

British Scriptural Geologists in the First Half of the Nineteenth Century: Part 2. Granville Penn (1761-1844)

TERRY J. MORTENSON

ABSTRACT

*At a time when many early geologists were abandoning Genesis and compromising with the new old-Earth interpretations of Hutton, Werner, Buckland, Cuvier and others, Granville Penn made a courageous stand in defence of the Scriptures in his book **A Comparative Estimate of the Mineral and Mosaical Geologies**. Penn insisted that Earth history began with six literal days of creation by God, during which the 'primitive' (granitic) rocks were created with an appearance of age (on Day 1) and a major geological upheaval occurred which built and shaped the first land (on Day 3). The global year-long Flood was then responsible for devastating the Earth, building most of the layers of fossil-bearing rocks, and eroding today's valleys when retreating. Penn's work received positive recognition. He insisted that geology as a study of history depended on divine revelation, but should also be built on the sound philosophical basis of Bacon and Newton.*

BIOGRAPHICAL SKETCH¹

Granville Penn was born in Spring Gardens, a hamlet in the parish of Wooburn, Buckinghamshire,² on December 9, 1761, the fifth but second surviving and youngest son of Thomas Penn, and the grandson of William Penn, who founded the colony of Pennsylvania in America.³

He matriculated, without taking a degree, from Magdalen College, Oxford, in November, 1780, and then became an assistant chief clerk in the War Department, from which he received a £550 pension. He married Isabella, daughter of General Gordon Forbes, on 24 June, 1791, and they settled in London for many years. Together they had four sons and five daughters, with one of each dying in infancy.⁴ All three sons who reached manhood received an MA from Christ Church, Oxford. One became a barrister and another became an Anglican clergyman.⁵ This family information, in the absence of other information, suggests that Penn himself was an Anglican.

In 1834 when Penn's brother John died, he took over the family estates of Stoke Park, Buckinghamshire, and of

Pennsylvania Castle, Portland. When Penn died at Stoke Park on 28 September, 1844, he willed to his son and his heirs £3,000 per year for 500 years out of a perpetual annuity of the £4,000 granted to the Penn family by an act of Parliament to compensate for losses sustained in America.^{6,7}

Penn loved the study of languages (being fluent in French, Greek, Latin and possibly Hebrew) and ancient literature. He was a Fellow of the Society of Antiquaries,⁸ wrote several books dealing with biblical criticism and published a number of competent translations of ancient Greek works, including a critical revision of the English version of the New Testament. He also wrote some theological works particularly related to biblical chronology (past and future) and the early history of post-Flood mankind. Many of these works went through more than one edition. His major work on geology was **A Comparative Estimate of the Mineral and Mosaical Geologies**.⁹ It was first published in 1822, received a supplement in 1823 in response to Buckland's theory on Kirkdale Cave, and was revised in light of criticism and greatly enlarged to two volumes for a second edition in

1825.¹⁰ The later edition will be the focus of this study.¹¹

GEOLOGICAL COMPETENCE

Penn made no claim to be a geologist, but he was well read in the geological literature of his day. His book contains many quotes, most of them long and all well documented, from the most recent books by British geological writers such as Buckland, Conybeare, Macculloch, Hutton (Playfair's version), Kirwan, Jameson, Greenough, Bakewell, Brande and Parkinson, and by French geological writers such as Cuvier, D'Aubuisson, Humboldt, Saussure and Deluc. He read geological articles in such periodicals as *Journal de Physique*, *Bibliothèque Universelle*, *Philosophical Transactions*, *Annals of Philosophy* and *Geological Transactions*. In addition he carefully read and responded to the reviews of his first edition of *Comparative Estimate* in such journals as the *Eclectic Review*, *Journal of Science* and the *British Critic*.¹²

Throughout *Comparative Estimate* Penn gave little indication of first-hand observation of geological phenomena. Nevertheless, he was not insensitive to the charge from the geologists, to whose theories he was offering critique, that he was not qualified to comment on the subject. In his long appendix on Buckland's Kirkdale Cave theory he seems to intimate the extent of his own observations of geological phenomena, when he wrote:

I am well aware, that it has long been a common resource of many who, after laborious and hazardous enterprises to collect facts in geology, find the conclusions which they have drawn from those facts questioned by others who have not engaged in the same particular enterprises, to exclaim, that the objections are those of "mere cabinet naturalists", who have not inspected the objects on which they pretend to deliver an opinion. But, this "argumentum ad silentium" has no title to produce it; for, the facts reported, are certainly of no value whatever to science, if they do not enable all reflecting and philosophical minds to reason effectually and conclusively upon them; and, no one can at the same time, both impart his knowledge to others, and keep it all back to himself. And, that the sobriety of "the cabinet" is materially needed to revise and regulate the often hasty and impassioned combinations of actual inspection, is virtually admitted in the concession of Cuvier; "that many who have made excellent collections of observations, though they may have laid the foundations of true geological science, have not therefore been able to raise and complete the edifice". Besides, it does not follow, because a writer meditates in his cabinet, or, because he has not visited the limestone caves of England and Franconia, that he has not made researches out of it: or, because he abstains from a recital of his travels, that he has not explored the mountainous chains of the Alps, or the Pyrennees, or sought the interior of the earth in various

*places, as, at Hallein in Salzburg, Bex in Switzerland, Mont St Pierre near Maestricht, and elsewhere; which are no negative instructors in preparing the mind for geological investigation.*¹³

Furthermore, Penn argued, it is sound logical induction, more than the quantity of geological observations, that is critical to the erecting of a reliable geological history of the Earth.

*The Mineral Geology, confidently reposes on its delusive error, that he who sees most, judges best; and it expects, by that rule, to secure the palm in every geological contest. As if judgement, were the necessary product of vision. But, as the two faculties have no such necessary ordination and dependence; he who sees enough, with a more instructed judgement, will better apprehend the fundamental truths of geology, than he who sees more than enough, with a judgement less instructed. It is one thing to accumulate data, and another thing to reason soundly upon them when accumulated: as will be frequently exemplified in the progress of this work. . . Certainly, he who has read numerically most books [sic], is not necessarily the best critic; and, by the same principle, he who has seen numerically most rocks [sic], is not necessarily the best geologist. . . Although, then, it is undeniably true, "that those who have contributed most to the advancement of Natural Philosophy, have had, at the same time, a tendency to generalize, and an accurate knowledge of a great many particular facts"; yet, it was not the tendency, but the sound ability, that enabled them to contribute to that advancement.*¹⁴

In response to Buckland's assertion in *Vindiciae Geologiae* that a qualified natural philosopher cannot be content with mastering one branch of science but must have a breadth of knowledge over the whole range of science, Penn added that in the area of historical geology other branches of learning were also essential.

*But, it is also no less certainly true; that all the physical sciences combined cannot serve the philosopher to apprehend the historical basis on which alone the complex Science of Geology can securely stand, unless he is further succoured by the concurring auxiliaries of Sacred and Ancient Learning. If he would attain to that apprehension, he can no longer be allowed to "remain satisfied" with the exclusive illumination of the Physical Sciences.*¹⁵

Some indication that Penn's work did not reflect complete geological ignorance, or misunderstanding of the geological works he read, may be gained from two reviews of his book. One review was in the form of a book published anonymously in 1828, called *Conversations on Geology*, which primarily compared Penn's geological theory of Earth history with those of Werner and Hutton and generally considered Penn's the best, though the author did not agree with Penn on every point.¹⁶ The geologically-informed author of *Conversations on Geology* remarked, possibly

on the basis of personal acquaintance, that Penn was an 'excellent geologist', 'who is extensively acquainted with the facts and theories of modern **Mineral Geologists**', and who 'is a pupil of the celebrated Saussure', and had been 'long among the Alps and Pyrenees'}¹

The **Magazine of Natural History** review of **Conversations on Geology** also described Penn's geological theory as a 'more rational and plausible system' than the others to which it was compared.¹⁸ The **Eclectic Review** said of the first edition of the **Comparative Estimate**:

*This is by far the most plausible and masterly attempt, which has hitherto been made, to compare the facts of geology with the sacred records of the Creation and the Deluge.*¹⁹

A two-part review of Penn's first edition and the subsequent supplement on Kirkdale Cave appeared in the **Quarterly Journal of Science, Literature and Arts**.²⁰ The reviewer hailed Penn's 'valuable book' with 'unfeigned satisfaction'.²¹ He said that Penn

*invariably supports his assertion by reference to some writer of established authority' and his argument was 'remarkable for the closeness of its reasoning' and for the spirit of upright honesty and manly candour which animates every page.*¹¹

As for Penn's discussion on the formation of coal, the reviewer felt that Penn handled the subject 'with the judicial caution which the obscurity of the subject demands'.²³ The reviewer highly recommended the book because

*its philosophy is founded on that of Bacon and Newton; its reasoning on the mode of first formations and secondary causes, are in strict harmony with that philosophy, and at least as plausible as any that have been advanced by the Huttonian and Wernerian schools; . . . and its excellent moral and religious tendency.*²⁴

