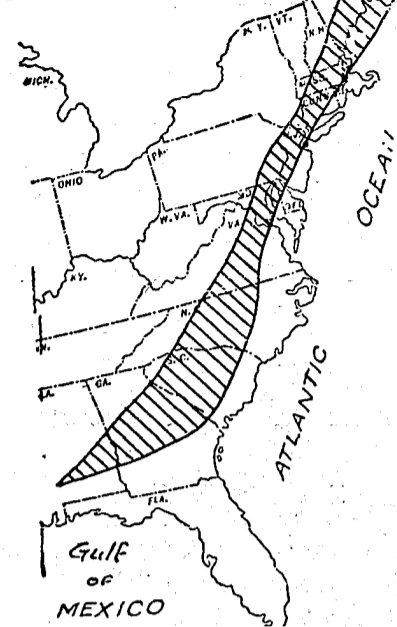


How Stone Mountain

By POOLE MAY

Industrial Geologist, Atlanta, Bir

Shaded area showing Piedmont Mountain Chain Archaen Complex rocks.



Map showing the formation of what is now the eastern half of North America. The shaded area covering the eastern mountain regions, was all that was above the water in the days of which Mr. Maynard writes. All the rest was at the bottom of the wastes of ocean which then almost covered the surface of the earth.

INTRODUCTION.

The author had an opportunity during the year 1914 to make a detailed study of all the rock formations in DeKalb County, Georgia, in which county Stone Mountain is located. Eight months were spent in field work in differentiating the geologic formations; studying their physical, chemical and microscopic characteristics; working out the sequence of the formations which consist of rocks of those of the oldest known geologic age of molten origin to those of Cambrian time when life had developed in the ancient oceans to a fairly advanced stage.

Viewing these rocks was like looking at the pages of a book, with the book standing on end, for the rocks of the Stone Mountain area were all standing up at a high angle due to the fact that they had been folded due to the great pressure to which they have been subjected from time to time. No section of the world's rocks is more intricate in its folding; no rock structures are more difficult to untangle; no section of the world has been subjected to greater metamorphism than have the rocks of the Stone Mountain District. We are able to turn over the leaves of rock which had fallen just as the leaves fall from the binding of an old book, due to the faulting of the rocks, namely their slipping because of folding and earthquakes, because of stream erosion which has cut through the soils and upper layers of decomposed rocks.

In this great complex of rocks, the most

striking geologic and physical feature is Stone Mountain which has shot up from a deep seated magma, on up through this great book of rocks, unlike anything, anywhere.

STONE MOUNTAIN, a huge granite dome situated sixteen miles east of Atlanta, stands nearly two thousand feet above sea level and nearly eight hundred feet above its surrounding plateau. It measures more than seven miles in circumference at its base, with nearly twenty-five million square feet of exposed granite. It is the most profound geologic phenomenon in the United States east of the Rockies and surpasses anything of its kind yet known in grandure. This great gray granite boss is elliptical in shape, with its longest axis trending east and west, oriented by nature to conform to the oldest known geometrical art. Its steepest side a sheer precipice, bulges forward near the center and faces northward and on it is being carved in solid granite the greatest memorial to the Confederacy.

The complex rocks of the Stone Mountain District form a part of the oldest rocks known in geologic time, which rose from the sea and extended from Southwestern Alabama trending northeast through Georgia, the Carolinas, Virginia and Maryland occupying that area now known as the Piedmont Plateau and extending well up into Canada. Plate 1 C represents these complex rocks rising to a height of ten thousand feet above Atlanta and in this group of complex rocks at a later period Stone Mountain was intruded as shown in plate 1 by S, coming up in a great vent from a magma of molten rocks at a great depth, like a volcano, which did not reach the surface of the earth at that time.

Here in the midst of this great Piedmont Plateau, which extended much further east and west than it does now, stands Stone Mountain, perched on a great divide separating this area into two well defined drainage districts. As one looks from the top of Stone Mountain, the Piedmont Plateau takes the form of a vast plain, dissected by numberless ravines, with deep red and vari-colored soils. As the mist of gray is rising at dawn, one cannot help but feel the impulse of a bygone day, as pictured on the mountain in relief the rebel hosts are marching from the Appomatox of defeat, facing the rising sun of the east in the glorious light of eternal day.

