ARARAT—THE MOTHER OF MOUNTAINS

CLIFFORD L. BURDICK, PH.D.
206 N. *Jacobus Avenue, Tucson, Arizona*

This article presents some of the observations made during an expedition to Mt. Ararat sponsored by the Archeological Research Foundation of New York. Eastern Turkey consists of a relatively barren undeveloped area. Tectonically it is very active, and unstable structurally. The region has been folded, faulted, and intruded with basic types of volcanic rock, such as andesite and basalt. Mt. Ararat is 17,000 feet high, and at its greatest height perhaps measured nearer 20,000 feet.

Evidently the cover rocks were Paleozoic and Mesozoic limestone, and in places like Mt. Ararat were domed up by rising magma which burst through channels along fault lines.

During the Flood period at least three blankets of basaltic or andesitic lava were extruded over the original Ararat which may have only been about 10,000 to 12,000 feet high originally.

Much of the lava is in rounded blocks called pillow lava, having a conchoidal appearance indicating it flowed out from the fractures while under water. After subsidence of the flood waters, almost the whole north-east side of the mountain blew up forming the Ahora gulch. Rock fragments and ash from this eruption cover about 100 square miles.

Greater Ararat is covered with an ice cap down to the 14,000 foot level. This cap is hundreds of feet thick and divides into 12 "fingers" or glaciers.

An analysis of five rock samples is given and also a list of fossils found by Abich.

Introduction

Mount Ararat is one of the best known mountains historically, but also one of the least known geologically. For some reason some scientists have shied away from that area, perhaps because of its very Biblical connection.

Two German geologists have made geological observations of the Ararat area; Hermann Abich, about 1845; and M. Blumenthal some 110 years later. Abich, it appears, was not afraid to mention the Flood and the Ark of Noah in connection with Ararat, but not so with Blumenthal. So far as I know, geological evidence concerning Mount Ararat is unavailable to American science, while geological data for most other parts of the world is quite abundant.

In 1946, an archeological company was organized in California, the Sacred History Research Expedition, with the objective of helping to fill this empty void scientifically, by means of archeological, geological, glaciological, and other projects planned.

Dr. Kinnaman, the famous American archeologist was to be a member of the expedition. Col. Koor, the Russian soldier-archeologist, was to lead us to some 20 archeological sites in need of investigation. But perhaps the time was not yet ripe. Twenty long years passed before this study of the Ararat area became reality. In 1966, ten scientists and mountain climbers actually arrived at camp on Mount Ararat to begin this important work.

George Vandeman was chairman of the board of the Archeological Research Foundation of New York, and a prime mover in the organization. R. E. Crawford of Washington; Drs. Calvin and Agatha Thrash of Columbus, Georgia; Wilber Bishop of Cleveland, Tennessee, and Sam Martz of Nashville, were directors of the Foundation.

Dr. Lawrence Hewitt of Huntsville, Alabama, was leader of the expedition, assisted by Harry Crawford of Denver, who had previously scaled the mountain to its peak. Nicholas Van Arkle of Holland was in charge of the glaciological work, mapping the ice cap-some 17 square miles in extent. He was ably assisted by two Swiss mountaineers.

Alva Appel of Washington, D. C. and William Dougall of Seattle assisted Mr. Crawford in mountain climbing and recording general observations of interest, (even hoping that one such observation might happen to be some remains of Noah's Ark, as per rumors that natives from time to time had stumbled on portions of the original wood).

Dr. Hewitt, besides giving leadership to the expedition, made a botanical study of the mountain and gathered and pressed some 150 plant and flower specimens. Mr. Eryl Cummings of Farmington, New Mexico, assisted me in making geological observations and in gathering rock samples.

Although the Archeological Research Foundation was the organizational unit, it operated largely on contracts with the United States armed forces, and with the Turkish government. The Turkish military command furnished transportation, as well as an interpreter and a soldier guard. The U. S. military command furnished

tents, bedding, supplies and great quantities of food (C Rations). Since the expedition operated largely in a sensitive military zone, some of the scientific data gathered were of a classified nature.

