Part I

Perplexing Problems within Geomorphology

This initial part of Volume I will introduce many of the outstanding mysteries of geomorphology, the subfield of geology that studies the Earth's surface features—what geomorphologists call "landforms." Landforms are mysterious only within the uniformitarian paradigm, which has repeatedly failed to explain these features for over the past 200 years. This strongly suggests that the problem is the uniformitarian paradigm and that it is time for a "paradigm shift" because of all the unexplained anomalies that have accumulated, as suggested by Thomas Kuhn in *The Structure of Scientific Revolutions*. Such a paradigm shift causes a change in the interpretive framework and method. The only other option is a catastrophic paradigm. Therefore, it is time to go back to an earlier paradigm, the Genesis Flood, and specifically the Retreating Stage, for the explanation of landforms. This paradigm was rejected for reasons other than scientific observations. Could it be that this old, arbitrarily rejected paradigm could be the key to explaining the origin of landforms? This book will indeed show that the Genesis Flood is the key to understanding a host of landforms on the Earth's surface.

Chapter 1

Mysteries of the Earth's Surface

Books on popular geology, fossils, and geomorphology often lead the reader to believe scientists have solved most of the problems in earth science. But much of what you read will be theories or models—informed intellectual guesses about things that typically cannot be observed or subjected to experiment. Details of these models are often presented with great precision to support the impression that the "pros" have figured it out. For example, books on radiometric dating will boast that multiple, independent dating methods all "agree."

But digging below the surface, you might discover that the uncertainties outweigh what is really known. Furthermore some technical articles are frequently written questioning even the basic ideas of many theories. More importantly, a few scientists will admit that—like everyone else—scientists have biases that drive their thinking. In the earth sciences, the predominant bias is to assume that the Earth is billions of years old and that geological processes continue along at relatively slow rates.

In the field of geomorphology, this assumption has led mainstream scientists to affirm a few specific ideas about the formation of landforms, each of which has a number of problems. Upon further investigation, you will discover that they do not really have convincing answers about how landforms originated. This three volume book will reveal that geomorphology has many uncertainties. Furthermore, it will show that by adopting a different paradigm—young earth catastrophism—we can often provide better answers to many of the questions in geomorphology.

The Two Paradigms of Mainstream Geology

Geology has two distinct emphases. One is the study of minerals, rocks, strata, earthquakes, volcanoes, and other crustal features on Earth. This is observational science. The other is the interpretation of how those features formed over time. A discipline that studies past events is not science but history. Many of the rocks, fossils, and landforms originated or were changed in the past. No one was there to observe these events. But one can apply forensics, the gathering of clues in the present, to describe the past in the hope of explaining the origin of landforms.

One way of reconciling the scientific and historical aspects of geomorphology and other earth sciences, is to understand that history of nature or natural history is a "mixed question." In other words, information from various disciplines comes together to answer questions that any one discipline cannot answer by itself. In this way of investigating Earth's past, science is used in a forensic sense, similar to that familiar to anyone who watches crime dramas on television.

But just as criminal forensics requires the context of a case, we need to understand the context for forensic investigations in natural history. The first order of business is to make sure that the assumptions are understood by all sides. Knowledge of the past does not originate in a vacuum. Before the 1700s, scholars predominantly looked to the Bible for information about history. Most believed in Creation, a global Flood, a young Earth, and the origin of languages and people groups at the Tower of Babel. All these events are readily derived from a plain reading of Genesis 1-11 and the historical facts of these chapters are affirmed in many places in the rest of the Bible.

The biblical view of the world and history changed dramatically beginning in the 1700s. It was replaced by the secular ideas of the Enlightenment. Rejecting biblical history, they attempted a purely natural explanation of Earth and its past, based on processes observed happening in the present. Two major implications were the vastly increased age of the Earth and the rejection of a global flood as a geological cause. Without the Flood, geologists attempted to understand how the rocks, fossils, and landscapes came to be. They derived many creative explanations, confident that biblical history was gone for good.

What sort of process did they see as having formed the rocks, fossils, and landforms? Specifically, they noticed that rain and flooding erode the ground and deposit the eroded debris on a flood plain or delta. They saw eruptions from volcanoes such as Mount Vesuvius. They saw tsunamis, like the one that destroyed part of Lisbon, Portugal, in the earthquake of 1755. They decided that these processes were adequate to explain the rocks, fossils, and landforms they observed. During the decades that followed, the concept focused on ongoing, low-energy processes and in 1832 it was given the name *uniformitarianism*.[1,2,3,4] Its primary proponent, Charles Lyell, called it the principle of actual causes and a French geologist, Constant Prevost, invented the term "actualism," which is still popular today. Since that time, geology has been based on the uniformitarian principle. Until the late 20th century, it emphasized low-energy processes; in recent decades it has made room for rare catastrophes.