Stone Mountain had passed through millions of years of its life history before the Island Empire of England was formed; before the Alps, the Rockies, the Pyranees and

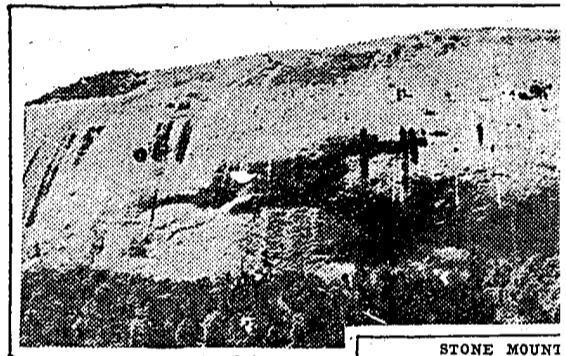
The Story of the Divine Formation of the Was Conceived In Volcanic Heat, For Below the Surface of the Earth Marvel and Admir

Mr. Maynard herewith describes, for the first time, the true scientific story of the which, in ages so distant that it was before the dawn of history, a volcanic disturbance upward and how the pressure above made of the mass the crystalline rock we know today until today Stone Mountain, practically impervious to the elements, stands high "Stone Mountain had passed through millions of years of its life history before the Pyranees and the Himalayas were conceived; millions of years before the atmosphere It is a fascinating story and one that every Georgian should read. For ever that nature has placed within this state.

the Himalayas were conceived; millions of years before the atmosphere carried enough oxygen for land animals to exist. Stone Mountain has been a witness to the growth and development of every great division of the animal kingdom; the advent of the vertebrates; the age of the greatest luxuriance of plant growth the world has ever seen, when the land was full of strange creatures, amphibians, great hosts of lizards, crocodiles, dinosaurs, Ichthyosaurs and flying saurians. It witnessed the most remarkable change in the world's atmosphere when the great plant growth absorbed the carbonic acid gas to form coal deposits on the Carboniferous, resulting in an atmosphere enriched by oxygen, paving the way for an atmosphere in which man could live.

Stone Mountain has witnesses the greatest animal migration on the North American Continent. The prolonged cold of the ice age brought about the accumulation of great ice sheets which soon began to flow. Ahead of these ice sheets fled the hosts of land animals, the horse, the elephant, the mastodon, the sabed-toothed tiger, to meet and mingle with the giant pigs and other weird animals which came up from the tropics. Who knows but that Stone Mountain was a haven in the night for those aborigines who sought refuge in terror of the oncoming animal hordes.

We all know of the interesting discoveries in Georgia of the Mound Builders, of flint instruments obviously worked into form by human hands, with conclusive evidence that man is an ancient inhabitant of North



STONE MOUNTAIN

VERTICAL SCALE—1 INCH, 6,000 FEET. HORIZONTAL SCALE—1 INCH, 30 MILES.

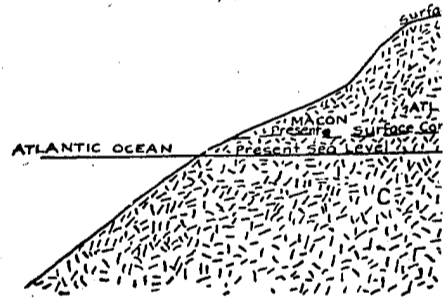


PLATE N

America. We have evidence everywhere our country was peopled by these savages beyond the traditions of the oldest tribes. Perhaps we may find on Stone Mountain tracings of the markings of these vandals.

Our first impulse, when we stand at the foot of this eighth wonder of the world is to pick up a chip of the rock and to wonder of what it is composed. We first notice the brilliance of the flaky mineral; we find that it has a flat surface as smooth as glass; we can split it off into thin flakes with a knife edge or with the fingernail and the thinner the flakes the better we can see through them, so we prove to our entire satisfaction that here is a rock or a mineral through which the sunlight travels, we agree that it looks like the eisenglass we used to see in the stove front, and sure enough that is what it is, mica.

We also see associated with the mica, lense-shaped crystals, sometimes almost white or gray or pink, with a smooth glassy surface and we find that this mineral is too hard to chip off with the fingernail, so we try a knife edge and discover that we can't even scratch it with steel; we find that it has two nearly perfect crystal faces perpendicular to one another and these characteristics distinguish it as feldspar.