Eastern Turkey is a relatively undeveloped and semi-desert area, lying across a recognized earthquake zone, composed largely of volcanic rock. The people native to that area have to work hard to make a living, and the Turkish government welcomed this scientific expedition gathering data on biology, geology, glaciology, soil chemistry and related aspects of the region.

Much of our work during the summer of 1966, revolved about the Mount Ararat region, which created general interest because of its historical connection with the Ark of Noah. The Armenians, who have inhabited that area for many centuries, call the mountain, Massis; the Turks call it "Agri Dagh," or *painful mountain*. The Persians call it Koh-i-Nuh, that is, the "Mountain of Noah."

Geomorphology

The central backbone of Turkey between Ankara and Erzurum is composed of a treeless, barren series of mountain chains of folded and uplifted Paleozoic and Mesozoic limestone. This is the central watershed and the source of the Tigris and Euphrates rivers. This limestone has been intruded in places by volcanic rocks, as at Kayseri (Caesarea) the locale of excavations for Hittite artifacts. The Hittite museum in Ankara is well worth visiting. South of Kayseri is a multi-peaked, snow-capped mountain of some 15,000 feet elevation, known as Erciyes.

From Erzurum, east to the Russian-Iranian border, the landscape consists mainly of volcanic rocks, except for occasional outcrops of limestone. Much of this volcanic rock is on the borderline between basalt and andesite, the samples collected from Persia being the most basic (mafic) as are also the Tendurek mountains, south-west of Mount Ararat, and the Hama, Kale and Pamuk mountains to the west.

The swampy plain between Dogubayazit and Ararat is some 4,500 feet above sea level, but on the north and east sides of Ararat the Aras river valley is between 2,500 and 3,000 feet above sea-level. Some 50 miles northwest of Mount Ararat along the Aras river is an extensive salt mine with a thickness of some 400 feet.

South-east of Little Ararat near the Iranian border is a deep round hole in the basaltic rock about 100 feet in diameter caused by a meteorite that struck the ground in 1910, drilling a clean round hole deep into the earth.

Greater Ararat is perpetually covered with an ice capping down to the 14,000 foot level in

Figure 1. Greater Ararat and Lesser Ararat, looking Southwest, from the Aras river—the boundary line between Turkey and Russia. Ahora gulch is in the foreground of Greater Ararat.

summer. This ice cap is hundreds of feet thick and as it flows down the sides of the mountain, it divides into twelve "fingers" or glaciers, two of which are the Parrot and Abich glaciers, the latter of which tumbles down a vertical precipice thousands of feet into the Ahora gulch, with a mighty roar that can be heard for miles. Two of our mountain climbers, who were camping in the gulch, were nearly buried when 100,000 tons or so of ice and snow came roaring down the gulch.

The comparatively high snow-line is due to the light precipitation and the upward rush of dry air, from the Aras plain. This plain is a veritable bread-basket for both Turkey and Russia. Although the upper and lower zones on the mountain are sterile, the middle zone, from 5,000 to 11,500 feet, is covered with good pasture, upon which the Kurdish sheep and goat herders depend.

Mount Ararat is about equidistant from the Black Sea and the Caspian, the Mediterranean and the Persian Gulf. Around Mount Ararat gather many traditions connected with the Deluge. Col. Koor, the Russian soldier-archeologist, lists some 20 such archeological sites which should be investigated.

Both the ice cap and the resulting glaciers move over rough terrain, which breaks them into segments, separated by crevasses. Often new falls of snow drift over these crevasses, thus hiding them from view. Climbers sometimes fall into them. In 1965, a 21 year old Oxford student tried to climb the mountain alone, and was never again heard from. It was presumed that he fell into a crevass. The year before an Austrian doctor was separated from his party in a blinding snow storm, and search parties were unable to find him. It has been thought that he too suffered the same fate. Our

