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COLIN RUSSELL

## Noah's Flood :

### 2 : Noah and the Neptunists

**A vastly over-simplistic view of the history of geology pictures a group of old-time Christian Neptunists fighting a losing battle with free-thinking Plutonists. Dr. Russell, Reader in the History of Science and Technology at the Open University, tells us what in fact happened and helps us to see the story in perspective.**

#### *NOAH AND THE NEPTUNISTS*

In introducing my subject I take it that my brief is to attempt to put the controversies concerning the Flood into some kind of historical perspective. I make no claim to special geological expertise and shall not carry into the fray the weapons of the modern earth scientist. But in so far as I find the history of scientific themes a topic of perpetual fascination, I am glad to share in a survey of the past in the hope that it may perhaps throw some light upon the problems of the present.

We are, of course, concerned with one of the famous interactions between science and theology and one which presented a series of changing aspects in quite a short period of time. Our first task will be to sketch the main course of events leading up to the general adoption of a uniformitarian outlook. We shall try to identify the underlying causes of these events and to see in what ways theological and other non-scientific factors played a significant part in the developments.

### 1. *Changing attitudes to the deluge*

For many centuries the Genesis story of the Flood, reinforced by numerous references elsewhere in the Bible, has exerted a powerful grip on man's imagination. Doubtless it will still continue to do so. But the scientific implications of the narrative only become plain when attempts are made to correlate features of the story with natural phenomena still observable today — the ways in which this was done led to a succession of different attitudes partly determined by the prevailing climate of scientific opinion and partly contributing to that climate.

In trying to delineate the succession of views we must emphasise two other preliminary points. First, the ideas did not follow one another in simple sequence; frequently there was overlap and generally there was controversy. Secondly, it is well to be aware of the dangers implicit in an approach like that of A. D. White in his *Warfare of Science with Theology*, first published in 1895 and recently reprinted. This contains much useful source-material but labours under the almost total inability to see events in any other light than that of the eventual rout of theology at the hands of an all-powerful science. Fortunately such Whiggish historiography has yielded ground in recent years to a more temperate and balanced approach in which the issues are seen to be far more complex than White would allow and in which the "victory of science" is seen in somewhat less simplistic terms.

What, then, was the pattern of events we have to describe?

#### 1. *The Flood as a cardinal point in the geological time scale*

Although sporadic efforts had been made in earlier ages to relate the Flood to observed natural phenomena (e.g. Tertullian held it responsible for fossil remains), the issue was not seriously joined until the late eighteenth century.

Perhaps it is as well to begin with Buffon. Having conducted

a series of experiments in which spheres of different materials and different sizes were allowed to cool, he calculated how long it must have taken for the planets in our solar system to reach habitable temperatures from an (assumed) initial white heat. He concluded our earth to be nearly 75,000 years old. Earlier writers (such as Burnet) had suggested the "days" of Genesis might be really long epochs, and Buffon wove their ideas into his own scheme of 7 long geological eras. In his *Epochs of Nature* (1778) he became the first to give clear articulation to the doctrine that the earth had its own history. Of course his figures by modern standards are absurdly out, but he had made his point.

This new historicist element in science demanded a time-scale and a time-scale needs points of reference. The most prominent of these was very soon the Deluge of Noah. We shall see some of the reasons for this in a moment, but as the Creation was pushed back ever farther into time the Flood became the focus of attention. After all *this* had taken place in historic time, and evidence for its occurrence (once you knew what to look for) was accumulating on all sides — As Richard Kirwan wrote in 1799:

Shells known to belong to shores under climates very distant from each other are in sundry places found mixed promiscuously with each other; *one sort* of them, therefore, must have been transported by an inundation; the promiscuous mixture can be accounted for on no other supposition. These appear to me the most unequivocal geologic proofs of a general deluge.

## 2. *The Flood as a major geological agent*

Attention having been focussed upon the Flood as a great crisis in history, it is not surprising that further memorials to it should be sought in the rocks. Now that geological change was becoming an acceptable assumption the Flood offered a ready-made explanation. But it did not happen all at once, and it is necessary to tread warily in retracing our steps.

