also provided the setting for a considerable part of the New Testament.

The Landing-Place of the Ark as an Archaeological Site

Most searches for the Ark have concentrated on one object: the Ark itself. But where the Ark landed there must have developed, through those early years, a large settlement of people. This fact, as far as I know, has never been considered.

There might now be nothing left of the Ark, except, perhaps, a deposit, about 300 feet long and 20 feet wide, of ballast stones. There might also be bits of metal: nails and plates used to reinforce the hull. (Although if such things were made of iron, they might have rusted away long ago.) There might be other artifacts among the stones; for it is a well known fact that many objects find their way down into the hold of a ship.

At this site, under the upper layers of earth, there could be found evidence of this settlement, from which Noah drew the people to make up the various waves of migration. There might still be remains of the altar on which Noah made that very important sacrifice (Genesis 8:20.) It would not be surprising, although it is not mentioned in the Bible, if there should be a memorial. It might be the same as the altar, as in Joshua 22:26-29; but no sacrifices would ever have been made on it.

One important difference between this archaeological site and others, somewhat later but still from the early millennia after the Flood, would be that metal objects should be found in it. For the antediluvian people knew of metal (Genesis 4:22). Indeed, the very construction of the Ark could be evidence that they knew how to use metal.

Noah, we can assume, took on board the Ark a large supply of tools made of metal. Later, when they were worn out they were discarded; also, no doubt, some good ones were lost by accident. There could be broken pottery, household utensils, tools, and objects of all kinds. In other words, the site at which the Ark landed would be a small island, having archaeological objects different from those from surrounding sites from later millennia. Such a find alone should serve as evidence that the site was indeed that at which the Ark landed.

In conclusion, let me say that I am at a loss to find words to express adequately the importance of that settlement somewhere near the head-waters of the Tigris and Euphrates rivers, in the ancient kingdom of Ararat.

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QUOTABLE QUOTE

" . . . though we christen effects by their most sensible and nearest Causes, yet is God the true and infallible Cause of all; whose concourse, though it be general, yet doth divide itself into the particular Actions of every thing, and is that Spirit, by which each singular Essence not only subsists, but performs its operation."

Sir Thomas Browne, *Religio Medici.*

CONTROVERSY ABOUT ICE AGES

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The concept of a glacial period after the flood, which has been proposed by several creationists, is examined in this article. The slowness of glacial erosion, and the scale of the effects which have been attributed to ice erosion, such as the rock basins of the Great Lakes, are not favorable to the idea of a short glacial period. The erosional effects of the currents of the flood waters can account for much of the work which has been attributed to ice erosion, and the drift can be explained by rock disintegration in place. Thus there is no need for a glacial period in creationist geology.

Introduction

The idea of an ice age following the deluge has been supported by several creationists, perhaps because the glacial theory is so persuasive. However, questions about the duration of the ice age, and the date of the flood as indicated in the biblical chronologies, have aroused doubts about the glacial theory in the minds of some.

The glacial theory has seemed so compelling that it has been suggested that chronologies in the Bible may be stretched or extended, on the assumption that not all

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names in the lines of descent are recorded. Thus it is supposed that an ice period of a few thousand years duration may be fitted in.

Another suggestion is that the ice age was much shorter than generally believed, and that the conventional four major divisions of the glacial period may be condensed to one. The evidence for glaciation in Precambrian and Paleozoic rocks is believed capable of another interpretation.

The writer has developed a new explanation of the drift, which accounts for many of the features believed to have been caused by ice sheets in terms of the flood. Disintegration of surface rocks due to decrease in pressure as the crust of the earth was elevated from the flood waters can account for the formation of drift *in situ*.

This alternate explanation was developed from physical principles believed consistent with past conditions which existed during the flood. The writer's objections to the glacial theory are derived from the recognition of anomalous characteristics of the drift, when interpreted in terms of the glacial theory.[1]

Part of the work involved in presenting a new theory is to show that there is indeed a need for it, so it is pertinent to point out problems and inconsistencies in the glacial theory, and in the suggestion by some creationists that an ice age could have followed the biblical flood.