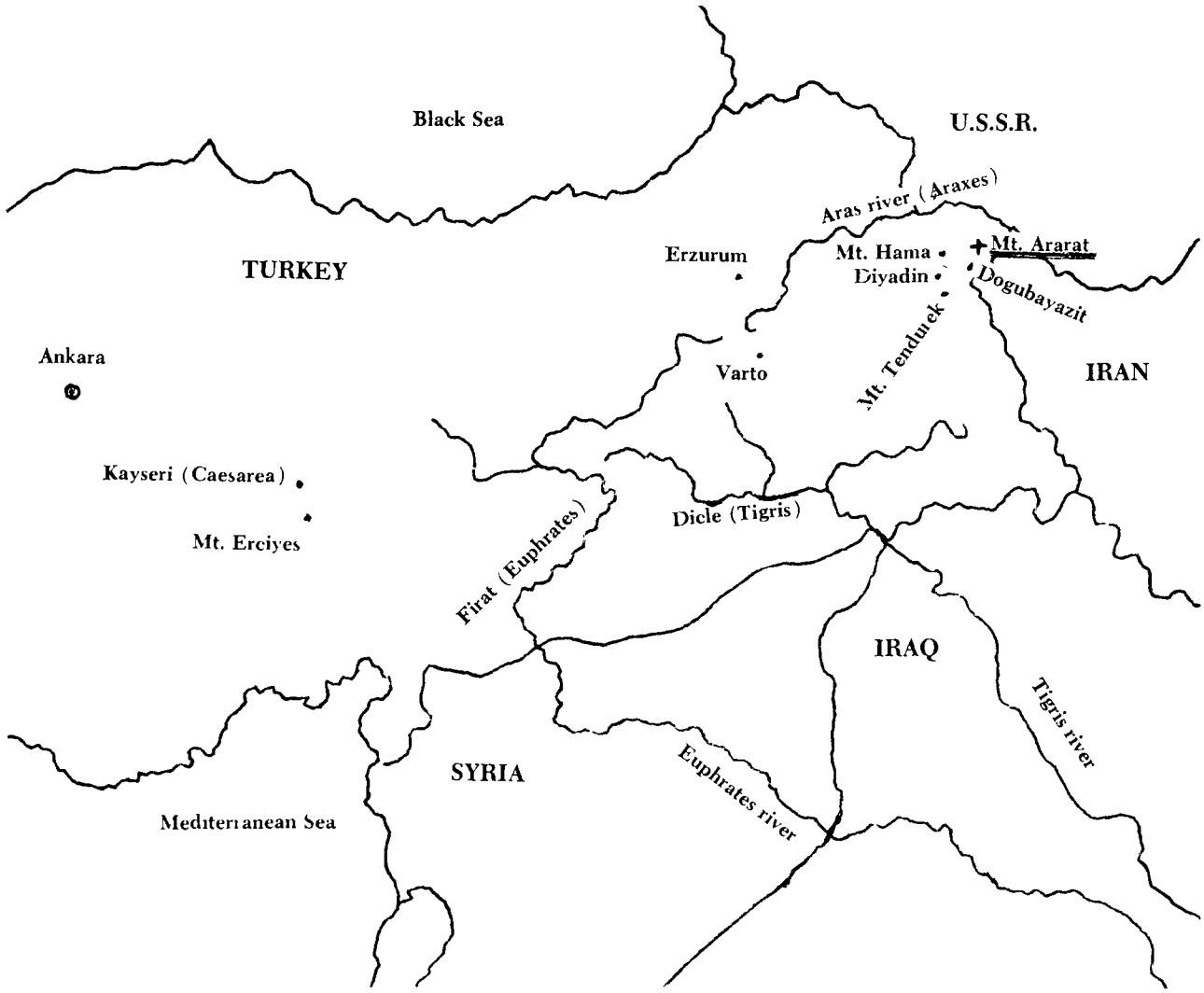

Figure 2. General geography of Ararat region.

mountain climbers never climbed the mountain in less than groups of three tied together with nylon ropes. Even so, two of them actually fell into crevasses, but were pulled free by their companions.

The dangers are many. Storms of wind of 100 miles an hour and temperatures of below zero made life disagreeable for our glaciologists. Also, our geologists were caught out on the mountain in a thunder-storm in pelting sleet and rain, and the ensuing fog made it difficult for them to find their way back to camp late at night, soaking wet, cold and exhausted. Without a good sense of direction and a flashlight, they might have been "victims" of Ararat.