The belief in the potent geological action of water became

known, not unreasonably, as Neptunism. By far the most influential of the early Neptunists was A. G. Werner, a professor of mineralogy in Saxony. Many of the rocks in this area are indeed sedimentary and their formation could be credibly interpreted in Wernerian terms.

Werner postulated an enormous mass of water covering the whole earth and containing in solution materials which would crystallise out as granite and other primitive rocks. At later stages chemical precipitation would occur, the water level would drop, land would appear and further alluvial strata would be deposited. During these events life had concurrently appeared, but volcanoes were quite recent (coal-fired, apparently!).

There were, of course, considerable difficulties attached to such views even at that time. How could one explain the steep inclinations of some strata? What about the cases where the sequence was inverted? Where did all the water go? Werner faced many of these problems but not all his answers were convincing. But his influence on geological thinking was enormous. His own literary output was small, but his ideas were rapidly disseminated through his students and disciples. Many have felt that his Neptunist philosophy exerted a powerful retarding action on geological progress. Others, however, acknowledge the greater importance of his teaching methods with the emphasis on systematic observations and practical training. By all accounts his students thought the world of him, and he did give to mineralogy one of its first major paradigms.

Having thus spoken about Werner it is important to dispel several misconceptions. He was not the first to think in Neptunist terms (one can cite de Maillet's *Telliamed* of 1748, to give but one example), nor, so far as I can tell, was he obsessed with the Deluge of Noah. But he was concerned with the primal geologic agency of water and he was the first to found an influential school to propagate (and extrapolate) his views. As d'Aubruissou observed (1819):

One can say of Werner what has been said of Linnaeus, that

his disciples have covered the earth and that from one pole to another nature has been interrogated in the name of one individual man.<sup>2</sup>

During the early years of the nineteenth century there must have been many who identified Werner's universal ocean with the Flood of Noah. Clear cases are hard to find, but one of Werner's most redoubtable champions, the Scot, Robert Jameson, felt it necessary to give an explicit denial to such an assumption. The point is that by now (1808) the whole Neptunist position was under attack and many geologists were relegating the universal ocean to the realms of mythology.

I refer, of course, to the rise of the Vulcanist (or Plutonist) viewpoint associated specially with the name of James Hutton. His *Theory of the Earth* (1795) was in many respects the foundation-stone of modern geology. For our purposes we may define the Huttonians' attitude to the Flood as a geological non-event.

### 3. *The Flood as a geological non-event*

James Hutton (1726 – 1797) was to be the man who contributed most to the downfall of the Neptunists. Oddly enough, he says very little about them, but his alternative system of geology was incompatible with much Neptunist thinking and ultimately supplanted it altogether.

Like Werner, Hutton tended to be a man of one city though his travels were more extensive and his observations more general. He was born in Edinburgh and there he returned for much of his working-life. Now it happens that Edinburgh (unlike Freiburg) is built on volcanic, not sedimentary rocks; Hutton's house was hard by Arthur's Seat! Whether for this reason or not, Hutton became convinced that the basic geological agency was not water but fire. His shrine was that of Vulcan not Neptune! There were doubtless other factors also, which predisposed him to a consideration of fire and we shall return to these later.

Hutton did not ignore the action of water. He believed that there were 2 kinds of rocks, one of which (igneous) had a volcanic origin, while the other (aqueous) was laid down by water. They had reached their present form, however, by the combined actions of high temperature and pressures. In this way Hutton accounted for such phenomena as the extrusion of granite into limestone fissures.

Hutton had thus the best of both worlds, and it is perhaps unfair of posterity to label him a Vulcanist. But his commitment to a constant series of interactions involving water and heat led him to a momentous conclusion about his time-scale. Unlike the Neptunists, he regarded the whole earth as being in a state of dynamism and thus requiring immense time. In his own words —

We have now got to the end of our reasoning; we have no data further to conclude immediately from that which actually is. But we have got enough; we have the satisfaction to find, that in nature there is wisdom, system, and consistency. For having, in the natural history of this earth, seen a succession of worlds, we may from this conclude that there is a system in nature; in like manner as, from seeing revolutions of the planets, it is concluded that there is a system by which they are intended to continue those revolutions. But if the succession of worlds is established in the system of nature, it is in vain to look for any thing higher in the origin of the earth. The result, therefore, of our present enquiry, is, that we find no vestige of a beginning — no prospect of an end.<sup>3</sup>

Not only did this attitude eliminate Noah's Flood as a cardinal point in a geological time-scale, it also raised the whole question as to whether such a time-scale could be determined. Hutton argued further that "general deluges form no part of the theory of the earth, for the purpose of this earth is evidently to maintain vegetable and animal life, not to destroy them".

