Religious Thought in the Second Quarter of the Nineteenth Century,** Ph.D. Thesis, Cambridge University, pp. 328 and 331.
25. Gould, S. J., 1975. Catastrophes and steady state Earth. **Natural History, 84** (2): 16.
26. Here in an endnote Young cites, without comment, the 1822 work of Granville Penn and the 1837 book by George Fairholme. In 1987 Young said of these two men that
    ***'despite some acquaintance with geology,* [they] *overlooked many important details of geology. The views of literalists no longer carried weight with Christians thoroughly trained in geology'*.**
    He mentions no other Scriptural geologists of the period.
    See Young, D. A., 1987. Scripture in the hands of geologists (Part One). **Westminster Theological Journal,** 49:25.
27. Young, D. A., 1988. **Christianity and the Age of the Earth,** Artisan Sales, Thousand Oaks, California, p. 54.
    In his most recent book, he is a little more generous, when he states that ***'a few were competent field observers who had described regional geology'***. He names George Young, but he briefly discusses only the views of Granville Penn, George Fairholme and William Kirby. He does not mention John Murray and William Rhind, who along with Young were the most geologically competent Scriptural geologists.
    See Young, D. A., 1995. **The Biblical Flood,** William B. Eerdmans Publishing Company, Grand Rapids, Michigan, pp. 124-128.
28. Gillispie, C. G, 1951. **Genesis and Geology: A Study in the Relations of Scientific Thought, Natural Theology and Social Opinion in Great Britain, 1790-1850,** Harper and Brothers, New York, p. 152.
29. This was a book published anonymously (but written by Robert Chambers) in 1844, which presented a radical evolutionary view of the origin of biological life. It was vehemently opposed by virtually all scientists at the time, though it helped prepare the ground for Darwin's **Origin of Species** 15 years later.
30. Gillispie, Ref. 28, p. 163.
    Again there is confusion. Fairholme's work was ignored by contemporary geologists. However, Ure's received a scathing critique by Sedgwick, and Pye Smith's views were greatly appreciated by the leading geologists, precisely because he favoured the old-Earth views, unlike Ure and Fairholme.
31. Gillispie, Ref. 28, pp. 223-224.
32. Millhauser, M., 1959. **Just Before Darwin: Robert Chambers and the Vestiges,** Wesleyan University Press, Middleton, pp. 52-56.
    Tom Mclver largely follows Millhauser's interpretations in his remarks on various books by Scriptural geologists in his **Anti-Evolution: An Annotated Bibliography** (1988).
33. Haber, F C, 1959. **The Age of the World: Moses to Darwin,** John Hopkins, Baltimore, p. 204.
    Haber mentioned none of the geologically competent Scriptural geologists. He referred to Penn only by name and devoted a page to **Bugg, whom he called *'a typical example of literalist opposition'* to old-**Earth geological theories (p. 212). He named no Scriptural geologists of the 1830s, when their writings were most numerous.
34. Moore, J. R., 1986. Geologists and interpreters of Genesis in the nineteenth century. *In:* **God and Nature: Historical Essays on the Encounter between Christianity and Science,** D. C. Lindberg and R. L. Numbers (eds), University of California Press, Berkeley, p. 337.
35. Rupke, N. A., 1983. **The Great Chain of History: William Buckland and the English School of Geology 1814-1849,** Clarendon Press, Oxford, pp. 41-47.
36. Marston, V P., 1984. **Science and Meta-Science in the Work of Adam Sedgwick,** Ph.D. Thesis, The Open University, pp. 290-308.
    However, in his discussion he gave only two sentences to the geologist George Young and makes no mention of John Murray, William Rhind or George Fairholme.
37. See, for example:
    Lindberg, D. C. and Numbers, R. L. (eds), 1986. **God and Nature: Historical Essays on the Encounter between Christianity and Science,** University of California, Berkeley.
38. Porter, R., 1976. Charles Lyell and the principles of the history of geology. **British Journal for the History of Science,** IX(32) part 2:91-103.
39. Rappaport, R., 1978. Geology and orthodoxy: The case of Noah's Flood in eighteenth century thought. **British Journal for the History of Science, XI:** 1-18.
40. Hooykaas, R., 1972. **Religion and the Rise of Modern Science,** William B. Eerdmans, Grand Rapids, Michigan.
41. Hooykaas, R. , 1974. Genesis and geology. *In:* **New Interactions Between Theology and Natural Science,** The Open University Press, Milton Keynes, pp. 55-87.
42. Klaaren, E. M., 1977. **Religious Origins of Modern Science,** William B. Eerdmans, Grand Rapids, Michigan.
43. Rupke, Ref. 35.
44. White, Ref. 17.
45. Draper, J. W, 1875. **A History of the Conflict between Religion and Science,** London.
    Draper held the same view as White, Ref. 17, but focussed his attention on Catholics, rather than Protestants, which does not relate significantly to the Scriptural geologists, since the leading ones were Protestants.
46. Brooke, J. H., 1991. **Science and Religion: Some Historical Perspectives,** Cambridge University Press, Cambridge, pp. 35-37.
47. Rudwick, M. J. S., 1986. The shape and meaning of Earth history. *In:* **God and Nature: Historical Essays on the Encounter between Christianity and Science,** D. C. Lindberg and R. L. Numbers (eds), University of California Press, Berkeley, pp. 296-297.

48. That is the view that there have been numerous regional or even global catastrophes separated by long periods of uniformitarian calm.
49 Whitten, D. G. A. and Brooks, J. R. V, 1972. **The Penguin Dictionary of Geology,** Penguin Books, London, p. 74.
50. These include:
Ager, D. V, 1981 [1973]. **The Nature of the Stratigraphical Record,** The Macmillan Press Ltd, London.
Albritton, C. C, 1989. **Catastrophic Episodes in Earth History,** Chapman and Hall, London.
Berggren, W. A. and Van Couvering, J. A. (eds), 1984. **Catastrophes and Earth History.**
Clube, S. V. M. and Napier, W. M, 1982. **The Cosmic Serpent: A Catastrophist View of Earth History.**
Hsu, K. J., 1986. **The Great Dying.**
Ager was formerly head of the geology department at University College Swansea (1969-1988) and president of the Geologists' Association (1988-1990). Provocatively, he used the same frontispiece to his book on catastrophism that Lyell had used in 1830 in his uniformitarian **Principles of Geology.** Ager's hero of early nineteenth century geology was the catastrophist, Georges Cuvier, whom Ager eulogised in the first chapter of his book.