To remember what uniformitarianism means, think of the word "uniformity"—there has been a uniformity of geological processes clear back to the beginning of time. Uniformitarianism can also be remembered by the motto: "The present is the key to the past." This assumption has since become a dogma of earth science in which all observations and interpretations are made to fit.

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[1] Rudwick, M.J.S., 2005. *Bursting the Limits of Time: The Reconstruction of Geohistory in the Age of Revolution*, The University of Chicago Press, Chicago, IL.

[2] Lyell, C., 1830. *Principles of Geology*, First Edition, Volume I, 1830, The University of Chicago Press, Chicago, IL.

[3] Lyell, C., 1832. *Principles of Geology*, First Edition, Volume II, The University of Chicago Press, Chicago, IL.

[4] Lyell, C., 1833. *Principles of Geology*, First Edition, Volume III, The University of Chicago Press, Chicago, IL.

Figure 1.1. The 11,000-foot (3,350 m) high Spanish Peaks of the northern Madison Range, southwest Montana, as seen from the authors study window.

Another important assumption of geology is that of an old Earth. Through much of church history, theologians accepted a young age for the planet, based on the chronological data in the Bible. The most famous biblical chronologer was Archbishop James Ussher, who determined the famous date of creation as 4004 BC. But the growth of secularism led to a rejection of the Bible and the idea that Earth was very old. The French naturalist, Buffon, argued publicly in the mid-1700s for an age of more than 75,000 years, and in private for millions. That trend caught on among secular scholars of the Enlightenment, and millions of years became a common belief. It fit well with the idea of uniformitarianism, because if one assumes present processes formed all the rocks, fossils, and landforms, then their lower energy levels would require much more time. Therefore, the Earth became old—almost overnight. Uniformitarianism and deep time (old ages) became the guiding principles of geology and earth science that continue to this day.

As mentioned earlier, the principle of uniformitarianism has been modified by the (grudging) recognition of rare catastrophes in the rock record, such as the Lake Missoula flood[5] and meteorite impacts thought to have caused the dramatic extinction of the dinosaurs.[6] Younger geologists often prefer the terms "neocatastrophism" or

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[5] Oard, M.J., 2004. *Frozen in Time: The Woolly Mammoth, the Ice Age, and the Biblical Key to Their Secrets.* Master Books, Green Forest, AR.

[6] Oard, M.J., 1997. The extinction of the dinosaurs, *Journal of Creation* 11(2):137–154.

"actualism."[7] Although these catastrophes are not observed at the present time, they are considered "plausible natural processes" and therefore are accepted by mainstream scientists. However, much of geology was built on Lyell's version of uniformitarianism, which is sometimes called "gradualism." Its failure to explain the rock record has not caused geologists to rethink their assumptions; it has only led to a retreat to "actualism," which attempts to save as much uniformitarianism as possible. For all practical purposes, secular geologists still look upon the Earth and its features as being formed by present processes over millions and billions of years.

Figure 1.2. Sentinel Butte, western North Dakota, an erosional remnant 1,000 feet (300 m) high indicating much erosion of the High Plains of eastern Montana and western North Dakota.

[7] Many geologists have recently converted to neocatastrophism or "actualism," where they have rejected the slow, steady processes observed today for all Earth events. They admit to a few large catastrophes in Earth history. Also, the increased acceptance of neocatastrophism has involved no wholesale reconstruction of geology as a discipline, and no weeding out of the many decades of strict uniformitarian assumptions that influenced the methods, assumptions, and conclusions of geology. The unstated major assumption of neocatastrophists, as in all of modern geology, is that of naturalism, that nature is all there is, there is no supernatural, is a fact, which of course is not scientific and cannot be justified by science. Furthermore, neocatastrophists do not address the implications for Flood geology inherent in their rejection of strict uniformitarianism. I will continue to refer to secular scientists as uniformitarian scientists for sake of simplicity, realizing that the situation is more complicated today.

Therefore, we should expect that secular geology, steeped in Enlightenment thought, would attempt to explain landforms using the principle of uniformitarianism operating over billions of years. And that is exactly what has happened. For nearly two centuries, geologists have tried to explain landform as having been formed very slowly by rivers, rain, wind, and waves. But in doing so, they have discovered that their explanations do not fit very well with their observations. Many consider the landforms on Earth's surface as having mysterious origins.

