REVEALING PLACE THROUGH PERFORMANCE:
A Seismic Research Center in Kaiti, New Zealand

by
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REVEALING PLACE THROUGH PERFORMANCE
Revealing Place Through Performance:  
A Seismic Research Center in Kaiti, New Zealand
Glendower:
The frame and huge foundation of the Earth
Shak'd like a coward...
I say the Earth did shake when I was born...
The heavens were all on fire, the earth did tremble.

Hotspur:
Diseased Nature oftentimes breaks forth
In strange eruptions: oft the teeming earth
Is with a kind of colic pinch'd and vex'd
By the imprisoning of unruly wind
Within her womb; which, for enlargement striving,
Shakes the old beldam Earth, and topples down
Steeples, and moss-grown towers. At your birth
Our granddam Earth, having this distemperate,
In passion shook.

William Shakespeare, Henry IV. part I.
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CHAPTER ONE
Introduction
"In Nature's infinite book of secrecy, a little I can read" (William Shakespeare, *Antony and Cleopatra* I-ii). If we all had the foresight of Cleopatra's Soothsayer, there might be little utility in engaging performance to intensify the experience of place that comprises architecture. However, too often our architecture serves to remove us from the environment we inhabit, and our "reading" of nature results in prepackaged conditions and experiences. Thus, there exists a strong impetus to develop a discourse in architecture that serves to identify and intensify the experience of the site.

Performance is a viable means of connecting with the environmental forces that exist in a site. It attempts not to control these forces; rather it urges the development of an architectural agenda to respond to them. It celebrates these powers and invites interaction with them. That this in turn shapes and defines habitation of the building emphasizes its implicit viability. The user of the building must engage both the experiences of the architecture itself and the experiences of the site as well. Specifically,
seismic, coastal, light, wind forces, and hill and valley, land
and sea, and access connections must be made. The
symbiosis of building and user must correspond to the
symbiosis of building and site, and likewise of user and site.

For this agenda to be advanced, a critical
understanding of site, of environmental forces, and of
performance is anticipated. This thesis suggests a test
case, an architectural experience founded upon such a
critical examination. The program is specifically a small
seismic research campus, set in a splendid valley along the
coast of Poverty Bay in Kaiti, a suburb of Gisborne, New
Zealand. The site selection, the process of which is
described fully, served to locate a region where these
environmental forces would be particularly relevant, and
where cultural limitations and preconditions would not.
Actually, the lack of an implicit cultural, (e.g. urban), status
quo is a veritable hindrance to the creation of an
architectural place. The architecture must rely partly on
invention, the process of which is also detailed, and as a
result, the architecture remains somewhat ambiguous and
for lack of a societal measure, non-critical.

The concept of performance is itself vague.
However, a sincere effort is made to define it concretely. In
recent years, a field has emerged in the study of performance theory, with goals to identify patterns of performance, or what theoretician Victor Turner terms "universals of performance." From these patterns emerges a definition that bears strongly on the theoretical work of Artaud and Brecht, and on the staged work of the Prague school and the Absurdists. In all, performance relies on several critical criteria: transformation of conscious understanding of reality, direct physical activity or action, (with a given intensity and sequence), and interaction between "performer" and "audience," (with particular importance placed on reception and evaluation). These criteria can be applied to all performance, from contemporary staged drama to tribal ritual, to child's play, and indeed to the actions of a building in its environment.

Herein exists another essential paradox that remains not wholly resolved in the thesis project: the need for specificity of an explicitly vague quality. Whereas an intrinsic element of the performance of natural phenomena is the essential randomness of their action, the process of employing performance as a design tool champions a far less random method of definition. Again, ambiguity is the mitigating factor in the design.
More concrete than the overall philosophical employ of performance are the specific physical and geological processes at work on the site. The design benefits strongly from a methodical understanding of the structures of the earth’s crust, and of the actions of light, wind, and tide, which are all summarized. Through this understanding of physical actions, complementary behaviors are anticipated in the building forms, which potentially serve to mirror the direct environmental actions, and hopefully intensify those actions.