Tradition places the Garden of Eden in the valley of the Aras river; Marand is the burial place of Noah's wife; at Ahora (Aghuri) was the spot where Noah planted his first vineyard. Incidentally, we noticed this summer that a vineyard is still located there. Here was also situated the monastery of St. James, until both it and the village of Ahora were destroyed in 1940 by an earthquake and resulting avalanche, which came thundering down Ahora gulch.

James Bryce, the British statesman, author, and later ambassador to Washington once climbed Mount Ararat, and he wrote of his experiences in a book, *Transcaucasia and Ararat,*

> I know of nothing so sublime as the general aspect of this huge yet graceful mass seen from the surrounding plains: no view which fills the beholder with a profounder sense of grandeur and space than that which is unfolded, when, on climbing its lofty side he sees the far-reaching slopes beneath, and the boundless waste of mountains beyond, spread out under his eye. Its very simplicity of both form and

color increases its majesty. All lines lead straight up to the towering, snowy summit. There can be but few places in the world where so lofty a peak soars so suddenly from a plain so low, and consequently few views equally grand . . . the mountain raises itself solitary and solemn out of a wide sea-like plain.

Structure

The structural trends of eastern Turkey are in a northwest, southeast direction, such as the Aras river flowage, and the "lining-up" of the triple volcanic peaks, Alagoz, on the Russian side of the Aras river, and Greater Ararat and Lesser Ararat, in Turkey. These triple peaks are in a line, because that is the direction of strike of the elongated fault in the basement complex up through which the molten magma flowed.

If the fractures are shallow, as in the August 19, 1966 quake, no lava is emitted, but when the fault extends many miles deep, it taps the area where the temperature exceeds the melting point of basalt, about 1,200 degrees Centigrade. The fault or fracture relieves the surface pressure, and the hydrostatic pressure forces the liquid magma to the surface, much as oil is blown out when an oil gusher is drilled.

The Tendurek mountains to the west and southwest of Ararat are also volcanic extrusions along faults parallel to the Alagoz-Ararat fault lines, and are part of the complex fault system which winds and twists in a generally north-south lineament through the Dead Sea in Palestine and across the Red Sea into eastern Africa, comprising what is known as the East African Rift. This fault or rift is signalized by volcanism and block-faulting, indicating tension faults.

The Dead Sea, about 1,300 feet below sea-level and the deepest land depression on earth, is a **graben,** or fault-block, that has dropped down when the tension drew the crust apart. I followed the most recent fault for some 50 miles from Varto, the epicenter of the August 19 quake, to a point between Erzurum and Ararat.

This most recent faulting, which caused the severe earthquake, which wrecked the city of Varto and caused some 2,000 deaths, was minor in displacement as compared with the scars left by the earlier faulting which took place presumably at or soon after the Flood period. The recent rift caused a displacement of mere feet, while the "original" fracture zone was probably miles wide in places, and furnished a channel-way up through which flowed mountains of magma. This may have taken place at the time of the volcanism which formed the Alagoz-Ararat mountain chain.

Apparently the Paleozoic-Mesozoic limestone complex which covered parts of the region was severely deformed, compressed, folded, and in places like the Ararat area domed up when the rising magma burst through. This doming effect is most evident when one views the same limestone formation on all sides of Mount Ararat. The beds dip away from the mountain on the Turkish, the Russian, and the Persian (Iranian) sides.

There were several eras of volcanic events. Professor Nazmi Oruc of Ataturk University at Erzurum told me that his soil sample study from well drillings in the Aras valley showed at least three periods of volcanism, the layers of lava being interbedded with sediments.

West-southwest of Ararat and west of Diyadin occurs a thick bed of basalt overlaid with limestone, apparently conformable. A river flows through the limestone, and the latter has been folded into an anticline which has fractured along the axis. This fracture has permitted ground water to penetrate down to the limestone-lava contact.

The lava was apparently not very cool, when the limestone was laid down, for it heated the water to the boiling point, and the steam pressure has forced steady geysers to shoot from the surface. This water flows down the sides of the geyserite or tufa and is caught in pools similar to the hot water pools in Yellowstone Park.