51. Davies, G. L.H., 1993. Bangs replace whimpers. **Nature,** 365:115.
52. For example:
Heylmun, E. B., 1971. Should we teach uniformitarianism? **Journal of Geological Education,** XIX.35-37.
Gould, Ref. 25, pp. 14-18.
Gould, S. J., 1975. The great Scablands debate. **Natural History, LXXXVII(7):12-18.**
Shea, J. H., 1982. Twelve fallacies of uniformitarianism. **Geology,** 10:455-460.
Kauffman, E., 1987. The uniformitarian albatross. **Palaios, 11(6):**531.
53. Redondi, P., 1989. *In:* **Galileo Heretic,** R. Rosenthal (transl.), Penguin Books, London.
Pietro Redondi has argued forcefully that Galileo's views of astronomy were not the real issue in the trial. Rather it was his natural philosophy and advocacy of atomism (which threatened the Eucharistic doctrine of transubstantiation) that brought the charge of heresy. Officially made a Catholic article of faith at the Lateran Council of 1215 and classically formulated by Thomas Aquinas (1225-1274), transubstantiation had been reaffirmed in the Council of Trent (1551) and was a fundamental doctrine of the Counter-Reformation.
54. Hooykaas, Ref. 40, pp. 1-7, 124-126.
55. There had been others before, too, such as the moderate Lutheran, Rheticus, who studied mathematics and astronomy under Copernicus and helped get his book published. Rheticus had virtually the same view of the interpretation of Scripture in relation to the study of nature that Galileo had and he wrote about it in a pamphlet in 1539. See:
Hooykaas, R., 1984. **G. J. Rheticus' Treatise on Holy Scripture and the Motion of the Earth,** North-Holland Publishing Co., Oxford.
56. Galilei, G., 1615. Letter to the Grand Duchess Christina. *From*: Drake, S. (transl.), 1957. **Discoveries and Opinions of Galileo,** New York, p. 186. *Reprinted in:* **Science and Religious Belief 1600-1900: A Selection of Primary Sources,** D. C. Goodman (ed.), The Open University, Milton Keynes, p. 34 (1973).
57. Galilei, Ref. 56: Drake, pp. 182-183 and Goodman, pp. 32-33.
58. In addition to Redondi's work cited above, analyses of the Galileo affair can be found in:
Hummel, C. E., 1986. **The Galileo Connection,** InterVarsity Press, Downers Grove, Illinois.
Russell, C. A., 1985. **Cross-Currents: Interactions Between Science and Faith,** William B. Eerdmans, Grand Rapids, Michigan, pp. 37-54.
Russell, C. A., Hooykaas, R. and Goodman, D. C, 1974. **The 'Conflict Thesis' and Cosmology.** *In:* the series **Science and Belief: From Copernicus to Darwin,** The Open University, Milton Keynes.
Shea, W. R., 1986. Galileo and the Church. *In:* **God and Nature: Historical Essays on the Encounter between Christianity and Science,** D. C. Lindberg and R. L. Numbers (eds), University of California Press, Berkeley, pp. 114-135.
Dillenberger, J., 1960. **Protestant Thought and Natural Science,** Doubleday, New York, pp. 22-28.
Kuhn, T S., 1971. **The Copernican Revolution,** Harvard University Press, Cambridge, Massachusetts, pp. 219-228.
59. It will be seen later, however, that this thinking developed in stages in geology generally and in the minds of individual geologists. At first only Genesis 1 was reinterpreted, while the Flood of Genesis 6-9 was seen as a global, geologically significant event. After 1830 Genesis 6-9 was reinterpreted to mean a local and/or geologically insignificant flood.
60. By way of comparison, Galileo interpreted the account of the miracle of the long day of Joshua 10:12-15 as literal history, though he explained the stationary position of the Sun in terms of Copernican theory and the language of appearance. He apparently also took the account of the creation of the Sun on the fourth day of Genesis 1 to be literal history. See: Galilei, Ref. 56: Drake, pp. 211-215 and Goodman, pp. 47-49.
61. Bacon, F, 1906. **Advancement of Learning,** Oxford edition, Book I, part VI. 16, p. 46.
62. Parcelsus (14937-1541) was a Swiss doctor and chemist.
63. Bacon, Ref. 61, Book II, part XXV16, p. 229.
64. Bacon, F, 1859. **Novum Organum,** A. Johnson (transl.), Book I, part lxv, p. 42.
65. Bacon, Ref. 64, Book I, part lxxxix, p. 82.
66. Rudwick, M. J. S., 1963. The foundation of the Geological Society of London: its scheme for co-operative research and its struggle for independence. **British Journal for the History of Science, 1(4)** :325-355.
67. Moore, Ref. 34, pp. 322-350.
68. Bacon, Ref. 61, pp. 43-44.
It might be argued that since Bacon said that Solomon gained his insights on the natural world from learning, he was simply stating that Solomon was a good natural philosopher, anticipating Bacon's methodology. But this interpretation is debatable because Bacon said that Solomon was also endowed with wisdom about divine and moral philosophy, and it is doubtful that Bacon thought this wisdom came by Baconian-style scientific methods of analysis. Furthermore, there is no indication that Bacon believed that the use of such scientific methodology was the way Moses discovered the laws of leprosy or the men in Job's day discovered these geographical and astronomical truths.
69. Bacon, Ref. 61, Book I, points VI.2-8, pp. 40-42.
Bacon's statement on the days of creation reads (pp. 40-41):
'It is so then, that in the work of the creation we see a double emanation of virtue from God; the one referring more properly to power, the other to wisdom; the one expressed in making the subsistence of the matter, and the other in disposing the beauty of the form. This being supposed, it is to be observed that for anything which appeareth in the history of the creation, the confused mass and matter of heaven and Earth was made in a moment; and the order and disposition of that chaos or mass was the work of six days; .. . So in the distribution of days we see the day wherein God did rest and contemplated his own works, was blessed above all the days wherein he did effect and accomplish them'.
70. **Dictionary of National Biography** on Bacon, p. 824.