Herein lies the critical heart of the design at the intersection of physical behavior and performance. While only basic principles of these physical forces are analyzed and employed, they provide a magnificent stage for the actions of the building. Likewise, the actions of the building serve as a vital datum for measuring, appreciating, interpreting, and otherwise understanding environmental actions. This is the critical symbiosis mentioned above between building and site. With the introduction of the user, there exists the basis for a critical cultural identity. While tending partially toward invention, each specific tectonic element in the design serves a double purpose: intensification of an environmental fact, and intensification
of an experience of place. This union forms, in effect, the critical basis for evaluating the design; in other words, this characterizes the cultural experience of the site.
CHAPTER TWO
Site Information
CHAPTER 2
SITE INFORMATION

SITE HISTORY

"Then take me disappearin' through the smoke rings of my mind, down the foggy ruins of time, far past the frozen leaves, the haunted, frightened trees, out to the windy beach, far from the twisted reach of crazy sorrow."1

-Bob Dylan, Mr. Tambourine Man

The site, on Sponge Bay, lies at the end of Sponge Bay Road, 4 kilometres north of Gisborne in the suburb of Kaiti. Gisborne is a small city, once the center of a great sheep packing and shipping community, and now a regional capital and agricultural hub. It is the easternmost city in New Zealand and the first city in the world to greet the new sun each day. This, coupled with its reputation for clear weather have earned it the nickname "the first city of the sun."

Gisborne itself is rich with history for it is in fact the first landing site of Captain James Cook, whose Endeavour first brought European settlers pakeha, to New Zealand, in
1769. This event was not wholly unnoticed by several tribes of Maori, who themselves had emigrated to New Zealand from other parts of the Pacific some 500 years prior. The Maori too landed near Gisborne, at several sites on the east cape, and were well established throughout northeast Aotearoa, (New Zealand). Two tribes settled in the Gisborne area, the Ngai Tutekohi, and Ngati Ruapani. An old Maori map of Sponge Bay gives it the name Papawhiriki, and indicates the site of a marae, or meeting house, probably for the Ngati Ruapani family. The "Pa" suggests that the site was deemed sacred, and even today, zoning maps indicate the presence of a Maori burial site midway up the East hill. A wide beach and barrier islands in Kaiti served as a suitable landing site for Cook, however, he found little raw material of value and sailed "out of the bay which I [Cook] named Poverty Bay because it afforded us nothing we wanted."2 That name exists today, along with a cultural mixture of Maori and Pakeha; Gisborne today is 50% Maori.3

In time, Gisborne grew as a frontier town at the gateway to the East Cape. As lands were cleared, its harbor rendered it a regional hub of farming and herding. Whaling operations were established along its beaches

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3. ibid.

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(8) Maori map of Sponge Bay, ca. 1900 showing location of Kanuitara Pa
(9) Exterior of Maori marae, Tiki Tiki, East Cape

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(10) Maori map of Sponge Bay, ca. 1900 showing location of Kanuitara Pa
(11) Exterior of Maori marae, Tiki Tiki, East Cape
and in the 1880's Sponge Bay briefly served as an informal whaling camp. The clearing of the harbor was extended greatly, and Sponge Bay grew again in importance to the city of Gisborne. Tuamoto Island, a small island off the coast, was destroyed and removed to clear the harbor. At the eastern end of Sponge Bay, Tuaheni Point marked essentially the entrance to the harbor. A lighthouse was built, though it no longer exists, and pilot markers were laid in the Bay.

While the maritime interests of the site were expanding, so too were the farming interests. At this time, land clearing and farming activity were growing quickly. About the turn of the century, the land at the end of Sponge Bay Road was purchased from the Maori by the Knowland family, who established a small sheep farm. Their farmhouse today is home to the eldest granddaughter and her family, and although they still own a small flock of sheep, they lease their farmland to other sheep ranchers.

That is essentially the state of the site today. The New Zealand Government purchased land at the other end of Sponge Bay Road for a practice rifle range for the Army. At the Pacific end, the site is used as a rocky surfing beach.
The rest remains formal and informal paddocks for sheep and cattle.

Photos by William Crawford, first mayor of Gisborne
(13) Sheep shearing, Rangatira Station, 1893
(14) Dipping sheep, Whataupoko station, 1895
(15) City of Gisborne from Kaiti Hill, 1885
(16) Work on harbor breakwater, 1889

(12) Surfer on Sponge Bay Road

Notes:


3Ibid.
(17) Poverty Bay
"It is shaped, sir, like itself, and it is as broad as it hath breadth; it is just so high as it is, and move with its own organs..."

Shakespeare, Antony and Cleopatra.

When sheep walk up a hill, they walk along the side of the hill, not directly up its face. Thus the slopes of the hills have developed an interesting stepped character. Steps range from two to twelve feet wide separated by one to four feet vertically. Myriad paths connect these steps, and about 80 feet up the eastern hill, a wider road has been made. The valley remains very fertile property, once fed by a stream bed to the sea.

