

Museum of Geology for Breezewood, PA

“Studying the Role of Architecture
in the Science of Geology”

A Thesis

by

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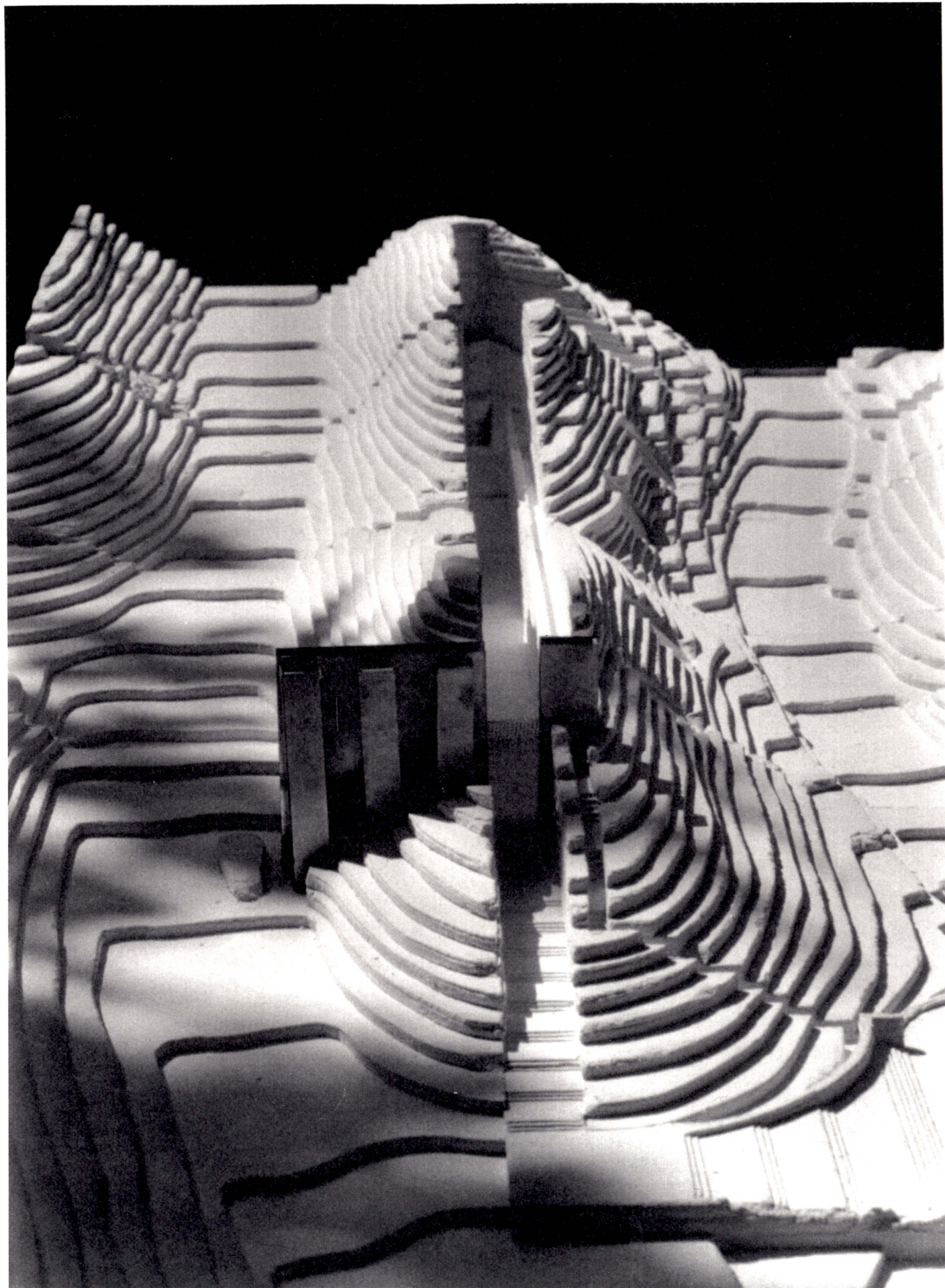


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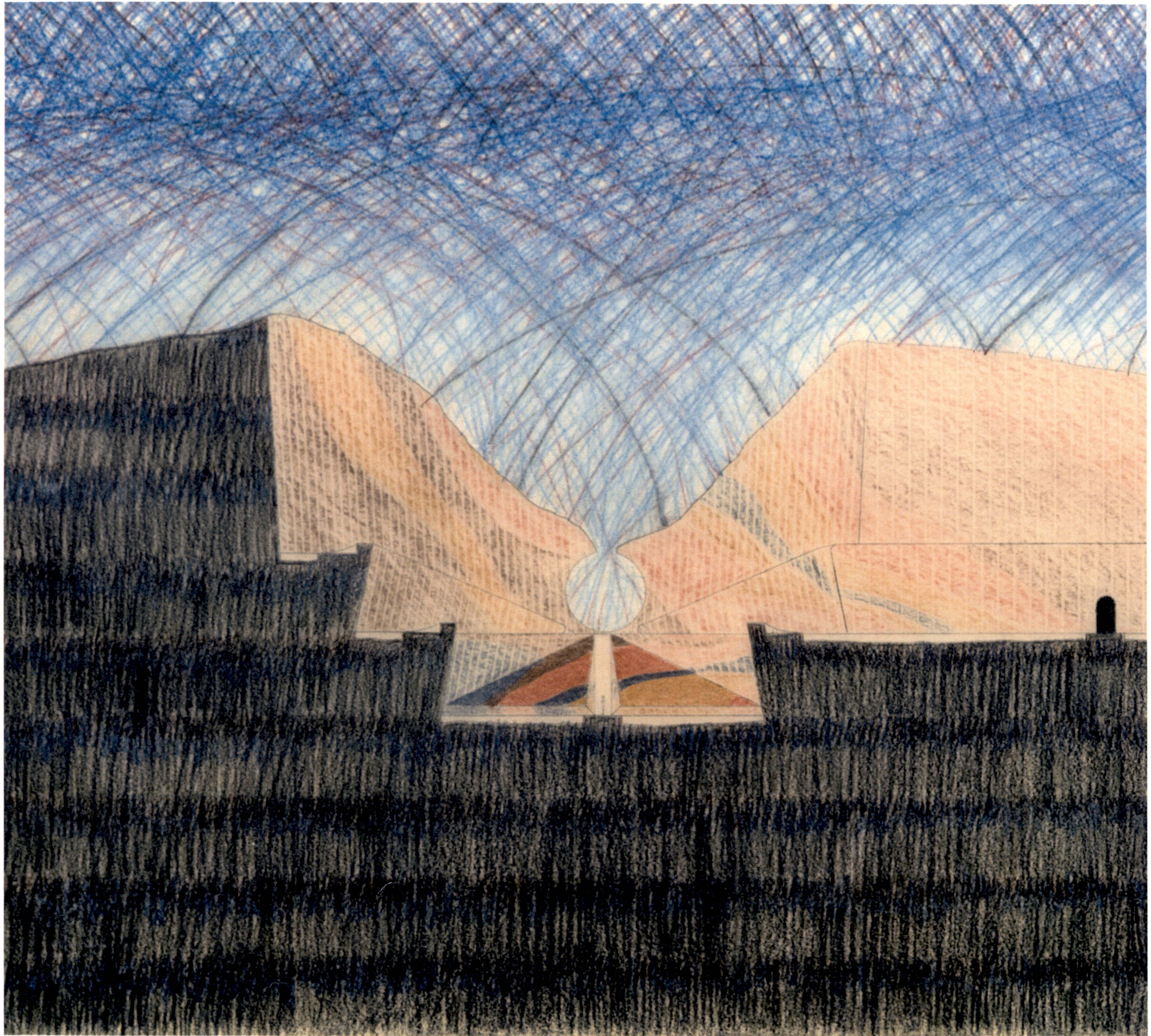
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ABSTRACT

People cannot be trained to marvel at landscapes, nor to love their places and their planet. On the other hand, love of place and of the Earth are scarcely sentimental extras to be indulged only when all technical and material problems have been resolved...

The experiences of places, spaces and landscapes in which academic geography originates are a fundamental part of everyone's experience, and geography has no exclusive claim to them. Indeed, one of the first aims of a phenomenology of geography should be to retrieve these experiences from the academic netherworld and to return them to everyone by reawakening a sense of wonder about the Earth and its places. (1.)

Designing a place which reawakens a sense of wonder of the Earth becomes the mission statement for this design thesis: a place which emphasizes the very real and immediate experiences which we share with the land (and landforms) that can not only support our daily existence, but can soar above us to heights which inspire myth and imagination; a place which uniquely reveals itself to each person promoting personal observations and personal interpretations.



INTRODUCTION



INTRODUCTION

The design project, a Museum of Geology for Breezewood, Pennsylvania, is intended as an exploration of the role of Architecture in the process of bringing the science of Geology the everyday experience.

Before the design of the museum is presented, it should be made clear why it is important that the world of science should be brought back to the world-at-large.

Throughout history, people of all cultures have struggled to understand their world and their place in the world. Heidegger described this a trying to find an “existential foothold” between the here and the hereafter - between those things of the Earth and those things of the spirit. The struggle of mankind to interpret his place (and purpose) between these two spheres of physical and spiritual existence is the foundation for our myths, legends and religions, and these beliefs become part of each culture’s daily life - a common bond within each community. Spiritual beliefs have also served to explain phenomena which cannot be understood solely within the realm of a cultures physical world, and conversely, the physical world - landforms, the weather, vegetation, etc. - is studied for clues which may provide a window into our spiritual world.

Wind and lightning, rainstorm and river floods, breakers and tidal waves, earthquakes and volcanoes would seem to be direct and visible manifestations of powerful but unseen supernatural beings. Nor would the more obtrusive features of the landscape fail to add their influence - mountains with their clouds, tempests, and landslips, craigs and precipices with their strange grotesque half-human shapes, ravines with their gloomy cliffs and yawning chasms between.

It is not difficult to conceive how from these concurrent materials, there would spring fables, legends, and myths, long before the spirit of scientific observation and deduction was developed, and how such fables might continue to satisfy the popular imagination long after that spirit has arisen among the more reflective few. The earliest efforts at the interpretation of nature found their expression in the mythologies and cosmogonies of primitive people... (2.)

But as Western civilization began to “cleanse” itself from myths or fables and move towards facts, logic and

reason for their new interpretation of the world, many fields of science, including geology, struggled in their infancy to become “pure and rational” and devoid of a culture or mythology. Academic geology evolved and grew predominantly within its own context and lost contact with the rituals and activities of daily life. The following is one example of this internal evolution in the science of geography:

Because much of present-day geography is technical and far removed from the everyday experience, it is virtually impossible to see any connection between, for example, investigations of mechanisms for the geographic transmission of economic fluctuations and the readiness-at-hand of equipment. Further, the relationship is limited because only a small fraction of the population has detailed knowledge of academic geography and, therefore, few people are able to make the connection between it [geography] and their personal experiences of places and landscapes. Geographic experiences, however, do not suffer from this obscurity. Though they are not commonly known by name, they are experiences which everyone has and which require no text books or special methods to be appreciated. They go directly from place to person and person to place. (3.)

When the study of geology, or any branch of science, can be rooted to the Earth through the experiences of many people rather than proceed as an esoteric academic exercise, its discoveries and continuing questions can once again become part of everyone’s life through shared knowledge, celebrations and memory.

The museum of geology for Breezewood, Pennsylvania is intended as a meeting place for geologists and the general public - neutral ground, as it were. Art galleries and museums offer to the public a chance to peer into the world of the artist through the artists medium, but it also provides the art community an opportunity to see what is reaching the people and, perhaps, a chance to ask, “Why?”

This museum of geology will fulfill similar functions, but with the added dimension of bringing the people directly in contact with the geology - a living laboratory. This is essential if we are striving to make the “geological experience” a part of our everyday experiences. In essence, to make every hillside or outcropping of rock an extension of this museum, and to make the hand

which wields the stone appreciate the gravity of the mountain from which it came.

The sciences must once again become accessible if they are to remain meaningful as communities and cultures grow and evolve. The science of geology is a clear and obvious first choice to bring the pursuits of science and the experience of the everyday towards their common ground - the Earth.

GEOLOGY: The science that deals with the physical history of the Earth, the rocks of which it is composed, and the physical changes which the Earth has undergone or is undergoing.



GEOLOGY

The fundamental principles of geology, unlike most branches of science, are not susceptible to mathematical analysis. It is through the observation of the Earth's growth, erosion, movements and shifts that are preserved in the natural forms and strata of the Earth - and deduction thereof - that geologists interpret the history of Earth and its inhabitants.

The early masters laid a broad foundation of the science of geology through observation and deduction, and they were able to draw incredible conclusions from the most basic information. They began to surmise that the world of the present was not the same as the world of the past: deserts appeared where there was once only oceans and canyons were carved through lands which were once joined.

But it is not the conclusions which they reached that make their work timeless, it is the principles which they established. They discovered that the Earth had recorded its own history which was continually growing and being amended, and this history also came with its own timeline, that could be read not exclusively by scientists, but by everyone.

Just as primitive man had tried to understand the world in which they lived - interpreting volcanic eruptions as punishment from their gods, etc. - these early geologists were trying to understand their world, and both groups based their theories on observable phenomena. But as our technology grew, our interpretations were no longer based solely on the observed. New theories and paradigms emerged based on the findings of computer data, shifting magnetic polarities and electromagnetic mapping of the ocean floor.

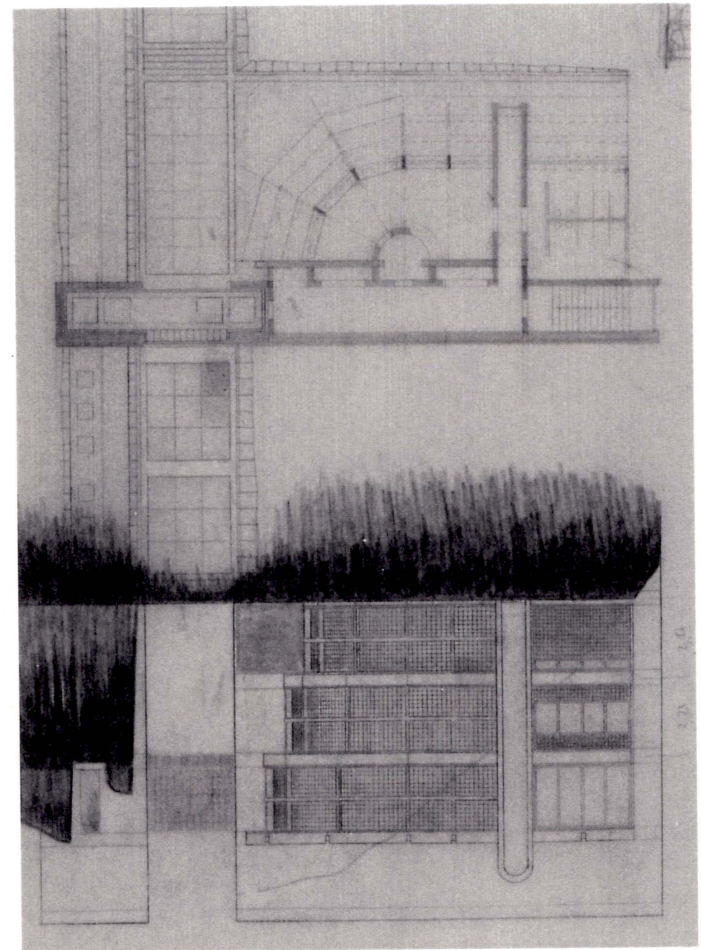
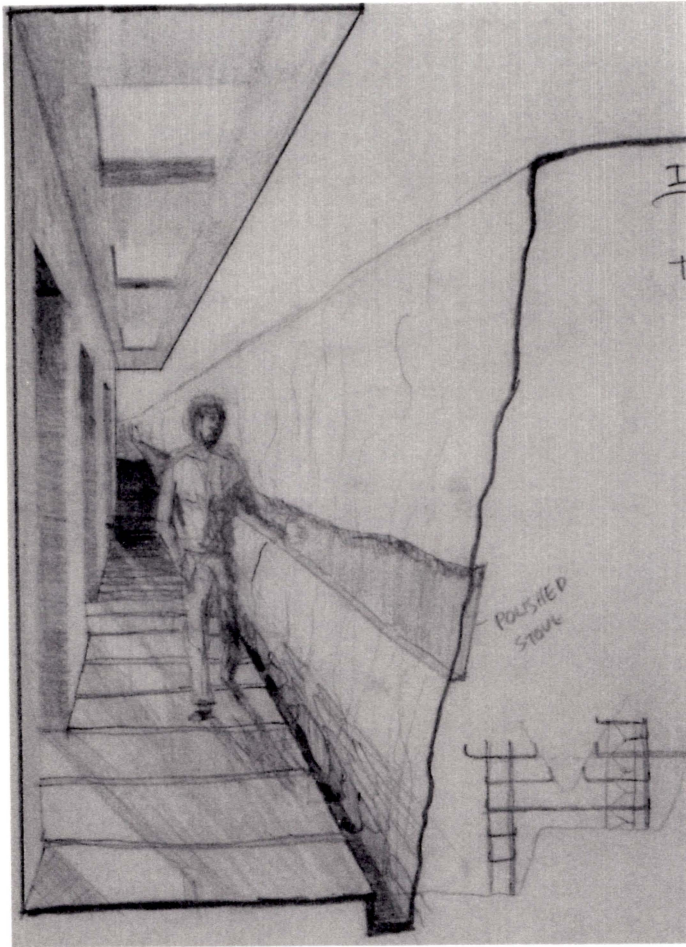
These new interpretations also require a knowledge of the materials and the structure of the Earth as well as the processes which are continually altering it, and we learn much of this information from sources outside the realm of geology as well as from specialized divisions within the field. Because many of the processes involve movement, physical changes and chemical changes, geologists enlist the aid of other sciences, such as physics and chemistry, but geology also overlaps into most of the other sciences as well: astronomy, botany and zoology for example. Within the field of geology, there are also divisions which emphasize certain aspects

of geology. Cosmology, petrology (the study of the character and origin of all types of rock), structural geology, dynamic geology, geomorphology (including plate tectonics), paleontology and historic geology are the common subdivisions in the broad spectrum of "Geology".