Limitations of Ice Erosion

In the glacial interpretation of the drift, it is supposed that the ice sheets broke up bedrock, rounded the stones during transport, and redeposited the debris as it is found today. The erosional action of ice is invoked to explain fiords, deep lake basins, and mountain valleys.

Erosion by ice sheets is accomplished by the mechanisms of quarrying and abrasion, which would need to have been active over a considerable period of time to account for the scale of existing landforms.

The erosional power of ice cannot be invoked beyond limits, as there are several facts which tend to indicate that ice sheets would be rather ineffective as erosional agents.

Quarrying is active as ice slides over a rough bedrock surface. Protuberances may be removed by the shearing stress caused by the moving ice. The quarrying process would be less effective once the bedrock was worn smooth, as noted by Whillans: "Although some as yet undescribed mechanism can perhaps create new protuberances, the existence of smoothed terrain where glaciers have been active argues against the continuous creation of such bed roughness in many places. Quarrying and the abrasion mechanism . . . in time, destroy the bedrock protuberances which are necessary for the quarrying mechanism to work most effectively."[2]

Whillans showed that abrasion, too, must be limited. The existence of tools, derived from the quarrying process, would be necessary for abrasion to occur.

Abrasion could occur only within a narrow range of conditions in the ice sheets. If there was too much debris in the sole of the glacier, deposition would occur which would protect the bedrock surface from further abrasion. If there were too little debris, the tools would be forced up into the ice and would do no work on the bed. Whillans stated:

> The abrasion mechanism may depend on a delicate balance between the mechanisms that determine the density of glacial debris, and so may be efficacious in a rather narrow range of subglacial environments.[3]

Each of these processes is dependent upon the velocity of the ice sheet. In regions where there is no downhill slope, or where the glacier is supposed to have moved uphill, (which presumably would have occurred more slowly) these erosional mechanisms would be less effective.

Origin of Lake Basins

It is commonly stated in text books that the ice sheets eroded the rock basins of the Great Lakes, but this concept has been disputed. A leading glacialist, H.L. Fairchild, argued that it would be physically impossible for an ice sheet to erode deep basins in rock.[4]

Fairchild noted that ice in deep rock basins would be stagnant, and would act as a bridge over which the upper layers of the ice sheet would flow. He wrote:

> Shearing of the upper and more rapidly moving layers of the glacier ice over the lower, basal, and laggard layers seems to be established by observation. To whatever degree this factor is active it diminishes the velocity factor at the bottom of the ice and antagonizes erosion . . . It argues specially against the flow of ice at the bottom of basins, and implies that the ice resting in a basin is likely to form a bridge over which the upper ice can travel. This is an important fact with reference to the assumed glacial origin of lake basins.[5]

Since several of the Great Lakes basins reach depths well below sea level, a considerable amount of erosion would be required at the base of the glaciers. Fairchild claimed that once charged with debris, the ice becomes less effective as a grinding agent, since the rock burden slows down its movement.

The polishing action of ice also hinders the erosion process, and the rock flour acts as a lubricant, preventing abrasion. Fairchild pointed out that ice sheets cannot deepen valleys without widening them, and he showed from observations of existing glaciers that the action of ice as an eroding agent is relatively ineffective.

Glacial erosion of lake basins, Fairchild claimed, is founded in analogy and is almost wholly inferential—it is merely assumed, since no other cause has been discovered. He stated:

> Some physiographers appeal to glacial action and postulate a thousand feet of cutting by ice because their rules and principles of topographic evolution do not immediately explain the peculiarity of the topography.[6]

The idea of deepening of the Great Lakes basins by glacial scour was also discredited by J.W. Spencer, who thought that crustal warping was a major factor in the formation of the basins. Spencer stated:

> At the present time in the investigation this subject can be quickly dismissed. The question whether

> glaciers can erode great lake-basins is hardly pertinent, for nowhere about the lakes is the glaciation parallel to the shores or vertical escarpments which are associated with the lakes.[7]

This observation is no less true today, negating any suggestion that the Great Lakes basins furnish evidence for glacial action.