The **Supplement** only strengthened the reviewer's convictions about the 'talents and right-mindedness' of Penn and the 'logical precision and force' of his objections against Buckland's theory that Kirkdale Cave was an antediluvian hyaena's den, though the reviewer objected to some points in Penn's argument.²⁵ Finally, he praised Penn for the 'gentlemanly tone' and 'respectful terms' he used in reference to Buckland.²⁶

James Kennedy, an Irish classical scholar and divine who followed the old-Earth views of Buckland, disagreed with Penn on the age of the Earth but nevertheless called Penn's work 'ingenious'. He thought Penn's refutation of Faber's day-age theory of Genesis 1 to be good and Penn's discussions of First Cause and the original creation to be 'to a certain extent, sound and demonstrable'.²⁷

GEOLOGY AND GEOLOGISTS

Penn never expressed any opposition to the study of geology or any other science. On the contrary, he affirmed

that geology is a 'delightful study', and mineralogy is a 'sound and valuable science'.²⁸ Furthermore,

*The science of GEOLOGY, the last of those reserved measures of light which have been opened upon us, has this remarkable character above all the preceding physical sciences; that, it not only conducts the intelligence, like them, to the discernment of the God of Nature, but advances it further, to a distinct recognition of that God of Nature in the God of Scripture.*²⁹

Throughout his work he showed great respect for the 'eminent and distinguished' geologists with whom he disagreed.³⁰ Wherever he could, he frequently expressed appreciation for the research and philosophical inductions they had made. So, for example, Conybeare was a 'valuable reverend writer on Geology' and a 'learned', 'able' and 'instructive mineralogist'.³¹ Buckland was an 'excellent author' of 'eloquent and sublime piety' to 'whose valuable labours we are wholly indebted'.³² Saussure was considered by Penn to be 'one of the most able and most deservedly celebrated mineralogists of our time'.³³ Cuvier was 'the illustrious comparative anatomist who has devoted so much genius and zeal to the investigation' of fossil animal remains and in this field of study 'probably will remain for ever unrivalled'.³⁴ Humboldt was a 'Herculean explorer' and 'indefatigable scrutinator' of geological phenomena.³⁵ And D'Aubuisson, to whom Penn referred more than anyone else, was a man of 'superior genius', than whom 'no one has displayed more ability, acuteness, general circumspection, and integrity'.³⁶

When Penn disagreed with these respected geologists it was over the interpretation of the facts, not the facts themselves, except when so-called 'facts' were really disguised theoretical inferences from the facts. He contended that the old-Earth geologists erroneously relied on a 'seductive principle' that the facts in geology are **self-evident**, and need only to be **seen** to be **believed**.³⁷ He believed and attempted to show that the geologists themselves were not aware that many of their 'facts' were theory-laden. After quoting Humboldt's expressed desire to avoid hypothesis in his factual description of the crust of the Earth, Penn wrote,

Yet, notwithstanding this emphatic disclaimer of all hypothesis, notwithstanding this determined advocacy of facts, and facts only, the "Geognostical Essay" is governed throughout by a masked theory; of which its eminent author appears to be hardly conscious, but of which the attentive reader will have caught some surmise from the reservation claimed by the author; "of adding what is only probable, (that is, in his own opinion) to what appears completely verified", and thus, of incorporating theory with the facts of his observation and experience. This theory of probabilities, I shall now proceed to unmask; in order that we may be able to distinguish and ascertain exactly, how far his geognosy of fact is also a geognosy of

*hypothesis, and thus reveals itself to be only another variety of that Alchymical Geology, which has already been examined and exposed.*³⁸

For these reasons, Penn distinguished between the legitimate science of mineralogy, which like botany and zoology explores the present **nature** of the relevant objects of study, **and** the '*spurious and baseless science*' of Mineral Geology', a term taken from Cuvier's **Ossemens Fossiles**.³⁹ Penn used the term, Mineral Geology, collectively to describe all the old-Earth theories which tried to explain, purely by observation of the geological phenomena and reference to secondary physical and chemical causes, '*the mode of first formation*' of the primitive mineral substances of the Earth and '*the mode of the changes*' those substances had subsequently undergone, that is, the original creation and history of the Earth.⁴⁰ Mineral Geology was a branch of mineralogy which Penn considered to contain many of the notions of the ancient Greek atomic philosophy of chaos. As a view of Earth history, Penn's 'Mosaic Geology' was an alternative to 'Mineral Geology', not to the science of mineralogy. We will come back to this distinction shortly, for it is at the heart of Penn's argument.

THE RELATION BETWEEN SCRIPTURE AND GEOLOGY

The **Dictionary of National Biography** article on Penn, probably following several of Penn's critical reviewers, says that Penn made '*an unscientific attempt to treat the book of Genesis as a manual of geology*'. But this is precisely what Penn disclaimed and his argument seems consistent with his stated intentions.

First, Penn argued that Genesis and geology ought to be connected because it was philosophically permissible, even necessary, to attempt to identify the God of Scripture with the God of Nature, that is, to show that they are one and the same God, as Scripture itself teaches. And since God had communicated certain historical facts about the original creation of the Earth and the Flood, it would certainly not be prudent to disconnect them from the geological study of the surface of the Earth. Rather, Penn insisted, to trace the connection of Genesis to geology would be '*of the first importance, in Man's relation to God under Divine Revelation*', as it would contribute to our confidence that Scripture is of divine origin, as we are sure Nature is.⁴¹ Conybeare and others contended that physical science only had a connection to natural religion, not revealed religion, that is, science could help only to prove the existence and attributes of the Author of Nature from His works.⁴² Penn countered that the Christian already knew this from abundant and obvious physical evidence, and that the unbeliever had no excuse for not acknowledging this fact, as Paul says in Romans 1:18-20. The real problem, said Penn, was to show that the God of Scripture is the God of Nature.⁴³

Penn objected to the assertion of Conybeare and other

geologists that the study of Scripture and of geology should be dissociated because (as the old-Earth geologists asserted) the professed object of Biblical revelation was to treat only the history of man.⁴⁴ Penn argued that Exodus 20:11 shows that God intended to impart to man special and particular historical knowledge about the origin of the celestial bodies and the plants and animals of land and sea, **before** He imparted a history of man's own origin.

*The history of the origin and relations of all and each of these, is therefore as much a professed object of Revelation, as the history of the origin and relations of Man himself.*⁴⁵

Also, if, as Conybeare admitted,⁴⁶ the dealings of Divine Providence in regard to man was a professed object of Scriptural revelation, then a knowledge of the Divine Judgments at the Fall and the Flood would necessarily be encompassed in that object. But, Penn argued, according to the Bible, these judgments had universal physical, as well as spiritual, effects on the Earth. Therefore, what the Bible said about the origin, formation and universal changes to the Earth was a professed object of Divine Revelation.⁴⁷

Penn insisted that the Bible did not include '*a system of physical truth*', as Conybeare (and others) claimed that people such as Penn did believe.⁴⁸ To this false accusation Penn responded, that these old-Earth geologists argued

'as if no physical FACTS could be imparted to man by revelation without being accompanied, at the same time, with a SYSTEM of physics. No system of physics, is imparted to us; but fundamental physical facts are most certainly imparted to us, in order that we may have a secure and certain basis on which to found the system which, by the due exercise of our intelligence, we may construct, and which could, otherwise, never have acquired any secure and certain basis at all. Our reason is, indeed, to work; but, it is set right in the first instance, that it might not necessarily work wrong.

*We have, therefore, no physical system, but, we have grounding physical facts. . . . those simple grounding principles which the Mosaical revelation alone either does or can supply . . . opening to us . . . the true foundation on which the historical science of Geology must ultimately rest.*⁴⁹

In defining the Mosaical Geology on the basis of his detailed consideration of what Genesis teaches about the original creation, Penn re-emphasised this distinction.

'Although, therefore, we are not to look for physical science technically so called, or for a system of physics, in the history, it is nevertheless manifest, that it behoves us to endeavour to trace the harmony subsisting between the physical facts which are there declared or intimated, and the physical phenomena which are apparent in the globe; from the investigation of which harmony, by the light of sound philosophy, we shall be able to deduce, and establish, a true Mosaical Geology. It would argue a very great obtuseness of intellect, not to be able to discern the difference between physical

*facts and a system of physics; the former of which, though not the latter, are included in the Mosaical history, and they therefore challenge our first attention, in considering the **history of the Earth** or the **foundations of Geology**.*⁵⁰

Penn repeatedly stressed that geology was different from other sciences in that it dealt with the past, rather than merely presently observable processes. Therefore, expertise in the study of the latter was no guarantee of accuracy in the reconstruction of the former.