Hutton's own writing came in for severe handling from his opponents, many of whom identified the Wernerian position with Biblical truth. But in 1802 Hutton's opinions were rescued from the oblivion into which they were in danger of falling on account of his own turgid and repetitive style and the diatribes of his

opponents. In that year the Edinburgh geologist John Playfair published his own *Illustrations of the Huttonian Theory*. Although dissenting from Hutton's denial of a Flood, Playfair was anxious to exonerate him from a charge of impiety:

The Author of nature has not given laws to the universe, which, like the institutions of men, carry in themselves the elements of their own destruction. He has not permitted, in his works, any symptom of infancy or of old age, or any sign by which we may estimate either their future or their past duration. He may put an end, as he no doubt gave a beginning, to the present system, at some determinate period; but we may safely conclude, that this great *catastrophe* will not be brought about by any of the laws now existing, and that it is not indicated by any thing which we perceive.

To assert, therefore, that, in the economy of the world, we see no mark, either of a beginning or an end, is very different from affirming, that the world had no beginning, and will have no end. The first is a conclusion justified by common sense, as well as sound philosophy; while the second is a presumptuous and unwarrantable assertion, for which no reason from experience or analogy can ever be assigned. Dr. Hutton might, therefore, justly complain of the uncandid criticism, which, by substituting the one of these assertions for the other, endeavoured to load his theory with the reproach of atheism and impiety.<sup>4</sup>

Playfair's lucid exposition was called forth by a desire to defend the reputation of Hutton (who died in 1797) from the mounting hostility of the Neptunists. Of these Kirwan was probably the most outspoken representative, but Jameson, de Luc and others were not slow to join battle. As Gillispie writes:

The discussion did, in fact, produce an astonishing heat, most of which was given off by the advocates of water . . . The partisans of fire were much less feverish.<sup>5</sup>

The opposition was very heterogeneous. Some fought for one motive, some for another. Theology and science were hopelessly confused together. But the opponents were united in their defence of the Flood as a major historical event and from their fulminations two other viewpoints emerged.



#### 4. *The Flood as the ultimate catastrophe*

Richard Kirwan wrote as follows:

Having, I flatter myself, established, in the preceding Essay, the credit due to Moses on mere philosophic grounds and abstracting from all theological considerations, I shall not scruple taking him as a guide as far as his testimony reaches, in tracing the circumstances of the most horrible catastrophe to which the human and all animal species, and even the terraqueous globe itself, had at any period since its origin been exposed.<sup>6</sup>

Setting aside for a moment his theological reasoning, we can see that Kirwan's Flood was *universal* and *catastrophic*. It was also the "most horrible" of all such events. But it is interesting also as an anticipation of the much more influential ideas of the French anatomist Georges Cuvier.

During the Neptunist-Vulcanist dispute the arguments had been ostensibly about mineralogy. Now, in the early nineteenth century, Cuvier was to lead a return to the study of palæontology. He was deeply impressed by his discovery that fossil-bearing strata near Paris showed real discontinuities and found it impossible to reconcile these findings with the uniformitarian progression of Hutton.

He became the foremost spokesman of the geological doctrine of catastrophes. Accepting Hutton's immense time-scale he postulated an almost rhythmic series of catastrophic upheavals intermitting with periods of relative quiescence. The last of these mighty events was the Flood of Noah.