The valley itself has a general North-South orientation, its southern exposure to the sea, its northern toward town. The hills themselves are quite steep. The East hill rises at a 20° slope to a height of 400 feet; the West hill rises at 25° for 280 feet. These hills are the highest in the near vicinity and have thus served as important navigational landmarks. They are well dotted with survey marks and beacons. The thesis proposes to
advance this role with a small network of communication towers to connect the seismic center to seismic telemetering stations around New Zealand and the Pacific Rim and to other centers around the world.

The hills descend directly into the sea, and their Southern faces, particularly of the East hill, offer pertinent reminders of the erosion forces of tall sea waves and ocean winds. Little vegetation, save some brambly bushes, grows on the bottom third of the hills. Rather, slipping rock faces rise to about 100 feet, where a wide well-traveled sheep path moves along the slope. Above the path, grass grows in pockets that rise more gently to the summit ridge. Actually, this 100 foot level path gets quite wide in places and acts nearly as a secondary datum on the mountain. This characteristic is well-emphasized in the design.

At present, much of New Zealand is given over to grazing animals - sheep, cattle, and deer. Thus extensive forest clearing has taken place, and vegetation on the hills consists mainly of wild grasses, mowed continuously by hungry sheep. Where trees cannot serve as architectural demarcations, fences exist. By in large, the fences run straight up the steepest face of a hill, leaving the more navigable regions open to grazing. Hikers are encouraged
to cross fences with the placement of simple steps. This makes the hills of the site accessible to tramping along the coast, a common New Zealand pastime. The design encourages this activity by emphasizing the 100 foot datum, and connecting the two hills at that level with a bridge. Thus the site could be experienced as part of a walking track, in a larger progression along the coast North to Makorori Beach, a popular wide public beach, and South to Gisborne, not too far away.

The more direct access to the site, along Sponge Bay Road, offers direct connection to the informal beach at Sponge Bay. However, given the rocky conditions, this beach is suitable only for surfing, and that sport is better accommodated at North Makorori. Nevertheless, a walk along the beach, manageable at low tide, is a thoroughly rewarding experience, particularly as one approaches Tuaheni Point.

The various rock strata slip diagonally and reach out into the water, perpendicular to the coastline. These rock "fingers," on the microcosmic scale, reflect ocean waves and direct water into small, informal tidal pools. On the face of the hills, these diagonal strata reveal the geological history of the site, with various slips and discontinuities.
REVEALING PLACE THROUGH PERFORMANCE

Reading the Site

(24)
Layers of silt and sand collect between more permanent layers of rock and these softer, newer soils continuously slide and change with respect to the calcified tertiary rocks. In a larger sense, the valley can be viewed as one of the fragile layers, held in virtual tension between two hills formed by tilted slabs. This quality, too, is explored in the design.

The three major forces affecting the continuous erosion and change of the valley are the sea, the rain, and the wind. While the valley surface is about twelve feet in elevation above the beach, the boundary between the valley and the beach is perpetually bombarded by waves and wind. According to the Knowlands, a fence along the beach needs to be moved inland every few years. At the base of the hills inland, the reverse phenomenon, a sifting, takes place. Rain water washes down the mountains and deposits mud and topsoil, fertilized by sheep waste, at the edges of the valley. In this deep, very fertile soil, trees take root and grow very quickly. The deforestation of the hills for grazing has increased erosion from the hills, and made this effect somewhat more pronounced. A small grove of trees exists at the foot of both hills. As many of the trees as is possible will be retained in the new development of the site.
however, their presence is more important as a reference to natural erosion processes than it is itself a formidable environmental force or detail.

Much more critical as a force affecting the site is the passage of light throughout the day. Given that the valley is oriented North-South, it is awash in dominant North light most of the day. Gisborne sits at latitude 38° south, much the same as say, Washington D.C. In summer, (December 21 through March 21), the sun shines at as much as a 75° angle at the middle of the day. Given that the mountains do not shade the valley much except at early morning and late afternoon, the opportunities of a wide, open site are available and accommodating. The project explores the ability to "capture" North light with East-West walls, that reflect light down into the bodies of the building masses.

Finally, in reading the site, one must consider the seismic forces that continually shape the site. New Zealand is bisected by the boundary between the Pacific Plate and the Indian Plate. This boundary crosses New Zealand in the East on the East Cape, just North of Gisborne. The Pacific Plate moves generally westward, while the Indian Plate moves generally northward, resulting in a tilted, non-vertical boundary, much deeper in the west than in the
east, where the plates meet only 15 kilometres below the surface. Since most earthquakes occur at plate boundaries, it is easily understood that earthquakes in the East tend to be shallower and earthquakes in the West tend to be deeper. A map of earthquake activity confirms this assumption.