71. Bacon, F, 1819. **The Works of Francis Bacon,** London, Vol. II, pp. 480-488.
72. Bacon, Ref. 71, pp. 482-484.
73. Fowler, T, 1878. Introduction. *In:* F Bacon, **Novum Organum,** p. 45 (1878).
74. Hazard, P., 1953. **The European Mind: 1680-1715,** J. Lewis May (transl.), Hollis and Carter, London, p. 160.
75. Elwes,R. H. M., 1951. Introduction. *In:* B. Spinoza, **The Chief Works of Benedict De Spinoza,** Dover Publications, New York, Vol. I, p. xiv (1951).
76. Colie, R. L., 1959. Spinoza and the early English Deists. **Journal of the History of Ideas,** XX:25.
77. Stephen, L., 1876. **History of English Thought in the Eighteenth Century, London,** Vol. I, p. 33; quoted by Colie, Ref. 76, p. 29.
78. Brown, C, 1990. **Christianity and Western Thought,** Apollos, Leicester, pp. 185-189, 197-214.
79. Brooke, Ref. 46, p. 194.
80. Other examples were T. H. Home, a great Anglican Biblical scholar, who wrote an 81-page tract for wide distribution called **Deism Refuted** (1819). I consulted the sixth edition of that first year. Another edition appeared in 1826 and an American edition came out in 1819. It was

warmly reviewed in the **Edinburgh Monthly Review,** Vol. II (1819), pp. 661-670, where the writer complained of deistic belief spreading among the lower classes.
Other tracts or books refuting deism included Rev. Thomas Young's **Truth Triumphant** (1820), Francis Wrangham's **The Pleiad; or, A series of abridgements of seven distinguished writers, in opposition to the pernicious doctrines of deism** (1820), Robert Hindmarsh's **Christianity against deism, materialism, and atheism** (1824), and the anonymous translation from French called **Alphonse de Mirecourt; or, The young infidel reclaimed from the errors of deism** (1835).

81. Hinchliff, P., Regius Professor of Church History at Oxford University, in May 18,1993, lecture at Oxford University on the subject of nineteenth century religious thought.
82. Harrison, R. K., 1969. **Introduction to the Old Testament,** William B. Eerdmans, Grand Rapids, Michigan, p. 10.
83. Harrison, Ref. 82, p. 188.
84. VanderMolen, R. J., 1984. Spinoza. *In:* **Evangelical Dictionary of Theology,** W. A. Elwell (ed.), Baker, Grand Rapids, Michigan, p. 1040.
85. Brown, Ref. 78, pp. 301-309.
86. Henning, G. R., 1984. **The Authority of the Bible and the Rise of the Modern World,** p. 412.
87. Harrison, Ref. 82, pp. 10-15.
88. Rogerson, J., 1984. **Old Testament Criticism in the Nineteenth Century: England and Germany,** SPCK, London, pp. 154-156.
89. Rogerson, J., Rowland, C. and Lindars,B., 1988. **The Study and Use of the Bible,** Marshall Pickering, Basingstoke, pp. 104-114.
90. Rogerson, Ref. 88, pp. 161-168.
Though Pusey was critical of the German scepticism, many of his readers suspected the negative influence of the Germans on his thinking.
91. Boys, T, 1832. **A Word for the Bible,** London, pp. 3-6.
This 54-page book was a response to an article in the **Christian Guardian** in January, 1832, which denied that all of the Scriptures were inspired. Other concerns about German neology penetrating England appeared in:
Christian Observer, XXXIV:479-481 (1834).
Christian Observer, XXX**VII**:378 (1837).
92. See **Dictionary of Scientific Biography** on Werner, p. 259.
93. On Hutton, see:
Dean, D. R., 1975. James Hutton on religion and geology: the unpublished preface to his **Theory of the Earth** (1788). **Annals of** Science,32:187-193.
Laudan, R., 1987. **From Mineralogy to** Geology, Chicago University Press, Chicago, pp. 115-117 concurs regarding both.
94. At best, Lyell tended toward deistic unitarianism, like his uniformitarian friend G. P. Scrope. See:
Russell, C. A., 1985. Cross-Currents: Interactions Between Science **and Faith,** William B. Eerdmans, Grand Rapids, Michigan, p. 136.
Rudwick, M. J. S., 1974. Poulett Scrope on the volcanoes of Auvergne: Lyellian time and political economy. **British Journal for the History of Science,** VII(27):227.
95. Rudwick, M. J. S., 1962. The principle of uniformity. History **of** Science, 1:85.
96. Marston, Ref. 36.
97. In 1650 Archbishop James Ussher published his now famous calculations that set the date of creation at 4004 BC.
98. For further discussion of these seventeenth and eighteenth century writers on geology, see:
Rudwick, M. J. S., 1985. **The Meaning** of **Fossils,** University of Chicago Press, Chicago, pp. 1-93.
Young, Ref. 27, pp. 27-42.
99. For further discussion of these three writers, see:
Brooke, Ref. 46, pp. 234-242.
Hahn, R., 1986. Laplace and the mechanistic Universe. *In:* God and Nature: Historical Essays on the Encounter between Christianity and Science, D. C. Lindberg and R. L. Numbers (eds), University of California Press, Berkeley, pp. 256 276.
100. Gillispie, Ref. 28, pp. 41-82.
101. Hallum, A., 1992. Great Geological Controversies, pp. 1-29.
102. Werner's influence on many of the most prominent nineteenth century geologists in Britain and Europe is discussed in
Laudan, R., 1987. **From Mineralogy to Geology,** Chicago University Press, Chicago, pp. 93-112, 222-228.
103. **Dictionary of Scientific Biography** on Werner, pp. 259-260.
104. This was not a new idea. Aristotle expressed similar views in his **On Meteorology.** See:
Rudwick, M. J. S., 1985. **The Meaning of Fossils,** University of Chicago Press, Chicago, pp. 37-38.
105. O'Rourke has argued that it was empirical philosophy (that is, all knowledge is based on experience), more than deism, that underpinned his theory. But these are closely related, since deism insists on explaining everything from the laws of nature, which are known only through experiential analysis of the world. Whether Hutton was an empirical deist or deistic empiricist, his worldview was anti-Christian. See:
O'Rourke, J. E., 1978. A comparison of James Hutton's **Principles of Knowledge** and **Theory of the Earth. ISIS,** 69(246):5-20.
106. Smith, W, 1815. **A Memoir to the Map and Delineation of the Strata of England and Wales, with part of Scotland.**
107. Smith, W, 1816. **Strata Identified by Organized Fossils,** London.
108. Smith, W, 1817. **Stratigraphical** System **of Organized Fossils,** London.
109. See:
Phillips, J., 1844. **Memoirs of William Smith,** London, pp. 25-26.