In the theory of glacial erosion of the Great Lakes basins, it is assumed that pre-glacial valleys were present in which the ice became channeled. Vast time periods are assumed by uniformitarian geologists, in which this erosion could occur. But the extended time would tend to result in filling up the rock basins with sediments from rivers, rather than excavating them to depths well below sea level.

Some investigators have supposed that pre-glacial rivers which flowed along channels now buried in drift could have excavated the Great Lakes basins. This is inconsistent with the fact that the deepest lake is Lake Superior, most distant from the ocean. The lake reaches a depth of 223 meters below sea level.

The depth of these buried valleys is insufficient to account for the deep lake basins by river erosion. Thwaites stated:

> Although a large part of the lake shores are in glacial drift, enough wells have been drilled to prove that even were all the drift removed, (i.e. at the outlets), the levels of the lakes would not fall more than 300 feet.[8]

Recent investigations on the local character of the drift tend to dispute the glacial erosion of lake basins, since material would have to be carried enormous distances for the erosion of the basins of the Great Lakes.

Whillans noted that the feldspar content of the drift, and the composition of the drift compared with bedrock, show only very limited transport of the drift could have occurred. He suggested that breakup of bedrock was mostly a pre-glacial process, and that transport of material occurred by a freezing on of debris at the base of the moving ice. This could not explain the erosion of the lake basins, however, and he suggested "Some other mechanism must be invoked for the removal of material from the Great Lakes."[9]

Escarpments a Barrier to Ice Motion

The glacial theory is unable to account for the deep lake basins, and neither does it account for the great escarpments in the Great Lakes region. It is believed the escarpments were formed by uniformitarian processes during the supposed millions of years before the glacial period.

The Niagara Escarpment presents an enormous difficulty for the glacial theory. Throughout its entire length, this escarpment would form a barrier to the motion of the ice sheets. It stretches from central New York, through southern Ontario, Lake Huron, northern Michigan, to Minnesota and Wisconsin, where the uplifted Niagara formation forms the western shore of Lake Michigan. It is associated with three of the Great Lakes basins: Lake Ontario, Lake Huron, and Lake Michigan.

The escarpment consists of a long line of cliffs and bluffs, with deep valleys and indentations. It is concentric with the Michigan Basin of Paleozoic sediments, and the boundary of the Paleozoic rocks and the Canadian Shield.

Geologists believe the Niagara Escarpment was formed by subaerial erosion in pre-glacial time. According to W.M. Tovell, the erosion of the escarpment took some 300 million years. Tovell wrote: "By the time the first glaciers advanced a million years ago, the escarpment looked essentially the way it does today."[10]

If this were true, the escarpment would have been a major barrier to the motion of the ice. Flow would have to be from the lower side to the higher, since orientation of the drumlins near the escarpment shows this direction of motion. These are believed to have been caused by ice sheets, in the glacial theory.

At Cabot Head, on the Bruce Peninsula, Ontario, the escarpment drops away steeply to depths of more than 400 feet in Georgian Bay. It would present an immense wall of rock against the ice sheet sliding across the floor of the bay from the Canadian Shield on the eastern shore. How the ice could have overcome this barrier, and continued its movement across the Bruce Peninsula, to excavate the basin of Lake Huron, is difficult to conceive.

On the top of the escarpment in the Bruce Peninsula, the rock contains deep crevices in places and seems to have not been affected by the ice sheet. Coleman suggested the ice sheet missed these places:

> On the Bruce Peninsula between Lake Huron and Georgian Bay the tableland rising 400 to 1,000 feet above the water shows only Precambrian boulders and a greatly weathered surface of Niagara limestone, while at low levels there is fresh boulder clay with beautifully polished and striated limestone pebbles, indicating that the Wisconsin ice lobe was thin and failed to sweep over the highland.[11]

However, drumlins are present on the peninsula and on Manitoulin Island. It could be asked, if the ice sheet was thin, how could it flow up out of the bay and form these drumlins? How could it deposit granite boulders on top of the escarpment?