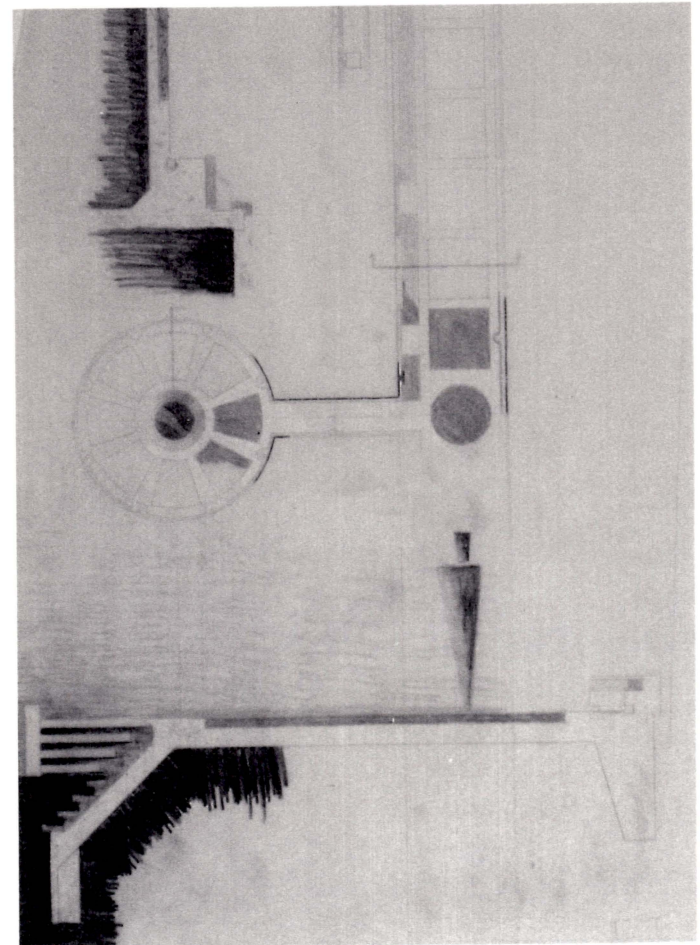
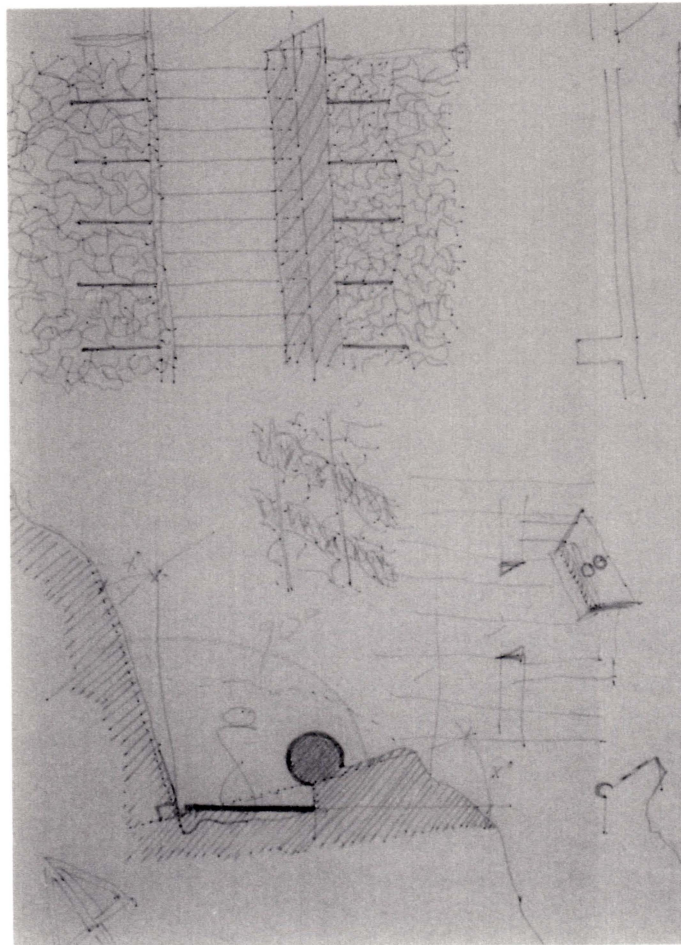
Because of these numerous specialties within geology and the necessarily interdisciplinary nature of all sciences, common methods and a common language for recording events and information have evolved to allow greater access to the available information from science to science and from generation to generation. Mineral and rock identification is based on the periodic table of elements developed by chemists and their allies. Paleontologists list fossil findings by their species, genus, family, etc. - a system developed by the early biologists. Dynamic geologists study the forces and movements that have affected the Earth's strata, and the results of these movements and other natural forces are observed and identified by the displacement of the strata from its original position - that is, from the horizontal. It is a system unique to geology based upon an observable phenomenon, and is used as an ordering system throughout the design of the museum.

Though many of the more recent theories presented by geologists cannot be recreated for the museum experience, most of the information and data that has been gathered to bring us to this far can, to some degree, be understood through our eyes, ears and fingertips. The texture, density and mass of the rock can reveal many of the reasons why the layers of strata slump, slide and erode in the patterns that we see. We can study sections through the strata and observe the geometry and structure of the minerals in their natural state and make connections to their everyday uses.

It is in this three dimensional world of geology that we do reside. How and where we build our houses and cities? Where should we drill for oil or excavate for coal? Where will find water? The need to answer these questions keeps the general public in touch with the science of geology. The museum of geology is the place to begin or reaffirm this connection.



DESIGN



DESIGN

The design of the Museum of Geology evolved slowly through many phases, and at each step many questions were posed and many options were considered. Some of the choices considered appear on the previous page and to the right. A fundamental idea or direction was needed to put the design on the right path.

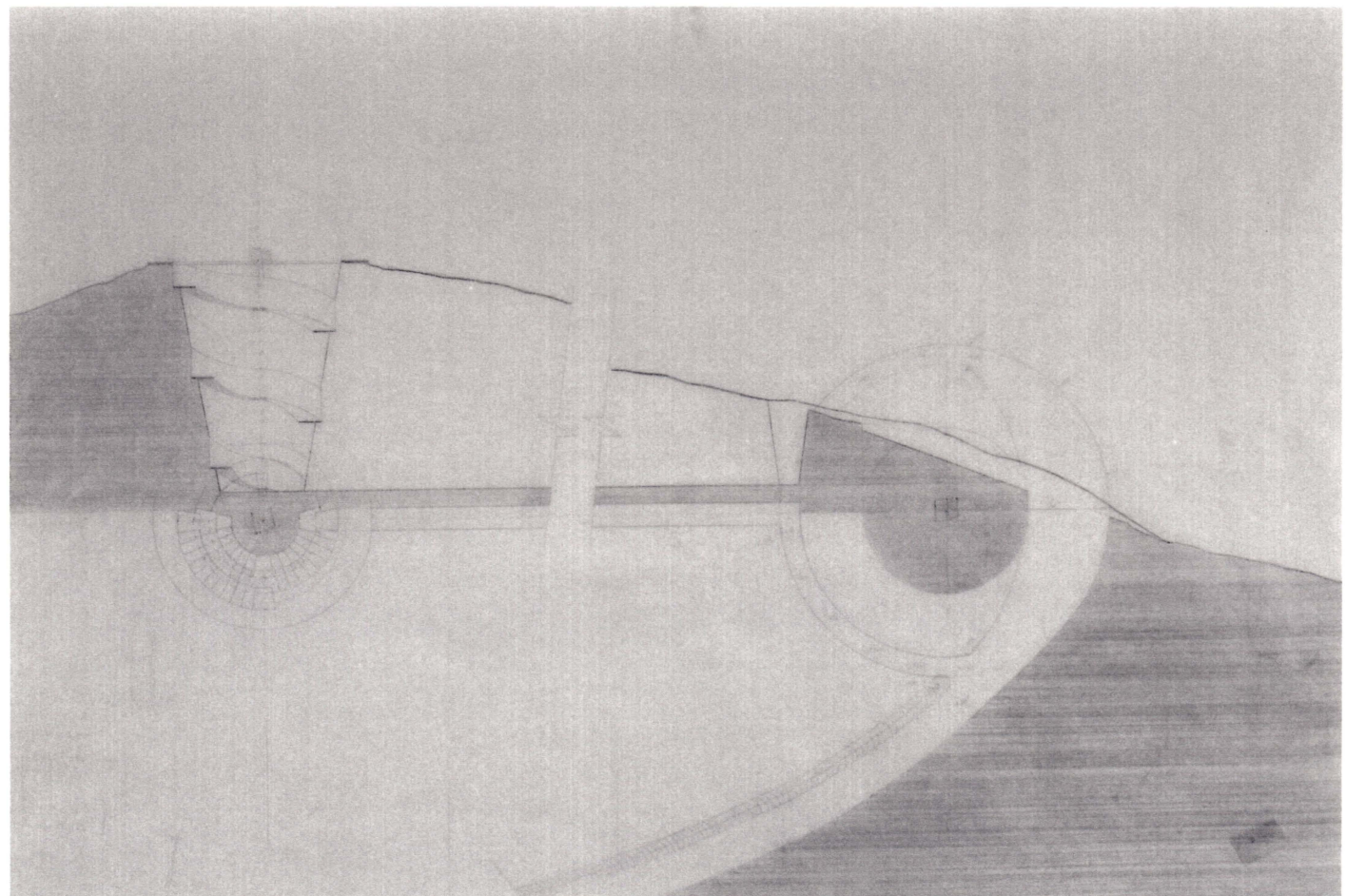
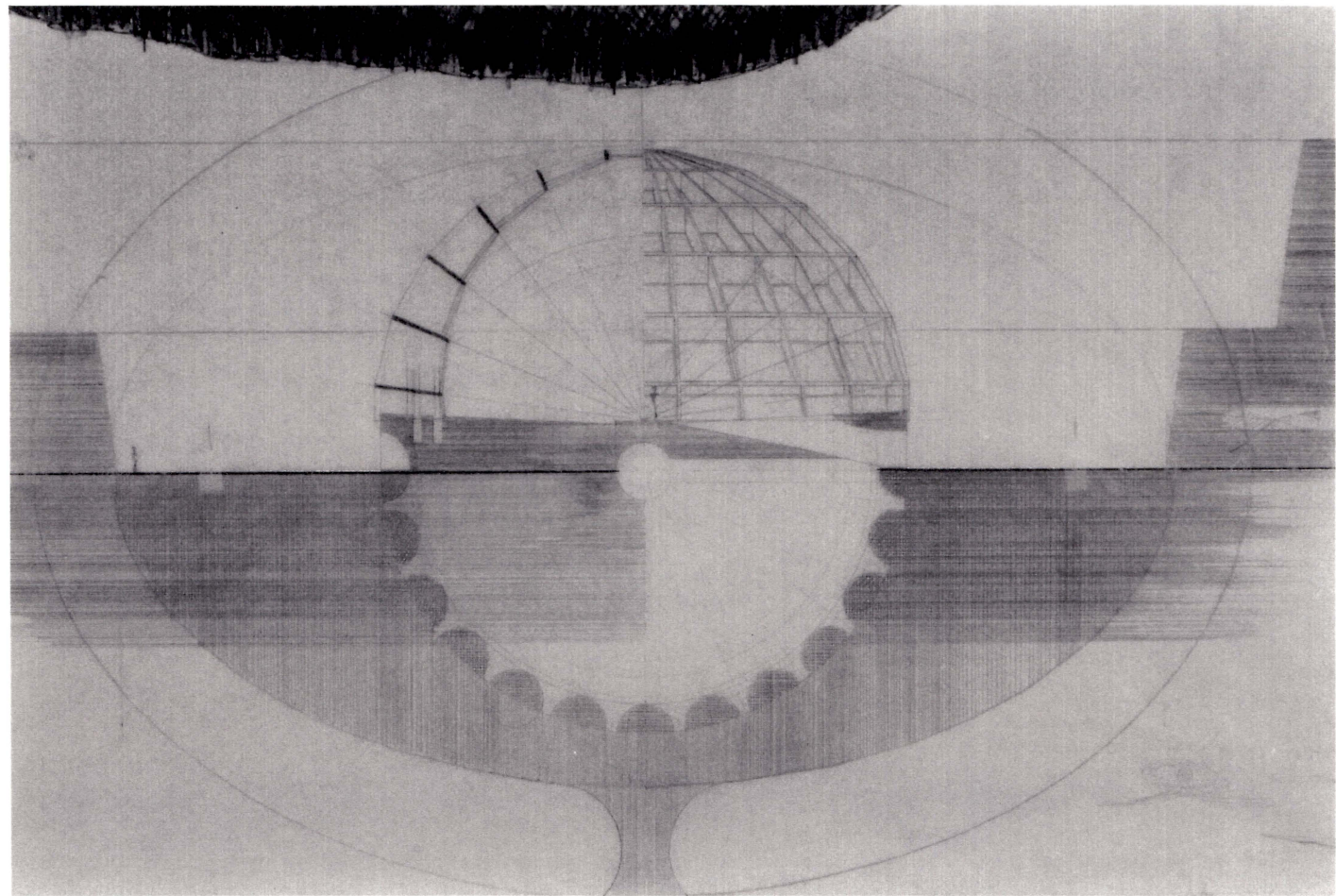
I searched for my direction in two primary sources: the thesis statement, "studying the role of architecture in the science of geology", and from the site, which seemed an obvious choice for a building which dedicates its use to the study of the Earth and the rocks of which it is composed. These two sources became one as the thesis statement evolved and became less general and more articulate: The role of architecture *is*: to introduce the visitor to the geological experience which the site offers.