*What true comparison can be made, between the **measurement of present objects of sense and the recovery of past facts of history?** Because we can apply rules of arithmetic or mathematics to **present objects**, we are not **therefore** incapacitated to recall **past events**. In the former case, we have the evidence of the truth **always with us**; in the latter, we must seek it **elsewhere**, for we can never find it in the **subject matter of our study**!⁵¹*

He quoted with approval the opening remarks of the review of Buckland's **Reliquiae Diluvianae** in the **Quarterly Review**:

*The science, as it is perhaps improperly called, of **geology**, (observes a recent learned Journalist) differs from all other sciences in one material respect. It contemplates, not only **what is**, but **what has been**. It embraces the **history** of our globe, as well as its **actual composition**; it endeavours to trace the succession of events which have preceded its present state; to ascertain, not only the changes which have taken place, but the **causes**, or, in other words, the **physical connexion** of those changes; and to determine the **order**, the **time**, and the **circumstances**, under which they were effected. The province of the **Geologist** resembles therefore in some respects that of the **Historian**: he must diligently **examine ancient documents**.*⁵²

The Mineral Geologists considered only the geological phenomena as the 'documents' of history (from the 'book of nature'), which were to be studied and interpreted to reconstruct the past. But Penn argued that these geologists developed faulty theories because they rejected or ignored the written historical documents, that is, Genesis. The 'documents' of the Mineral Geologist were really only the 'monuments and medals' of the past.

*But, what could we make of **monuments and medals**, if it were not for the **auxiliary references of history?** The mineral geology has indeed a strong **tendency** to explore, inquire, and collect these relics of the globe's antiquity, in rich abundance; but, to **decipher them when collected**, far exceeds the bounds of its capacity, unless it associates to itself **another and a more authoritative geology**. It was wisely observed by Mr. Kirwan; that "**past geological facts** being of an **historical nature**, all attempts to deduce a complete knowledge of them **merely from their still subsisting***

*consequences, to the exclusion of unexceptionable **testimonies**, must be deemed as absurd, as that of deducing the history of Ancient Rome solely from the **medals** or other **monuments of antiquity** it still exhibits, or the scattered ruins of its empire, to the **exclusion of a Livy, a Sallust, or a Tacitus**". . . . It is evident to reason, that **certainty concerning a past fact**, — such as is, the **mode** by which all material existences were **really first formed, or were really afterwards altered** — must be **historical certainty**: the subject, therefore, is no longer a subject for **philosophical or scientific induction**, but for **historical evidence**, it demands a **voucher competent to establish its truth**. Now, the **voucher** that could establish the **fact** respecting the **true mode of first formations**, must have been a **witness of that mode**; but, the **only witness of the mode of first formations or creations**, was the **Creator Himself**!⁵³*

Genesis then gives us the Mosaical Geology, the historical framework for understanding the monuments of the past. Within this framework, or 'General Elementary Scheme', Penn said, geologists have plenty of room to investigate and speculate.

*'Within the limits of this **General Elementary Scheme**, all **speculation** must be confined which would aspire to the quality of **sound Geology**; yet, vast is the field which it lays open, to exercise the intelligence and research of sober and philosophical **mineralogy and chemistry**. Upon this **legitimate ground**, those many valuable writers, who have either **incautiously lent their science** to uphold and propagate the vicious doctrine of **chaotic geogony**, or who have **too cautiously withheld their science** from exposing and refuting it, may geologise with full security; and, transferring their mineralogical superstructures from a **quick-sand** to a **rock**, may concur to promote that true advancement of **natural philosophy**, which Newton held, and demonstrated, to be inseparable from a proportionate advancement of the **moral**. They may thus, at length, succeed in perfecting a **TRUE PHILOSOPHICAL GEOLOGY**; which never can exist, **unless the PRINCIPLE OF NEWTON form the FOUNDATION, and the RELATION OF MOSES, the WORKING-PLAN**.*⁵⁴

Now the reason, said Penn, that many past attempts to interpret the fossils and rocks in the light of Scripture had failed, was not because theology had wrongly meddled in a foreign domain of study, but because either the theologians did not know physical science well enough or the physical philosophers had possessed an inadequate knowledge of the details recorded in the sacred history of the Bible, particularly Genesis. But these errors on both sides were fundamental to the question of the origin and subsequent changes of the Earth, because '*the question at issue is a **compound question**; it is both **physical and historical**; for it seeks the **historical truth** of a **physical fact**.*⁵⁵ Obviously, Penn felt that he had an adequate knowledge of

both the physical and the biblical facts to attempt to give a rationally compelling answer to this question.

THE PHILOSOPHICAL FOUNDATION OF COMPARATIVE ESTIMATE

Volume I deals exclusively with the original creation, or 'the mode of first formation', as Penn termed it. Volume II treats the changes to the Earth since the first formation, focussing primarily on the Noachian Deluge.

After an 80-page introduction in Volume I, in which Penn clarified the arguments in the book by responding to critics of his first edition, he then endeavoured methodically to show that Mineral Geology was contradictory to the Newtonian and Baconian principles of philosophising. This is the part which, Penn rightly said in his introduction, was ignored by his negative critics, but which was fundamental to his whole argument. So it is important to consider it carefully.

First, he argued that there are only two guides to interpreting the history of the Earth reflected in the four geological divisions of the Earth's surface (primary, transition, secondary and tertiary): the Mosaic and Mineral Geologies. These, he said, are mutually exclusive, even contradictory guides, for Mosaical Geology rested on divine testimony about historical facts, whereas Mineral Geology ignored this inspired Scriptural account and constructed its history solely from geological phenomena and chemical and mechanical principles, as then understood. To determine which was true, Penn proposed the application of the test to which Mineral Geology always appealed, namely, the '*reformed philosophy of Bacon and Newton*'.⁵⁶

On the basis of quotes from D'Aubuisson, Penn carefully defined Mineral Geology in contra-distinction to mineralogy (as noted above) and showed that it claimed to follow the inductive scientific method of Bacon and Newton in explaining how the Earth was formed.⁵⁷ He reasoned that if Mineral Geology did not do well by the standard of Newton and Bacon in explaining the first formation of the Earth, we would have justification for distrusting its history of the changes and revolutions that had occurred since that first formation.

Using seven pages of quotes from D'Aubuisson, Jameson, Cuvier, Kirwan and DeLuc he showed what the old-Earth geologists (whether Huttonian or Wernerian) believed about the first formation of the Earth: a once fluid chaotic mass (whether igneous or aqueous) was gradually formed into the present spherical Earth with a crust of primitive crystalline rocks, solely by the laws of matter operating over long ages of time. This, they claimed, was a conclusion resulting from the methodical combination of observation, experimentation, and inductive logic based on proven principles of physics, as advocated by Newton and Bacon. But, quoting from Newton's *Opticks*,^{58,59} Penn contended that this view of first formation was directly opposed to Newton. Newton, he argued, believed that by

His great intelligence God initially formed the Earth, immediately and perfectly, in a solid ellipsoidal condition suitable to the end for which it was formed (that is, a habitation for life), and not as a chaotic mass which would evolve by the mere laws of nature to the intended end.

Penn illustrated this contradiction between Newton and Mineral Geology by considering the spherical shape of the Earth. Relying on both Newton's writings and Newton's expounder, Colin MacLaurin (1698-1746),⁶⁰ he argued that the old-Earth geologists had actually misused Newton's *Principia Mathematica* to defend their notion of a once liquid globe. He contended that Newton merely **supposed** the once liquid state of the Earth as a philosophical hypothesis in order to demonstrate something mathematically, but that Newton gave no evidence of believing that this supposition actually was **geological fact**.⁶¹

The reason, Penn said, that Mineral Geology was in opposition to Newton was because these geologists did not carry their analysis and induction back as far as Newton had — to the investigation of the first formation (or creation, as Newton called it) of all matter in general in order to ascertain the most general cause. Quoting from Newton's *Optics*, Penn contended that Newton attributed the existence and perfection of such things as the planetary systems and the bodies of animals to the wisdom and skill of an eternal Creator.^{62,63} In other words, the three kingdoms of minerals, plants and animals were originally formed by the same cause — the immediate or instantaneous acts of the supernatural Creator. In light of this Penn remarked,

*'Newton's rules of philosophising require, that we should refer to the same common cause, all existences which share the same common properties; and, the three kingdoms of matter, share equally the same common properties of matter But, besides sharing the same common properties of matter, they demonstrate a community of system; each existing with relation to the others, and having the reason of its own existence in that relation . . . The first formations of each of which, must of necessity, that is, in philosophical consistency, be referred to the same operating cause, and to the same mode of operation. If any one of the three was originally formed perfect for its end, so also were they all.'*⁶⁴

Penn proceeded to build up to the geological implications of this by considering the first formed, or created, animal matter (particularly focusing on the bones of the first man), and the first plants (focusing on the tree trunk of the first tree). From this discussion he proposed two principles of first formations of plant and animal matter. First,

*'those first formations of the Creating Agent anticipated by an immediate act, effects which were thenceforward to be produced only by a gradual process, of which He then established the laws.'*⁶⁵

In other words, the laws of nature did not begin to operate until after the initial creation; they were not the means of

creation.