There is another glassy looking mineral

- CP Coastal Plain
- AV Appalachian Valley Area
- AM Appalachian Mountain Area
- S Stone Mountain Granite
- C Piedmont Complex

VERTICAL SCALE—1 INCH, 6,000 FEET. HORIZONTAL SCALE—1 INCH, 30 MILES.

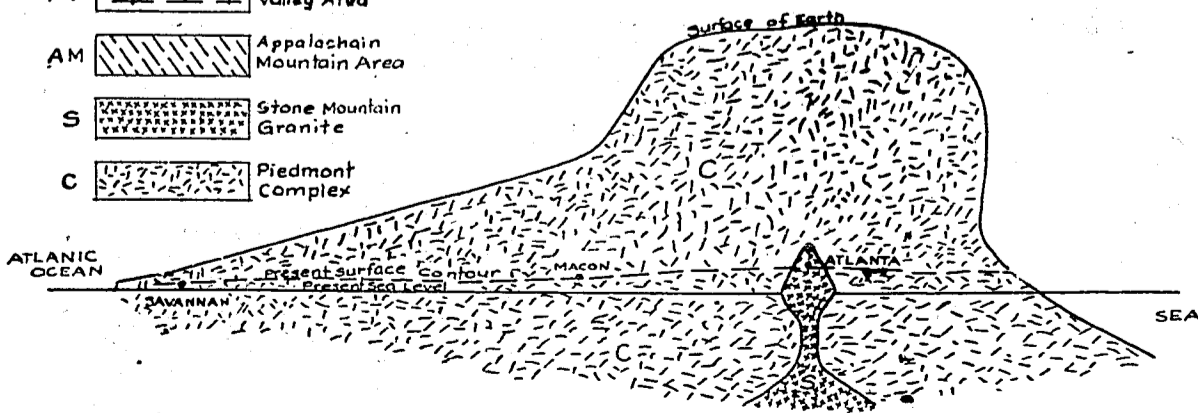


PLATE NO. 1

Stone Mountain Was Created

POOLE MAYNARD, Ph., D.

Birmingham & Coast Railroad

How the Mighty Mountain. How the Marvel Formed Through the Centuries Miles Earth and Today Stands, the Creation of Mankind

of the creation of Stone Mountain. He tells in careful, accurate words the manner in which many miles below the then surface of the earth, pushed the molten lava rock up today. How, through countless centuries, the earth above was gradually worn high above the surrounding plain. Says Mr. Maynard:

"The Island Empire of England was formed; before the Alps, the Rockies, the Himalayas were carried enough oxygen for land animals to exist."

For every Georgian should know the why and wherefore of the great stone mass

Mountain; we differentiate and classify these rocks with relation to their physical, chemical and mineral character and relative age; we consider every subdivision of the science of geology for a better understanding of its life history; we must look into every phase which relates to the constituent parts of the earth and its material; the structural arrangement of the deposits, the surface changes and the origin of topographic forms, the succession of events in geologic time, the materials from which rocks are derived, and study the crystal composition of the rocks under the microscope which reveals their nature and growth.

We find by comparing the rocks around Stone Mountain with rocks of known geologic age in other portions of the world that the rocks which surround Stone Mountain can be correlated with the oldest rocks which form the crust of the earth. We traverse the stream bottoms for exposures of these rocks, we visit the quarries and railway cuts where great ledges of rock are to be seen and everywhere we find these rocks bent and folded, with a laminated arrangement of crystals, with various types of rock of vein origin cutting through the great rock complex, all of which clearly indicates that the area has been subjected to many movements of the earth. These intrusive veins, we find, filled various size cracks and vents which resulted from the cooling, crystallization, consolidation and shrinkage of the rocks of the great complex. We recall that the study of the earth's history has revealed that there came a time when great continent making movements and mountain making forces brought about as the result of the greater density of the earth in some portions and less density of the earth in other areas, resulting somewhere in depression, somewhere in lateral pressure, forced upward great portions of the earth's crust, just as these same forces are working today in certain sections of the earth accompanied by earthquakes and volcanic phenomena. As mountains and continents rise, the more massive rocks and particularly the crystalline rocks resist bending and folding and crack, so that wide vents may extend to great depths of the earth's crust.