Smith, W, 1835. **Deductions from Established Facts in Geology,** Scarborough.
The latter work (a large one-page explanatory diagram) was Smith's last and clearest statement on his view of Earth history and was obviously intended to be a response to Lyell's uniformitarianism. Though when he referred to the 'Deluge' he possibly meant the Noachian Flood, he made no reference to Scripture. However, he was quite emphatic about the supernatural nature of the many revolutions and creations.
110. Woodward, H. B, 1907. **The History of the Geological Society of London,** Geological Society, London, pp. 17-20,53.
For a discussion of possible social and political reasons why these practical geologists were not in the Geological Society, see:
Rudwick, Ref. 66, pp. 325-355.
Grinnell, G., 1976. The origins of modern geological theory. **Kronos,** I(4):68-76.
111. Weindling, P. J., 1979. Geological controversy and its historiography: the prehistory of the Geological Society of London. *In:* **Images of the Earth,** L. J. Jordanova and R. S. Porter (eds), British Scoeity for the History of Science, Monograph I, pp. 248-271.
112. The term 'catastrophism', like 'uniformitarianism', was coined by the historian and philosopher of science, William Whewell, in his anonymous review of Lyell's **Principles of** Geology, in the **Quarterly** Review, XLVII(93):126(1832).
113. **Dictionary** of Scientific **Biography** on Cuvier.
Coleman, W, 1973. Cuvier and evolution. *In:* Science **and Religious Belief: A Selection of Recent Historical Studies,** C. A. Russell (ed.), The Open University Press, Milton Keynes, pp. 229-234; *reprinted from:* Coleman, W, 1964. Georges Cuvier, Zoologist, Harvard University Press, Boston, pp. 172-175.
114. Buckland, W, 1836. **Bridgewater Treatise,** John Murray, London, Vol. I, pp. 16, 94-95. The full title of this two-volume work was On the Power, Wisdom and Goodness of God as manifested in the Creation: Geology **and Mineralogy considered with** reference **to Natural** Theology, but I will generally refer to it as the Bridgewater Treatise for the sake of brevity.
115. Rupke,Ref. 35,pp. 60-61.
116. Buckland, W., 1820. Vindiciae Geologicae, Oxford University Press, Oxford, pp. 23,29-30.
117. Cuvier, G, 1813. Essay on the Theory of the Earth, R. Kerr (transl), William Blackwood, Edinburgh, pp. 12-18.
118. Phillips, J., 1829-1836. Illustrations of the Geology of Yorkshire, York, Vol. I, pp. 13-18.
119. Buckland, Ref. 116, pp. 37-38.
120. Gillispie, Ref. 28, p. 145.
121. Porter, Ref. 38, p. 91.
122. Hanna,W, 1849-1852. Memoirs of the Life and Writings of Thomas Chalmers, Edinburgh, Vol. I, pp. 80-81.
123. Chalmers, T., 1814. Remarks on Cuvier's theory of the Earth. The Christian Instructor; *reprinted in:* The Works of Thomas Chalmers

(1836-42), Vol. XII, pp. 347-372.

124. Sumner, J. B., 1816. **Treatise on the Records of Creation,** London, Vol. II, p. 356.
125. See Pusey's footnotes to:
Buckland, W, 1836. **Geological and Mineralogical Considerations with Reference to Natural Theology,** John Murray, London, Vol. I, pp. 22-25.
126. Faber, G. S., 1823. **Treatise on the Genius and Object of the Patriarchal, Levitical, and the Christian Dispensations,** London, Vol. I, chapter 3.
127. Faber, G. S., 1823. **Christian Observer, XXIII:420-425,** 480-487, 551-556, 693-697.
128. Miller, H., 1854. **The Two Records: Mosaic and the Geological,** London.
129. Miller, H., 1856. **Testimony of the Rocks; or Geology in its Bearings on the Two Theologies, Natural and Revealed,** W.P. Nimmo, Hay and Mitchell, Edinburgh, pp. 107-174.
130. Fleming, J., 1826. The geological Deluge as interpreted by Baron Cuvier and Buckland inconsistent with Moses and nature. **Edinburgh Philosophical Journal,** XIV.205-239.
131. Smith, J. P., 1837. **Mosaic Account of Creation and the Deluge illustrated by Science,** London.
132. Smith, J. P., 1839. **On the Relation Between the Holy Scriptures and Some Parts of Geological Science,** London.
133. In the 1820s Powell expressed his belief that the historical narrative of Genesis (at least the Noachian Flood) had some connection with the findings of geology, but he abandoned this view in the 1830s. See:
Corsi, P., 1988. **Science and Religion,** Cambridge University Press, Cambridge, pp. 60, 138.
134. Ashton, T. S., 1970. **The Industrial Revolution 1760-1830,** Oxford University Press, Oxford.
135. Reeve, R. M., 1971. **The Industrial Revolution 1750-1850,** University of London Press, London.
136. Woloch,I., 1987. French Revolution. **The World Book Encyclopedia,** World Book, Chicago, Vol. VII, pp. 450-452.
137. Puryear,V.J., 1987. Napoleonl. **The World Book Encyclopedia,** World Book, Chicago, Vol. XIV, pp. 12-17.
138. Plumb, J. H., 1987. **England in the Eighteenth Century,** Penguin Books, London, pp. 155-162.
139. On the widespread fear of French atheism and its effects, see:
Chadwick, O., 1971. **The Victorian Church,** London, Vol. I, pp. 1-2.
Anonymous, 1833. Review of **The History of Europe during the French Revolution** by Archibald Allison. **Blackwood's Edinburgh Monthly Magazine, XXXIII:**889-890.
Anonymous, 1833. The life of a democrat; a sketch of Horne Tooke. Part II. **Blackwood's Edinburgh Monthly Magazine, XXXIV:** 220-221.
Howse, E. M., 1976. **Saints in Politics: the 'Clapham Sect' and the Growth of Freedom,** George Allen and Unwin, London, pp. 101, 127.
Weindling, Ref. 111, p. 256.
140. Lawton, R. and Pooley, C. G., 1992. **Britain 1740-1950: An Historical Geography,** Edward Arnold, London, pp. 17-23,109-115.
141. Chadwick, O., 1971. **The Victorian Church,** London, Vol. I, pp. 1-166.
142. Thomson, D., 1950. **England in the Nineteenth Century,** Penguin Books, London, pp. 1-98.
143. Howse, E. M., 1976. **Saints in Politics: the 'Clapham Sect' and the Growth of Freedom,** George Allen and Unwin, London.