Another immense barrier to the ice movement occurs within Lake Huron. From North Point, Michigan, to Clark Point, Ontario, an underwater ridge runs across the bottom of the lake. On the northeast face it slopes very steeply to a great depth, below sea level in one place. On the southwest side the ridge slopes away more gently. At one point the ridge is only 36 feet below the level of the lake.[12]

The Niagara Escarpment and this submerged escarpment both constitute immense barriers to the supposed glacial erosion of the Great Lakes basins, suggesting another agent of erosion was the cause of these basins.

Flowerpot Island and the Glacier

Flowerpot Island is a small wooded island four miles from the end of the Bruce Peninsula, in the waters of Georgian Bay, Ontario. It is one of the islands of the Georgian Bay Islands National Park. The island is part of the Niagara Escarpment, which in the region is

submerged, and continues below the waters, emerging again at Manitoulin Island.

On the eastern side of the island are two stacks or pillars of rock, their bases at wave level, one 50 feet high and the other 30 feet high. These are composed of the rock of the escarpment, and were left behind by the erosion of the escarpment. The stacks are shown in Figure 1, and on the front cover.

Several facts indicate the rate of wearing away of the rock along the shores of the island is negligible. Caves high in the cliffs behind the stacks seem to have been there since the formation of the escarpment. An immense rounded boulder on a ledge near the larger flowerpot suggests no significant retreat of the escarpment since its emplacement.

The stacks would have been destroyed, however, if ice sheets a couple of miles thick had scraped over the region. They are located on the side of the island that would have received the greatest thrust from the hypothetical ice sheets that are believed to have filled and eroded the basins of the Great Lakes.

It seems paradoxical that the ice sheets capable of eroding the deep rock basin of Georgian Bay would leave behind such fragile and unstable pillars in a position that would have received the maximum wear and tear from the ice.

Figure 1. This shows the smaller flowerpot on Flowerpot Island, in Georgian Bay. Ontario, with the larger one in the distance. Parts of the stacks have been shored up by man. The Niagara Escarpment and Great Lakes basins may have been caused by erosion of unconsolidated sediments by flood waters during rapid uplift of the Shield area. Disintegration due to the rapid release of pressure caused caves on Flowerpot Island, and many of the features of the Niagara Escarpment. Stacks may have been left intact as the currents eroded the softer sediments that surrounded them.

Other pinnacles occur along the escarpment, one at Cabot Head, others at the Blue Mountains near Collingwood, and at Mount Nemo. Each of these present objections to the theory of an ice sheet flowing up and over the escarpment, since they would have been easily destroyed.

Limestone crags at Rockwood, Ontario, a region of numerous caves and potholes, also seem to have escaped the effects of glaciation. Coleman noted that this region was unglaciated,[13] yet it lies in close proximity to large bedrock drumlins!

Visitors to the Rockwood conservation area are notified by signs that the potholes were caused by meltwaters from the ice sheets, but this is paradoxical, since the drumlins are believed to have been caused by the movement of the ice sheet. Meltwater could not have poured down upon one spot long enough to erode the deep potholes.

Glaciers and Rock Sheet Overthrusts

The suggestion by some creationists that the glacial period was a short one, seems to require even more erosive power must be attributed to the hypothetical ice sheet than is imagined possible by even the most extreme glacialists.

The ice sheets of the past have been compared with overthrust folds or nappes in that a mysterious power of movement is attributed to both rock sheets and the ice sheets. H. Ramberg tried to discover a mechanism by which thin rock sheets could have been able to slide for hundreds of kilometres, by studying the motions of the Pleistocene ice sheets.[14]

Many creationists have questioned the concept of these rock sheet overthrusts over great distances, since no physical evidence for the motion exists at the thrust plane in some instances. It might be added, no cause for the movement is known either, and similarly the movement attributed to ice sheets of the past, in particular uphill movement, suggests there is indeed much in common between these concepts.