So if a bone of the first created man persisted and was found mingled with the bones of that man's descendants, the anatomist could not distinguish the created bone from the generated one, by the study of physical phenomena alone. Similarly, the botanist would be incapable of discriminating between a part of the trunk of the first tree and that of one of its generated offspring. This naturally led to Penn's second principle of first formations in the case of two of the three kingdoms of terrestrial matter, the plants and animals:

*'sensible phenomena alone cannot determine the mode of their formation, since the real mode was in direct contradiction to the apparent indications of the phenomena'*⁶⁶

Having established these points in relation to the plant and animal kingdom, Penn next made the connection to the mineral kingdom. As the first tree was not the result of a gradual process of lignification and the first bone was not the consequence of the presently observed process of ossification, so the first primitive rocks of the Earth were not the product of precipitation (or fusion) and crystallisation, as the physical phenomena alone would suggest to the observer. This reasoning, said Penn, applied equally to the two varieties of Mineral Geology: neptunian (Wernerian) or vulcanian (Huttonian).

*'The correspondence and correlation of the three subjects, are pointed out by physical science itself in the passages which have just been quoted; for, natural history there points out the analogy of the wood in the vegetable structure, and mineralogy points out that of primordial rock in the mineral structure, with the bone in the animal structure. Solidity and consistency, therefore, are the common properties of all the three. To produce that solidity and consistency, which were as necessary for the surface which was to sustain, as for the bodies which were to be sustained by it, was equally the end of the formation of each; and, therefore, according to Newton's second rule, we are bound by reason to assign the same identical cause for the solidity and consistency of each. And it will then necessarily follow; that primitive immediate crystallisation, can furnish no data for computing time, more than primitive immediate ossification, or primitive immediate lignification.'*⁶¹

So all of God's first creations in the mineral, plant and animal kingdoms were made in **correspondence** with the laws of nature, which He inaugurated **immediately after** the original creation, in **anticipation** of the phenomenological effects which would thereafter be produced only by those laws.

But to the anticipated objection of the old-Earth geologists that this would implicate God in the wilful deception of human students of His creation, Penn replied,

'Those phenomena cannot mislead, deceive, or seduce any one, who faithfully and diligently exercises his

*moral and intellectual faculties by the rule which God has supplied for their governance; but, only those who neglect to exercise them by that rule. For, those very faculties, while they direct us to infer universal first formation by the immediate act of God, caution us, at the same time, not to be misled by the phenomena which that act must necessarily have occasioned. They warn us, that all first formations of the material works of God, must have received a specific form of their substance, and therefore, must have exhibited to the visual sense specific characters, even at the moment when they were first called from non-existence into being. Whether it were the first formed bird, or the first formed shrub on which that bird rested, or the first formed rock on which that shrub grew, each must have instantly exhibited sensible phenomena; the first, of ossification, the second, of lignification, and the third, of crystallisation. Yet, the phenomena would not have been truly indicative of actual ossification and actual lignification in the two first cases; and therefore, they would not have been truly indicative of actual crystallisation in the last; that is to say, of those subjects having actually passed through any of these gradual processes. There is no possibility of escaping from the demonstrative power of this great principle, which extends itself, equally, to first formations in all the three kingdoms of terrestrial matter.'*⁶⁸

Penn insisted that those who rightly used their reasoning faculties would never be in danger of being deceived by primitive phenomena (that is, the initial Creation), because by rational induction, following the example of Newton and Bacon, they would ascribe them to the supernatural plan and action of God.

In the last two chapters of Part I, on the philosophical problems with Mineral Geology, Penn raised his objections to the idea that the omniscient and omnipotent God created an initially imperfect chaos, which with time and only by the laws of nature operating as they do now became ordered and perfectly suited to life, especially man. In other words, he rejected the old-Earth geologists' notion of the progressive evolution of the Earth (an idea which he considered an ancient pagan view) and he objected for three reasons.

First, such reasoning could not be applied to the first creations in the other two kingdoms of matter, plant and animal. God would have created perfect bone, perfect wood, so also a perfect rock. Not even the tender condition of nascent plants or animals under the present laws of generation was imperfect, but was a part of the sequence begun at the first perfect creation. At a time when most old-Earth geologists firmly rejected the notion of biological evolution, Penn wrote,

'If the Mineral Geology could shew it to be probable, that the first man and the first tree subsisted at first an "imperfect substance, which day by day was fashioned when as yet there was none of them", then indeed it

might infer, with some consistency, "the comparatively **slow progression** of our planet, from a state of **chaos** to a state of **maturity**"; but, that it never can shew; and therefore, it can never draw the latter inference from the laws **now in operation in generated beings**, without renouncing all pretensions to the faculty of grounding or conducting a logical argument.⁶⁹

Second, it was philosophically faulty, argued Penn, to say that because every effect must have a cause, every sensible physical effect must have a physical secondary cause. Since the primitive granite rocks had never been observed in the process of forming, Mineral Geology was involved in very unsound philosophical reasoning to assume either an aqueous or volcanic cause.⁷⁰

Third, wrote Penn, Mineral Geology, in contrast to Bacon and Newton, was tending toward atheism or deification of nature in its attempts to attribute the first formation of the Earth to secondary physical causes. Though most Mineral Geologists at the time would have assumed an intelligent First Cause for the initial unordered matter, they attributed the present ordered state to time and the laws of Nature. But God did not need vast ages to create the world. Therefore Mineral Geology impugned the character of God.

To assume arbitrarily, a priori, that God created the matter of this globe in the most imperfect state to which the gross imagination of man can contrive to reduce it, which it effectually does, by reducing the creative Fiat to the mere production of an amorphous elementary mass; and then to pretend, that His intelligence and wisdom are to be collected from certain hypothetical occult laws, by which that mass worked itself into perfection of figure and arrangement after innumerable ages; would tend to lessen our sense either of the divine wisdom or power, did not the supposition recoil with tremendous reaction upon the supposers, and convict them of the clumsiest irrationality. The supposition, is totally arbitrary; and not only arbitrary, viciously arbitrary; because, it is totally unnecessary, and therefore betrays a vice of choice. For, the laws of matter could not have worked perfection in the mass which the Creator is thus supposed to have formed imperfect, unless by a power imparted by Himself who established the laws. And, if He could thus produce perfection mediately, through their operation, He could produce it immediately, without their operation. Why, then, wantonly and viciously, without a pretence of authority, choose the supposition of their mediation? It is entirely a decision of choice and preference, that is, of the will; for, the reason is no party in it, neither urging, suggesting, encouraging, or in any way aiding or abetting the decision, but, on the contrary, positively denying and condemning it. The vast length of time, which this sinistrous choice is necessarily obliged to call in for its own defence, could only be requisite to the Creator

for overcoming difficulties obstructing the perfecting process; it therefore chooses to suppose, that He created obstructions in matter, to resist and retard the perfecting of the work which He designed; whilst at the same time he might have perfected it without any resistance at all, by His own Creative Act ... To suppose then, a priori, and without the slightest motive prompted by reason, that His wisdom willed, at the same time, both the formation of a perfect work, and a series of resistances to obstruct and delay that perfect work, argues a gross defect of intelligence somewhere; either in the Creator or in the supposer; and I leave it to this science, to determine the alternative!¹¹

So Penn argued (even as an old-Earth critic later did^{72,73}) that the sensible phenomena of the Earth, by themselves, with an understanding of the present laws of nature, could never lead us to the right conclusion about the mode of first formation of the Earth, any more than they could with relation to the first animals or plants. In all three kingdoms of matter, the original creation was a perfect, immediate and humanly incomprehensible work of God. This conclusion about the initial creation, Penn contended, was philosophically consistent with Newton and was based on the divine revelation about the history of the early Earth, which was relevant to the discussion because geology was a historical science.

In the second half of Volume I then, Penn proceeded to expound the mode of first formations of the Earth according to the Mosaical Geology, laid out in Genesis. To that argument we now turn.

CREATION

The second half of Volume I contains Penn's detailed discussion of the six days of creation in Genesis 1. He began by reaffirming the fundamental principle, consistent with Bacon and Newton, that the mode of the first formations in the three kingdoms of plants, animals and minerals was by intelligent immediate acts of the Creator, which were antecedent to the laws of nature, which He set in operation for the perpetuation of the creation. And he reaffirmed the Genesis record as a reliable divine testimony of those historic events.