144. Chadwick says this dominant religious influence extended to the middle of the Victorian period. See:
Chadwick, Ref. 141, Vol. I, p. 5.
145. Overton, J H , 1894. **The English Church in the Nineteenth Century: 1800-1833,** London.
146. Cannon, Ref. 22, pp. 65-88.
147. Cannon, W. F., 1964. The role of the Cambridge Movement in early nineteenth century science. **Proceedings of the Tenth International Congress on the History of Science,** Hermann, Paris, pp. 317-320.
148. Morrell, J. and Thackray,A. (eds), 1981. **Gentlemen of Science: Early Years of the British Association for the Advancement of Science,** Clarendon Press, Oxford, pp. 17-35.
149. Some evidence of this influence will be presented subsequently.
150. Marston, Ref. 36.
Marston has shown here that Sedgwick held many views in common with evangelicals. Nevertheless, it seems undeniable that Sedgwick also was significantly influenced by the Cambridge Network and shared many of their ideas. **As** will be noted in the discussion on Cole (in a future paper), the evangelical **Christian Observer,** which favoured acceptance of the idea of an old Earth, shared some of Cole's concerns about Sedgwick's views as expressed in his **Discourse on the University.** Other insights into Sedgwick's views will be gained from the discussion on Ure and the one on the nature of geology as a historical science subsequently.
151. Cameron, N. M. de S., 1984. **Biblical Higher Criticism and the Defense of Infallibilism in Nineteenth Century Britain,** Edwin Meller Press, Lewiston, New York, pp. 37-38.
152. Cannon, Ref. 22, p. 78.
153. Chadwick, Ref. 141, pp. 60-75,167-231.
154. Hennell,M., 1977. The Oxford Movement. *In:* **Eerdmans' Handbook to the History of Christianity,** T. Dowley (ed.), William B. Eerdmans, Grand Rapids, Michigan, pp. 524-526.
155. Rausch, D. A., 1984. Oxford Movement. *In:* **Evangelical Dictionary of Theology,** W. A. Elwell (ed.), Baker, Grand Rapids, Michigan, pp. 811-812.
156. Toon, P., 1979. **Evangelical Theology 1833-1856: A Response to Tractarianism,** Marshall, Morgan and Scott, London.
From Toon's and my own research it appears that no Scriptural geologists were significantly involved in writing against Tractarianism.
157. Brooke, J. H., 1974. Natural theology in Britain from Boyle to Paley. *In:* **New Interactions Between Theology and Natural Science,** J. H. Brooke *et al.* (eds), The Open University Press, Milton Keynes, pp. 5-54.
158. Brooke, Ref. 46, pp. 192-225.
159. Introductory review and analysis can be found in:
Robson, J. M., 1990. The fiat and finger of God: The Bridgewater Treatises. *In:* **Victorian Faith in Crisis,** R. J. Helmstadter and B. Lightman (eds), MacMillan, Basingstoke, pp. 71—125.
Brock, W. H., 1966. The selection of the Bridgewater Treatises. **Notes and Records of the Royal Society of London, XXI(2):** 162-179.
Gundry, D. W, 1946. The Bridgewater Treatises and their authors. **History, N.S. XXXI:** 140-152.
160. The scientists were John Kidd, William Whewell, Charles Bell, Peter Roget, William Buckland, William Kirby and William Prout. The theologian was Thomas Chalmers. Buckland, Whewell and Kirby were also Anglican clergymen.
161. The only Scriptural geologist of the eight, William Kirby did attempt to address this issue. He was a distinguished entomologist and the only Scriptural geologist among the eight authors of the **Bridgewater Treatises.** See:
Kirby, W, 1835. **On the History, Habits and Instincts of Animals,** London, Vol. I, pp. xvii-lvi.
162. Kirby and Chalmers were more thorough than others on this issue. Kirby was quite explicit in attributing the evil in creation (including pestiferous insects) to the curse at the Fall of man. See:
Kirby, Ref. 161, Vol. I, pp. 9-17, 42-43, 324-331.
Chalmers linked all human suffering to man's moral perversity, but did not comment on the Fall of man or on death and suffering in the animal world. See:
Chalmers, T., 1833. **The Adaptation** of **External Nature** to the **Moral and Intellectual Constitution of Man,** Vol. II, pp. 97-125.
163. Orange, A. D., 1975. The idols of the theatre: the British Association and its early critics. **Annals of Science, XXXII:277-294.**
164. Howarth, O. J. R., 1931. **The British Association for the Advancement of Science: A Retrospect 1831-1931,** London.
165. Morrell and Thackray, Ref. 148.
166. Russell, C. A., 1983. **Science and Social Change: 1700-1900,** Macmillan, London, pp. 186-192.
167. Hinton, D. A., 1979. **Popular Science in England, 1830-1870,** Ph.D. Thesis, University of Bath, pp. 223, 254-256.
Hinton said that even Lyell's **Principles of Geology** was not commonly stocked and suggested that the avoidance of geological works was probably due to the controversial nature of geology.

168. For a more detailed discussion of these different organisations, see: Russell, Ref. 166, pp. 151-186.
169. Geisler,N. L., 1984. Augustine of Hippo. *In:* **Evangelical Dictionary of Theology,** W. A. Elwell (ed.), pp. 105-107.
170. White, Ref. 17, Vol. I, p. 211.
171. Augustine, 1968. **The Retractions,** M. I. Bogan (transl.), Catholic University of American Press, Washington DC, pp. 78, 170-171 (footnotes by Bogan).
172. Augustine knew no Hebrew and not until he was an old man did he develop a modest ability in Greek. See: Taylor, J. H., 1982. Introduction to his translation of Augustine's **The Literal Meaning of Genesis,** Newman Press, New York, p. 5.
173. This uncertainty of interpretation in Genesis continued apparently throughout his life. Two years after completing his commentary on Genesis he wrote: *'As for these "days", it is difficult, perhaps impossible to think — let alone to explain in words — what they mean.'* Augustine, 1952. **City of God: Books VIII-XVI,** G. G. Walsh and G. Monahan (transl.), Catholic University of America Press, Washington DC, Book XI, Chapter 6, p. 196. Later, near the end of his life, he remarked about his Genesis commentary: *'In this work, many questions have been asked rather than solved, and of those which have been solved, few have been answered conclusively. Moreover, others have been proposed in such a way as to require further investigations'.* Augustine, Ref. 171, p. 169.