Erosion of the Great Lakes basins by glacial scour was suggested in 1863 by W.E. Logan, first director of the Geological Survey of Canada. He noted grooves and striations disappearing into the waters, which he attributed to glacial action.

Striations, however, may have other explanations. Early geologists thought these may have been caused by diluvial currents. The writer has suggested that striations may have been caused by movements of the drift, caused by expansion of the sand and gravel over its original volume, upon disintegration of rocks as pressure was released during uplift of the continents from the flood waters.

The disintegration product in some places may have been removed by the currents of the flood waters, leaving the striated bedrock exposed.

Striations an Objection to Erosion

Fairchild pointed out that the striations are evidence against significant erosion by ice sheets, since the cross-

ing paths show no erosion of the rock occurred since the first set of scratches was produced. He wrote:

> The removal of rock by the slow process of glacial abrasion is so ineffective that it is practically a negligible factor in ice erosion. The smoothing, polishing, or sandpapering of rock surfaces is rather an argument against deep erosion, as it is such a slow process that it is inconsistent with great excavation . . .
>
> The glacial striae themselves supply one of the clearest proofs of the slow and ineffective character of abrasion. Cross-striae are very common phenomena, and may indicate different movements of the ice-body and not merely varying currents. This certainly proves the weakness of the later abrasion, for if general abrasion were such an effective process as to cut hundreds of feet into crystalline rocks during the Pleistocene period the rock should be removed so rapidly that double sets of striae would be rare phenomena.[15]

For creationists who suppose a glacial age followed the flood, the slowness of the rates of glacial erosion is a problem. Since the glacial theory is a uniformitarian one, it is possible to test the postulated effects of the ice sheets by comparison with the characteristics of existing glaciers. To do so is very unfavorable for the glacial theory, and suggests there is no way the ice age could be limited to a few thousand years, as suggested by those who propose an ice age following the flood.

One of the problems with this concept is that the rates of supposed glacial action must be greatly exaggerated, to account for the effects assigned to glaciation within a short period of time. Instead of one or two million years in which the ice sheets grew and did their work, creationists can afford only at most one or two thousand years, without straining the biblical account. As a result of the necessary acceleration of the rates of glacial erosion, events that seem somewhat plausible in terms of uniformitarian time scales seem highly improbable without sufficient time.

The Duration of the Glacial Period

As an example, consider the rate of accumulation of the postulated ice sheets. If the ice was thick enough for significant flow to occur, it must have been about two miles thick at the center, and one would think that amount of ice would take a rather long time to accumulate.

Suppose the rate of accumulation was similar to that in the Antarctic today. Over most of the continent, accumulation is about 5 cm of ice per year, but the rates are greater near the perimeter of the ice sheet.[16]

Suppose an accumulation rate of 15 cm of ice per year for the hypothetical ice sheet in North America, thought to have covered about 4,000,000 square miles. The growth of this ice sheet would have taken something like 20,000 years, which is clearly incompatible with the time scales being seriously discussed in creationist literature.

Another calculation reveals the rate of flow of the ice sheets would have been too slow for the necessary amount of rock transport that has been attributed to the Pleistocene ice.

For example, supposing an ice sheet with a diameter of 2,000 km, with a parabolic profile, and a mass balance of 15 cm of ice per year, we are informed "a particle of ice would take 75,000 years to travel from X = 50 km to the edge of the ice sheet. About 60% of this time would be spent in reaching X = 300 km."[17]

The rate of flow of the ice sheet, if it was comparable to the ice in existing ice sheets, was limited by its viscosity, and if it is supposed the ice moved any faster than physical principles would indicate, the possibility of heating due to internal friction should be taken into account. Perhaps the ice sheet would melt due to the extra heat!

I suggest incorporating the glacial theory in creationist reconstructions of earth history creates many difficulties and contradictions, and an alternate theory would be desirable. The glacial theory has provided a pattern for the interpretation of certain facts, but it is wise to view theories as tentative, and be willing to consider alternate explanations when they come along.