If there is any circumstance thoroughly established in geology, it is that the crust of our globe has been subjected to a great and sudden revolution, the epoch of which cannot be dated much further back than five or six thousand years ago . . . and consequently, that the human race has only resumed a progressive state of improvement since that epoch, by forming established societies, raising monuments, collecting natural facts, and constructing systems of science and learning.<sup>7</sup>

By 1820 most popularly held geological views in Britain were of the "catastrophic" school. No little credit for this remarkable fact lies with the Oxford mineralogist, William Buckland. Deliberately intending to reconcile geology with the Mosaic record, in 1819 he began a study on "Evidences of a Recent Deluge". Two years later a discovery at Kirkdale, Yorkshire, of a large cavern with a vast number of animal bones brought Buckland post-haste to investigate. His conclusions were published in 1823 as:

*Reliquiae Diluvianae; or, Observations on the Organic Remains Contained in Caves, Fissures, and Diluvial Gravel, and on Other Geological Phenomena, Attesting the Action of an Universal Deluge.*

With immense confidence he asserted:

The grand fact of an universal deluge at no very remote period is proved on grounds so decisive and incontrovertible, that had we never heard of such an event from Scripture or any other authority, Geology of itself must have called in the assistance of some such catastrophe to explain the phenomena of diluvial action which are universally presented, to us, and which are unintelligible without recourse to a deluge exerting its ravages at a period not more ancient than that announced in the Book of Genesis.<sup>8</sup>

At Cambridge, Adam Sedgwick, like many others defected from Werner to Hutton. But he agreed with Buckland on that universal catastrophe, the Deluge.

The sacred records tell us — that a few thousand years ago "the fountains of the great deep were broken up" — and that the earth's surface was submerged by the waters of a general deluge; and the investigations of geology tend to prove that the accumulations of alluvial matter have not been going on many thousand years; and that they were preceded by a great catastrophe which has left traces of its operation in the *diluvial detritus* which is spread out over all the strata of the earth.<sup>9</sup>

However, as Leroy Page has recently pointed out, it tended to be a clerical minority of geologists (including Conybeare and Kidd) who made this positive identification. For the most part

the opinion was gaining strength that the Flood was essentially a non-violent affair: not a convulsion but an inundation.

### 5. *The Flood as an extensive inundation*

The possibility that Noah's flood, although covering most if not all of the earth, had been relatively non-violent was being mooted in the eighteenth century. Partly because it avoided a collision between science and faith, and partly on simply exegetical grounds, numerous writers were advocating an inundation theory. This was the position of Chalmers, Playfair and others including the Rev. Thomas Whitaker (1819) who wrote:

The annihilation of the human race, with a few exceptions, was the object of God, and for that purpose an inundation, without these supposed convulsions, otherwise than as required for producing that inundation, was quite sufficient.<sup>10</sup>

Buckland's *Reliquiae* was critically received by William Fitton on these same grounds. More damaging attacks were made by John Fleming, a Scots Calvinist minister who wrote of the Flood in 1826:

I am not prepared to witness *in nature* any remaining marks of the catastrophe, and I find my respect for the authority of revelation heightened, when I see on the present surface *no memorials* of the event.<sup>11</sup>

### 6. *The Flood as a local phenomenon*

Here again there had been early anticipation. Thus de Luc had been roughly handled by Kirwan on this very issue — that is for suggesting the flood might not have been quite universal. De Luc had supposed that a few islands had escaped to account for the occurrence of marine remains *under* those of land animals (1809). For him, the world was the earth inhabited by man.

This indeed reflected still earlier assertions by Stillingfleet and others.

The "local flood" theory appears to have been espoused by Charles Lyell in his *Principles of Geology* of 1830. He raised the question "whether the deluge of the Scriptures was universal in reference to the whole surface of the globe, or only so with respect to that portion of it which was then inhabited by man". Agreeing with Fleming's views also he said

There are no terms employed [in Genesis] that indicate the impetuous rushing of the waters . . . on the contrary, the olive-branch, brought back by the dove, seems as clear an indication to us that the vegetation was not destroyed, as it was then to Noah that the dry land was about to appear.<sup>12</sup>

These views were, of course, but a small part of Lyell's whole uniformitarian philosophy. Going beyond the actualism of Hutton's alternate activity and rest, he supposed that the present was the key to the past and that nature had *not* been "parsimonious of time and prodigal of violence". It would take us too far from our subject either to explore more deeply into Lyell's own philosophy of science or to assess its importance in history. It is sufficient to say that, in Gillispie's phrase, *The Principles of Geology* "administered the *coup de grâce* to the deluge", — that is, as a major geological agency. Whewell delicately contrived to see in geology "a new lamp along the path to natural theology" without totally abandoning Mosaic science; Buckland wrote his *Bridgewater Treatise* without reference to the Flood; and Sedgwick, then President of the Geological Society, publicly announced his recantation of the "philosophic heresy of diluvialism".