Some of these pools are just the right temperature for bathing, and are usually put to such use. This hot springs tufa is varicolored like that in Yellowstone. Local Turkish authorities hope eventually to make a park or national monument of this hot springs-geyser area.

The orogeny of the hot springs bespeaks fast tectonic activity, catacylsmic action. and does not fit long-ages geology. Seemingly, basaltic extrusion was quickly followed by deposition of limestone before the hot lava cooled. If this limestone, designated Cretaceus, was laid down some hundred million years ago, surely the lava would have lost its heat long ago, for the limestone covering the basalt is not very thick. In fact one wonders how it could have retained its heat this long even if the rock was formed at the time of the Flood!

The Genesis record tells us that, early in Creation week, the whole earth was covered with water similar to the flooding by the Deluge; the difference being that the whole earth was originally almost a perfect globe, without mountains and ocean basins. There was less water then to cover the earth than now.

Then, the record tells us, the Creator formed the ocean basins, and dry land by diastrophism or uplift. The water ran off the land into the basins; as most geologists agree that the ocean basins existed from earliest times. We are not

informed how high the continental cratons or mountains were, but presumably not as high as now. Genesis mentions rivers; among them is the Euphrates, which rises not too far from Mount Ararat. A river drainage system needs high land for its source.

Evidence gathered at Mount Ararat indicates that the original mountain was much lower than the present one and was of different composition or at least of different texture and different color. The metrological differences will be discussed later, but the original Mount Ararat apparently was not more than from 10,000 to 12,000 feet in height. The present peak is about 17,000 feet, and at its greatest height perhaps measured nearer 20,000 feet. Erosion has worn it down.

During the Flood period—in the broad sense—at least three blankets of basaltic or andesitic lava were extruded over the first Ararat. Volcanic eruptions have taken place periodically ever since, but with subsiding activity. More recent flows have been extruded from cracks lower down on the mountain as each succeeding extrusion had less force than the preceding one.

Ararat is known as a *shield* type of volcano.

This section would not be complete without mentioning what was perhaps the most violent eruption associated with Ararat. This did not occur in 1840 as some have surmized, it was infinitely more terrific. Very likely some time after the flood-waters had subsided, almost the whole north-east side of the mountain blew up. A long deep gash was opened in the mountain, known now as the Ahora gulch. This is many miles long and thousands of feet deep and wide, and a conservative estimate would be that from one to two cubic miles of rock debris and volcanic ash was blown from the mountain.

Large surface fragments were hurled miles away down toward the lower slopes of the north-east side, where they are yet visible. Lighter volcanic ash was blown into the upper atmosphere and settled down as light-colored whitish tuff on the east and north-east sides of the mountain.

This ash covered some 100 square miles of surface to a thickness of from hundreds of feet near the mountain to a few feet, ten miles away. Thus, a sloping pediment of some 3-5 degrees was formed, which is similiar to those seen in the desert Southwest in Arizona. As a result, varied rock specimens of the whole Ararat area are found in the Ahora gulch.

This is the type of volcanic eruption that buried Pompei and Herculaneum. Presumably Noah and his family had left the area by that time. The original Ararat had been deeply blanketed before that, and the only part of the original Ararat now exposed is that at the head of the Ahora Gulch where the giant explosion opened it up.

Little Ararat and other parasite cones are of more recent origin, for Little Ararat is smoother and less gullied and eroded than Greater Ararat. The only forests in the whole area are located on the eastern slopes of Little Ararat.