Earthquakes lose energy as they travel through soil and rock, and therefore, shallower earthquakes tend to be felt more, and in effect, though they do not necessarily release more energy than deep earthquakes, they tend to cause much more surface shaking. Moreover, wave propagation is greater in softer, alluvial soils than in harder, older rocks. The valley is vastly alluvial in composition. Finally, as waves, earthquakes are subject to reflections and local distortions off harder materials. Peel Street in downtown Gisborne is always the most damaged street in Gisborne in an earthquake, because it sits in an alluvial trench, and receives reflections and wave magnifications, off nearby greywacke under other parts of the city. At the site, the valley may be subject to similar wave distortions and magnifications, as earthquake L-waves, P-waves and S-waves reflect off the harder strata in the mountains.
All these factors place Gisborne among the most seismically active regions in New Zealand. Regional faulting in Wellington make the capital more prone to serious damage, but in terms of numbers of earthquakes and their intensities, Gisborne is very active, feeling several thousand earthquakes a year. A large number of side faults, emanating essentially at the plate boundary are evident in the vicinity. In fact, geologists have mapped a major side fault which passes straight through the valley and into Sponge Bay. The thesis emphasizes the seismic anomalies of the site, particularly the increased propagation through the valley, and potential reflections of waves.

Upon reading the site, one understands some of the environmental forces that continually shape and define it. An analysis of light, wind, access, terrain, geology, and land/sea, hill/valley, and seismic properties reveals an exciting set of conditions to which the architecture must responsibly refer and react. These are the fundamental forces about which a veritable performance is anticipated. By building with forms that intensify these experiences, the architecture constantly reacts and changes to meet the changes of the site. Thus the architecture can exist in
spiritual symbiosis with the site. This thesis is specifically the engagement of that problem.
SELECTING A SITE

"...Is this the scene
Where the old Earthquake-daemon taught her young
Ruin? Were these her toys?"

-Percy Bysshe Shelley, *Mont Blanc.*

Of course, the "reading" of the site is made with guidance. The very selection of the site was decided in accordance with guidelines that would ensure that a varied and active site would be inhabited. Several critical factors came into play, from which an option of four or five sites was generated. A site visit to each of the sites highlighted the Sponge Bay site as optimal.

First, the site has to be in a major seismic zone. Upon studying fault maps and shaking data for New Zealand, a particular seismic zone was established, bisecting the North Island diagonally from Wellington to Gisborne.¹ Noting that the depth of the plate boundary was much less in the East than in the West, and that much of the domestic fascination with earthquakes in New Zealand is in response to the major 1931 earthquake in the East, near Napier, the general Eastern coast of the North Island from...
Hawke Bay northward could be considered. Furthermore, seismic behavior on the microclimatic scale must be considered. As mentioned earlier, seismic waves propagate better through softer sedimentary soils, than older, more solid strata. The project stresses high levels of seismic activity, specifically long natural periods of vibration, and thus soft soils. Fortunately, much of the Hawke Bay and Poverty Bay region is basically alluvial in geologic composition and therefore subject to high wave propagation.

Second, the site has to be near an urban center. This constraint is generated principally through practical concerns relating to access, infrastructure, and most importantly, accessibility to public. Any performance depends critically on the interaction between "performer" and "audience." For the nature of the program, this audience consists mainly of visitors to the center, whose association with the architecture and with the site is not one of familiarity, but rather one of discovery and of education. Therefore, a somewhat transient audience is necessary to integrate vitality into the experiential qualities of the architecture. This necessitates convenience to a population center. On the east coast of New Zealand, there are three
major population centers--Napier, Hamilton, and Gisborne. The site selection process highlighted sites near these centers.

Third, the site has to be located on the coast. The exchange between land and sea is extremely active, and thus well suited to a study of the architectural engagement of dynamic environmental forces. Moreover, New Zealand's history is one of association with the sea, and herein exists a basis for a cultural datum, otherwise lacking in the program. This third criteria eliminates Hamilton as an optional region, therefore the process of site selection concentrated on the coastlines of Hawke Bay, near Napier, and of Poverty Bay, near Gisborne.