## 2. *Factors behind changing attitudes*

The historian needs to do more than chronicle "mere" facts; he must also say *why* events turned out as they did. What factors determined the changes in scientific attitude?

### 1. *Scientific Factors*

The rôle of *scientific observation* is always crucial, whatever the detractors of science may say, and it was so here. Granted that a subject like geology presents its own particular problems (scattered locations, etc.) it remains true here, as in many less scientific areas, that observations were made without inhibition. Indeed the accumulation of data exerted pressure on Lyell and others to rethink their basic assumptions. We have already seen Werner at work in Saxony, Buckland in England and Hutton in Scotland.

One man requires special mention. That is William Smith — the father of stratigraphy. A surveyor whose work on canals took him all over England, he was the first to realize that each stratum has its own fossil record, and to show how strata in widely separated areas were related.

Geology is not perhaps a subject often associated in popular thought with laboratory *experiment*, yet several experiments had vast importance for the direction matters went. Hutton (1772) extracted salt from zeolite with hydrochloric acid and thus established an alkali present in a stony body. More important, Sir James Hall was able to show in the laboratory that *crystalline* substances can be obtained from melts (as opposed to solutions) — so debunking the argument that hexagonal granite crystals must be aqueous in origin. He also demonstrated the retention of CO<sub>2</sub> by carbonates under very high pressures and temperatures. These observations helped considerably to establish the Huttonian system of dynamics.

Then there is the question of *scientific method*. Just how do you argue from the facts? Bacon's inductive ideals were much admired and a common piece of scientific invective was to assert that your opponent's arguments were no longer truly inductive! That was how Playfair countered the Neptunists, for example.

But the basic issue is that of *scientific tradition*. This determines all else, it would seem. Facts are incorporated or rejected

by the criterion of their *relevance* for the paradigm then in dominance. Buffon, for instance, was under the spell of Newtonian physics and sought to work within that scheme. Hutton, in addition to living on an extinct volcano, had been a close associate and admirer of the Scottish chemist Joseph Black whose work on heat was so important. On the other hand Richard Kirwan was a chemist, and a mineralogist of note. As his chemistry was for a long time conceived within the phlogiston paradigm, so his geology reflected the interests of the "wet chemistry" of his day.

## 2. *Theological Factors*

May I first make 3 simple preliminary points:

1. The argument that theological opposition to any given geological axiom was great seems to have been overstated. Recent scholars have laid responsibility at the door of Lyell whose historiography in *Principles of Geology* now seems to have been deficient.
2. The question as to whether Noah's flood took place was not an issue. The debate centred round the relation between this and empirical findings of geology.
3. Many geologists were clergymen and it is over-simple to depict the church on one side of the fence and science on the other. And most non-clerical geologists possessed some kind of religious belief.

If science was under subsection to non-scientific constraints, Biblical thought was also impressed by external forces. Strongest of all, perhaps was the fear that science would lead to atheism. Thus Kirwan spoke of "various systems of atheism or infidelity" favoured by the darkness of modern geology. De Luc supposed that this was particularly true of an abandonment of a literal interpretation of the Genesis story of the Flood. Over all there lay the shadow of events in France and a fear that Revolution

elsewhere would be fostered by such a climate of religious doubt.

The eighteenth century had other legacies, too. It had witnessed the widespread acceptance of a mechanistic cosmology. The early disastrous essays in "gapmanship", where certain inexplicable astronomical data were ascribed to a God-in-the-gaps, had been replaced by Laplace's *Système du Monde* where God was an unnecessary hypothesis *in Science*. Deism had gained much ground and a God who intervened in history was an unpopular concept. The emphasis on Natural Theology was partly a rear-guard action in response to these pressures. Further, the eighteenth century had been curiously deficient in historical perception (though here we must exclude the Scottish historians and Gibbon). Right at the end of that period a historical consciousness erupted in several different areas at once, and one of them was certainly geology.