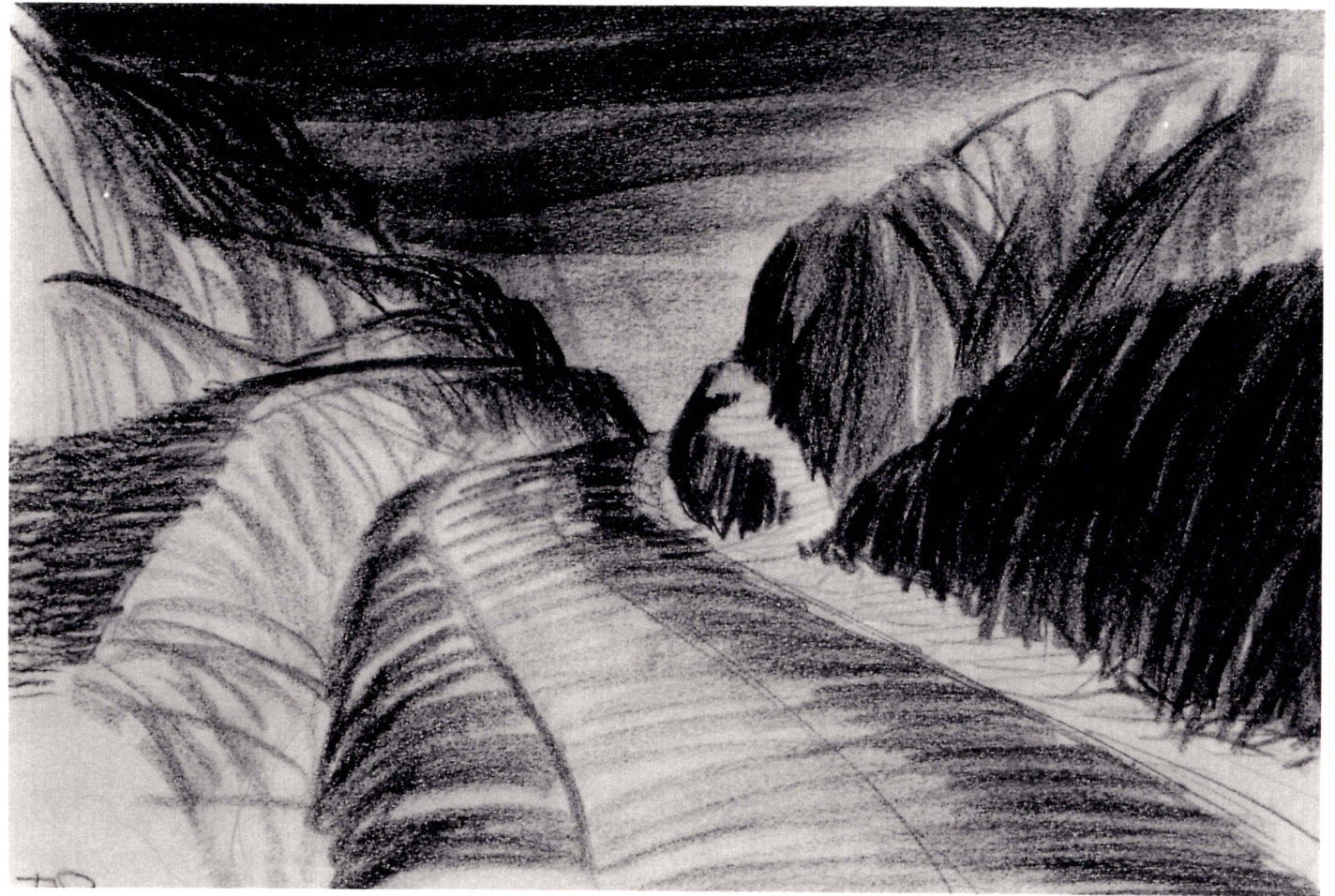
The methods used to introduce the visitor to the geology are secondary to the notion that the introduction must be architecturally presented. This is necessary because the science of geology will not look to the architectural community if it has nothing more to add the existing methods of the geologists.

This having been said, it *is* the architectural methods employed that give the project its richness and complexity - most likely because can find the origins of the methods rooted in the principles of geology and from the existing conditions and configurations of the site.

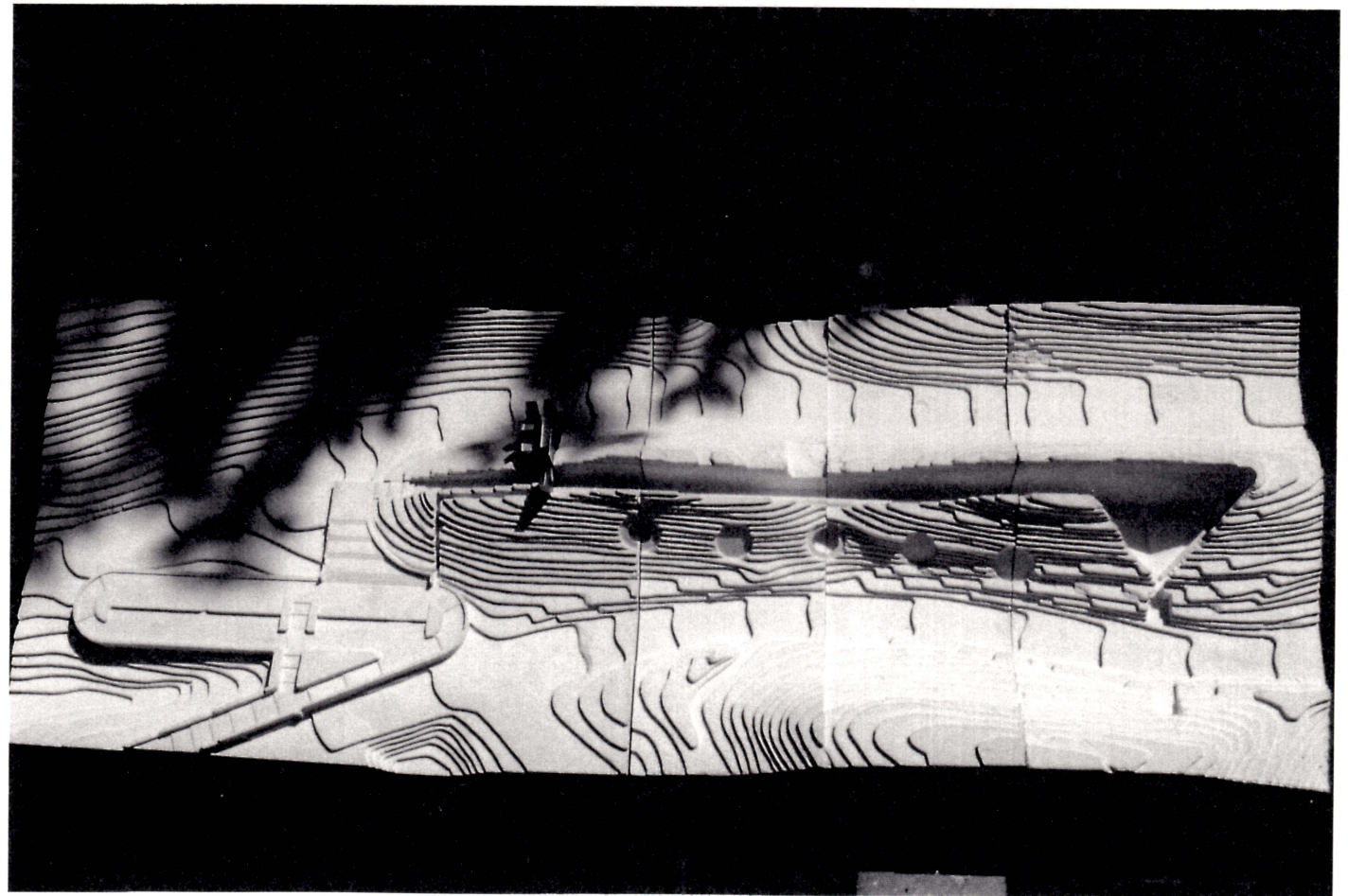
The process which I have chosen to examine the design of the museum involves the discussion of the distinct architectural elements of the museum and the methods which each element employs - individually and as part of the sequence of events- to introduce aspects of the geological experience to the visitor.

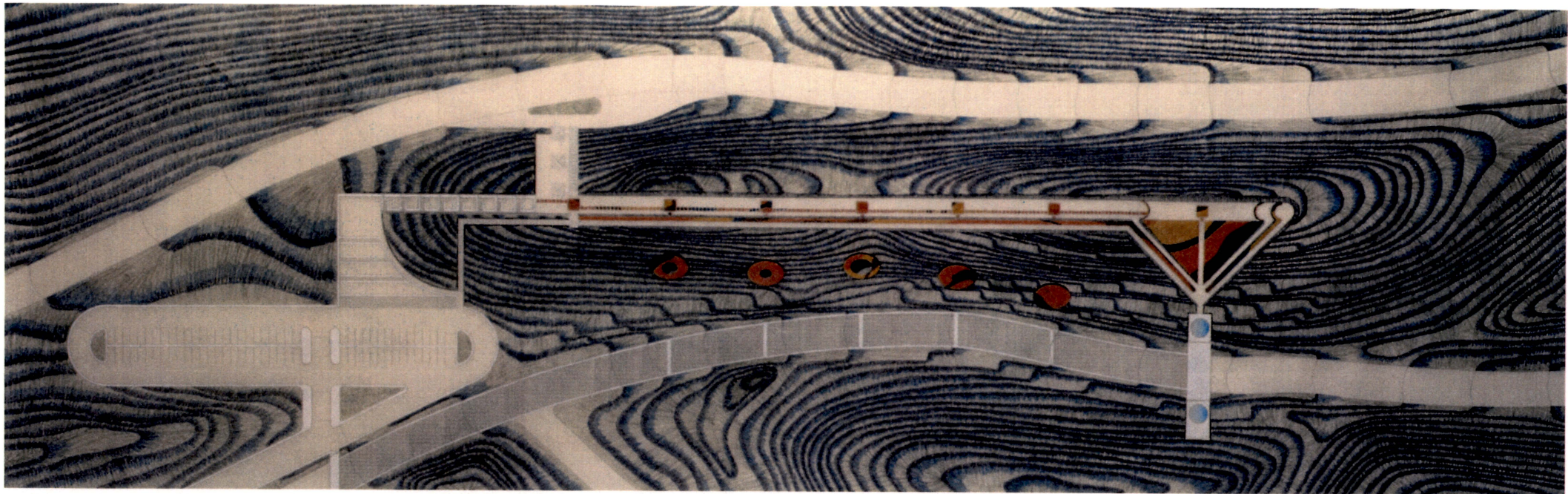
As each of the pieces (the gate, the theatre, the galleries, etc.) is examined, it will become clear that the configuration and orientation of the site was paramount in the design process. It is therefore prudent to discuss the site as a whole before each element is discussed.





SITE





SITE

"Here," wrote Goethe on an outcrop of granite, "I rest directly on a foundation which reaches into the deepest regions of the Earth. In this moment the inner forces of the Earth act directly upon me." (4.)

The site chosen for the Museum of Geology is nestled amongst the hills and valleys which constitute one small portion of the Appalachian Mountains. Dramatically altered by man when state route 30 (a divided highway at this point) was cut through this rocky hillside, the site has been divided into three sections which are depicted as the long, somewhat horizontal bands on the site plan. The museum is primarily developed in the strip between Rt. 30 East and Rt. 30 West - the section most isolated by the above mentioned manipulations of man. It is also this isolated section in which large steps were dramatically cut into the rock making way for the highway and revealing much of the strata, including a glimpse of the composition and structure of the site.

Also within this middle band of earth, rock and vegetation are two peaks following a ridge which runs nearly parallel to the highway. The elevation and general form of these peaks remain relatively unchanged by the construction (or in this case, destruction) necessary for the highway. The eastern peak has the highest elevation on the site, rising more than 150 feet above the highway and forty feet higher than the western peak. Valleys, falling as much as seventy-five feet below Rt. 30, can be found on the extreme east and

Above: Overall site plan

SITE (continued)

west portions of the site. A shallow creek at the bottom of the valley, flowing west, carries the rain and run-off towards the Juanita River which winds its way through this portion of the Appalachian Mountains.

With the valleys on the East and West of the site and the highway cutting into the North and South edges of this rocky hillside, we are left with, in essence, a large outcropping of rock 170 feet wide with sides of partially exposed steps of strata nearly one quarter of a mile long and up to 150 feet above the highway.

Just as all places have unique qualities and characteristics - each having been shaped by natural forces and mankind's advances - this site offers its own set of circumstances, conditions and history. The movement of the glaciers in this area, the continuous aging of an old mountain, the past lives of plants and animals, patterns of wind and rain, and the evolution of our society have all been recorded in some manner in the layers of strata, the remains of fossils, and in the topography and landforms present. Some information is revealed through observation and study, much more lies hidden, waiting to be discovered.

The site provides clues to its own history, and it provides guidance to the means by which we can discover this history. The placement of the ridge and peaks, the orientation of the site in relation to the sun, the composition of the materials, the topography, the surrounding landforms all offered insight into the means which may be used to learn about this unique place in the world. Just as geologists and scientists have their methods to discover truths, judge theories and determine facts, the site has a method as well.

It is the desire to allow the site to reveal its history and methodology to the visitor that makes the site become the Museum of Geology.