Stratigraphy

Abich and others in the past have done stratigraphic studies in the limestone formations of eastern Turkey. They identified index fossils and others belonging to late Paleozoic, mainly Permian; also Triassic, Jurassic and Cretaceus of the Mesozoic, besides some of the early Tertiary. The following are Abich's classifications, taken from the Dogubayazit-Igdir area:

Devonian, gray limestone:	*Atrypa reticularis* *Atrypa aspera* Spiriferseminoi
Mississippian, dense limestone:	*Productus auritus* *Dalamella michellini*
Pennsylvanian, dark limestone:	*Fusulina verneuili* *Productus intermedius* *Fusculinella lenicularis*
Permian, limestone, shale:	*Goniatites albichianus* Reticularia Spirigera *Zaphrentis lepticonica*
Triassic, limestone, dolomite:	Xenodiscus-Arten. Pseudomonotis-Arten Paratirolites-Arten *Goniatites abichianus*
Jurassic: (Ammonites)	*Soninia sowerbyi* *Lytoceras mediterraneum* *Sphaeroceras bullatum*
Cretaceus:	*Mortoniceras texanum* *Parapachydiscus neubergeri* Cyclasteraturicus
Eocene:	*Discocyclina archiaei* *Nummulites irregularis* Asterodiscus
Oligocene:	*Nummulites incrassatus*
Pliocene:	Planorbis *Clupea lanceoplata* *Cardium protractum* *Tapes greganus* *Orbicella defrancei*

These fossils are *all* invertebrates.

Petrology

As already mentioned, Eastern Turkey lithologically consists mainly of two types of rock, Paleozoic and Mesozoic limestone intruded by

volcanic rock, much of it being an andesitic-basaltic complex on the borderline between andesite and basalt. For that reason it is not practicable to map off certain parts of the mountain as basaltic and other parts as andesitic, since composition varies from place to place, not permitting a mapable unit.

The central highlands of Turkey consist in large part of a whitish limestone interspersed with volcanic rocks. The eastern part of the country is mainly volcanic, interspersed with limestone.

Many of the faults cutting through the mountain of Ararat have been filled with a red intrusive rock that resembles a sandstone, but strangely enough is of essentially the same composition as the black and gray basalt and andesite, the difference being that the black magnetite has been oxidized to a red goethite. Following is a typical mineralogical composition:

Sample No. 1

augite 3% rimmed with geothite
hypersthene 5% rimed with geothite
andesine (55) 52%
glass 40% partly devitrified
magnetite trace

The augite is a triclinic pyroxene, while hypersthene is orthorhombic in crystal structure. These pyroxenes are more typical of basalt than andesite, but the plagioclase is andesine, from which the rock *andesite* gets its name. The high percentage of glass indicates that the rock was quickly "frozen" or cooled, so that solidification took place quickly, too fast for crystals to form.

Sample No. 2 was a gray-black rock taken from the 12,000 foot level to the north of the Ahora Gulch. The mineral composition is strangely like sample No. 1, although macroscopically it does not much resemble it.

Sample No. 2

augite 1%
hypersthene 10%
andesine (43) 87%
magnetite 1%
apatite trace
(Apatite is a phosphorus oxide)

As alluded to in the section on Structure, the Ahora gulch exposes the inner core of the original mountain which is distinct in color and texture from the volcanic rock. It is coarse-grained porphyry with a light buff color and much pyrite. This indicates a deep-seated intrusive that cooled slowly, permitting the coarse phenocrysts to form first. Then the whole mass was uplifted through the cover-rock, allowing the remainder of the magma to cool more quickly and form fine grained crystals and glass. This inner core may represent the original mountain dating from Creation. Sample No. 3 was collected from several places in the Ahora Gulch.

Sample No. 3 Andesite porphyry

bastite 5% (replaces a pyroxene)
glass trace (inclusions in plagioclase)
hypersthene trace (poikolitic inclusions in plagioclase)
andesine 50 94%
sphene trace
leucoxene trace
apatite trace

Sample No. 4 is also a sample from the Ahora gulch from the inner core of the mountain. Its mineralogy is similiar.

Sample No. 4

augite 4%
hypersphene 10%
andesine (55) 30%
(rims are andesine 50)
magnetite 2%
glass 53%
apatite trace

Sample No. 5 is also from the same source as the two previous, but the rock is a basalt rather than an andesite, because the plagioclase is more basic-labradorite.

Sample No. 5 Basalt-porphyry

augite 1%
hypersthene 3%
labradorite 35%
glass 56%
hematite 5%

These samples are typical, and it would not be necessary to give details on more samples.