The volcanic phenomena which usually accompanies these movements of the earth, while they are assensive and intrusive are not necessarily extrusive.

Here in the midst of this great rock complex we find evidence of a huge crack which extended downward until it reached a point, where although the bowels of the earth were as rigid as steel, yet they were made viscous by the release of pressure as a result of the Stone Mountain vent and molten rock forced its way upward to occupy this huge vent in the Archaen Rock Complex, just as water in an artesian well, or oil in a newly discovered pool is forced upward through



POOLE MAYNARD, Ph. D.,

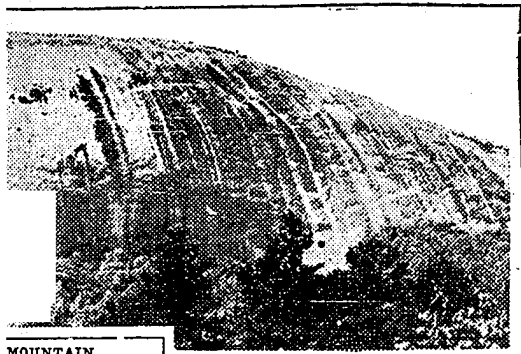
Author of this remarkable scientific story of the creation of Stone Mountain,

any artificial opening which brings about that relief of pressure.

The molten rock or magma which came from unknown depths and penetrated the Archaen Complex was destined to be the greatest memorial to the Confederacy. As the Stone Mountain Magma was forced up and came in contact with this rock complex, portions of the rock complex were melted, as is evident from points of contact between the granite and the complex, so that the channel occupied by the molten rock was rounded out and the form which it took, represented largely by its present contour, resulting from pressure from below meeting pressure from above, the magma spreading and cracking the Archaen Complex along its cleavage planes, the lines of least resistance.

In our travels around the world we have seen the fresh lava flow in the Hawaiian Islands and in Japan, we have studied the old extinct volcanoes in our own Rocky Mountains and we conclude that there are no physical similarities between Stone Mountain granite and these new or old extinct volcanoes. The old volcanic rocks are of fine grain, they have a dead like appearance, they often have a glass-like fracture; we know these volcanic rocks have cooled rapidly, they are often very porous, leaving air spaces as the result of the blowing out of steam. We find by chemical analysis, though, that this Stone Mountain granite is the same composition as some of these lava flows and we find that if we take this same volcanic rock and in the laboratory place it under great heat and great pressure allowing it to cool gradually, this volcanic rock will be transformed into similar crystals to those which form Stone Mountain. We therefore come to the conclusion that Stone Mountain did not reach the surface of the

Continued on Page Fourteen.



STONE MOUNTAIN

more than allow the light to pass through, they have broken the white light of the sun up into various wave lengths and these various wave lengths are represented by the colors we behold. We see that this Stone Mountain granite is wholly crystalline; it is of igneous or molten origin with granitic structure; it is massive and acidic, namely, the granite was formed from a magma rich in silica, alumina, potash and soda, but poor in lime, iron and magnesia. The crystals are of medium size, the quartz and feldspar are intimately interlocked and associated with numerous black mica. The quartz is characterized by wavy extinction with many lines of fracture displaying evidence of pressure. The feldspar are of irregular size and consist of Orthoclase, Plagioclase and Microcline. The accessory minerals are biotite, opalite, Zircon, hornblende with secondary muscovite and chlorite. The sulphides and oxides of iron are characterized by their almost complete absence.

Our microscopic examination has proven to us without question that Stone Mountain is an igneous rock of molten origin and then more questions pop into our mind; was it the crater of an old volcano, maybe it is different from the rocks which surround it, certainly it must be, otherwise, it would not be standing out here alone and we ask ourselves how can we tell where this mountain came from? How old is it? Is it growing larger or smaller? How much does it weigh? What is its chemical composition?

The life history of Stone Mountain is as plainly written in the rocks as is the history of the peoples who have inhabited the earth, and just as we turn over the pages and read and visualize the history of the race, just so we can read and interpret every page in the life history of Stone Mountain. We study in detail the rocks in an area of nearly four hundred square miles surrounding Stone

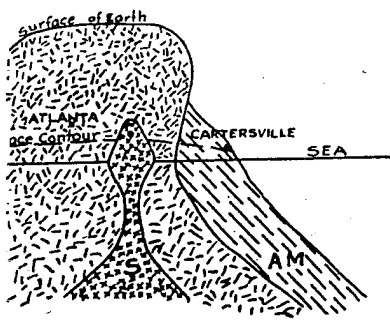


FIG. NO. 2

intertwined with the mica and the feldspar which looks like glass, which is crystal silica and is called quartz.