174. Augustine, 1982. **The Literal Meaning of Genesis,** J. H.Taylor (transl.), Newman Press, New York, Vol. I, pp. 103-107, 124-125, 134-136, 141, 149. He never ventured to say how long these non-literal days lasted. He possibly believed that the last three days of creation were literal 24-hour days.
175. Augustine, Ref. 174, Vol. I, pp. 125, 141-142.
176. He did not name specific people and theories but only spoke generally of those who believed that Earth history was an eternal cycle of destruction and renewal, either in piecemeal fashion or on a global scale from time to time. See: Augustine, 1952. **City of God: Books VIII-XVI,** G. G. Walsh and G. Monahan (transl.), Catholic University of America Press, Washington DC, Book XII, Chapters 10-13, pp. 263-267.
177. Augustine, Ref. 176, Book XV, Chapters 11-12, pp. 436-440.
178. Augustine, 1954. **City of God: Books XVII-XXII,** G. G. Walsh and D. J. Honan, (transl.), Catholic University of America Press, Washington DC, Book XVIII, Chapter 40, pp. 148-149.
179. Augustine, Ref. 176, Book XV, Chapter 27, pp. 480-484 and Book XVI, Chapters 9-10, pp. 504-507. He did not believe in a flat Earth, as some have suggested, but that no men were living on the other side of the world because, it was thought, the ocean was not crossable. See: Augustine, Ref. 176, pp. 504-505. Russell, J. B., 1991. **Inventing the Flat Earth,** Praeger, New York, pp. 20-23,40-45.
180. Luther, M., 1958. **Luther's Works,** Vol. I: Commentary on Genesis 1-5, J. Pelikan (ed.), Concordia, St Louis.
181. Luther, M., 1960. **Luther's Works,** Vol. II: Commentary on Genesis 6-14, J. Pelikan (ed.), Concordia, St Louis.
182. Luther, Ref. 180, pp. 5, 19, 89, 122-123.
183. Luther, Ref. 181, pp. 150-153.
184. In his lengthy footnote in William Buckland's **Bridgewater Treatise** Ref. 114, Vol. I, p. 25, Edward Pusey, Regius Professor of Hebrew at Oxford, said that Luther allowed for the possibility of the gap theory in that the 1557 edition of Luther's German translation of the Bible placed a ' 1 ' in the margin at Genesis 1:3. Pusey's interpretation of this marginal notation was in error, however. Luther's commentary makes this clear. But also, Luther's 1523 translation of Genesis has nothing in the margins and the 1545 version has the numbers of the days in the margin at the end of each day's description (so ' 1 ' is at verse 5). See: **D. Martin Luthers Werke: Die Deutsche Bibel,** 1954, Weimar, 8 Band, where the two versions face each other on opposite pages. Also, the 1558 and 1576 versions of **Biblia,** Wittemburg, follow the 1545 edition in this matter.
185. Luther, Ref. 180, pp. 75-76.
186. Luther, Ref. 180, pp. 36, 77-78, 204.
187. Luther, Ref. 180, pp. 87-90,204-208.
188. Luther, Ref. 181, pp. 3,65-66,74-75,93-95.
189. Calvin, J., 1992. **Genesis,** J. King (transl.), Banner of Truth, Edinburgh, pp. 58-59.
190. Calvin, J., 1994. **Institutes of the Christian Religion,** H. Beveridge (transl.), William B. Eerdmans, Grand Rapids, Michigan, pp. 141-142.
191. Hooykaas, Ref. 40, pp. 117-124.
192. Russell, C. A., Hooykaas, R. and Goodman, D. C, 1974. **The 'Conflict Thesis' and Cosmology,** The Open University, Milton Keynes, pp. 71-72.
193. As in the reckoning of the days from evening to evening rather than morning to morning. See: Calvin, Ref. 189, p. 78.
194. As in the case of the 'two great lights', the Sun and Moon, described in Genesis 1:14-15, in comparison to the more exact way that astronomers speak. Calvin, Ref. 189, pp. 84-87,256-257.
195. On the days of creation he said, *'It did not, however, happen from inconsideration or by accident, that the light preceded the sun and the moon . . . Therefore the Lord, by the very order of the creation, bears witness that he holds in his hand the light, which he is able to impart to us without the sun and moon. . . Here the error of those is manifestly refuted, who maintain that the world was made in a moment. For it is too violent a cavil to contend that Moses distributes the work which God perfected at once into six days, for the mere purpose of conveying instruction. Let us rather conclude that God himself took the space of six days, for the purpose of accommodating his works to the capacity of men'.* Calvin, Ref. 189, pp. 76, 78.
196. On the age of the Earth he wrote that in Genesis, *'the period of time is marked so as to enable the faithful to ascend by an unbroken succession of years to the first origin of their race and of all things. This knowledge is of the highest use not only as an antidote to the monstrous fables which anciently prevailed both in Egypt and the other regions of the world, but also as a means of giving a clearer manifestation of the eternity of God as contrasted with the birth of creation, and thereby inspiring us with higher admiration. We must not be moved by the profane jeer, that it is strange how it did not sooner occur to the Deity to create the heavens and the earth, instead of idly allowing an infinite period to pass away, during which thousands of generations might have existed, while the present world is drawing to a close before it has completed its six thousandth year.'* Calvin, Ref. 190, p. 141.
197. Calvin, Ref. 189, pp. 58,76, 111, 132-133.
198. Calvin, Ref. 189, p. 286.
199. Dillenberger, J., 1960. **Protestant Thought and Natural Science,** Doubleday, New York, pp. 156-158.
200. Wesley, J, 1763. **Survey of the Wisdom of God in the Creation,** Vol. II, pp. 22, 227.
201. On the Flood, see also his sermon on original sin: Wesley, J., 1829-1831. **The Works of the Rev. John Wesley (1829-1831),** Vol. IV, pp. 54-65.
202. Wesley,Ref. 201, Vol. IV,pp. 206-215 (God's approbation of His works).
203. Wesley, Ref. 201, Vol. IV, pp. 215-224 (On the Fall of man).
204. Wesley, Ref. 201, Vol. VII, pp. 386-399 (The cause and cure of earthquakes).
205. Wesley, Ref. 201, Vol. IX, pp. 191-464 (The doctrine of original sin, according to Scripture, reason and experience, especially pp. 196-197).