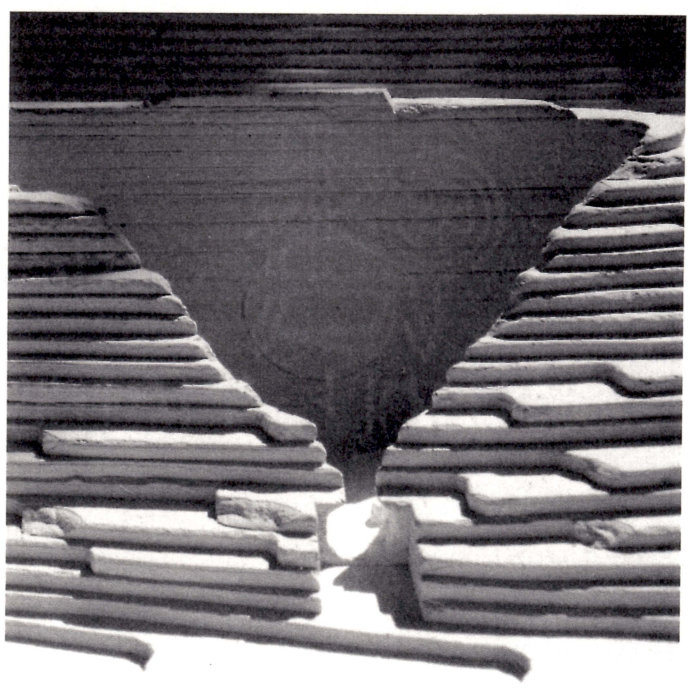
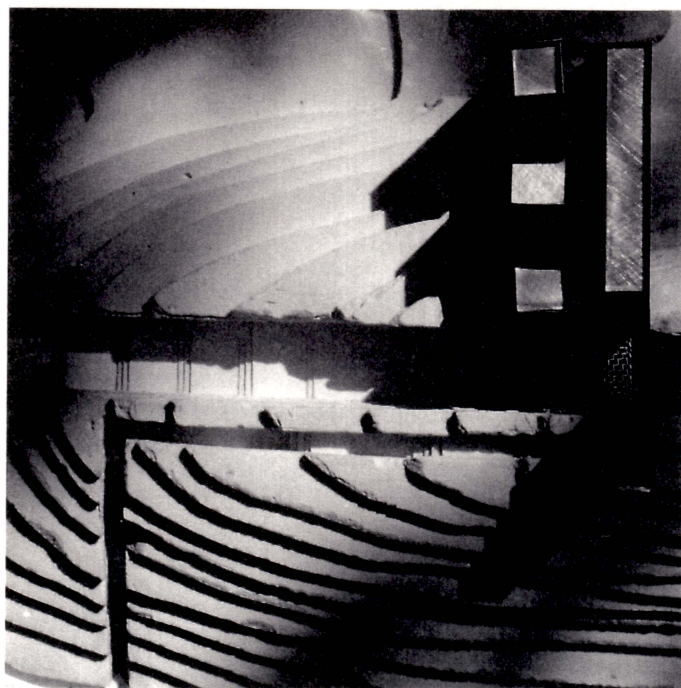
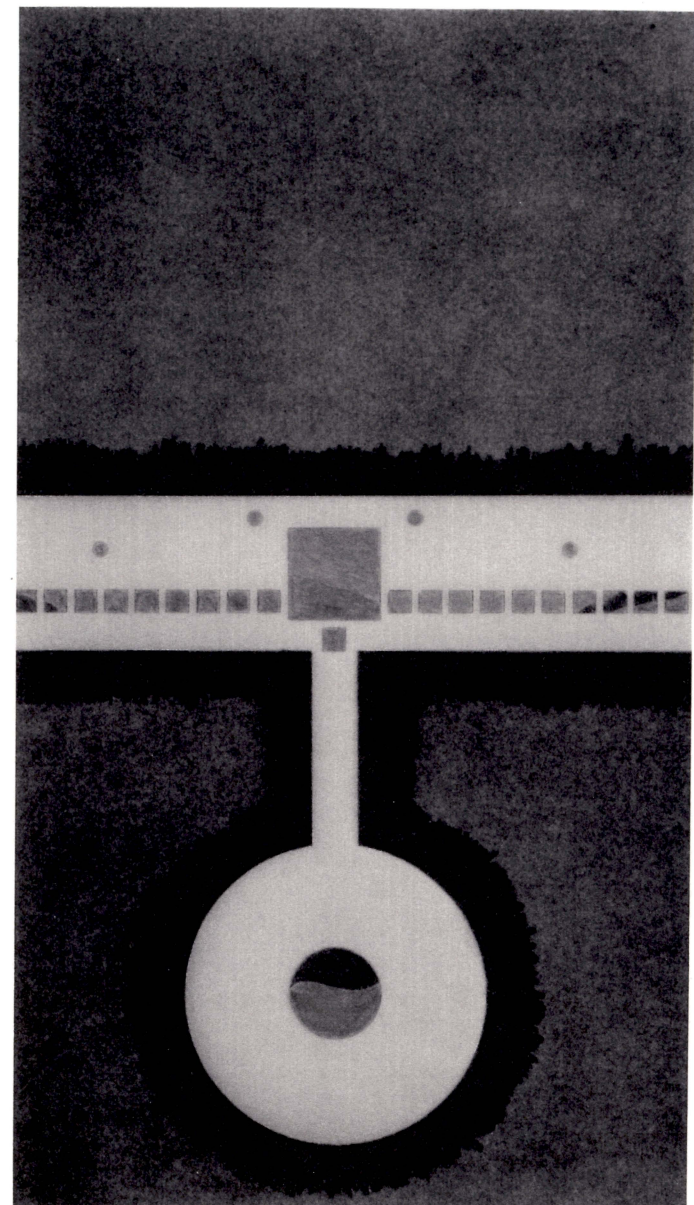
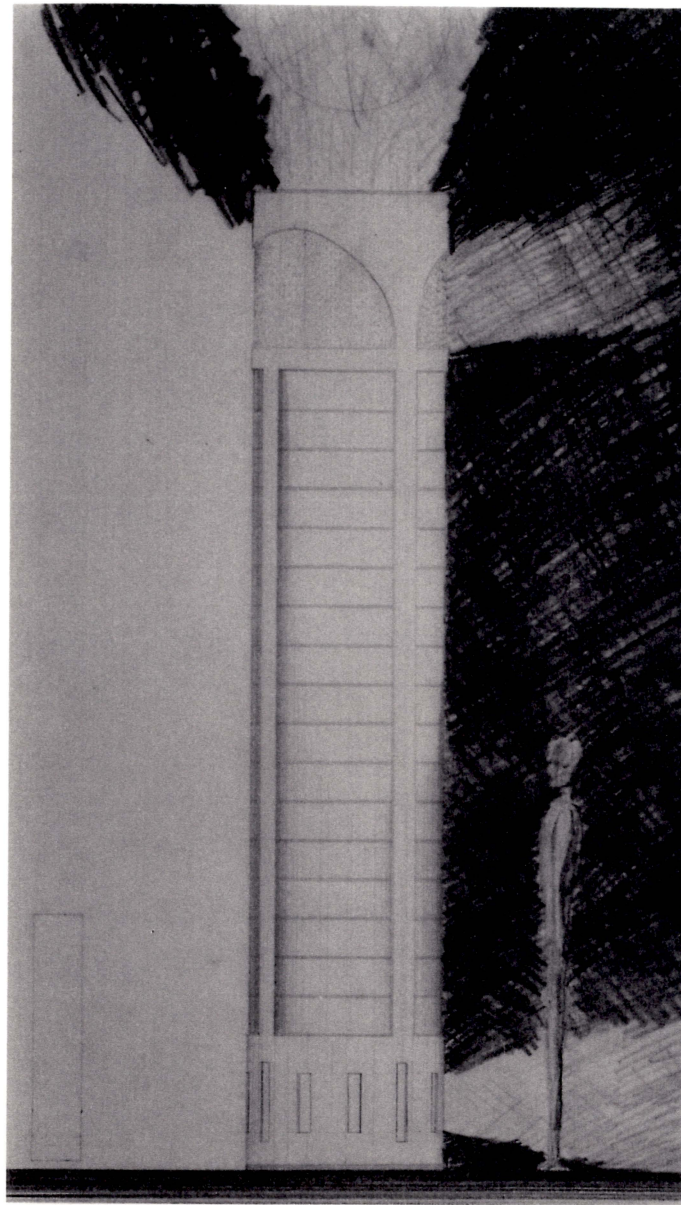
It is also the desire to allow this museum, functioning as an icon of roadside geology, that makes the thousands of roadcuts along the millions of miles of highway become museums of geology for their particular location.



Near right: Existing site detail

Above right: View of site from Rt. 30 Eastbound

THE ELEMENTS: Parking Deck, Entry Plaza, Great Hall, Gate, Towers, Galleries and Theatre.



THE ELEMENTS

Though not designed in the linear process depicted, the illustration to the right does provide insight into the functions and responsibilities of the individual elements with regard to the whole. It will also provide the format for the order of the discussion to follow.

Beginning with Figure 1, we can see the Great Hall or datum which connects all of the elements of the museum.

Figure 2 depicts the addition of the beginning and end of the datum, respectively, the Entry Plaza and the Theatre.

The Gate and the Towers are added in Figure 3.

In Figure 4, the five Galleries accessible from the Great Hall are the last of the primary elements in the museum.

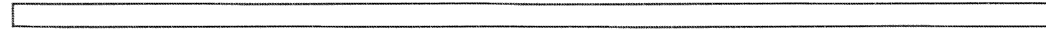


Figure 1

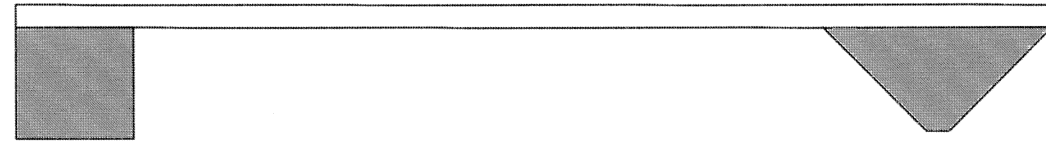


Figure 2

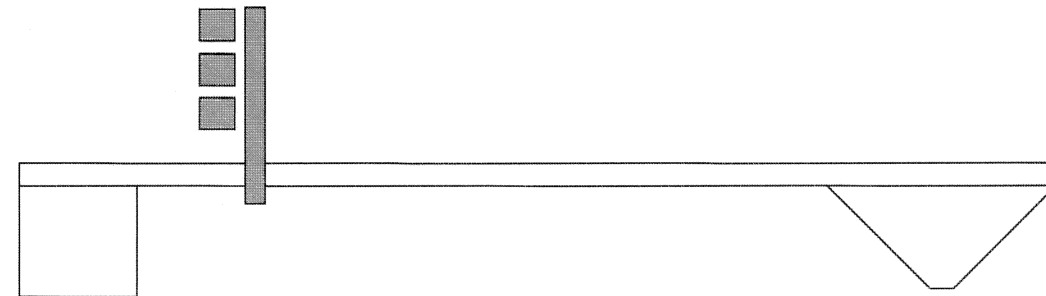


Figure 3

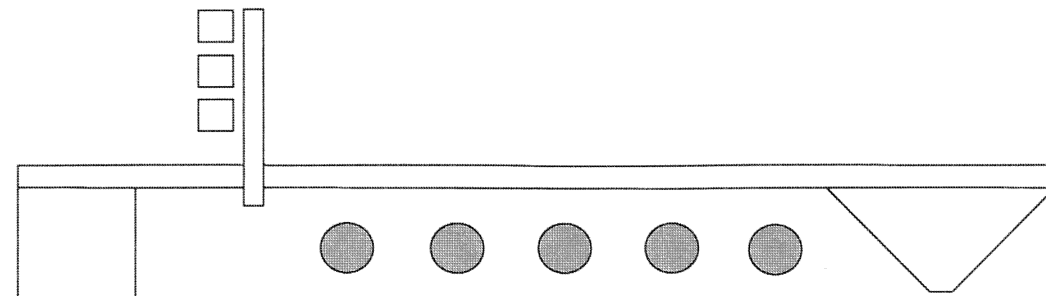
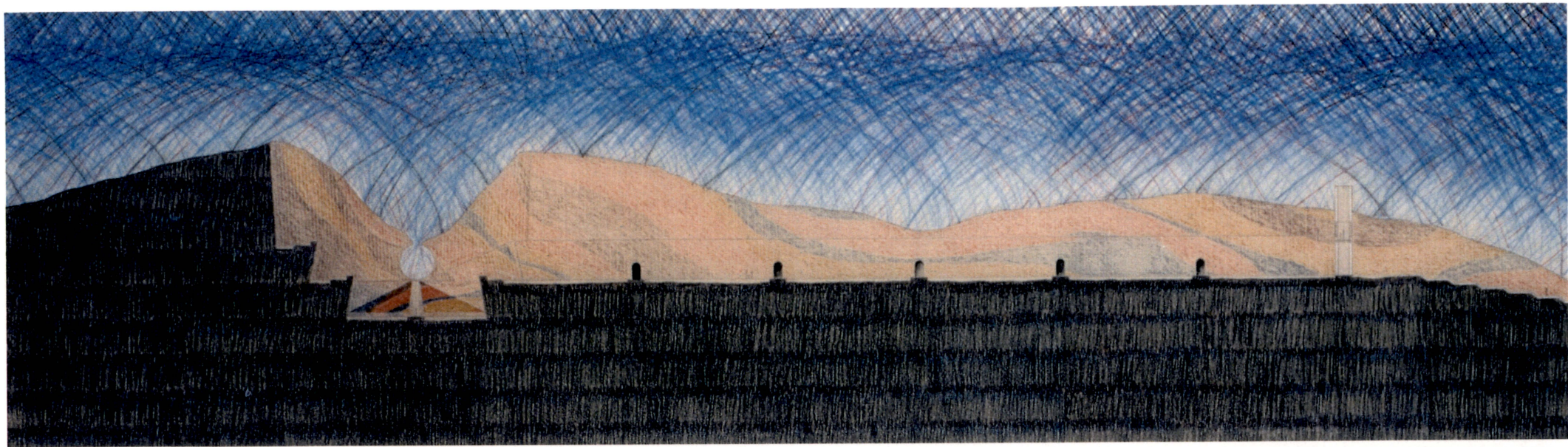
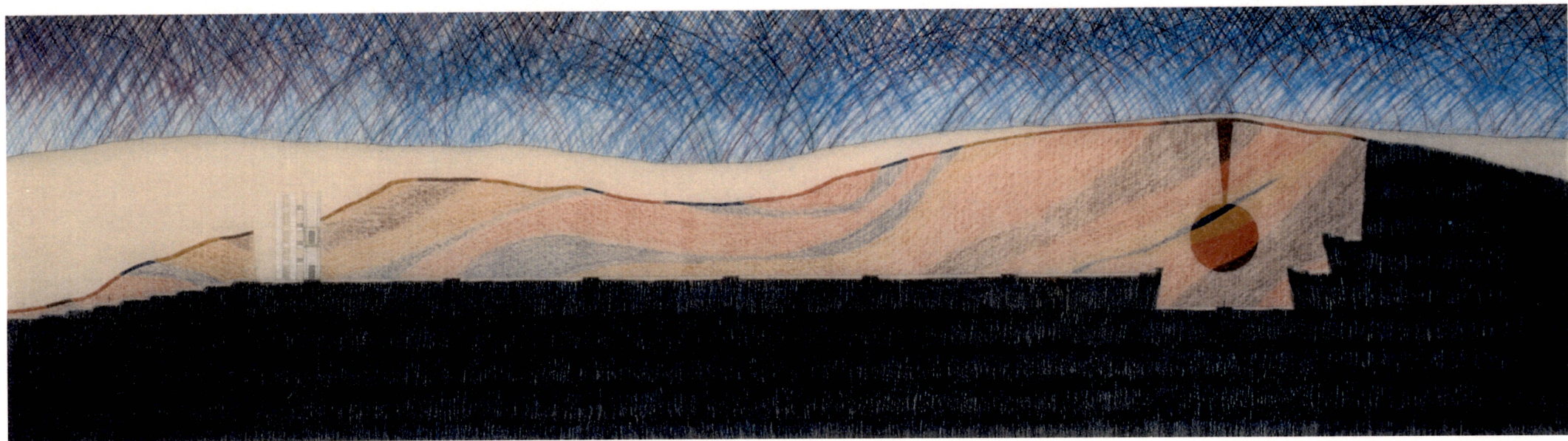


Figure 4



Section through path looking South



Section through path looking North

GREAT HALL : DATUM

The most striking aspect of the design for the museum of geology is the relentlessly horizontal path cut through the mountain creating both the architectural and geological datum.

The twenty-four foot wide path leads the visitor from the Entry Plaza, past the Towers and under the Gate, through the "Great Hall", and finally to the Theatre which terminates the axis. The axis follows the line determined by the two highest points of the site but maintains a constant elevation. Thus the visitor, who has walked from the parking deck and across the Plaza - both of which are elevated above the Earth - begins

his or her journey into the Museum of Geology along the datum with the walls of rock slowly rising above the path, bringing the visitor deeper and deeper into the Earth.

Conceptually, the need for the constant elevation of the path through the Great Hall is two-fold: it allows the visitor to comprehend the variations in the topography of the site by seeing the change in height of the rock walls as well as by sensing the changes in the quantity and quality of light which filters down to the path. Secondly the constant elevation of the path provides the geological datum to study the vertical displacement of the strata from its original horizontal position within

the rock walls.

Organizationally, the Great Hall ties all of the elements together. Each piece adds to the experience of being on the path. The Plaza is a gathering place for the Great Hall, the Gate is a threshold and grand entry, the Theatre is the terminus, etc. Functionally, the path is the circulation spine of the museum. Spiritually, the Great Hall is the nave of this geological cathedral.