We have easily discovered then that the three principal mineral constituents of Stone Mountain granite are mica, feldspar and quartz and we think, if we could only see through the granite just as we see through the mica we might find additional minerals. We know that if the granite specimen is ground thin enough and polished, to about the thickness of tissue paper, the light will pass through all the crystals just as easily as it passed through the mica.

We grind down one side of the chip of granite and polish it to a very smooth surface, then we mount the smooth surface on a glass slide and grind and polish the other side of the rock until it is so thin that the light readily passes through it. We place the thin rock slide under a very high power microscope magnified so that it would make a flea appear as large as a house cat and as we look at this thin section of Stone Mountain granite we see the contour of every crystal, we observe which crystal formed first, we see other mineral crystals between those we saw with the naked eye and these are called the accessory minerals; we see almost every color of the rainbow, or the thin crystals have done something

VERTICAL SCALE—1 INCH, 6,000 FEET.
HORIZONTAL SCALE—1 INCH, 30 MILES.

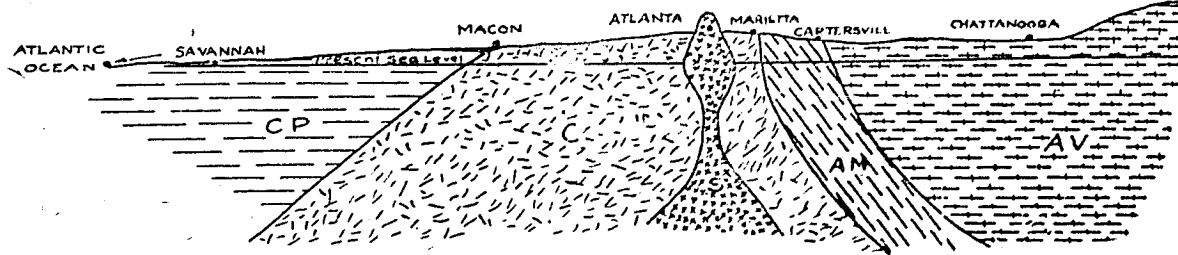


PLATE NO. 3

How Stone Mountain Was Created

Continued From Page Thirteen.

earth when it was intruded the Archaen Complex. Figure 1 S shows the hypothetical form of the outline of the Stone Mountain magma, ascending from a deep seated magma, extending up through a vent in the earth's crust, spreading out as it was retarded in its ascension by the pressure of the overlying rocks, which at that time, extended to at least ten thousand feet above sea level. Then the Stone Mountain magma began to cool, it cooled slowly, very slowly. The cooling was so slow that like particles which have an affinity one for the other moved together in a viscous mass. The exceptional pressure arising from the weight of the overlying rocks and the pressure from below seemed to have been practically equal in all directions, so that the crystallization of the mineral constituents developed normally. The conditions under which crystallization of the mineral constituents took place was ideal and the entire granite boss is strikingly homogeneous in its physical and chemical character. Gradual cooling and consolidation of the Stone Mountain magma took place and small cracks developed due to shrinkage which have later been filled with other intrusive rock. Planes of cleavage developed which are well defined and semi-circular lines of rift parallel to the general dome shaped contour of the mountain originated as a result of pressure.

We have concluded that the Stone Mountain magma cooled slowly at that time at great depth under the surface of the earth. We come to the conclusion that the rocks of the great Piedmont Plateau which are now exposed and form the surface of the earth of which Stone Mountain is a part represent the roots of a great mountain chain once as high as the Rockies, rising ten thousands feet above sea level, as drawn to scale in Plate 1 and as shown in map No. 1 extending from central Alabama through central Georgia trending in a general northeast direction well up into the Arctic. This Piedmont Mountain Chain has during its life history been subjected to intervals of elevation and depression and during the great time interval which dates almost from the very beginning of geologic time, this mountain chain has been subjected to erosion, namely the decomposition of rocks by the ordinary agencies of weathering, the transportation of these decomposed soils and rocks by rivers to the low lands of the several seas now occupied by the Appalachian Valley and mountain areas to the west and the Coastal Plane to the south and east.