Mysteries of Geomorphology

Geomorphology is the study of the surface of the Earth ("geo" means earth and "morphology" refers to shape). Geomorphology is therefore the study of the form, structure, or shape of Earth's surface. (More detail can be found in the in-depth section at the end of this chaper).

Figure 1.3. A plateau on dipping sedimentary rocks, southeastern Uinta Mountains, Utah. Arrow points to a prominent dipping layer.

Although we all see, live on, and enjoy the features of Earth's surface, it is amazing how unaware we are of the mysteries surrounding their formation. Mountains, plains, river valleys, canyons, and deserts are amazing places. I hope this book will open your eyes and cause you to see them in a whole new light. Specifically, I hope that you will see the need to examine them from the perspective of a new paradigm.

One example of an unexplained landform is the mountain range (Figure1.1). Mountain ranges can be small—several hundred feet tall and only several hundred square miles in area. Or they can be high like the Himalayas of South Central Asia—tens of thousands of feet high and hundreds of thousands of square miles in area. Despite being perhaps the most prominent landform on every continent, the origin of mountains is still unknown. Evolutionary geomorphologists, Cliff Ollier and Colin Pain, wrote a provocative book in 2000, *The Origin of Mountains*, and listed 20 proposed mechanisms for the uplift of mountains, none of which can be demonstrated.[8] Most scientists today explain mountains using the theory of plate tectonics, although the actual mechanisms are speculative and often not convincing. Ollier and Pain admit that plate tectonics rarely explain mountains.

Other landforms are no less difficult to explain. For example, plateaus and mesas exist all over Earth. Many are erosional remnants shaped out of horizontal layers of sedimentary rocks (Figure 1.2). Others were carved from tilted sedimentary strata (Figure 1.3). But what is difficult to explain is the fact that many of these are cut smoothly across

Figure 1.4. A pediment just east of the northeast Beartooth Mountains, Montana (arrow).

alternating hard and soft sedimentary layers. In other words, the smooth surface of the mesa or plateau does not vary with the hardness of the underlying rock, which it should. Usually, erosion is faster and more extensive on soft rocks than on hard ones. We should then expect a surface of alternating valleys and ridges, not a smooth plateau. Why would the dipping sedimentary rocks of varying hardness below the surface be planed equally?

These relatively flat, smooth surfaces are called planation or erosion surfaces, which often are used interchangeably. Mesas formed on horizontal sedimentary layers are probably also planation surfaces, but their origin is more difficult to demonstrate. I will

[8] Ollier, C. and C. Pain, 2000. *The Origin of Mountains*, Routledge, London, U. K, pp. 307–310.

refer to planation surfaces as smooth while erosion surfaces as rolling. No geomorphologist has been able to explain Earth's many, large planation surfaces, although many have tried. Planation surfaces will be examined in depth in Volume II.

Another mystery is the existence of planation surfaces along the edge of mountains, ridges, or plateaus (Figure 1.4). These are called pediments ("pedi" means foot and "ment" means mountain). They are common features. Like other landforms, pediments are not seen forming today; thus, the axiom of uniformitarianism does not apply. Uniformitarianism predicts that we would see all these landforms forming today. What we observe is the opposite; pediments are being destroyed by erosion. For uniformitarian geologists, pediments are another mystery of geomorphology: "The curious and ubiquitous nature of this landform suite…has baffled geologists for over a century."[9] Pediments will be analyzed in Volume III of this book.

Figure 1.5. Gravel-capped Miller Mountain, a pediment remnant north of the eastern Uinta Mountains, Utah, capped by cobbles and boulders whose lithology is different from the underlying sedimentary layers.

Another curious feature of pediments and planation surfaces is the thin covering of rounded rocks often found on them. These rocks are typically different from those of the underlying plateau or the surrounding countryside (Figure 1.5). These rounded rocks were clearly deposited by water. Water was also the likely agent of erosion of the underlying surfaces. But how can we explain water depositing rocks on top of high plateaus? This mystery will be explained in Parts IV and V of this volume.

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9 Strudley, M.W., A.B. Murray, and P.K. Haff, 2006. Emergence of pediments, tors, and piedmont junctions from a bedrock weathering—regolith thickness feedback. *Geology* 34:805.