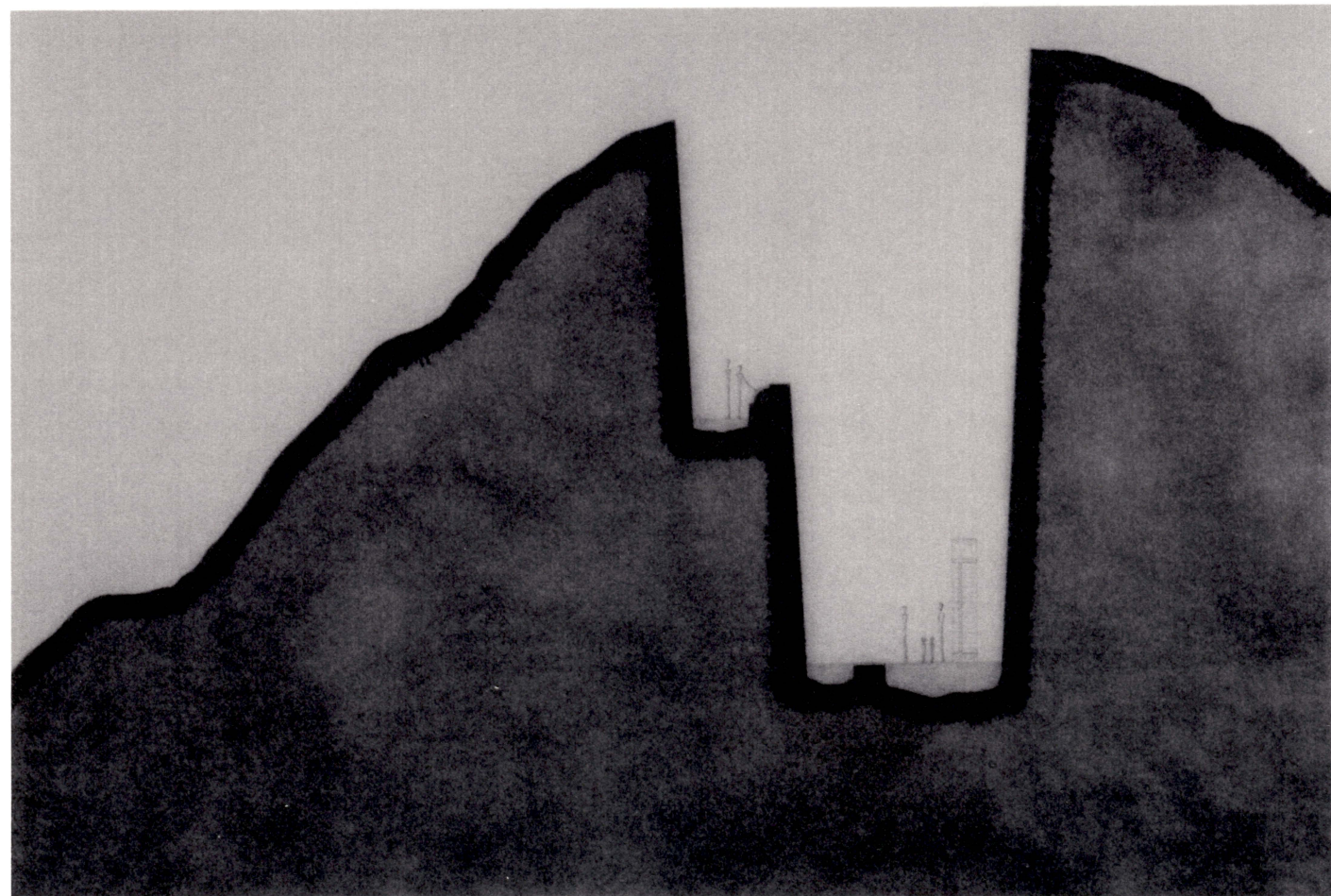
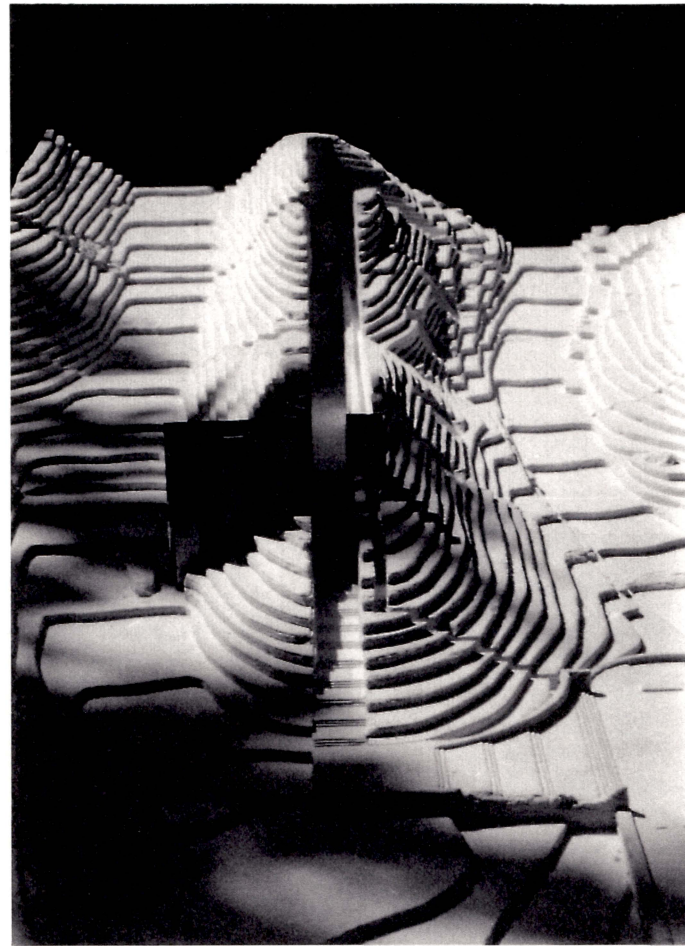
There is also a second passage which brings the visitor back to the gate and/or the parking deck. This passage is raised twenty-five feet above the main path, and separating the two paths is a large six foot wide handrail

DATUM (continued)

that is carved from the site. A continuous eighteen-inch horizontal strip of this handrail is smoothed and polished, and the visitor can closely examine and touch the rock which can be seemingly scaleless in other parts of the museum. Minute pieces of minerals, slight color differences, and variations in texture will be detectable on the polished handrail. It is for this type of personal study and reflection that the upper passage was designed.

Both paths and the areas surrounding the Towers, Gate and Galleries use gravel as the primary material for walkways. Carved squares of rock constitute the other walkway surface. It is the contrasting support beneath each footstep and the different acoustical qualities of each surface material that compliments the other. These walking surfaces are also a signal to the visitors that they have left the world above the Earth and outside the heart of the museum and have immersed themselves in the study of the materials and structure of the Earth.

It is the goal of the datum to tie together the elements of the museum while it draws the visitor deeper into the museum and introduces the methods, scales and structure of the site's geology.

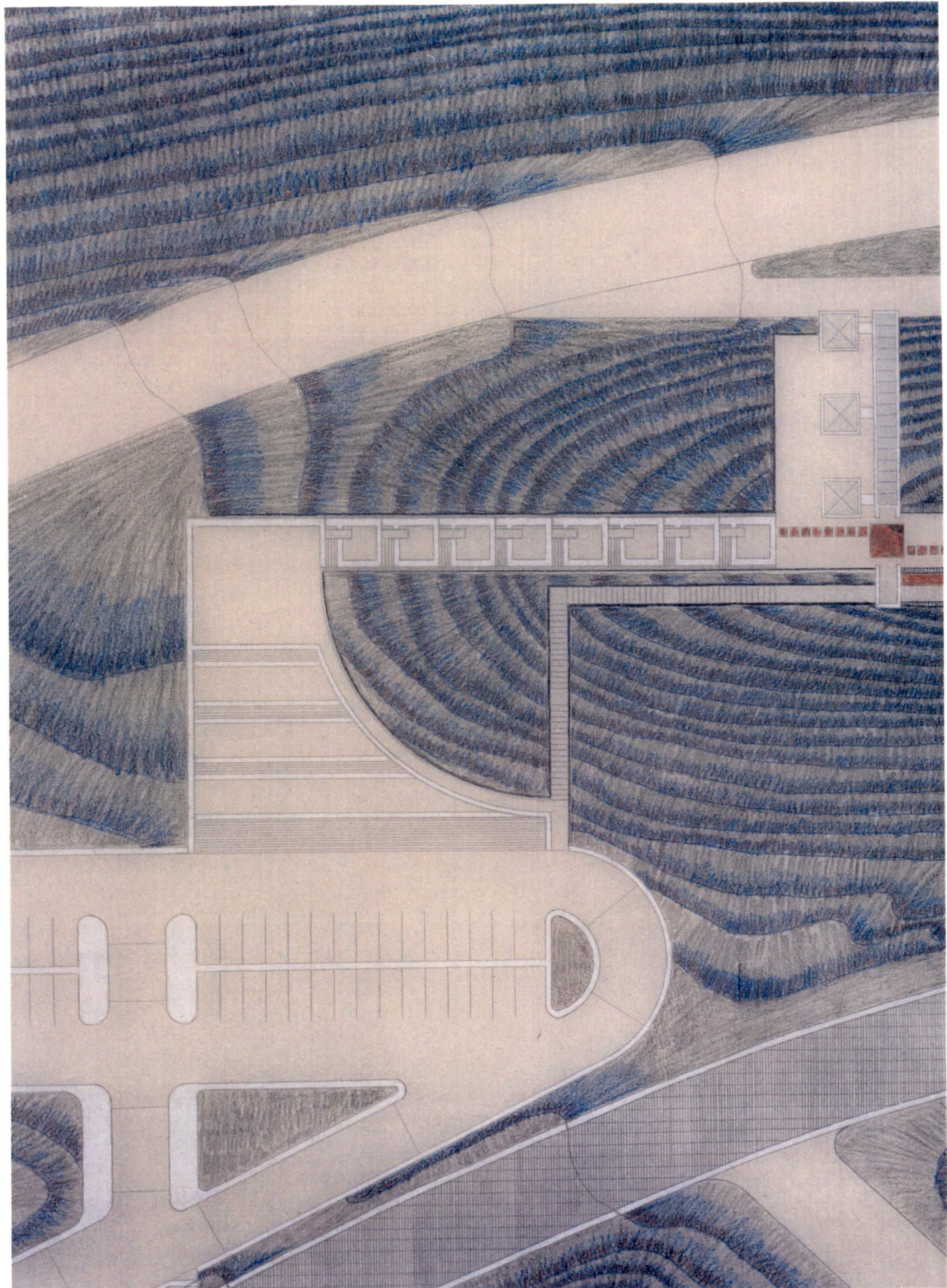


Above right: Two views of the datum in the model
Near right: Typical section through the Great Hall

ENTRY PLAZA

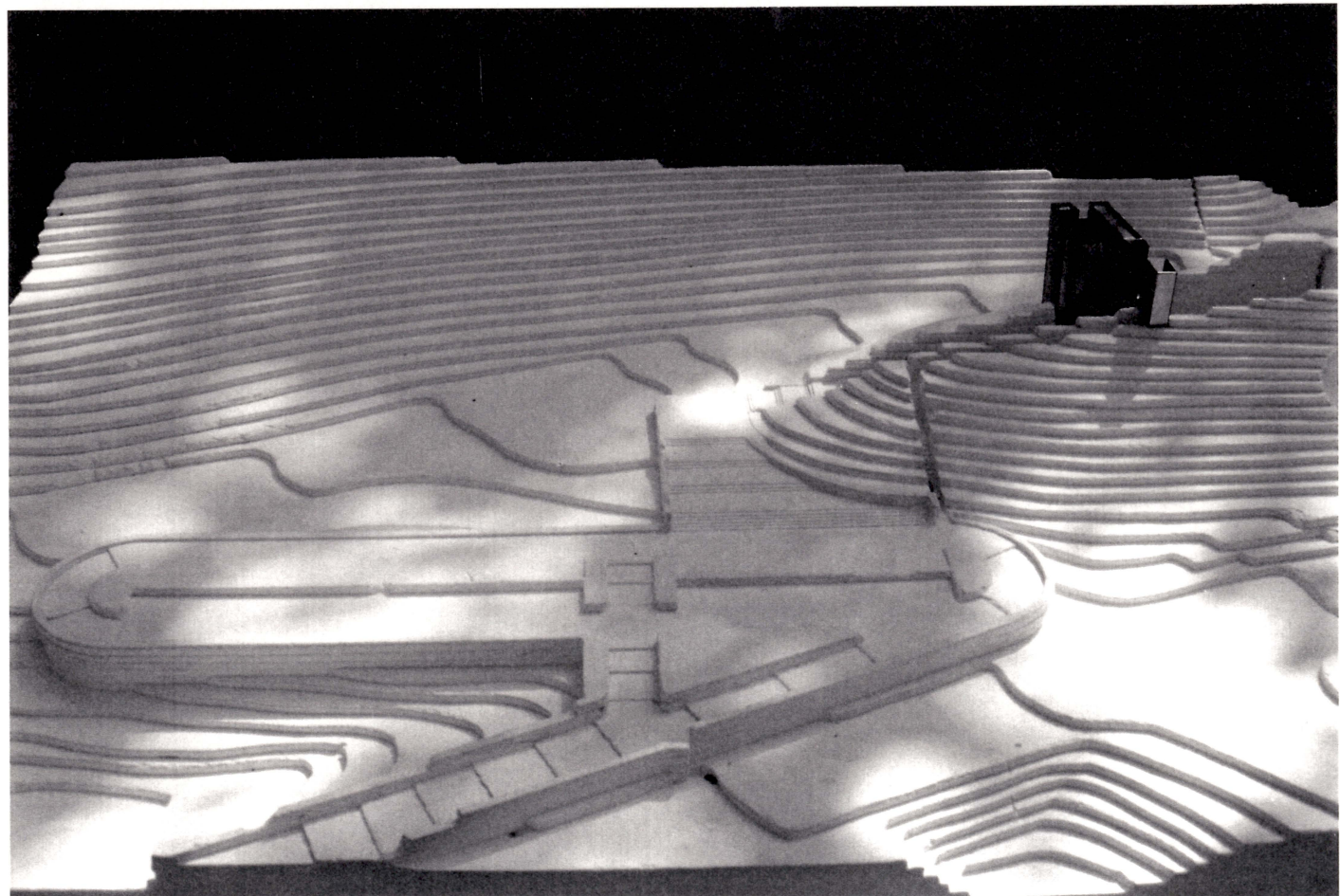
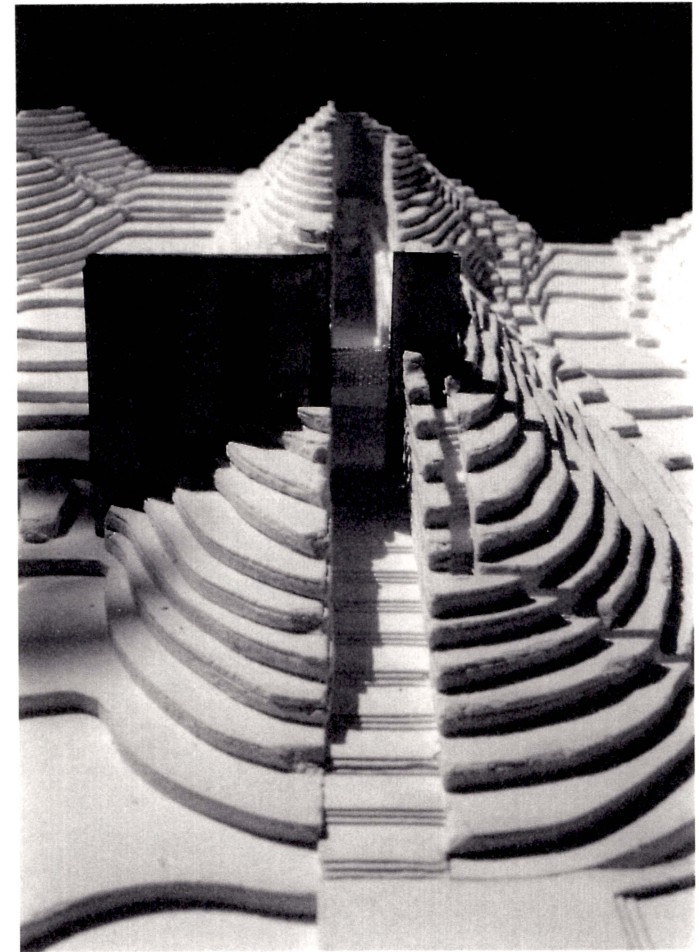
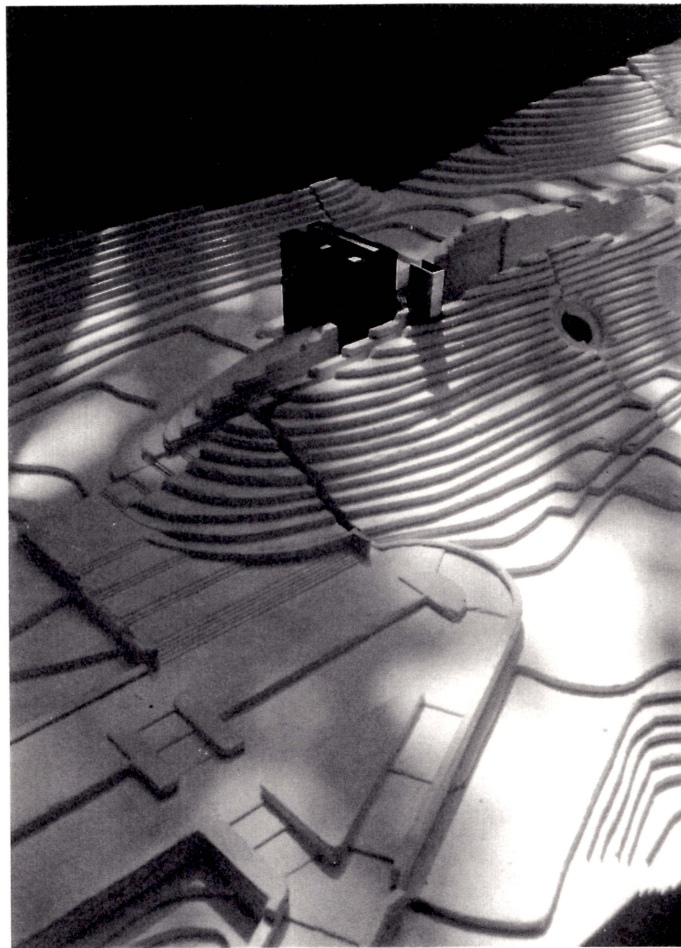
Walking from the parking deck, the visitor moves towards the concrete terraces of the Entry Plaza, marking the beginning of the path and datum. In addition to the terraces and steps, the Plaza is composed of a set of stairs leading from the upper passage and a ramp, both of which are used to isolate a portion of the hillside as the center-piece and ordering device of the Plaza. The plan shown to the right most clearly illustrates this.