He also laid down the two rules of proper interpretation of Genesis:-

- (1) all of Genesis, including Genesis 1, is strictly historical, with no vestige of allegorical or figurative description, and
- (2) this history was adapted to the comprehension of the common man by the use of phenomenological language, so that Moses described 'the effects of creation **optically**, or, as they would have appeared to the eye; and without any assignment of the **physical causes**'. By describing effects accurately, 'according to their sensible appearances', Moses enabled the reader 'to receive a **clear and distinct impression of those appearances**,

and thus to *reduce them to their proper causes, and to draw from them such conclusions as they are qualified to yield.*⁷⁴

Penn took the 'Days' of Genesis 1 as literal twenty-four hour periods. Though giving general praise for Faber's **Treatise on the Patriarchal, Levitical and Christian Dispensations** (1823), Penn devoted a 24-page endnote to a biblical refutation of Faber's day-age theory. To show that in the Bible *yom*, the Hebrew word translated 'day', **only** meant an ordinary day, Penn carefully examined (apparently all) the Scriptures which Faber used to argue that *yom* could denote either one rotation of the Earth on its axis, or one revolution of the Earth around the Sun, or 1,000 years, or an indefinite time period, or even the whole creation week. Penn concluded that the only reason Faber adopted this impossible interpretation was because of the pressure of old-Earth geological theories.

To reject the gap theory, Penn argued, using support from ancient Jewish and Christian commentators, that the Hebrew conjunction used seven times in Genesis 1:1-3 would not allow the insertion of long ages of time between verses 1 and 2. He also examined the key words *tohu* and *bohu* in Genesis 1:2 and showed from the Bible and ancient commentaries that these words meant 'invisible' and 'unfurnished' and therefore conveyed no sense of chaos or of time. Finally, he spent nearly 30 pages exposing the problems he saw with the interpretations of biblical scholars like Horsley, Rosenmuller and Patrick who had tried to accommodate the theories about pre-adamite creations or chaos.⁷⁵

On a close examination of other particulars in Genesis 1:1-5, Penn argued that the Earth was created instantly in its present spherical shape with a compact granite surface covered with, and yet distinctly separated from, a universal ocean of water, rather than of a muddy liquid. The Sun, Moon, planets and stars were also created on Day 1. The Sun's heat immediately caused a universal vapour or fog, which blocked the Sun, but not its light, from view on Earth.⁷⁶

On Day 2 God created the atmosphere lifting the water vapour above it like a canopy, which yet obscured the Sun's shape. On Day 3 God caused by volcanic force, it seemed reasonable to Penn to assume, the sudden depression of part of the Earth's underwater surface to instantly form the seabed and make dry land appear. This deepening of part of the Earth's crust was a violent disruption, the first revolution of the Earth, initiating the new laws and agencies of geological change and causing the surface of the newly formed seabed to be covered with fractured and comminuted materials and soils. This, in Penn's Mosaical Geology, was the fragmentary, transitional formation (which later became known as the Cambrian-Silurian formations). Thus the newly created Earth was radically modified before the first plants were made instantly and perfectly formed in a mature condition later on Day 3.⁷⁷

On Day 4 the canopy of vapour was dispelled so that

the celestial bodies became visible on Earth. Penn devoted a number of pages to explaining, on the basis of our knowledge of the solar and lunar movements, that the Moon was created on the first day in the position of the new Moon so that on the fourth day of creation it would be in the right place in the sky to rule the night as it was ordained. He also argued that it was unphilosophical to assign a different cause to the light of the first three days, than that causing light on the Earth from Day 4 onwards: this then was another reason for saying the Sun was created on Day 1. Curiously, in his detailed analysis he did not discuss Genesis 1:16 at all, which other Scriptural geologists and most commentators at the time took to mean that God had actually made the Sun, Moon and stars on the fourth day.

The chapters on Day 5 and 6 were brief. Penn emphasised that the various marine, winged and land creatures were made in fully mature form, just as the first formations of the vegetable and mineral kingdoms had been. He also devoted several pages to countering Saussure's notion of the insignificance of man. In his analysis of Day 7 Penn reasoned that when God's creative activity ceased, the laws of nature commenced, by which God providentially sustains His creation. He also remarked on the issue of time and calendars, with a rejection of the Julian day count developed in the sixteenth century by Scaliger.⁷⁸

THE FLOOD AND GEOLOGICAL CHANGES SINCE THE CREATION

Volume II is devoted to a comparison of the views of the Mineral and Mosaical Geologies regarding the mode of the changes or revolutions of the Earth since the initial creation. Penn argued that since he had established in Volume I the validity of the Mosaical Geology and invalidity of the Mineral Geology with respect to first formations, it was also philosophically sound to compare these two geologies to the rest of the geological features of the Earth to determine which theoretical framework best fits the actual observations of the Earth. A comparison of Genesis to old-Earth geological theory regarding the changes or revolutions on the Earth since creation was all the more appropriate, in Penn's view, since in the previous few years D'Aubuisson, Cuvier, Dolomieu, Saussure, Pallas and DeLuc had all affirmed that geological evidence clearly proved that the last universal aqueous revolution had occurred at about the time set for the Flood by Scripture and pagan traditions.

Penn first began with a biblical argument that the Flood was universal, violently destroying the surface of the whole Earth, not just mankind living on it. This was defended by a technical discussion (of the Hebrew compared with ancient translations and commentaries) on the explicit statements to this effect in Genesis 6:13 and 9:11, coupled with II Peter 3:6-7 and Job 22:16. Though at the Fall the curse in Genesis 3:17 affected the Earth to such a degree that people at the time of Noah's birth recalled it (Genesis 5:29), the full consequences of that curse were not felt until the Flood.

As the first revolution on Day 3 of Creation Week suddenly produced the first habitation for man, so the second revolution suddenly resulted in a new Earth. The main difference was that in the latter case the revolutionary alteration of the Earth's surface transpired over the course of 12 months. To accomplish this destruction and renovation God resumed immediate creation-type operations in the world, that is, the laws of nature that commenced operation on Day 7 were to some extent suspended or altered temporarily during the year of the Flood. As in the first revolution on Day 3, God used global volcanic and earthquake activity (which in the Flood was also abetted by winds and 40 days of rains) to cause the eruption of violent inundations.

So in Penn's view the Flood was a preternatural event, not a part of the normal course of nature, as many old-Earth geologists viewed it, though God used the forces of nature to accomplish His judgment. The ocean transgressed the land by the gradual sinking (over the course of five months) of the pre-Flood continent. During this process, the sea was violently agitated until no land remained to cause the flux and reflux of the waters. Similarly, as the continent progressively subsided, the pre-Flood seabed was raised to become the new land.⁷⁹

In light of all this, Penn argued, we ought to expect that the geological phenomena would show evidence of two distinctly separated periods of global volcanic activity, that is, two and only two revolutions in Earth history. Generally, the present continents should indicate that they had been under the ocean for a long time (roughly 1,600 years) and that those waters were removed from the Earth at the time assigned by Moses for the Flood. Relying on the descriptions of geological phenomena given by the leading authorities, he sought to demonstrate how the four divisions of the geological record corresponded to the biblical history. The primary geological formations were created instantly on the first day of creation. The transitional formations were primarily the product of the first revolution, which suddenly occurred on Day 3. The lower portion of the secondary formations with their marine plant and animal fossils (including the coal measures⁸⁰) accumulated during the 1,600 years between creation and the Flood and remained largely in a soft state. The upper secondary with land plant and animal fossils and the tertiary were attributable to the year-long Flood, which also carved the valleys systems.⁸¹

Having laid out his general theory about the Flood and Earth history, Penn then proceeded to deal with the arguments that the old-Earth geologists used to defend their notion of many revolutions before the creation of man.

To account for the order and complexity of the fossil record and the presence of tropical plants and animals buried in northern latitudes, the Mineral Geologists postulated many revolutions and creations separated by long periods of time, a major climatic change in the past, and that fossil animals generally lived and died where they are buried.

Penn rejected these ideas and instead attributed the strata containing the fossil remains of land animals to the Flood. He did this on the basis of a lengthy consideration⁸² of '*agents now acting generally on the surface of the globe*':⁸³ the movements of the waters in the present oceans.

Penn reasoned that since the Flood was gradual and successive in covering the land over the course of several months, winds and currents would have produced advances and recessions of the sea. As we see in the present ocean, the retiring currents would retrograde as the next wave advanced against the land. Also on a more global scale there would have been massive and simultaneous fluxes and refluxes of the sea, such as the present equatorial current from Africa to America and the Gulf Stream from America to Europe. These currents during the Flood would have had the ability to carry debris long distances in a few days. Penn cited several recent examples of this kind of oceanic transport, such as plant debris from Mexico ending up on the shore of Norway, and a ship's mast being conveyed from Jamaica to Scotland. Postulating a different land-sea configuration before the Flood, he figured that whereas today the fluxes and refluxes of the sea predominate in easterly and westerly directions, during the Flood there would have been more of a north-south pattern, bringing tropical creatures to the northern latitudes.

Penn reasoned that during the 40 days of rain at the beginning of the Flood, the soils would have been supersaturated and easily eroded away with much plant and animal debris. Because the sea was agitated, the debris would not have been immediately buried, but rather transported in masses in different directions and for various periods, depending on the durability of the creature and the power of the currents, before eventually being deposited.