The Disintegration Theory of the Drift

Many of the phenomena that are believed to show the former existence of continental ice sheets may be explained in other ways, so a creationist has no need for the problematic glacial period after the flood. Drift deposits commonly exhibit the pattern of cross stratification, which may be an effect of shattering and disintegration of rocks, rather than of sedimentary deposition.[18]

This shattering was caused by the rapid release of pressure on rocks, as overlying sediments were removed by erosion, or by decreasing pressure of flood waters.

The disintegration could affect either primitive (Precambrian) rocks, or sedimentary rocks deposited during the deluge, that were lithified as pressure decreased.

The presence of fossils in cross stratified rocks and sands shows their sedimentary origin, but the pattern of cross stratification may be due to another secondary cause, or metamorphism of the rock following its deposition as a sediment. The fossils in these formations do not negate the possibility of this disintegration origin of the pattern of cross stratification.

With the new concept, the drift can be considered a product of rock disintegration in place. Kames and eskers may be explained as expansion effects, resulting from the disintegration at the time of the flood, rather than deposits of former ice sheets.[19]

Striations on bedrock under the drift may have been caused by movements due to expansion. Where the striations are found on bare rocks, it is possible these rocks once had a drift cover formed by disintegration, which has been eroded by the currents of the flood waters, leaving a striated pavement. Polish on rock surfaces below the drift may also be due to a disintegration effect.

Erratics in the drift may have been formed in place, by concretionary development, as precipitates from solid solutions in the rock. Precipitation would result from the rapid change in pressure. These became peb-

bles and boulders as the matrix around them was shattered and changed into sand.

Some very large erratics, left behind on bedrock, may have been formed in this way, and become isolated when the sand and smaller stones were washed away by the currents of flood waters.

Examples of rocks transitional between limestone and a crystalline rock are common in areas with limestone bedrock. Many of the boulders in the drift exhibit a concentric internal structure, or contain pebbles or concretions inside, or in other ways reveal their concretionary origin.

Benjamin Tappan suggested an *in situ* origin of the crystalline erratics found in Ohio, shrewdly drawing the analogy of the transition of quartzite into sandstone.[20]

After several generations of the glacial theory, an *in situ* interpretation of erratics is difficult for some to grasp, but it is not proposed without reason. The drift is generally similar to the bedrock from which it was derived. Shattered pebbles occur in the drift which could not have been rounded by abrasion in ice sheets or rolled around in the beds of streams.

Explanations of how the stones became rounded are vague and unsatisfactory in the glacial theory. If it is said the stones were rounded during transport in the ice, there must have been some kind of wonderful milling action within the glaciers, unlike any ice sheets existing today, which deposit angular rocks.

The stones are not less rounded at the center of the postulated ice sheets, but even in the region where the ice is believed to have originated, the stones have been found rounded and scratched.[21]

If the rounding of stones is attributed to fluvial action after deposition, how is it that the striations on their surfaces were not obliterated?

The variety of composition of stones in the drift has long been cited as evidence for its transportation by ice, but the variation itself is a difficulty for the glacial theory. The variety of limestone boulders in the drift in southern Ontario far exceeds the variety of possible Paleozoic sources.

The range in composition of boulders is well explained by the concretionary development followed by disintegration. The difficulty of explaining the variety of stones in drift is noted in the following comment by Price:

> Unfortunately, the wide variations, in terms of petrology, lithology, and sedimentology, that occur in glacial sediments make interpretation and generalization very difficult, suggesting that glacial environments are very complicated and produce highly variable sediments.[22]

These facts which are problems in the glacial theory are actually evidence for the disintegration explanation.

High Shorelines and the Flood

The idea of a glacial period after the flood, lasting until fairly recent times, requires that another extensive flood must be invoked to explain the series of raised shorelines present in many parts of the world. Around the Great Lakes of North America, and in Scandinavia, these are attributed to the glacial lakes assumed to have been formed by ice lobes blocking valleys as the ice melted away.