206. Horne,T. H., 1818. **Introduction to the Critical Study and Knowledge of the Holy Scripture,** London, Vol. I, p. 3.
207. Allibone, S. A., 1877. **A Critical Dictionary of English Literature,** London, p. 890.
208. Allibone, Ref. 207, p. 889. **Dictionary of National Biography** on Home.
209. Sample reviews are quoted in: Horne,T. H., 1827. Preface. **A Compendious Introduction to the Study** of **the Bible,** London, second edition.

These included:
Christian Remembrancer (high church Anglican), **Evangelical Magazine** (non-conformist), **Congregational Magazine, Home Missionary Magazine, Wesleyan Methodist Magazine** and **Gentlemen's Magazine.**

210. Horne,T. H., 1828. **Introduction to the Critical Study and Knowledge of the Holy Scripture,** London, Vol. I, pp. 514-515.
211. In the context he apparently meant direct supernatural revelation of otherwise unknowable information.
212. Again, in the context of what follows he apparently meant direct supernatural revelation of otherwise unknowable information.
213. Horne,Ref. 210, pp. 515-516.
The exact same remarks on inspiration appeared in the 1846 edition, Vol. I, pp. 474-476.
214. For the common man a similar explanation was given in:
Horne,T H., 1819. **Deism Refuted,** London, p. 32.
Home, Ref. 209, pp. 29-31, where he responded to (and rejected) the notion that the Bible **contains** the Word of God but is not in its entirety the Word of God. The tenth edition in 1862, the year of his death, said the same (pp. 33-35).
215. Non-commentary definitions were similar.
The Penny Cyclopaedia (1841) contained an article on 'Revelation', in Vol. XIX, pp. 425-429.
At the end it summarised the three most popular theories of inspiration at that time:-
(1) every word of the Bible was dictated by God (a view the article suspected was not widely held);
(2) ***'the writers were allowed to exercise their own judgment in the choice of their words; but in the meaning of each sentence, from the first verse of Genesis down to the last of the Revelations, they have been secured by supernatural interference from the least particle of error. This theory, which is not without support from well known theologians, represents perhaps more nearly than any other the popular creed';*** **and**
(3) the increasingly popular view that inspiration applied only to the so-called 'religious truths' rather than the historical statements of the Bible.
Published by the Society for the Diffusion of Useful Knowledge during the years 1833-1843, **The Penny Cyclopaedia** was a very popular work in its day, according to S. Padraig Walsh, **Anglo-American General Encyclopedias: A Historical Bibliography 1703-1967,** p. 142 (1968).
216. Scott, T., 1841. **The Holy Bible... with explanatory notes,** p. 3.
Scott wrote this preface in 1812. Regarding how Moses got his information for writing the Pentateuch, he added,
'Whatever he might have known or collected otherwise, he wrote under the infallible superintendency of the Holy Spirit or by immediate divine inspiration' **(p. 18).**
217. Scott, Ref. 216, pp. xi-xii. See also:
Stackhouse,T, 1737. **A New History of the Holy Bible,** pp. xvii, xxii-xxiv.
This latter work was republished many times up until as late as 1870. Bishop George Gleig issued an unabridged edition with additional comments in 1817. Similar remarks are in the introductions to the Old Testament and to Genesis (no page numbers given) in:
D'Oyly, G. and Mant, R., 1817. **The Holy Bible, with notes explanatory and practical,** Oxford; the 1823 edition of the same is identical.
218. For arguments by a prominent evangelical church historian that this belief in the infallibility and inerrancy of Scripture was the dominant view in the Church since the first century and not a doctrine created in the post-Enlightenment era, see:
Woodbridge, J. D., 1986. Some misconceptions of the impact of the 'Enlightenment' on the doctrine of Scripture. *In:* **Hermeneutics, Authority and Canon,** D. A. Carson and J. D. Woodbridge (eds), Zondervan, Grand Rapids, Michigan, pp. 237-70.
219. Home, Ref. 206, Vol. II, pp. 18-38.
Another work which Home highly recommended in defence of the credibility of the Pentateuch as authentic history was:
Faber, G. S., 1811 and 1818. **Horae Mosaicae: A View of the Mosaical Records with respect to their Connection with Profane Antiquity, their Internal Credibility and their Connection with Christianity,** London, two volumes.
These constituted his Oxford Bampton Lectures for 1801. In volume I Faber argued that pagan accounts of creation, the Deluge, and the period from the Deluge to the Exodus confirmed the truth of Moses' writings.
220. Home, Ref. 206, Vol. I, pp. 485-490.
221. Home, Ref. 206, Vol. II, p. 37.
222. Home, Ref. 206, 1834 edition, Vol. I, pp. 148-165.
223. Horne,T. H., 1839. **A Manual of Biblical Bibliography,** London, p. 283.
224. Home, Ref. 206, 1856 edition, Vol. I, pp. 583-590.
He indicated that William Buckland and John Pye Smith were the two primary influences in his change of thinking.
225. Home, Ref. 206, Vol. I, pp. 207-208.
226. Home, Ref. 206, Vol. I, pp. 198-209.
227. Home, Ref. 206, Vol. I, pp. 366-367.
228. Mildert, W. V, 1815. **An Inquiry into the General Principles of Scripture-Interpretation,** Oxford.
229. Home, Ref. 206, Vol. II, Appendix, pp. 25-34.
Geddes (a liberal Catholic) and Priestley (a unitarian) were cited for the sake of completeness, but he did not approve or recommend them. He also listed the commentary by the German, J. D. Michaelis. All commentaries in Table 1 are listed in the bibliography.
230. **Dictionary of National Biography** on Scott.
231. Symington, W., 1841. Introduction. *In:* T. Scott, **The Holy Bible ... with explanatory notes by T. Scott,** Glasgow, p. xx.
232. Home, Ref. 206, Vol. II, Appendix, p. 31.
233. Overton, Ref. 145, p. 178.
234. **Dictionary of National Biography** on Clarke.
235. Clarke, J. B. B., 1833. **An Account of the Infancy, Religious and Literary Life of Adam Clarke,** London, Vol. II, pp. 313, 350, 402.
236. Clarke, Ref. 235, Vol. III, pp. 35-36, 213, 472.
237. **Dictionary of National Biography** on Gill.