Smaller, isolated erosional remnants sometimes remain on planation surfaces and pediments. They can be anything from an isolated rock or spire to a small mountain. These erosional remnants have been given a number of names, but the most general name is the "inselberg." They are generally called "bornhardts" in Africa and "monadnocks" in the eastern United States. Ayers Rock in central Australia is probably the most famous inselberg (Figure 1.6).

Inselbergs are another puzzle of geomorphology. They are supposed to be millions of years old, but if they are that old, they should have been eroded down to nothing, since vertical faces erode faster than horizontal surfaces.[10] Erosional remnants will be explored further in Volume II.

Figure 1.6. Ayers Rock, central Australia, an erosional remnant 1,140 feet (348 m) high (courtesy of Tas Walker). The vertical beds of sandstone represent the top of a deep body of sandstone.

[10] Pazzaglia, F.J., 2004. Landscape evolution models. In, Gillespie, A. R., S. C. Porter, and B. F. Atwater (editors), *The Quaternary Period in the United States*, Elsevier, New York, NY, p. 249.

Another geomorphological curiosity can be found by following rivers. Rivers and streams often flow through mountains or plateaus in deep gorges (Figure 1.7). It would appear that the river or stream eroded the canyon, which would require water to flow uphill! To make the mystery more curious, these rivers often choose to flow through barriers when there is an easy downhill path around the barrier nearby. These features are called *water gaps*. Geologists and geomorphologists have developed several hypotheses, but none are a good fit for the facts in the field. Water gaps are another mystery that will be explained in Volume III.

From the high mountains to the ocean depths, landforms remain difficult to explain. The features of the ocean bottom are also topics of geomorphology. In the shallower waters, we encounter the first ocean mystery, a border of sedimentary rocks called the *continental margin*. They are found off of every continent and even large islands, extending from the coast out into the ocean. The continental margin is composed of a flat, wide *continental shelf*, which suddenly plunges down the *continental slope* into the deep ocean basins. Geomorphologists and marine geologists are not sure how these aprons of sedimentary rock formed, but the Flood paradigm has an easy explanation, which will be fleshed out in Part VI at the end of this volume.

Like water gaps, there are erosional canyons cut through the continental margin. The deepest submarine canyons usually originate on the continental shelf, and run perpendicular to the continents. They are thousands of feet deep and tens of miles long. Some are *deeper* than Grand Canyon. One, the Bering Canyon, is even *longer* than Grand Canyon, which is 277 river miles (445 km) long.[11] Like other features of the continental margins, geomorphologists are hard-pressed to explain submarine canyons.

[11] Vail, T., M. Oard, D. Bokovoy, and J. Hergenrather, 2008. *Your Guide to the Grand Canyon: A Different Perspective*, Master Books, Green Forest, AR.

Figure 1.7. Nenana River water gap, Alaska (arrow). The river starts on the south side of the Alaska Range and passes through a deep chasm to the north of the range.

What Is Geomorphology (In-Depth)

Geomorphology is the geological science that studies the general configuration of the Earth's surface, especially the study of the classification, description, nature, origin, processes, and development of present landforms and their relationships to the underlying geological structures.[12] Other names for geomorphology are physiography or physical geography, but I will use the term "geomorphology" except where they are used in quotes from others. Landforms are surface features that together make up the surface of the Earth. [13] They include broad features such as mountain ranges, plateaus, or plains, and small-scale features such as hills, valleys, slopes, canyons, or alluvial fans.

Geomorphology is concerned with the geography, topography, shape, and other pertinent features of the Earth's surface or to individual landforms. The science of geomorphology may provide a description of a plateau, giving its height, width, slope, etc. and classify it in relation to other plateaus.

However, specialists in this part of geology do not stick to description, but also

[12] Neuendorf, K.K.E., J.P. Mehl, Jr., and J.A. Jackson, 2005. *Glossary of Geology*, fifth edition, American Geological Institute, Alexandria, VA, pp. 267–268.
[13] Neuendorf *et al*., Ref. 12, p. 360.

attempt to explain the *origin* of landforms. Although done as a matter of course, this is a tremendous jump, because it moves from the domain of science to that of history. The rules of history are different from those of science because history requires more assumptions about what the past was like, and therefore introduces greater uncertainty, since there were no observers to describe the processes. The two dominant assumptions of secular geomorphology are deep time and uniformitarianism. These are fundamental tenets of the secular worldview that has prevailed since the time of the "Enlightenment."

Geomorphology also includes the study of the ocean floor, including bathymetry (the depth), shape, and relationship to other landforms. Of special interest are the continental margins and their features.