He thought that the pre-Flood seabed was a *yielding paste of differing qualities, arenaceous, argillaceous, or calcareous*' into which the plants and animals were imbedded, and cited a modern example of the burial power of the sea in the mouth of the Amazon River at high tide. Cuvier objected that the bones did not show evidence of transport, such as being rolled and triturated or generally buried as whole skeletons. Penn responded that the animals would have entered the water whole and floated on the surface, only gradually becoming dismembered before deposition.

In Penn's view, successive tides would deposit new accumulations of the remains of both marine and land creatures.⁸⁴ In the later stages of the Flood the violent retiring transient currents would have also cut the valleys of denudation while the sedimentary strata were still relatively soft.⁸⁵ Induration of the sediments was affected by the gravity of the mass and the rate of desiccation.

After this discussion of ocean currents during the Flood, Penn turned his attention to some other reasons that old-Earth geologists believed there had been many revolutions before man. One was the lack of fossil humans in the sedimentary strata. Penn responded to this objection in

two ways. First, as would be expected in Mosaical Geology, this was because man, as the most intelligent creature, would have escaped the rising Flood longer than all the other creatures, and secondly, because the pre-Flood land on which man lived was now at the bottom of the oceans. Still, he conceded, some vestiges of pre-Flood man should be found in the fossil record. Though acknowledging that the Guadaloupe fossil was no longer convincing evidence, he argued in an eight-page endnote that the discovery of fossil remains in the Cave of Durfort, in France, reported in 1823 by Marcel de Serres, and the human fossils mixed with extinct creatures in the limestone of Kostritz, Germany, both of which formations appeared to be contemporary with the Kirkdale Cave deposits analysed by Buckland, were strong fossil evidence of pre-Flood man.

Another problem was the extinction of so many creatures. Penn said that the Mineral Geologists were perplexed by this because they failed to combine morals with physics: the most probable physical cause of extinctions was the Flood, whereas the most probable moral cause was the will of the Creator. For some unknown purpose, Penn reasoned, God planned that only some of the pre-Flood animals should continue in the renovated world. Related to this was the Mineral Geologists' claim that existing species were never found buried with extinct ones, which therefore implied that they had not co-existed but that there had been many revolutions and creations. Penn challenged the universality of the claim that existing and extinct creatures were never mixed. But he also said that the order and complexity of the fossil record would be what he would expect from an agitated sea (during the Flood) gradually encroaching, with flux and reflux, over the various habitats of land and sea creatures.

To Penn's mind this conception of the Flood would also explain the mixture and alternation of terrestrial and marine fossils. He argued that freshwater and marine formations could not be determined by shells as some old-Earth opponents asserted, because the Flood would have easily mixed together freshwater and marine shells, and because both Greenough and Humboldt had raised objections about the possibility of successfully distinguishing freshwater and marine shells.⁸⁶

At the end of his discussion on the Flood Penn dealt with three tangential matters. One chapter was devoted to a consideration of the single-hump Arabian camel, as a unique proof of the global Flood. Since, unlike the two-hump Bactrian camel, it was found in the world only in the domesticated state,⁸⁷ there were only two possible explanations. Either man by a confederated effort had domesticated every wild Arabian camel in the world, or some cause had brought some of them under man's control and destroyed all the rest. The former explanation seemed most unlikely to Penn. He concluded that the Flood fitted perfectly the second explanation.⁸⁸

Penn believed that after the Flood God supernaturally created new vegetation for the Earth, since the seeds of

pre-Flood terrestrial vegetation would most likely not have survived the nearly year-long Flood. And since fossil animal remains were so different from existing species and many animals were particularly suited to different continents, he thought it probable that new animals had been created. He reasoned that because 'all' does not always have a universal meaning in the Bible, Noah only took some of the pre-Flood species on the Ark. Those animals were to be for man's post-Flood food and to be a reminder of the Flood to man.⁸⁹

Before drawing his discussion to a close, Penn remarked on the apparent contradiction of the idea of a global Flood with the description of paradise in Genesis 2:10-14, which mentions two post-Flood rivers — the Hiddekel (Tigris) and Euphrates. Without stating any justifications Penn summarily rejected DeLuc's way to resolve the problem, which Penn called a 'gratuitous invention'. DeLuc reasoned that the rivers of paradise were erased from the Earth by the Flood and the names were carried over by post-Flood man to attach to new rivers, just as emigrants to new lands often name new places with names of the homeland.⁹⁰ Instead Penn gave a detailed textual argument for why we should treat the four verses as a scribal gloss added to Moses' original text.⁹¹ While his argument was not convincing to many readers,⁹² it was based on sound principles of biblical criticism and, in methodology, did not represent a cavalier approach to Scripture (which he considered to be the sacred Word of God) as was charged by some of his critics. He was simply trying to solve the apparent contradiction in Scripture.

CONCLUSION

Though not a geologist himself, Penn was not completely incompetent to propose his theory of Mosaical Geology. He apparently made some geological field observations on the continent, and through careful reading he was not ignorant of old-Earth geological theories or the geological and palaeontological evidence used to support them. He respectfully challenged the logic of the inferences and theoretical interpretations drawn from the geological observations and legitimately, even if not always convincingly, used facts and arguments of some of his opponents against the reasoning of others. However, he never argued that because there was disagreement between Mineral Geologists this proved they were all wrong.

While the Mineral Geologists were claiming to follow in the philosophical tradition of Bacon and Newton, Penn contended that in the matter of the initial creation and the history of the Earth, they were actually contradicting these great philosophers. He argued that it was both Baconian and Newtonian to rely on the divine testimony about the original creation of the Earth and the two revolutions since then (Day 3 and the Flood). This, said Penn, was because of the uniquely historical nature of geology compared with other sciences at the time.

In his interpretation of Scripture, he used his skills in

biblical and literary criticism to build his case for a literal six-day creation about 6,000 years ago with two and only two subsequent revolutions, on Day 3 of Creation Week and at the Flood. These two revolutions, along with the work of the sea and its creatures over the approximately 1,600 intervening years, were sufficient to account for the geological record accumulated on the original supernaturally created primitive crust of the Earth. However, he displayed some inconsistency in arguing for the literal interpretation of Genesis, while at the same time arguing that the Sun was created on Day 1, not Day 4, and that only two of some, not all, of the kinds of pre-Flood animals were taken onto the Ark. Also his treatment of Genesis 2:10-14 as a textural gloss was (and no doubt still is) unacceptable to many readers.

Penn was apparently quite secure financially, so that money was not a probable motive for writing on geology. There is no indication that he was significantly interested in politics, economics, or ecclesiology. Nor does he appear to have been seeking any personal recognition from geologists. Rather, it was his convictions about the truth and authority of Scripture and his genuine interest in philosophically sound argumentation that compelled him to pick up his pen against the theories of the Mineral Geologists.