In places like Hudson Bay, where the shorelines are unquestionably marine, there must have been a depression of the crust of the earth to about 1,000 feet or more below sea level, and these events point clearly to major flooding after the formation of the drift, since the shorelines are frequently formed in drift.

One is tempted to identify the elevated shorelines with some of the last effects of the deluge, as many have done, since they are geologically recent. This is a reasonable conclusion, as the writer has shown elsewhere,[23] if the theory of an ice age is set aside. The disintegration theory of the drift fits in well with the explanation of the raised shorelines as the effects of the retreating waters of the flood.

Erosion by Flood Waters

It is not suggested that the disintegration process can explain all the effects which have been attributed to the ice sheets. There has been a great deal of erosion and sediment transport, excavation of lake basins, the formation of escarpments, which have been attributed to the work of glaciers and the effects of long ages of subaerial erosion before the glacial period.

Early American geologists observed the tilted sedimentary formations around the Great Lakes and concluded that immense quantities of rock had been removed. The Niagara Escarpment, for example, is a remnant of a sedimentary formation that once extended out over the basin where Lake Ontario is now found. Due to some immense erosional action, the strata are now missing. George F. Hayes of Buffalo wrote:

> There can be no doubt that the rock strata in the western part of New York, have been disintegrated and removed, from extensive tracts north of their present limits. It would be absurd to suppose they were once deposited in such ridges, with steep escarpments, as we now find them . . .
>
> That these rocks were deposited at the bottom of an ocean, is evinced by their fossil contents; that they have been elevated from its watery bed, requires no additional evidence other than their present altitude above its permanent level. If we seek for the cause of this gigantic phenomenon, and trace the ascending strata in a direction opposite their dip, we invariably come to primitive rocks . . .

This fact implies differential uplift of the basement has caused the tilt of the sedimentary rocks. But has this occurred rapidly, or was it slow, taking millions of years?

From the point of view of the uniformitarian geologists, the removal of such a vast amount of rock is evidence for the passing of great ages of time. With the assumption of evolution, the Paleozoic rocks are dated as hundreds of millions of years old. There was time for a considerable amount of erosion since the deposition of the sediments, time that is not available to creationists.

The alternate explanation in terms of the flood is that the sediments were eroded by currents generated by a rapid uplift of the continents from the depths. The

sediments may have been unconsolidated, so would be easily removed by the currents, and transported far to the south and redeposited as the speed of the currents decreased.

The effects of currents during the flood have been veiled by the ice age concept, but the evidence for denudation and excavation of lake basins were attributed to diluvial action by the early geologists.

> It happened that in America diluvialism was encouraged by the presence of the Great Lakes, particularly as for each great lake there were hundreds of minor lakes, all seemingly pointing towards a former general inundation of the continental interior. It is not surprising that many of the early American geological descriptions incorporated the idea of a flood or of a galaxy of major lakes.[25]

In some of these explanations, striations on rocks and the distribution of erratics were attributed to the power and violence of the diluvial currents. Others invoked icebergs for the transport of rock debris, and striated rock surfaces were attributed to the grinding action of icebergs which became grounded during a slow emergence of the land.

Sir J.W. Dawson opposed the glacial explanation of the drift, and argued for its deposition by icebergs during a prolonged submergence of the continent. He suggested the rock basins of the Great Lakes had been excavated by cold Arctic currents sweeping down over the continent from the northeast during this period of submergence.[26]

During the deluge, the scale of the currents would have been immensely greater and more effective as erosional agents than any uniformitarian mechanism. Sediments deposited in an earlier, tranquil stage of the flood may have been unconsolidated as uplift of the crust occurred. Some formations may have lithified earlier than others, making them more resistant to erosion by the currents initiated by the rapid uplifts of the crust.

The Great Lakes basins, and similar effects of erosion on a grand scale, such as the Niagara Escarpment and the Finger Lakes of New York, may well have been formed by the erosional action of rapid currents of the flood waters. The degree of erosion in the lower Great Lakes may indicate that some of the Paleozoic formations were in an unconsolidated condition at the time of excavation of the lake basins.