Geomorphology dates to the earliest days of geology. Naturalists in the late 1700s were interested in what they called physical geography, and the origin of landscapes and their features. Of particular interest were valleys, especially river valleys.[14] From the earliest studies, there was an argument over which came first—the valley or the river. Dr. M.J.S. Rudwick in his history of geology from about 1780 to about 1820 stated:

> A case that belonged more specifically to physical geography was the vexed question of the causal origin of valleys. … Valleys were observed to be of many forms. A few could plausibly be attributed to erosion by the streams that flowed in them, but most could not. For example, the "dry valleys" of the Chalk hills of northern France and southern England were just like other valleys in form, but they contained no streams at all. … So erosion by a sudden and violent rush of water, at some remote time, often seemed the most likely causal explanation of many valleys: the well-attested effects of violent flash floods were a persuasive small-scale analogue.[15]

14 Reed, J.K., 2011. Three early arguments for deep time—part I: time needed to erode valleys. *Journal of Creation* 25(2):83–91.

15 Rudwick, Ref. 1, pp. 102–103.

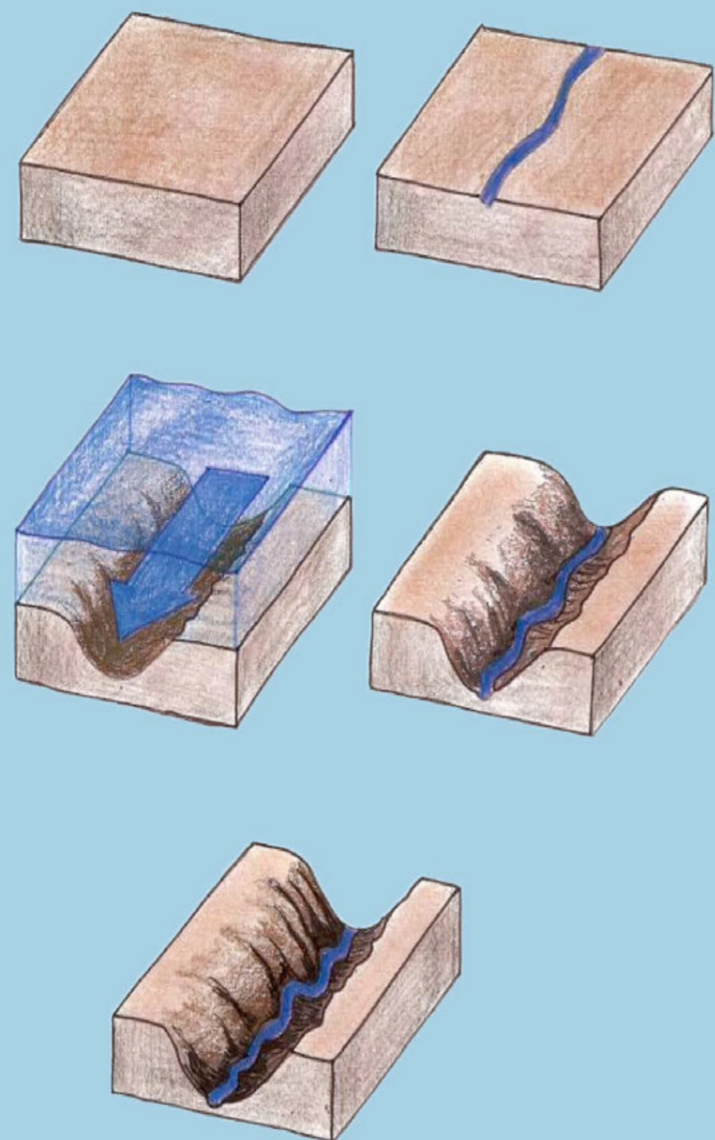

Figure 1.8. Comparison of the two major hypotheses for the origin of valleys around 1800 (drawn by Mrs. Melanie Richard). One group believed the valley came first through catastrophic erosion (left), while others believed the valley eroded slowly over millions of years (right).

There were scientists at that time who advocated a catastrophic origin for valleys; most of them attributed valleys to the actions of large tsunamis, undoubtedly influenced by the waves generated by the Lisbon earthquake of 1755. A few argued for their origin during Noah's Flood, but contrary to popular opinion, most of the catastrophists of that time had already rejected Genesis.

Figure 1.8 shows the two hypotheses for the origin of valleys around 1800. Eventually the dispute was settled in favor of the gradualists or uniformitarians, as they were later called. In other words, valleys were eroded by rivers over long periods of time. More information on the origin of valleys will be discussed in Volume III.