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- Imperial Dictionary of Universal Biography, III**, 1865, p. 526.
- Gentlemen's Magazine, II**, 1844, pp. 545-546.
- Burke, J., 1836. **History of the Commoners of Great Britain and Ireland, III**, p. 491.
- Burke, Ref. 5.
- Quarterly Review XIII** (April 1815), p. 211.
- Foster, J., 1887. **Alumni Oxonienses**, p. 1093.
- The **Dictionary of National Biography** article on Penn and the leading library catalogues attribute to Penn (apparently erroneously) the book, **Conversations on Geology**, published in 1828 (second edition in 1840). But according to the **Magazine of Natural History**, Vol. I (1829), p. 280 and pp. 463-466, which reviewed this anonymous book, it was supposedly written by J. Rennie, a respected scientist and former editor of the **Foreign Medical Journal**. I was not able to discover any more information about Rennie.
- Volume I contained 353 pages, plus an 80 page introduction, and Volume II had 426 pages.
- Hereafter it will be cited as **Comparative Estimate**.
- Penn's responses are scattered throughout the second edition, but most of them are concentrated in the introduction to Volume I.
- Penn, G, 1825. **Comparative Estimate**, 11:285-286.
- All emphasis in Penn's quotations is original, unless otherwise noted. In a footnote here he added, *'The Edinburgh Reviewer also, in order to walk over an argument which he does not care to encounter, affirms roundly, (but with courteous qualification), "that the Comparative Estimate is the production of one, who writes after reading very largely upon geology, and seeing very little of the actual appearances of the earth"'. (No. lxxvii, p. 206, note.) Yet, the Reviewer is perfectly ignorant of what the writer has seen of those actual appearances: but, Reviewers, like Pleaders, often allow themselves questionable latitudes of assertion, as make-weights in the arguments which they are striving to establish. See Vol. I, pp. 50, 51.'*
- Penn, Ref. 13, Vol. I, pp. 50-51. At the end he was quoting from Humboldt's **Superposition of Rocks** (1823), p. 32. He continued on page 52, *'In Newton, intuitive logic was dominant; and mathematics, were only the steps by which his logic ascended to the elevation to which it attained. In the mineral geology, physical impressions are dominant; and its logic, is only an artificial instrument which it seeks to employ for arranging those impressions. How many eminent mathematicians had seen apples fall to the ground, before the intuitive LOGIC of Newton's mind apprehended the phenomenon! How different that logic was from the logic of the mineral geology, we have seen by the difference of their respective conclusions'*.
- Penn, Ref. 13, Vol. I:vi, footnote.
- This work received a very positive review in the **Magazine of Natural History**, 1829, Vol. I, pp. 463-466, and, as noted earlier, was attributed to J. Rennie, a respected scientist. Of this book the reviewer wrote, *'It may be objected to these Conversations on Geology, that they contain too many objections, and leave many parts of the subject in utter uncertainty: but we may be permitted to reply to this, that all the systems of geology are precisely in the state in which they are here represented, uncertain and imperfect in their theories and speculations; though these are generally illustrated by interesting and well ascertained facts, and sufficiently plausible arguments. The author of the Conversations, therefore, it would appear to us, has acted judiciously in representing the actual imperfections of geology, rather than concealing them, and in expressing doubts upon points imperfectly ascertained, rather than dogmatising'*, p. 466. Another positive review of **Conversations on Geology** appeared in **Athenaeum**, 47 (September 17, 1828), pp. 737-738.
- [Rennie, J.], 1828. **Conversations on Geology**, pp. 293, 44, 306.
- Magazine of Natural History**, 1829, Vol. I, p. 465.
- Eclectic Review**, 1823, N.S. Vol. XIX, pp. 37-53.
- Quarterly Journal of Science, Literature and Arts**, 1823, Vol. XV, pp. 108-127, and Vol. XVI, pp. 309-321. The reviews are not signed, but probably were done, or at least approved, by William Brande (1788-1866), the editor, by whose name the journal was commonly known. Brande was professor of chemistry at the Royal Institution and close associate of Michael Faraday and Sir Humphry Davy. He also had a keen interest in and knowledge of geology. In 1817 he published his **Outlines of Geology**, which consisted of his lectures on Geology at the Royal Institution in 1816. The book was revised and nearly doubled in length before coming out in a second edition in 1829, in which Brande described Penn's **Comparative Estimate** as a 'masterly work', p. 3. Brande's book was a purely descriptive geology which avoided theoretical speculations. Apart from attributing the diluvial deposits (loose gravels and sands above the consolidated strata) and valleys of denudation to the global Noachian Flood, Brande did not commit himself on the age of the Earth. Brande was also a leading fellow of the Royal Society, serving as a secretary from 1816-1826, and an original fellow of the University of London, as well as a member of several foreign scientific societies. According to the **Dictionary of National Biography** article on Brande, *'During forty-six years Brande laboured most industriously in the front ranks of science'*.
- Ref. 20, Vol. XV, p. 108.
- Ref. 20, Vol. XV, p. 110.
- Ref. 20, Vol. XV, p. 125.
- Ref. 20, Vol. XV, p. 127.

25. Ref. 20, Vol. XVI, pp. 310-319.
26. Ref. 20, Vol. XVI, p. 321.
27. Kennedy, J., 1827. **Lectures on the Philosophy of the Mosaic Record of Creation**, Vol. II, pp. 214-215, and Vol. I, p. xv.
These ten lectures were given to Trinity College, University of Dublin (where Kennedy taught), in 1826 and 1827.
28. Penn, Ref. 13, Vol. I, pp. xxvi, 51, 140.
29. Penn, Ref. 13, Vol. I, p. xiv.
30. Penn, Ref. 13, Vol. I, p. lviii.
31. Penn, Ref. 13, Vol. I, pp. xx, xxvi, xxix and Vol. II, pp. 22.
32. Penn, Ref. 13, Vol. I, pp. 189 and Vol. II, pp. 120, 174, 322.
33. Penn, Ref. 13, Vol. I, p. 262.
34. Penn, Ref. 13, Vol. II, pp. 143, 393.
35. Penn, Ref. 13, Vol. I, pp. 327, 329.
36. Penn, Ref. 13, Vol. I, pp. 14 and Vol. II, p. 181.
37. Penn, Ref. 13, Vol. I, p. 89.
38. Penn, Ref. 13, Vol. I, pp. 329-330.
39. D'Aubuisson, following his teacher, Abraham Werner, called it 'geognosy'.
40. Penn, Ref. 13, Vol. I, p. 17.
41. Penn, Ref. 13, Vol. I, pp. xvi-xx.
42. Conybeare, W. D. and Phillips, W., 1822. **Outlines of the Geology of England and Wales**, p. li.
43. Penn, Ref. 13, Vol. I, p. xxxi.
44. Conybeare and Phillips, Ref. 42, pp. 1-ii.
45. Penn, Ref. 13, Vol. I, p. xxiii.
46. Conybeare and Phillips, Ref. 42.
47. Penn, Ref. 13, Vol. I, pp. xxiv-xxvi.
48. Conybeare and Phillips, Ref. 42.
Conybeare did not mention Penn by name but was clearly referring to Scriptural geologists.
49. Penn, Ref. 13, Vol. I, pp. xxvi-xxvii.
50. Penn, Ref. 13, Vol. I, p. 160.
51. Penn, Ref. 13, Vol. I, pp. 139-140.
52. Penn, Ref. 13, Vol. I, p. 7.
The quote is from **Quarterly Review**, 1823, Vol. XXIX, p. 138.
53. Penn, Ref. 13, Vol. I, pp. 150-152.
He quoted from Richard Kirwan, **Geological Essays**, 1799, p. 5.
54. Penn, Ref. 13, Vol. II, p. 250.
55. Penn, Ref. 13, Vol. II, pp. 273-274.
56. Penn, Ref. 13, Vol. I, p. 16.
57. Unfortunately for later students of this debate, Penn never dealt with the Baconian idea of the necessity of not unwisely confounding the two divine books (the book of creation and the book of Scripture), even though the passages from Bacon's writings, on which Penn concluded that Bacon believed in a literal six-day creation, were just a few pages before the passage about 'the two books'. But then I have seen no evidence that Penn's geological opponents ever dealt with the passages in Bacon that Penn did. Compare points VI. 2, 5, 6, 8 and 16 in Bacon's **The Advancement of Learning**, 1906, pp. 40-47.
58. Newton, I., 1931. **Opticks**, pp. 400 and 402.
59. Penn, Ref. 13, Vol. I, p. 33.
Adding emphasis, Penn accurately quoted Newton as saying,
'It seems probable to ME, that God in the beginning formed matter in solid, massy, hard, impenetrable, moveable particles, of such sizes and figures, and with such other properties, and in such proportion to space, as most conduced to the end for which he formed them. — All material things seem to have been composed of the hard and solid particles above mentioned, variously associated in the FIRST CREATION by the counsels of an INTELLIGENT AGENT. For, it became HIM who created them to set them in order; and, if HE did so, it is unphilosophical to seek for any other origin of this world, or to pretend that it might rise out of a CHAOS by the mere laws of Nature; though, being once formed, it may continue by those laws for many ages.'
In this Newton appears to have changed in his thinking, a fact of which Penn was apparently unaware. In 1680, 24 years before Newton published **Opticks**, he did entertain the idea that the Earth had formed from a chaos by gravitational force. See his letter to Thomas Burnet in H. W. Turnbull, (ed.), 1960. **The Correspondence of Isaac Newton**, Vol. II, p. 332.
60. MacLaurin, C., 1748. **Account of Sir Isaac Newton's Philosophical Discoveries**.
61. Penn, Ref. 13, Vol. I, pp. 40-49.
He argued thus,
'That he did not suppose that the earth had ever really been fluid, and that it had settled itself by laws of matter into its present figure; is proved, both by the object and hypothetical form of his proposition, and by his express ascription of its "figure and properties", as of those of all first formations, to the intelligent counsels and creative act of God, immediately. His own words, were sufficient to have preserved his proposition from the perversion which it has experienced; for, he states it in different modes, by which his intention is cleared from all ambiguity. He does not only argue, "if the earth were fluid", etc.; but he also argues, "if all circular diurnal motion were taken from the planets", etc.; "if all matter were fluid", etc. That these were only different hypothetical propositions, employed to illustrate the same principle, is thus manifest to every capacity' (1:44).
Penn quoted from Newton's **Mathematical Principles**, Book III, Prop. 18, Theorem 16.
62. Newton, Ref. 58, pp. 402-403.
63. Penn, Ref. 13, Vol. I, pp. 57-59.
Adding emphasis, Penn correctly quoted Newton as saying,
'Such a wonderful uniformity in the planetary system must be the effect of choice; and so must the uniformity in the bodies of animals; . . . these, and their instincts, can be the effect of nothing else than the wisdom and skill of a powerful ever-living agent.'
In this regard Penn also referred to Newton's **Four Letters to Bentley**.
64. Penn, Ref. 13, Vol. I, p. 64-65.
65. Penn, Ref. 13, Vol. I, p. 73.
66. Penn, Ref. 13, Vol. I, p. 74.
This was similar to how Philip Gosse, a biologist, would argue later in his **Omphalos**, 1857, except that Gosse used such reasoning to suggest that, in addition to the first plants and animals, the fossils, with the strata that envelope them, were also supernaturally created by God (rather than being a result of post-creation processes and the Flood, as Penn argued, or a result of long ages of time before Adam, as old-Earth geologists argued). This last suggestion of Gosse was fatal to his otherwise compelling argument about the original, created plants and animals.
67. Penn, Ref. 13, Vol. I, pp. 83-84.
68. Penn, Ref. 13, Vol. I, pp. 95-96.
69. Penn, Ref. 13, Vol. I, p. 107.
70. The origin of granite was at this time by no means certain among the old-Earth geologists. The same year of Penn's second edition, 1825, the leading Scottish geologist, Robert Jameson, was still arguing in print for an aqueous origin of granite. See Hallam, A., 1992. **Great Geological Controversies**, p. 22. Lyell remarked in his **Principles of Geology**, 1830-1833, Vol. III, p. 11:
'Origin of primary rocks. Nothing strictly analogous to these ancient formations can now be seen in the progress of formation on the habitable surface of the earth, nothing, at least, within the range of human observation.'
71. Penn, Ref. 13, Vol. I, pp. 124-127.
72. About 15 years later, one of Penn's opponents, the great philosopher of science, William Whewell, came to very similar conclusions:
'Geology and astronomy are, of themselves, incapable of giving us any distinct and satisfactory account of the origin of the universe, or of its parts. We need not wonder, then, at any particular instance of this incapacity; as for example, that of which we have been speaking, the impossibility of accounting by any natural means for the production of all the successive tribes of plants and animals which have peopled the world in the various stages of its progress, as geology teaches us. . . but when we enquire when they came into this our world, geology is silent. The mystery of creation is not within the range of her legitimate territory; she says nothing, but she points upwards!'
Whewell, W., 1837. **History of the Inductive Sciences**, Vol. III, pp. 687-688 (see also Vol. III, pp. 580-587 and 620):
73. In 1840 Whewell added,
'Thus we are led by our reasonings to this view, that the present order of things was commenced by an act of creative power entirely different to any agency which has been exerted since. None of the influences which