How do we come to such conclusions? We travel a hundred miles east of Stone Mountain and there we find the western margin of the Coastal Plane which has a width of two hundred miles or more, with its eastern margin the Atlantic ocean. We travel fifty miles west of Stone Mountain and here we find the Appalachian Mountain area of which the famous Georgia marbles are a part and bounded on the west by the Appalachian Valley and the Cumberland Plateau.

Plate 2 shows the area occupied by the Coastal Plane still an ocean which extended into Georgia, at that time to a sinuous line drawn between Augusta, Macon and Columbus, while the area between Marietta and Cartersville represents the first land area of strata derived from the Piedmont

Mountain Chain Complex, and the area between Cartersville and Chattanooga occupied by an inland sea connecting with the Gulf of Mexico.

In these stratified rocks, originally sediments, found in both the areas west of Marietta and east of Macon are sand and sandstone, quartzites, clays and shales, slates, limestones, marbles, etc., and entombed in these strata are the more insoluble minerals, such as the micas, gold, magnetite, etc., which were not decomposed and which came from the great complex rocks of the Piedmont Plateau of which Stone Mountain is a part.

The many minerals in the decomposed rocks of the Archaen Complex were sorted, washed and refined and are the source of most of the mineral wealth of the southeast. The unique Kaolin and Potash deposits of Georgia were derived from the feldspars carried in the rocks of the Piedmont Complex.

Plate No. 3 represents a cross section of the conditions as they exist today. Stone Mountain stands nearly a thousand feet above Atlanta and nearly two thousand feet above sea level. C represents the great series of complex rock, the roots of the great Piedmont Mountain Chain, consisting of granites and gneiss, schists, and a great variety of metamorphic rocks. AM represents the sediments of the Appalachian Mountain area represented by the Blue Ridge in Virginia and Maryland. AV the rocks of the Appalachian Valley area and the Cumberland Plateau with the great Coal Deposits of Alabama, Georgia, Tennessee, West Virginia and Maryland, and CP represents the unconsolidated sands, clays, fullers earth, bauxite, lime-rock, etc., of the Coastal Plain area.

In the Coastal Plain, the strata are as much as a mile in thickness, while in the Appalachian area the strata have a thickness of many miles. In order to account for the thickness and extent of the strata in the Coastal Plain and in the Appalachian areas which strata were derived from the Piedmont Complex, the Piedmont Mountain Chain must have reached a great height. While it is doubtful if this Mountain Chain ever exceeded ten thousand feet in elevation above the sea level at any one time, yet we do know that this does not represent the total thickness of the rocks eroded from the Piedmont Mountain Chain to account for the thickness and extent of the strata laid down in these pre-historic oceans.

After these overlying formations were worn away, the upper portions of Stone Mountain became exposed to these same destructive forces of nature, but Stone Mountain was different from the rocks of the Piedmont Complex.

What has caused such great resistance of the mountain to graduation? We find that it is due to the structure of the boss; to the interlocking of the crystals of feldspar and quartz, resisting the forces of disruption by exfoliation, namely, the circular peeling off of layer by layer, so common in igneous rocks and due to the expansion and contraction of mineral constituents of unlike nature; to the insoluble nature of the quartz and the aluminium silicates, namely, the feldspar and the mica and to the smooth crystal faces of the several minerals of which it is composed. As erosion continued the surrounding rocks were decomposed and carried away, while Stone Mountain defying the agencies of erosion was growing and is now growing relatively larger and larger, standing up in a great granite boss above the surrounding plain, defying the elements of nature, exemplary of the survival of the fittest.

Stone Mountain carries above the Piedmont Plain level more than seven and a half billion cubic feet of granite and its weight above this level is more than six hundred and twenty-eight million tons. If the granite alone in sight was loaded in freight cars carrying fifty tons each, it would require ten million, five hundred and seventy-two thousand, nine hundred and eighteen cars to carry it and the train would extend two and a half times around the earth.

As Stone Mountain was intruded into the gneiss complex it was formed after, or at a later period than the gneiss. The

correlation of this gneiss with similar deposits of known geologic age classes it in the Archaen Complex among the oldest of the known rocks of the earth.