Erosion Aided by Disintegration

Rock disintegration may have been active at the time of uplift and erosion of the sedimentary formations, conditions that would favor rapid lowering of pressures on the rocks. Deep lake basins in Precambrian rocks can be explained as the result of this process, followed by the excavation of the disintegration product by the currents.

The basin of Lake Superior, deepest of the Great Lakes, is formed in Precambrian rock. If sediments were deposited here, they were completely removed. Deep parallel channels and ridges at the eastern end of the lake may have been caused by the disintegration of rock in the vicinity of faults, and scouring by the currents of the flood waters. The rugged floor of the lake in this region could hardly be the result of glacial scour.

Deep lakes in the Canadian Shield, often long and narrow, may have been formed in a similar way. Pockets of drift, such as occurs at the southern end of Lake Mazinaw, may have been left intact, in places sheltered from the currents.

Canyons and valleys, such as Agawa Canyon, east of Lake Superior, may have been formed by rock disintegration in the vicinity of faults or structural weaknesses, and excavation of much of the drift by currents of the flood waters.

Some geologists believe thousands of feet of sedimentary rock have been removed from the Canadian Shield. W.A. White noted that outliers of Paleozoic rock have been found in many parts of the Canadian Shield, indicating sediments once covered the region. He supposed these had been stripped off by the ice sheets. "Before the ice sheet eroded most of its cover, central Canada seems to have resembled the central United States."[27]

White's argument for great glacial erosion near the center of the ice sheet was refuted by C.P. Gravenor, who argued that an ice sheet would be inactive in its central parts, and claimed the Shield had been exposed from the beginning of the glacial period.[28]

The exhumation of the Shield regions by rapidly flowing currents of flood waters, which removed unconsolidated sediments, is consistent with the conditions proposed for the excavation of the Great Lakes basins. The power of these currents would be determined by the rate of crustal uplift, so the erosion could be effective in the central parts of the Shield as well as at the perimeter.

The basins of the lower Great Lakes are eroded in weaker rocks, but the process of disintegration may have been active as well, as suggested by the drift layers on the floors of the lakes.[29]

Conclusion

The Pleistocene drift includes some of the best known and most accessible phenomena, but its interpretation has long been a subject of controversy. For creationists, the glacial interpretation seems to make more difficulties than it solves.

The alternative in terms of disintegration due to decrease of pressure due to rapid uplifts of the earth's crust helps to eliminate some of the difficulties. Not only was the flood responsible for the deposition of sediments, but also for extensive erosion in some areas.

The tilt of the sedimentary strata in the Great Lakes region, the corresponding warping of shorelines, and the evidence for great erosion in the lake basins and the removal of sediments from the Shield, all point to the rapid uplift of the earth's crust from the flood waters as the cause of a variety of phenomena. Currents were due to a differential uplift, centered in the Shield regions. Disintegration of rocks accompanying this rapid uplift aided the excavation of deep lake basins by the currents.

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UPDATE ON THE SEARCH FOR NOAH'S ARK

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The search for Noah's Ark is and has been at a virtual standstill for the last several years. To the author's knowledge there have been no strictly legal expeditions since 1973, and those that have climbed have produced minimal results. Efforts to launch an expedition for the summer of 1979 under the sponsorship of the Institute for Creation Research are in progress; and prospects are brighter now than in the past. The present government of Turkey is much more favorable to scientific research and foreign involvement than the previous one; but current internal political instabilities cloud the picture.

To most observers, the historical evidence that has been compiled is sufficient to conclude that a large, wooden structure has been preserved near the top of Mt. Ararat but more evidence is piling up. In the past few years several possible new reports have been uncovered, although some past accounts have come into question. Firm proof of the existence of Noah's Ark is still lacking; and that includes the elusive military photographs, which are reported to exist, but are not yet available to researchers.

This is a general view of Mt. Ararat from the north.

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