From the top terrace, the visitor ascends towards the gate. It is at this point the visitor leaves the elevated floor of the Plaza and parking deck and enters the site.



Plan view of Entry Plaza

ENTRY PLAZA



At right: Three views of Entry Plaza

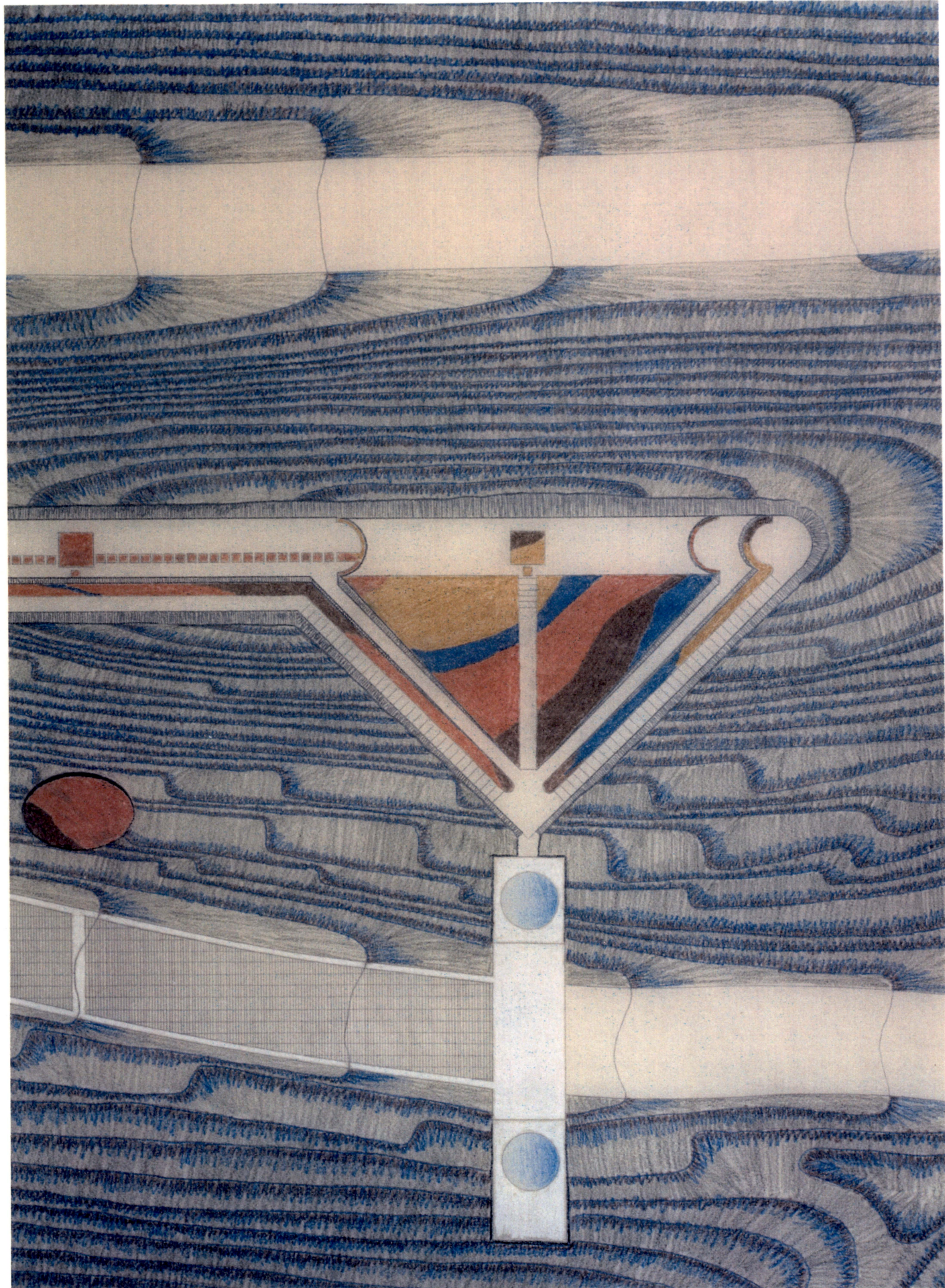
THEATRE

The climax of the journey through the Great Hall is the theatre. One dictionary defines a theatre as, "...an outdoor area for housing dramatic presentations..." The theatre of the museum of geology was design to accommodate performances as well as display the geological drama of the site.

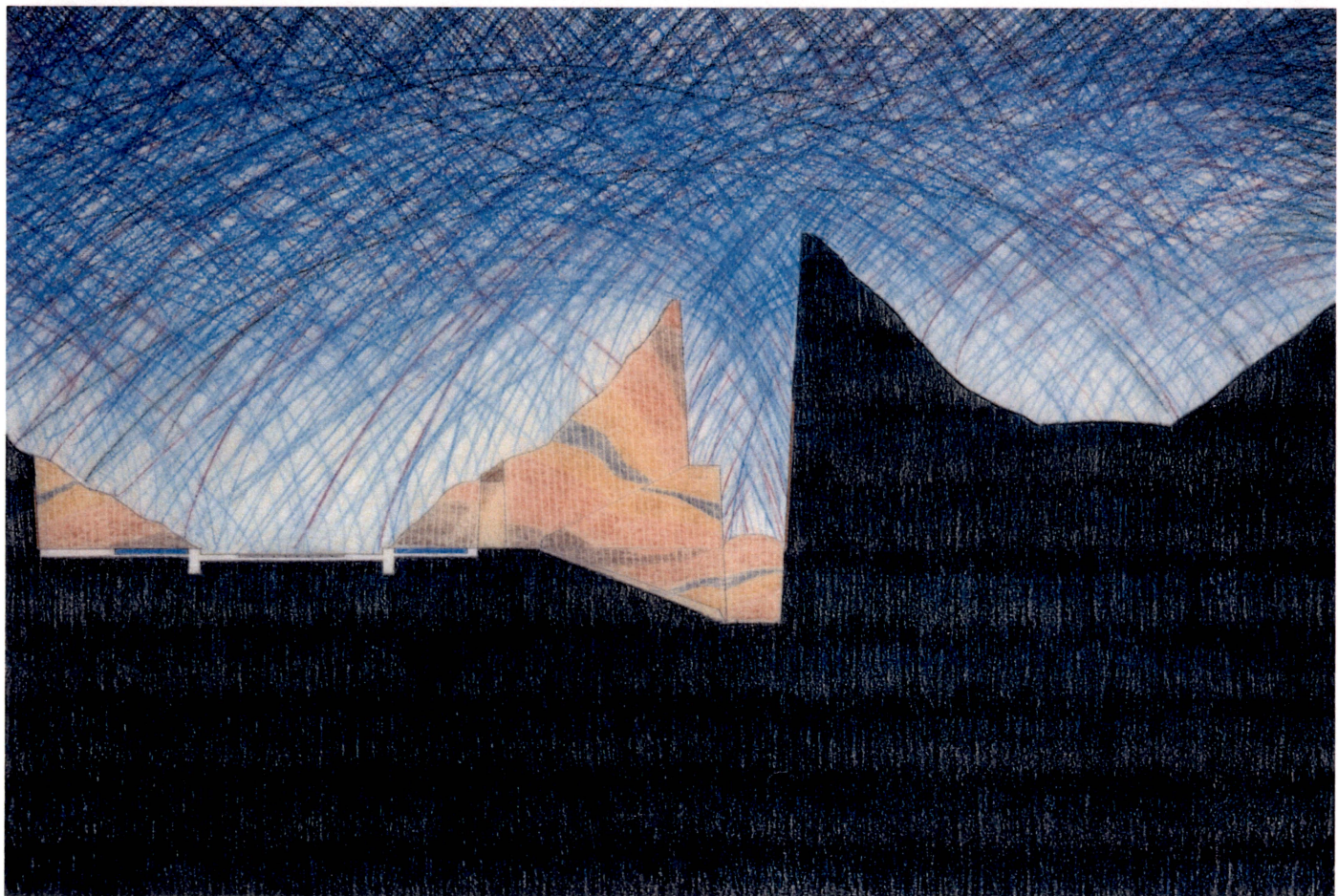
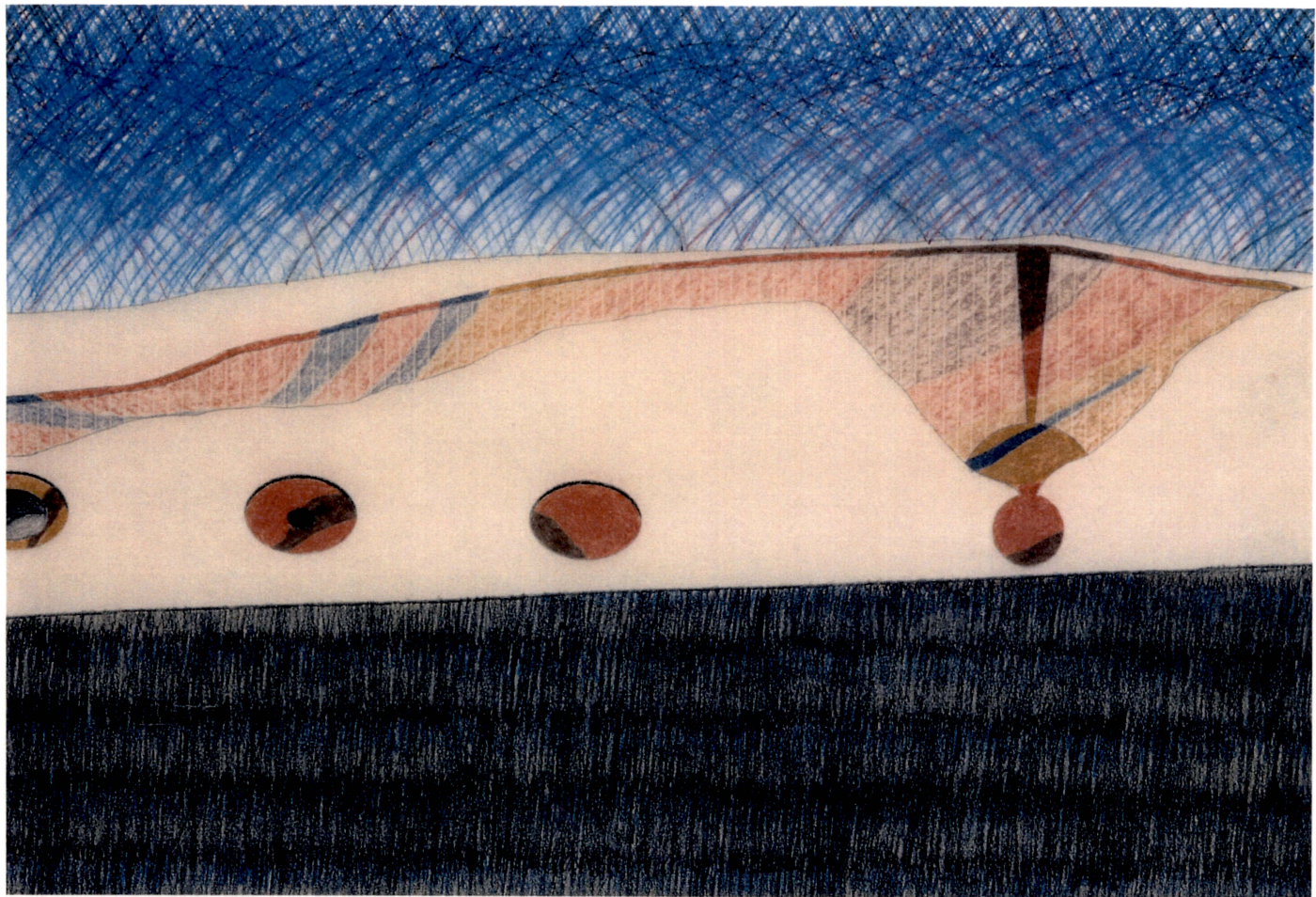
Leaving the Great Hall and following the outer edge of the theatre, we find ourselves at a large oculus that looks South across reflecting pools, the highway, and then in the direction of a polished disk of rock. The same (or similar) types of rocks and patterns of strata seen in this disk will also be visible in the immense polished disk which can be seen looking North through the oculus. The repetition of the patterns of strata in the opposing disks is a reminder that the void of the theatre and the void created by the construction of the highway were once a continuous mass.

The theatre's oculus is the climactic point for the highway travelers Eastbound on Rt. 30 who do not stop for the walking tour of the museum. The surface of the highway switches from asphalt to metal grating at the point perpendicular to the Entry Plaza. The metal grating is then punctuated with smooth section of concrete that are aligned with the polished disks on the exterior of the galleries. The last strip of concrete marks the alignment of the disks, reflecting pools, and the theatre's oculus - all of which, including the theatre itself, are centered on the highest point of the site.