Catacylsmic Flood Geology

Mount Ararat is easily associated with the Ark of Noah and the Flood in the thoughts of many people. Often the question is asked, What evidences, if any, are found around the mountain to substantiate the flood concept?

The answer would be that, if the flood was world-wide as we believe ample evidence indicates, then we should find such evidences not only around Mount Ararat but most anywhere. However, since this paper is an outline in brief of some of the main points of the geology of the Ararat area, I will attempt to point out a few evidences of the flood which were identified in the summer of 1966.

One such evidence has been described concerning the geysers and hot springs west of Diyadin. (See section on Structure) In time past, these geysers were apparently much more active, as volcanic activity was greater in times past.

Some lava was perhaps poured out under water while the flood was at its height, for stresses were built up in the crust of the earth, as it was put out of isostatic balance due to the shifting of sediments from one place to another.

The Hawaiian Islands were built up from the bottom of the ocean, some 14,000 feet deep, by volcanic extrusion. When lava is extruded under water it is cooled quickly and solidifies so rapidly that crystals often have no time to form, like obsidian; or very small crystals are formed,

Much of the basalt and andesite composing upper Ararat was of this type. The lava is often found in rounded blocks called *pillow* lava. because they are of pillow-like appearance having conchoidal fractures. Much of the basalt on Ararat had semi-circular fractures, typical of underwater extrusion. When did the waters reach the 14,000 foot level on Mount Ararat?

There is the puzzle of the upturned limestone beds surrounding Mount Ararat, on the Turkish, Russian and Persian sides. Near the city of Dogubayazit these limestone formations, some 1000 feet in thickness are tilted from as much as 45 degrees with respect to the horizontal to almost vertical. The true cause is apparent, although others have not apparently sensed it. The strata dip away from Mount Ararat on every side just as the surface dirt crust does when a seedling bursts up through.

Evidently Mount Ararat burst up through the limestone beds to form a near 20,000 foot peak or series of them; and, thus, provided shelter for the Ark from the tempestuous storm, as the waters began to recede. The Genesis account says that strong winds blew to dry up the flood waters. If the standard geologic column is right, then these limestone formations were laid down some 100,000,000 years before Mount Ararat came into existence, at a time when the greatest land inundation from the sea took place. For that reason, I wonder if perhaps the Cretaceus period and the Flood may not be synonomous? And, carrying the comparison a bit further, would that not place Creation week way back in the Precambrian? We, of course have presented our reasons for not accepting the validity of orthodox time scales, such as 100,000,000 years in earlier issues of Creation Research Society publications.

According to Genesis geology, we could scarcely visualize a universal deluge between Creation and the Flood, for the Euphrates valley, we believe, was the cradle of civilization. Limestone is precipitated under water; therefore, such sedimentary rock must have been laid down during the inundation of the earth by the flood waters–the early part perhaps–since Mount Ararat was apparently elevated to its full height during the latter period of the flood, to provide the above mentioned haven for the Ark. There are small peaks on the top of Greater Ararat, which might well have provided that haven.

This may not sound so much like fanciful speculation when one reads some recent findings of the Lamont geological observatory at Columbia University. The New York Times News Service for Jan. 3, 1967, reported:

> The findings also concern a layer of sediment 1,000 feet thick beneath the floor of the Atlantic. It apparently has lain undisturbed for 70 million years . . . The layer across the Atlantic floor appears to be a relic of a *cataclysmic* occurrence at the end of the Cretaceus period, 70 million years ago. During the Cretaceus, oceans covered much of the present-day continents. Toward the end of the period the land rose out of the sea (or the seas subsided). Water cascading off the land carried sediment that was laid down in the deep basins. This may account for the deep buried layer.

If we but substitute the word “Flood” for “Cretaceus” in the above statement, the Lamont Geological observatory has given a very graphic, and presumably accurate, picture of just what happened at the close of the flood-period. We can detect fracture patterns running across the ocean bottoms, which may have been deepened to make room for the flood waters “cascading” off the continents. Greater deepening of the ocean basins was probably compensated for by a corresponding rise in the height of the continental blocks. Findings of ocean floor research are described in the December 2, 1966 issue of *Science.*

As the waters further subsided, isolated epeiric-seas were formed by arms of land cutting off small bodies of water from the ocean. As the winds of hurricane force dried up these inland seas, salt was precipitated. I examined one such salt mine a few miles north-west of Mount Ararat. The salt was laid down in layers exactly as the limestone and sandstone and shale were, interbedded with thin layers of silt and dust.