How did the geologists respond? At one extreme were those who sought in their science for specific evidence of God's intervention in nature and history, particularly in the Flood. For these interventionists it was all or nothing. John Macculloch asserted in the 1830s, that "God does exert a perpetual government over the physical world at least" and evidence for this must exist in the rocks. Similarly Chalmers opposed Lyell because uniformitarianism asserted that by laws, and laws alone, the framework of our existing economy was put together. "It is thus that they would exclude the agency of a God . . . when this agency seems most palpably and peculiarly called for". The authority of Moses as a scientific commentator was not the only issue at stake. If he were unreliable in this rôle then Christianity itself would be in peril. So thought Joseph Townsend, the author of *The Character of Moses established for Veracity as an Historian . . .* (1813). So it became vitally necessary to establish his credibility. Kirwan, at least, was satisfied. From the "correlations" he found he concluded that the chances of Moses being right as against the opposite were in a ratio of  $10^7$ : 1.

Geology thus began to assume an apologetic role for scriptures. Yet it was also from geology that scripture was being attacked.

So there arose this concern among the faithful to establish *their* geology to refute that of the opposition (a pseudo-science!). As a result, well-meaning Christians were driving themselves into a perilous situation in which scripture was acquiring a determinative role for geology. With hindsight we can see that distaster was inevitable, and, in a measure, so could some of their own number. Indeed, the numerous references to Copernicus and Galileo suggest that some at least had learned their lessons from the past. There were in fact several writers who, like Lyell, explicitly disavowed any connexion between the Bible and science. William Knight wrote scathingly of "De Luc, Kirwan and the other cosmogonists of the present day, who have done all in their power to degrade the Sacred Writings by the arguments they have brought forward in their defence".

But between these two extreme viewpoints there appears to have been a moderate consensus, intolerant of premature identification of geological theories with Scriptural truth yet reluctant to admit *no* connection between the Bible and science. For those of this persuasion the general arguments of natural theology were conclusive. Let the final word be from one of the most influential advocates of this position, Adam Sedgwick:

Geology, like every other science when well interpreted, lends its aid to natural religion. It tells us, out of its own records, that man has been but a few years a dweller on the earth; for the traces of himself and of his works are confined to the last monuments of its history. Independently of every written testimony, we therefore believe that man, with all his powers and appetencies, his marvellous structure and his fitness for the world around him, was called into being within a few thousand years of the days in which we live — not by a transmutation of species, (a theory no better than a phrensed dream), but by a provident contriving power. And thus we at once remove a stumbling block, thrown our way by those who would rid themselves of a prescient First Cause, by trying to resolve all phenomena into a succession of material actions, ascending into an eternity of past time.<sup>13</sup>

## REFERENCES

1. R. Kirwan, *Geological Essays*, London, 1799, p. 56.
2. d'Aubruisson de Voissins, *Traité de Geognosie*, Strasburg and Paris, 1819, vol. i, p. xiv.



3. J. Hutton, "Theory of the Earth", *Trans. Roy. Soc. Edinburgh*, 1788, 1.
4. J. Playfair, *Illustrations of the Huttonian Theory of the Earth*, Edinburgh, 1802, pp. 119-120.
5. C. C. Gillispie, *Genesis & Geology*, New York, 1959, p. 73.
6. R. Kirwan, *Geological Essays*, London, 1799, p. 54.
7. M. Cuvier, *Essay on the Theory of the Earth*, 3rd edn., Edinburgh, 1817, p. 171.
8. W. Buckland, *Reliquiae Diluvianae*, London, 1823, p. 23.
9. A. Sedgwick, *Ann. Phil.*, 1825, 10, 34.
10. T. D. Whitaker, *Quart. Rev.*, 1819, 21, 53.
11. J. Fleming, *Edinburgh Phil. Jour.*, 1826, 14, 214.
12. C. Lyell, *Principles of Geology*, London, 3rd edn., Vol. iv., p. 148.
13. A. Sedgwick, *A Discourse on the Studies of the University*, Cambridge, 1833, p. 22.