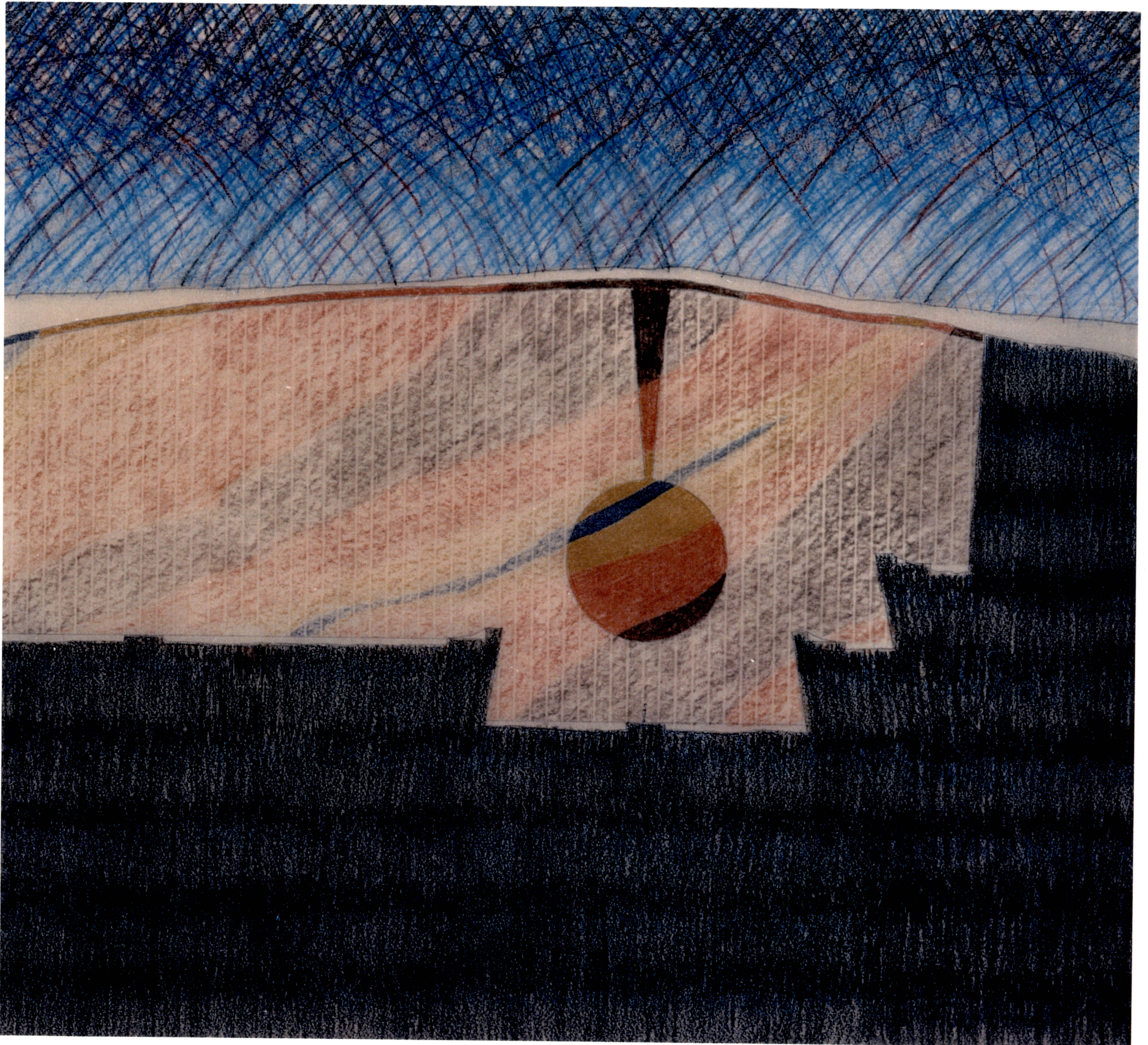
Looking North towards the wall behind the stage, we can view the immense disk as a source for the font of polished stone that erupts and follows the edge of the hillside. In the areas surrounding the disk and along the walls of the Great Hall, we can also distinguish the vertical scars left by the drilling utilized in the controlled blasting techniques used commonly to remove large portions of rock during highway construction.



At right: Plan view of Theatre



*Above right: Section through Theatre looking North
Near right: Cross-section through Theatre
Next Page: Section through Rt. 30 E. looking North*

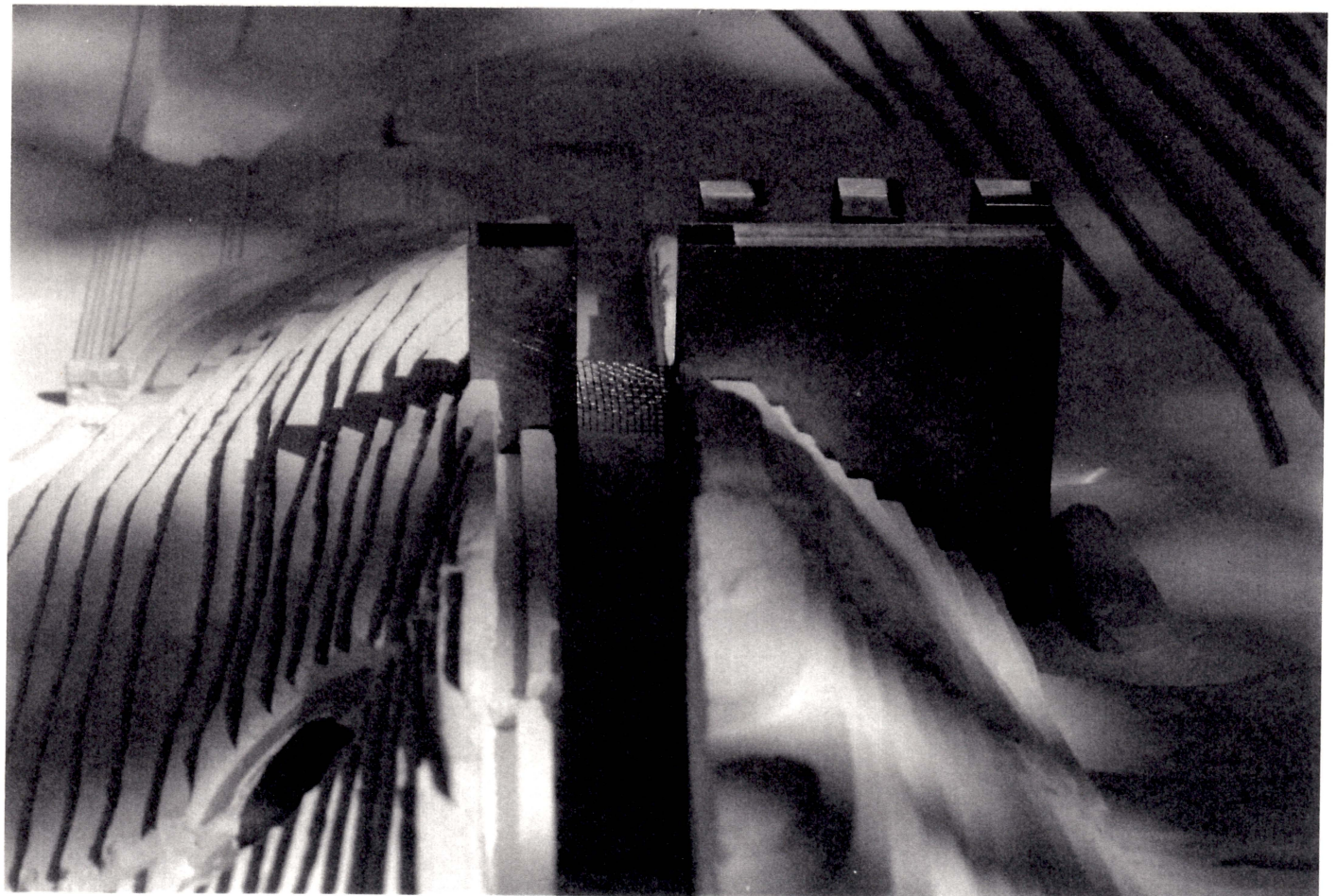
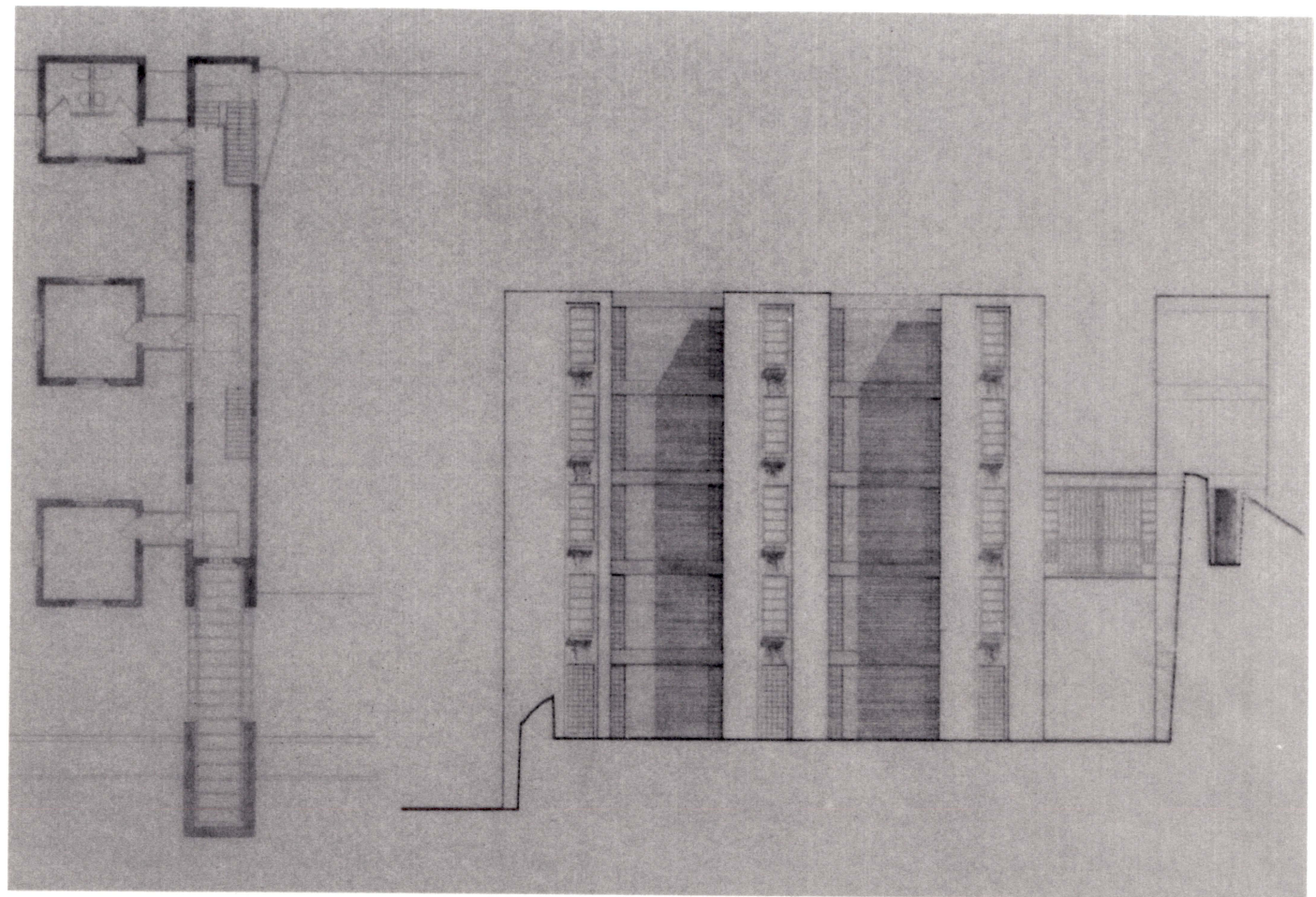


GATE & TOWERS

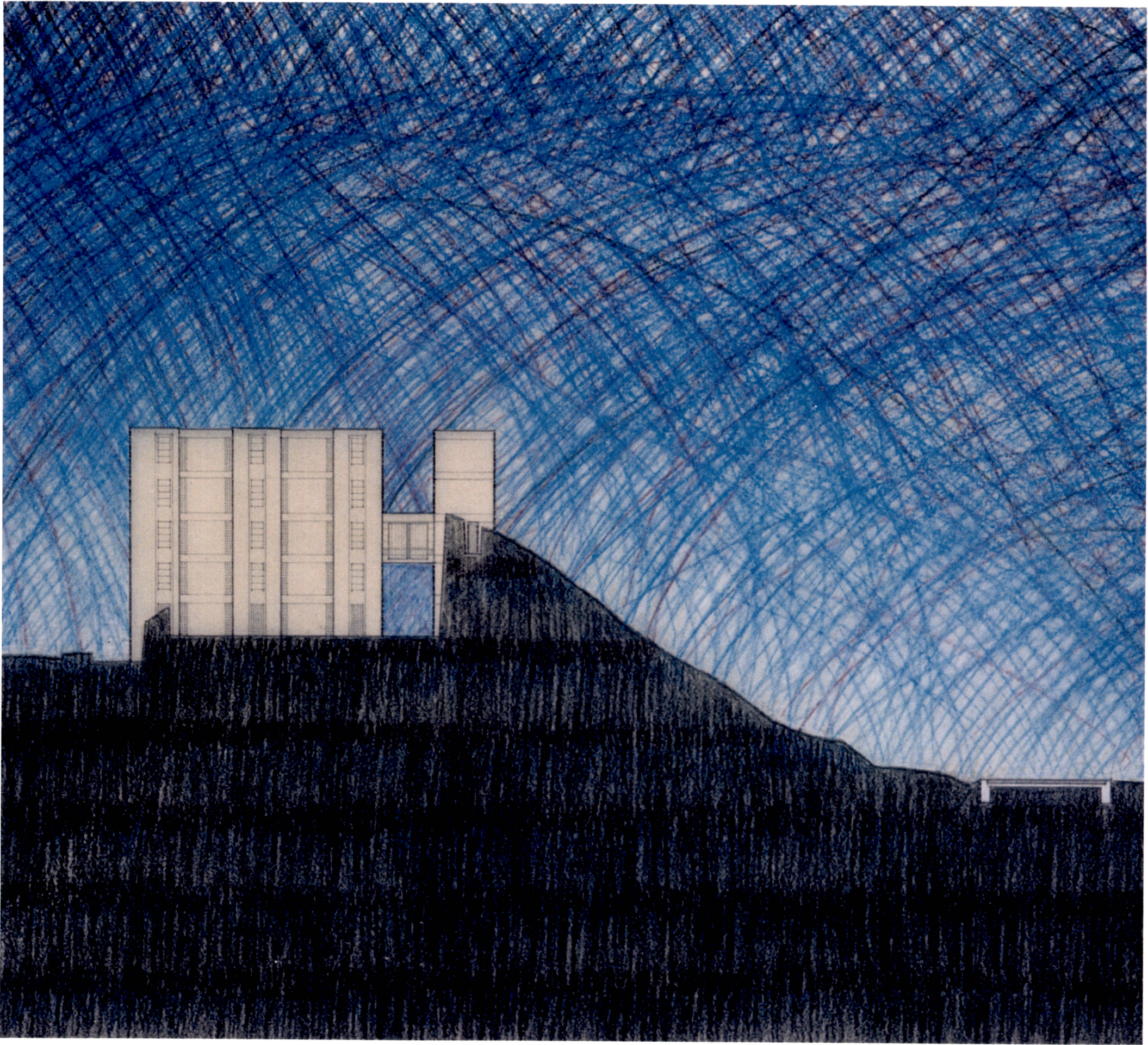
The Gate is the symbolic entrance to the Great Hall in addition to being the primary transverse circulation element.

The raising and lowering of the gate also controls access to the Theatre, Galleries, and the Great Hall. When lowered, the visitor can still access the towers, but can only catch a glimpse through the orthogonal metal grids of the gate to the Great Hall beyond. When raised, the gate bridges the third floor of the towers to the upper passage of the Great Hall while also opening the main path of the Great Hall to the public. The raising and lowering of the gate would only occur once a day.

The Towers house the necessary functions of a museum: offices, restrooms, gift shop, etc. As a form, the tower acts as a foil to the massive, horizontal nature of the site and the path. It is also a constructed, additive form that reaches up from the site rather than the subtractive forms of the Galleries, Theatre and Great Hall which are necessarily rooted to the structure of the Earth.