After the salt was precipitated, the wind evidently blew dust over the salt layer, then a stronger gale may have caused a tidal wave to bring in a fresh flooding of the basin. Then, as the winds died down, evaporating water again precipitated a new layer of salt. I counted as many as fifteen to twenty such layers in one place.

Such surges of water can be attested to by two mountaineers in the expedition. They were camping somewhat below the bottom end of

the glacier that flows down the bottom of the Ahora gulch. They were rudely awakened by a terrific roar from above when the glacier above the gulch broke loose, and some 100,000 tons of ice and rock came cascading down almost to where the men were camping. Needless to say they hastily moved their camp to safer ground.

The top of Mount Ararat, down to about the 14,000 foot level, is permanently ice-capped. This means the cap is a static entity; as the snow continues to fall, the ice-cap builds up. As a consequence of this build-up, ice "flows" outward as a *Rheid;* that is, a material that under continued pressure flows like a viscous fluid.

As the Ararat ice cap flows outward in all directions it divides into about a dozen fingers or glaciers flowing down various canyons. As is typical of all glaciers, the Ararat glaciers are eroding agents, carrying tremendous quantities of rock debris from higher to lower levels. This means that each year the total height of Ararat is a little bit lower than the previous year. If we knew the annual rate of erosion, we might be in a position to estimate the altitude of Ararat at the time of the Flood.

Scientists from the United States Geological Survey have found that glaciers in Alaska have no fixed rate of advance; that sudden surges cause what they call "catastrophic advances," at speeds from 10 to 100 times the normal rate. The normal flow is usually stated as from one to two feet per day. "The cause of these surges is not completely understood," said Dr. Mark F. Meier, research geologist at the U.S. Geological Survey office, Tacoma, Washington.

Summary

Eastern Turkey consists of a relatively barren, undeveloped area, quite without tree cover. Tectonically, it is very active, and unstable structurally. The region has been folded, faulted, and intruded with basic types of volcanic rock, such as andesite and basalt.

Previously the cover rocks had been Paleozoic and Mesozoic limestone, but these have been eroded, folded and faulted by frequent orogenic activity, forming volcanic mountains, among which are the Tendurek range, and also the Alagoz-Ararat system. These mountains are found along fault lines which provided channels through which molten magmas flowed from deep zones in the earth's crust, or upper mantle, where the temperature is well above that of the melting point of basalt, about 1,200 degrees Centigrade at one atmosphere pressure. (At depth, the hydrostatic pressure greatly raises the melting point of rock).

On the north and east of Ararat lies the Aras River fault block, at about 2,500 feet to 3,000 feet elevation as compared with the Dogubayazit (southwest) side of Ararat at about 5,000 feet. The rim of Ararat around the mountain forms a depression ring or "moat" of marshy land, not well drained. Perhaps this was caused by a "collapse cauldron." That is, after a volcano attains its greatest height of activity, the magma settles back into the "bowels of the earth," leaving an empty void, which recedes to lower levels, like the terrain around Long Beach California, after Signal Hill was drained of oil.

The original core of Ararat was andesitic and basalt porphyry. During and since the flood period, the total height was raised thousands of feet by successive cycles of volcanic extrusion.

The Mount Ararat region contains abundant evidences of cataclysmic geologic activity, as well as signs of the complete inundation of Mount Ararat and the whole area by flood waters.

Bibliography

Abich. H., "Die Besteigung des Ararat im Jahre 1845," *Boitrage z. Kenntuis d. russischen Reiches.* St. Petersburg, 1849.

Blumenthal, M., "Der Vulcan Ararat," *Rev. Fac Sc* Univ. *Instanbul,* Series B, Tome XXIII, No. 3-4, 1958.

Parrot, F. *Reise zum Ararat.* Berlin, 1840.