have modified the present races of animals and plants since they were placed in their habitations on the earth's surface can have had any efficacy in producing them at first.'

With regard to the nebular hypothesis for the origin of the Solar System, he continued,

'Here again, therefore, we are led to regard the present order of the world as pointing towards an origin altogether of a different kind from anything which our material science can grasp.'

Whewell, W., 1840. **Philosophy of the Inductive Sciences**, Vol. II, pp. 134-135 (see also Vol. II, pp. 137, 145, 157).

74. Penn, Ref. 13, Vol. I, pp. 162-163.

75. Penn, Ref. 13, Vol. I, pp. 169-177, 189-205.

Penn criticised Patrick and Horsley for admitting an elemental chaos and Rosenmuller for imagining a previous Earth, though rejecting the notion of a chaos, and for interpreting the Hebrew conjunction, 'waw', as the adverb, 'afterwards', in Genesis 1:2.

76. Penn, Ref. 13, Vol. I, pp. 182-185.

He justified the placing of the Sun's creation with that of light on Day 1, by saying that 'familiar effects' refer 'to their plain and obvious causes'. However, he did not deal with the fact that Genesis 1:14-18 says that God made the Sun on Day 4. So in this case, he was being rather arbitrary in his literal interpretation.

77. Penn, Ref. 13, Vol. II, pp. 38-39, 172-173.

This revolution was viewed by Penn as an act of divine foreknowledge, for this disrupted bed would become the base of the future lands of the post-Flood world.

78. Hellems, A. and Bunch, B., 1988. **Timetables of Science**, p. 199. Scaligier set Day 1 at January 1, 4713 BC.

79. Penn clarified his meaning of 'sudden' and 'gradual' with these remarks: *'Mineral geologists, who acknowledge that the sea once covered our present continents, dispute whether its retreat was sudden or gradual. Sudden, and gradual, are relative terms; that which is sudden by one comparison, may be gradual by another. A retreat of the entire ocean, effected in the space of twelve months, will be a sudden operation, compared with that imperceptible mutation of its bed, proceeding through an unassignable number of ages, which has been engendered in the imagination of some visionary geologists; but, it will be gradual, compared with that immediate and instantaneous operation, by which the universal abyssal waters were originally reduced within the bed of the primitive sea!'*

Penn, Ref. 13, Vol. II, p. 36.

80. Penn, Ref. 13, Vol. II, pp. 185-199.

Coal, he argued, was produced from the deposition of marine vegetation, rather than transported land plants. He suggested that lignites, on the other hand, might be the result of terrestrial vegetation floated and eventually deposited during the Flood.

81. Penn, Ref. 13, Vol. I, p. 4 and Vol. II, pp. 69-71, 150, 197, 287, 363.

Penn was not completely clear on these divisions. He preferred the terms primitive (or creative), fragmentary, sedimentary and diluvial (or tertiary or upper secondary).

82. Penn, Ref. 13, Vol. II, pp. 81-123.

83. Penn, Ref. 13, Vol. II, p. 86.

84. Penn, Ref. 13, Vol. II, p. 93 and Vol. II, pp. 112-113.

Penn was somewhat confusing, for me as well as the Edinburgh reviewer of Buckland's **Reliquiae Diluvianae**, on this point about limestone formation of Kirkdale Cave. Penn seemed to argue for successive accumulations of sediments (with organic remains) during the Flood, but in Vol. II, p. 121 he stated that

'my readers will have clearly seen, that I alleged the contemporaneous deposition of the bodies, not with the deposition of the rocks, but, with the event which first brought into a course of desiccation and consolidation the fluid calcareous mass; which had been deposited from the time of the first formation of the sea-bed.'

Penn devoted a 90-page supplement in Volume II to a refutation of Buckland's hyaena-den theory of Kirkdale Cave. Penn argued that the

animal remains were imbedded in the limestone during the Flood when it was still a pliable paste. While the **Edinburgh Review** was quite scathing of Penn's 1823 edition of this Supplement, it nevertheless acknowledged that some of Penn's remarks on Kirkdale Cave were *'not undeserving of attention'*. See **Edinburgh Review**, Review of Buckland's **Reliquiae Diluvianae**, Vol. XXXIX (October 1823-January 1824), pp. 206-207. It is noteworthy that in his discussion he made no reference to his fellow Scriptural geologist, George Young, who also rejected Buckland's theory of Kirkdale Cave.

85. Penn, Ref. 13, Vol. II, pp. 159-184.

Penn devoted a whole chapter to the formation of valleys, arguing that the present rivers running in them could not possibly have cut the valleys.

86. Penn, Ref. 13, Vol. II, p. 152.

In an endnote (Vol. II, pp. 371-393) Penn rejected Cuvier's interpretation of the Paris Basin as representing numerous revolutions. His reasons included:

- (1) the difficulty of distinguishing freshwater and marine shells,
- (2) the fact that gypsum is generally a saltwater formation and Cuvier only considered it freshwater on the basis of a few shells,
- (3) Cuvier offered no cause for the repeated inundations of the sea and his notion of freshwater inundations seemed impossible,
- (4) Cuvier offered no explanation for the supposed multiple creations,
- (5) the insensible transitions (or conformity) between strata that have vastly different fossils,
- (6) some strata have commingled freshwater and marine shells, and finally,
- (7) the fact that Cuvier ignored the biblical record.

87. This is still the case according to **World Book Encyclopedia**, 1987, Vol. III, p. 64.

88. Penn, Ref. 13, Vol. II, pp. 200-209.

89. Penn, Ref. 13, Vol. II, pp. 209-229.

Though Penn argued for a global Flood (Vol. II, pp. 7-19), he did not cite the use of universal terms in Genesis 6-9 in support of this conclusion. So technically he was not inconsistent in arguing here that not all kinds of antediluvian animals were preserved in the Ark. However, he also did not address the obvious exegetical difficulty this creates.

90. Penn, Ref. 13, Vol. II, p. 231.

91. Penn, Ref. 13, Vol. II, pp. 231-243.

92. **Eclectic Review**, 1823, N.S. Vol. XIX, p. 53.

The otherwise positive review in this publication called it *'ingenious and plausible'*, but proceeding *'wholly upon the dangerous ground of conjecture.'*

Terry Mortenson has been a missionary with Campus Crusade for Christ (CCC) for 22 years, spending most of that time working in Eastern Europe. He has a B.A. in mathematics from the University of Minnesota, an M.Div. in systematic theology of Trinity Evangelical Divinity School near Chicago, and in 1996 received a Ph.D. in the history of science (focused on the Scriptural geologists) from Coventry University in England. He is married and has seven children, and presently is a teaching fellow of CCC's Institute for biblical and Theological Studies in Budapest, Hungary. He can be contacted at: H-2045T6rokbalint, Hunyadi János u.#, Hungary, email <104466.204@compuserve.com>