238. Home, Ref. 206, Vol. II, Appendix, p. 27.
Adam Clarke said much the same about Gill in:
Clarke, A., 1836. **The Holy Bible ... with commentary and critical notes,** London, Vol. I, p. 9.
239. **Dictionary of National Biography** on Fuller.
240. Dunhill, R., 1983-1984. The Rev. George Bugg: the fortunes of a 19th Century curate. **Northamptonshire Past and Present, VIII(1):42.**
241. Dictionary of National Biography on Henry.
242. As noted at the end of the section on the history of geology, while geologists were debating the fine points of the classification of the stratigraphic record in the 1820s and 1830s, the vast antiquity of the Earth (in excess of the traditional 6,000 years) was firmly accepted by the majority of geologists well before 1820 and the later revisions of some of the most highly regarded commentaries (Home, Clark and Scott).
243. Rudwick,Ref. 10, p. 419.
244. Rudwick. Ref. 10, p. 418.
245. Rudwick, Ref. 10, p. 419.
246. Rudwick, Ref. 10, p. 425.
247. Rudwick gave no names of Scriptural geologists whom he considered to fit in this category.
248. Rudwick, Ref. 10, p. 29 (explanatory paragraph for figure 2.3).
249. Dictionary of National Biography on Sedgwick, p. 1117.
250. Clark, J. W. and Hughes, T. M., 1890. **The Life and Letters of the Reverend Adam Sedgwick,** Cambridge, Vol. I, pp. 199, 287.
251. Lyell did not really lengthen geological history in any way relevant to the Scriptural geologists' contention about the age of the Earth. When he devised his modified version of Hutton's uniformitarianism in the late 1820s, the old-Earth paradigm was in place and the Noachian Deluge had already been greatly reduced in geological significance.
252. This will be amplified shortly.
253. Woodward, Ref. 110, p. 41.
254. Buckland, Ref. 116, preface.
255. Rupke, Ref. 35, pp. 7-8.
256. Gordon, Ref. 16, pp. 1-12.
257. First published in 1813, it went through five revised editions by 1838 **and was considered to be *'undoubtedly the best of the early textbooks'*.**
See:
Woodward, Ref. 110, p. 84.
258. Wilson, L. G., 1964. The development of the concept of uniform-

itarianism in the mind of Charles Lyell. **Proceedings of the Tenth International Congress on the History of Science,** Hermann, Paris, pp. 993-996.
Dictionary of Scientific Biography on Werner, p. 257.
Rudwick, Ref. 10, pp. 54-72,457-458.
Fitton, W., quoted in Woodward, Ref. 110, pp. 52-53.
Fitton's original article was in **Edinburgh Review, XXIX:70-94** (1817).
Cannon, S. F, 1978. **Science in Culture: the Early Victorian Period,** Dawson, Folkstone, pp. 142-143.
Lyell, C, 1830-1833. **Principles of Geology,** John Murray, London, Vol. III, p. vi.
Rudwick, M. J. S., 1969. Lyell on Etna, and the antiquity of the Earth. *In:* **Toward a History of Geology,** C. J. Schneer (ed.), p. 289.
That is, those geologists involved in mining, building canals, railways and roads, and digging wells, etc.
Rudwick, Ref. 10, p. 419.
Lyell, C, 1836. Presidential address, February 19,1836. **Proceedings of the Geological Society of London, 11:359.**
Woodward, Ref. 110, pp. 36, 87, 286.
Macculloch, J., 1831. **A System of Geology with a Theory of the Earth and an explanation of its connexion with the Sacred Records,** London, Vol. I, pp. vi-vii.
Lyell, Ref. 263, Vol. I, pp. 89, 179-181.
Ospovat, A. M., 1976. The distortion of Werner in Lyell's **Principles of Geology. British Journal of the History of Science, IX(32):** 190-198.
William Whewell was also critical of Werner and Hutton for prematurely developing theories of Earth history based on very limited knowledge of the Earth. See:
Whewell, W, 1837. **History of the Inductive Sciences,** London, Vol. III, pp. 604-605.
Gould, S. J., 1987. **Time's Arrow, Time's Cycle,** Harvard University Press, Cambridge, pp. 70-72, 76.
Dictionary of Scientific Biography on Cuvier, p. 525.
Cuvier,G., 1813. **Essay on the Theory of the Earth,** R. Kerr (transl), William Blackwood, Edinburgh, pp. 111-114.
Rudwick, Ref. 10, pp. 53-72,457-458.
Woodward, Ref. 110, pp. 12,73.
Dictionary of National Biography on Greenough.
Rudwick, Ref. 10, p. 449.
See also:
Porter, R., 1978. Gentlemen and geology: the emergence of a scientific career, 1660-1920. **The Historical Journal, XXI(4):**809-836.
Smith, Ref. 108, p. vi.
Lyell, K. M. (ed), 1881. **Life, Letters and Journals of Sir Charles Lyell, Bart.,** John Murray, London, Vol. I, pp. 304, 397.
Rupke,Ref. 35, p. 255.
Rudwick, M. J. S., 1974. Poulett Scrope on the volcanoes of Auvergne: Lyellian time and political economy. **The British Journal for the** History **of Science,** VII(27):205-242 (especially, p. 227).
284. Rudwick, M. J. S., 1979. Transposed concepts from the human sciences in the early work of Charles Lyell. *In:* **Images of the Earth,** L. J. Jordanova and R. S. Porter (eds), British Society for the History of Science, Monograph I, pp. 67-83.
285. Rashid, S., 1981. Political economy and geology in the nineteenth century: similarities and contrasts. **History of Political Economy, XIII(4):** 726-744.
286. Rupke,Ref. 35.
287. Grinnell, G., 1976. The origins of modern geological theory. **Kronos,** I(4):68-76.
288. Cannon, Ref. 22, pp. 65-88.
289. Moore, Ref. 34, pp. 322-350.
290. Corsi,Ref. 133.
291. Ager, D. V, 1981. **The Nature of the Stratigraphical Record,** The Macmillan Press Ltd, London, p. 46.
292. Hitchcock, E., 1837. The historical and geological deluges compared. **The American Biblical Repository,** IX(25): 131-137. At this time (1837) Hitchcock, along with Benjamin Silliman (another prominent American old-Earth geologist), still believed the geological evidence indicated that a geologically significant global catastrophe had occurred at the time of Noah.
293. Smith, W., 1835. **Deductions from Established Facts in Geology,** Scarborough.
294. Phillips, Ref. 118, p. 4.

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