Above right: Plan and elevation of Gate & Towers
Near right: Model view of Gate looking West
Next page: Cross-section showing Gate & Towers



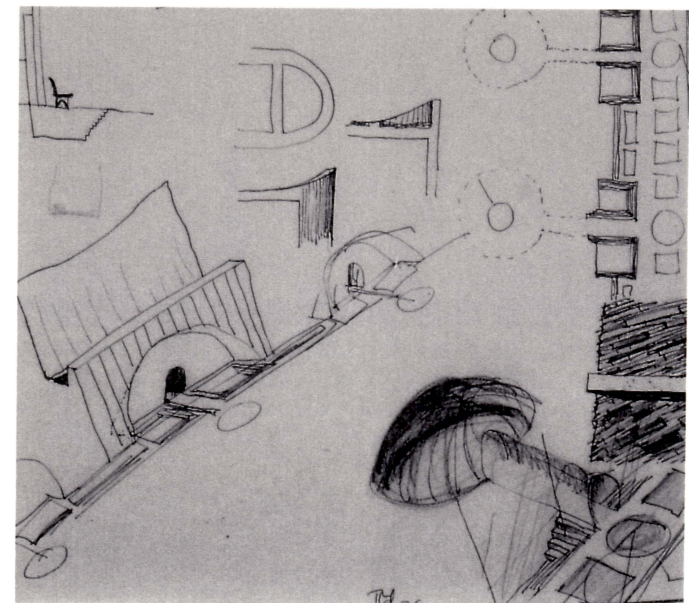
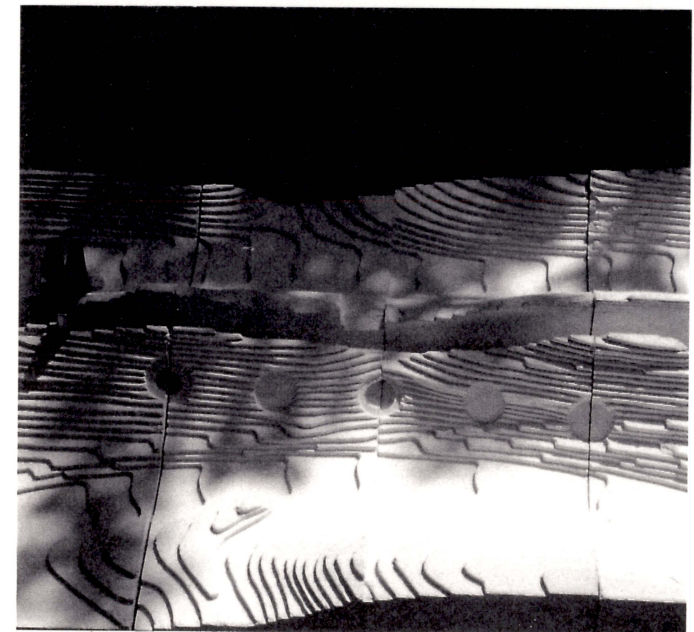
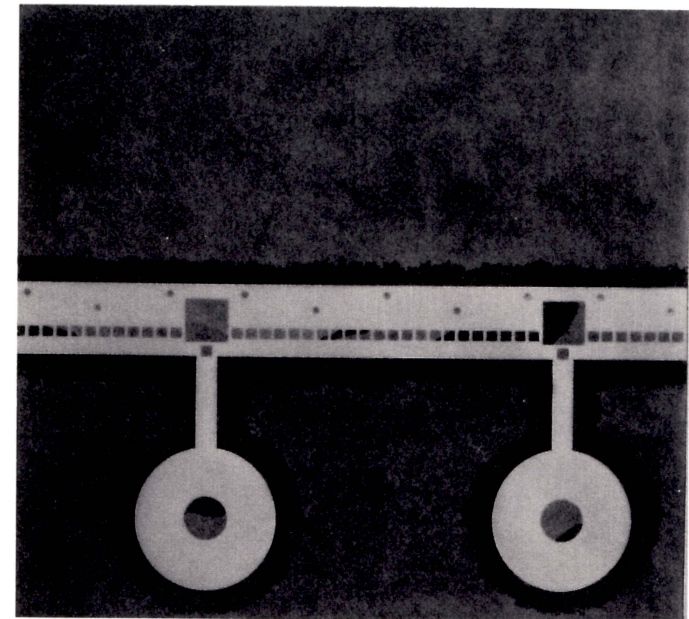
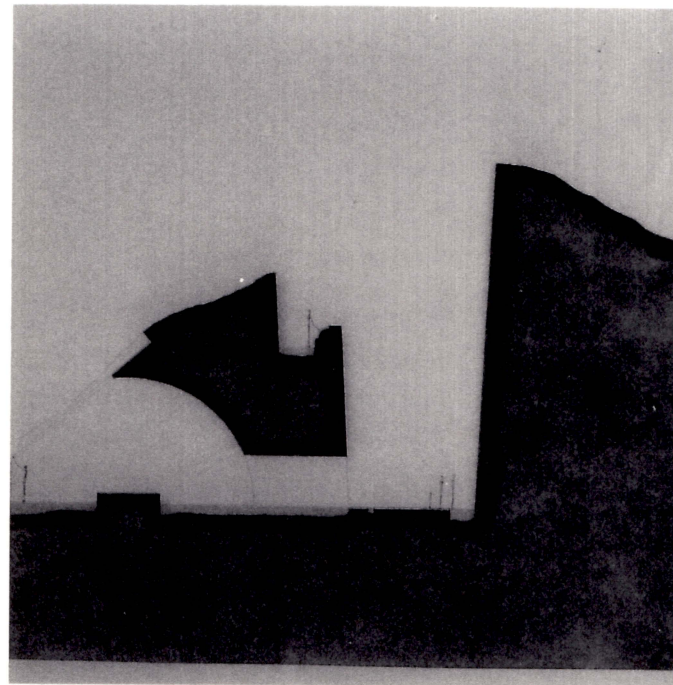
GALLERIES

Along the path the visitor finds five entrance tunnels which lead to the domed-shaped galleries - a respite from the overwhelming scale of the Great Hall and Theatre. Each of the five galleries is a place to study more thoroughly a smaller portion of the site.

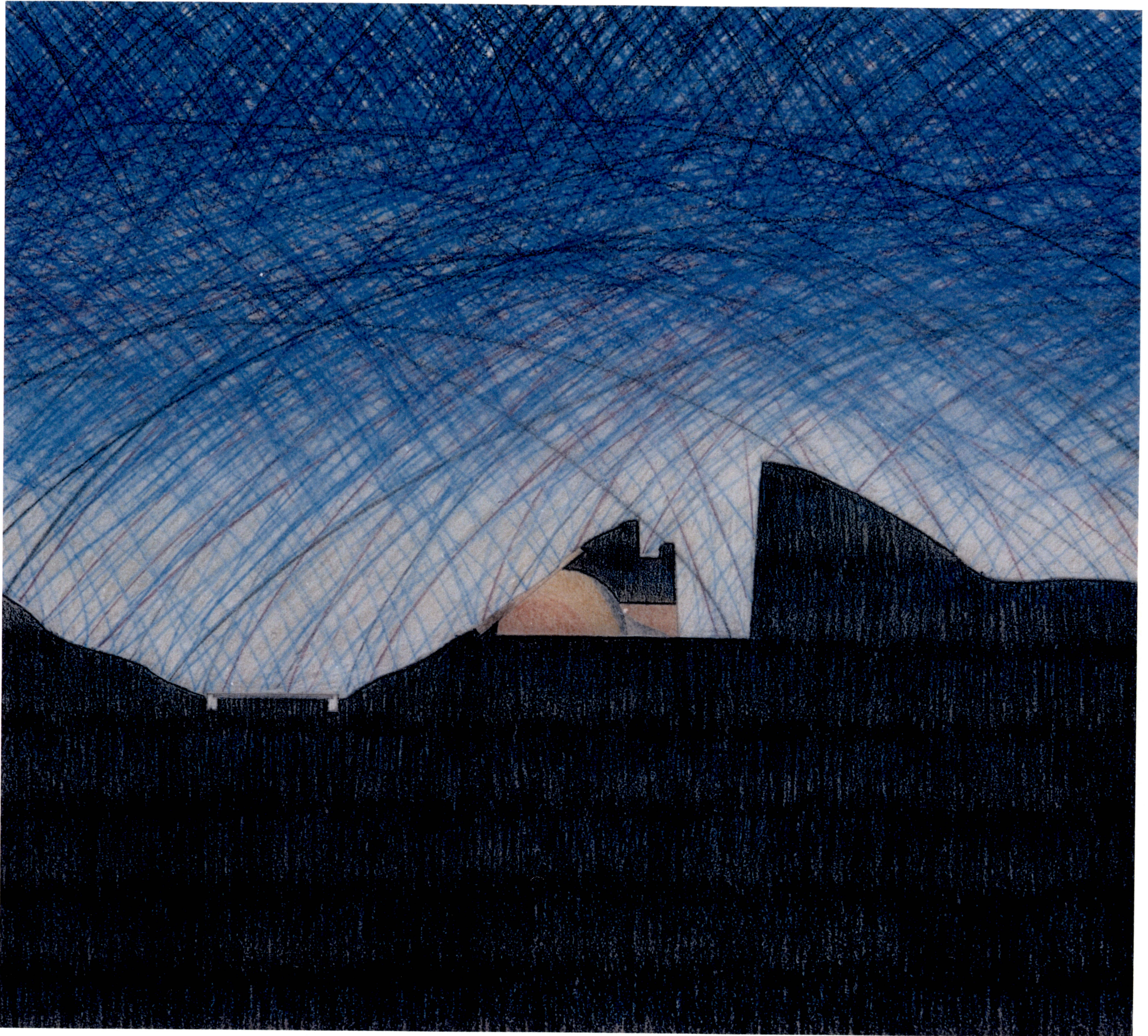
Structurally, the dome shape of the galleries is the most efficient and effective form to withstand the compressive forces of the rock. The shape also is also an opportunity to study the three dimensional displacement of the strata from its original horizontal plane. The sheer walls of the Great Hall can only examine the vertical displacement.

The dimensions of the entrance tunnel and the diameter of each dome is identical. The introduction of the polished disks along the exterior of the hillside that also remain consistent in elevation and diameter but follow the topography of the site create a varying size oculus at the intersection of these two forms. The sections pictured to the near right show the extremes. The lower section to the near right depicts the only condition which the dome and the disk do not intersect at all. This varying diameter of the oculus in each of the galleries informs the visitor of the changing exterior topography while still within the museum. The quantity and quality of natural light entering into the galleries, tunnels and filtering into the Great Hall will also differ from gallery to gallery. The oculus in each gallery is a window to the movements and cycle of the celestial world.

To the highway traveler, a small portion of the museum is revealed in the sequence of disk and dome intersections.



At right: Plan, section and model of Galleries
Next Page: Cross-section through Gallery

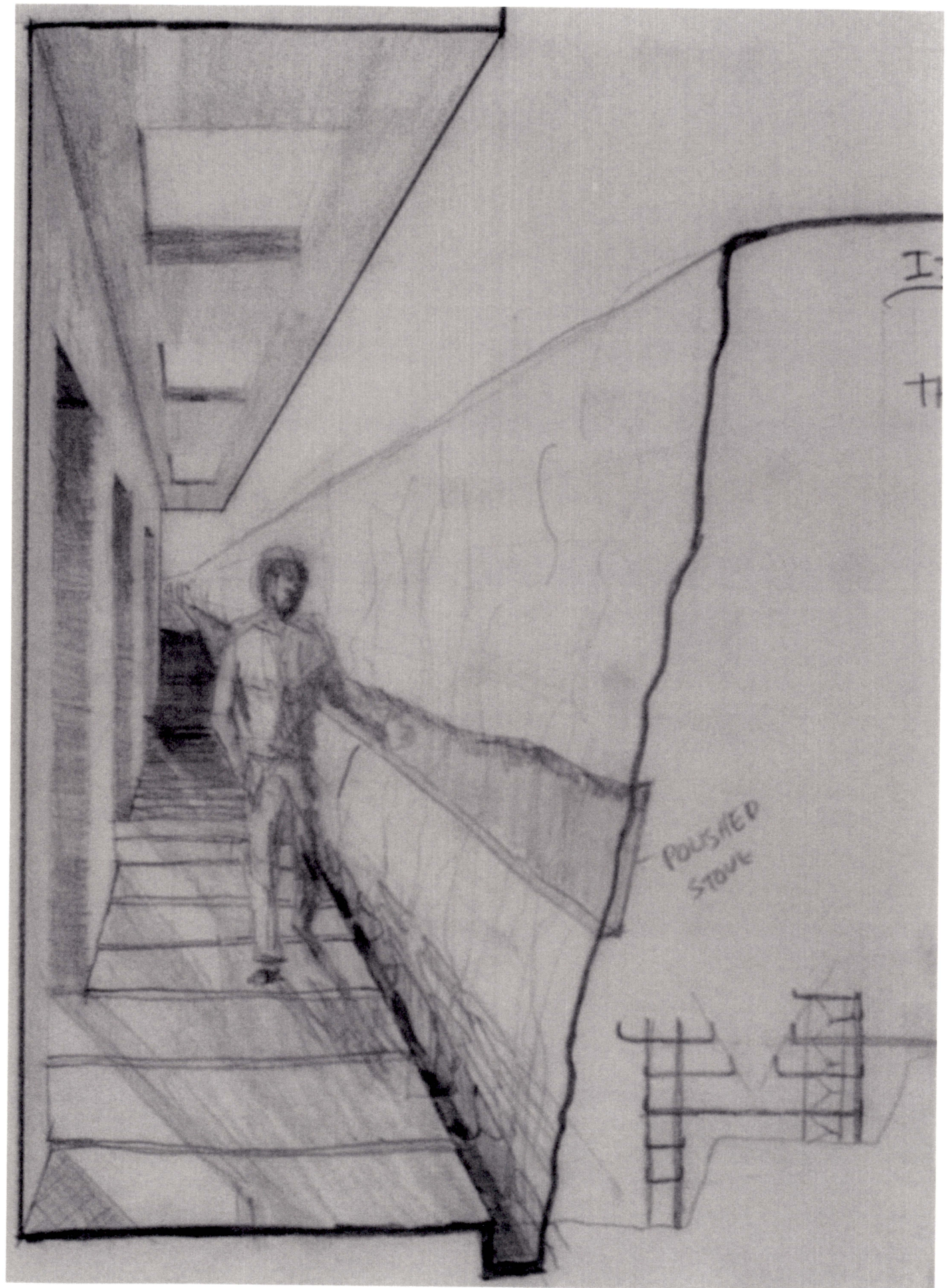


CONCLUSION

Here nature itself reveals its hidden order, and only asks man to make it more clearly manifest through building. (5.)

The design of the Museum of Geology for Breezewood, Pennsylvania pursued the role of Architecture in the process of bringing the science of Geology to the everyday experience. It is here that the public is being asked to join the geologists of the past and present to look again at our Earth and ask questions, make interpretations and wonder anew with an impassioned curiosity.

In this Museum of Geology it is the architecture which leads this journey. All of the elements working together to re-present the world of science not as a specialized esoteric endeavor, but as an integral part of our lives.



At right: Sketch of an initial idea for the path

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1. Seamon, David. "Geographic Experiences and Being-in-the-World: The Phenomenological Origins of Geography," Dwellin Place & Environment. p16.

2. Geike, Sir Archibald. The Founders of Geology. p38.

3. Seamon, David. p20.

4. Seamon, David. p19.

5. Norberg-Shulz, Christian. Genius Loci: Towards a Phenomenology of Architecture. p165.

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ABSTRACT

People cannot be trained to marvel at landscapes, nor to love their places and their planet. On the other hand, love of place and of the Earth are scarcely sentimental extras to be indulged only when all technical and material problems have been resolved...

The experiences of places, spaces and landscapes in which academic geography originates are a fundamental part of everyone's experience, and geography has no exclusive claim to them. Indeed, one of the first aims of a phenomenology of geography should be to retrieve these experiences from the academic netherworld and to return them to everyone by reawakening a sense of wonder about the Earth and its places. (1.)

Designing a place which reawakens a sense of wonder of the Earth becomes the mission statement for this design thesis: a place which emphasizes the very real and immediate experiences which we share with the land (and landforms) that can not only support our daily existence, but can soar above us to heights which inspire myth and imagination; a place which uniquely reveals itself to each person promoting personal observations and personal interpretations.