According to Williams, Schuchbert, Solias and Mathew* up to the close of the Archaen period represents an interval of approximately ten million years, after this came an interval of approximately seven-tenths and a half million years represented by the Algonquian Period. The two periods comprise the Proterozoic Era. At the close of this era the earth was subjected to the greatest structural changes in its history and the rocks of the preceding periods were rent and torn asunder. These earth movements are accompanied by vulcanism, some intrusive but not reaching the surface, great batholiths and lacoliths were formed in the interior of the earth and Stone Mountain, a Batholith, had its beginning and since that time more than a hundred million years have passed.

How long will Stone Mountain last? Rock decomposition is due to underground circulation of water; to moisture due to absorption; to acid waters carrying organic matter derived from vegetation; to the oxidation of the sulphides of iron and iron associated in other forms; to the expansion and contraction of mineral constituents of unlike nature due to excessive temperatures; to the atmosphere, especially when laden with impurities; to wind carrying sand.

When Stone Mountain was buried under rocks which have since eroded and especially when these overlying rocks were soaked with underground waters carrying organic acids and the sulphides of these formations were being oxidized, the granite of Stone Mountain was subjected to far greater weathering agencies than it can ever again be subjected to.

As Stone Mountain ascended from the bowels of the earth it is one of the pillars of the earth itself. During its life history hundreds of feet of strata have been displaced by earthquakes. Within sixty miles of Atlanta millions of years ago we have evidence of a great earthquake now described as the Cartersville Fault—yet Stone Mountain was not affected and there is no reason to believe that it will ever be harmed by earth movements.

Stone Mountain passed through all the ages with only superficial decomposition. The only evidence of alteration is the presence of very small amounts of secondary muscovite and chlorite which is seen under the microscope. These two minerals are very resistant to decomposition and are not in sufficient quantity to represent points of weakness.

In all probability the rocks of the Piedmont Plateau were subjected to the most rapid erosion during Carboniferous time, when the great coal beds were being formed. The earth at this time was enveloped in an atmosphere rich in carbonic acid gas. The predominance of sandstones and shales in this period indicates that erosion was rapid. Man could not have lived in such an atmosphere.

During the great ice age great glaciers came down from the Arctic, sweeping soils and partially decomposed rocks ahead of them and in them for hundreds of miles, but Stone Mountain although subjected to great cold has never been subjected to the destructive forces of glaciation, for they were dissipated before they reached the Mason and Dixon line.

Situated on a divide in the Piedmont Plateau, Stone Mountain is provided with natural drainage and there are no overlying rocks to provide impurities for rock

decomposition. The heavenly waters come from a clear atmosphere. The absorption ratio of Stone Mountain granite when emersed in water is only 0.067 per cent. The mean average temperature is 69 degrees and it is not subjected to the extremes of heat and cold. The hardness of the two essential minerals, quartz and feldspar is practically the same. The interlocking of these crystals due to their simultaneous growth prevents the contraction and expansion of this rock, so common in igneous rocks where the crystals are of unlike nature; the smoothness of the crystal faces resist atmospheric weathering. The chemical analysis reveals that the total iron content of the granite is less than one per cent and that the lime is negligible and combined with the alumina and silica in such an insoluble form that the whole decomposition of the silicates must take place before the lime is released. All this points to the fact that there can be no appreciable weathering of the mountain or the carved cavalcade for thousands of years.

Secreted along the cleavage planes of this granite boss are found from place to place a thin coating of greenish golden mineral, URANOPHANE, one of the ores of RADIUM, whose invisible rays forever rise to crown in a halo of everlasting glory the spirit of the defenders of the faith.

Here stands a monument which conceived in the belly of the earth, born midst the travail of the fires of hell has risen from its sepulchre, an inanimate body, transformed to a perfect crystal complex. It has risen and continues to rise higher and higher. One of the wonders of the world, it is more than forty-eight times larger around its base and a hundred and twenty times larger than the Pyramid of Gizeh.

We shall never cease to marvel at its majesty, sometimes at the dawn of day, sometimes in the hours of twilight. Even more fascinating than its outward splendor is the visualizing of its birth and everlasting life.

*Watson, T. L., Geological Survey of Georgia, Bull. 9-A p 117.

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*Bull. 789 U. S. G. S. p. 5.