Finally, the site has to free of preexisting cultural constraints. Basically, this means the site should be isolated, certainly not in an urban setting. To achieve clarity in engaging environmental forces, other criteria ought to be subordinated. The urban environment tends to supplant random environmental systems with typically more ordered "urban systems." Thus, "environmental" forces in an urban setting tend to be these "urban" forces, for example as ordering systems, access conditions, edge conditions, and to some extent massing. A site divorced from these
constraints can support a program and a tectonic behavior that in a sense is more elemental, and certainly more direct with respect to the environment. Thus, the site selection process eventually highlighted specific bluffs near Napier and near Gisborne, at Tangoio, Whirinaki, Sponge Bay, and Makorori.

Of these sites, Sponge Bay offers the greatest environmental presence. Upon driving down Sponge Bay Road, one quickly distances Gisborne, and focuses directly on the actions of the beautiful and energetic site. Here is a valley created by and in synchronicity with the forces of the earth—seismicity, topography, the sea, and light. By building with tectonic elements that specifically interact with these forces, one has little need for "artificial" applied ordering systems such as are present in the city. Rather, one takes clues from the earth as to inhabitation of the site, and in turn one offers meaning and understanding to those forces.

Notes:

CHAPTER THREE
Design Proposal
Chapter 3  
DESIGN PROPOSAL

GENERATING A SITE PLAN

"The strong-based promontory have I made shake, and by the spurs pluck'd up the pine and cedar."

When one studies a map of a city, one senses the forces that continually shape and define that city. If the city is on a coastline, it will extend itself out into the water with piers, and it will reciprocate with water entering the city as waterways, canals, etc. It will build a protective barrier against the forces of the sea, but it will be permeable and controllable. In the massing of the city, one may in time sense the geological structure under the city. Generally, the better soil foundations tend to support taller, or more massive buildings. Although this effect is tempered with piling techniques, one can make the general case that cities can reveal their geological foundations through their massing. Moreover, as buildings do get taller, they tend to become slender, in deference to the wind. In a sense, at
the scale of the overall city, one can perceive the overall environmental forces that perform in that city. However, at the scale of the site, these actions are rarely revealed. This thesis proposes that at every level of design, these forces be considered. Thus the generation of the site plan must be considered in the context of "reading the site," just as the city responds directly to its "site."

Early "first pass" designs, which did not fully engage the site, stalled quickly. The initial agenda was one of using principles of seismic design to develop two semi-autonomous systems in a single building. At the exchange between the two systems, there was the potential for "performance," as the two systems would respond differently to an earthquake and establish a dynamic tension at their juncture. To achieve maximum response, the building was sited at the most seismically active part of the site, in the valley. This approach is singular and biased toward seismic response. It ignores the other forces present on a site, and offers little new information about the actions of the environment, even those of earthquakes. It offers only the response of a singular building to an earthquake, information which is readily available.

(37) Early model of building sitting in center of valley.
This process was quickly abandoned in favor of a more thorough reading of the site. An initial response to the reading is a series of abstract "force diagrams." While not directly informing physical forms, these representations characterize in part the agenda used to develop a site plan. They are principally an emotional response, helping to understand the forces that do exist, and more importantly, the actions of those forces when they encounter a physical form.

From these diagrams, it became apparent that the site must be considered in total, not just as a buildable valley. Like the city, each part of the site has particular actions that must be considered, and the exchange between one condition and another reveals even more information. Moreover, connections beyond the site became apparent as necessary information. The penetration of the valley by the road seems a useful precondition to accept. Likewise, the informal sheep paths suggest possible extensions beyond the site, particularly at the 100 foot level. The possibility of connecting the hills at this level was immediately manifested.

Other opportunities were likewise revealed. The exchange between valley and sea could be realized...
through extension of the valley into the ocean, or the excavation of part of the valley to bring the ocean in, or both. The habitation of the hillsides could also be considered with respect to the movement of sheep, with main horizontal registrations, along the contour of the hill, and principal vertical access directly up or down the face of the hill. These structures could also be related directly to the passage of the sun throughout the day, with some buildings oriented East to receive morning light, and other buildings oriented West to receive evening light. Finally, the potential for exchange between valley and hills was revealed through the option of cantilevering off the hillside, over the valley.

As this site plan developed, individual forms evolved to express and reveal specific behaviors. Given the overall seismic conditions of the site, the valley behaves as the main "staging area" for earthquakes. It is somewhat imprudent to build directly on a fault, so there are no buildings in the valley. Rather, the valley contains a large surface made of independent and uniform six foot square tiles that are not connected and therefore can move up and down independently during an earthquake. In effect, when an earthquake strikes, a series of waves pass through the
valley, displacing independent tiles as they pass. Because an earthquake can essentially be centered anywhere, earthquake waves can be travelling in any direction. Therefore, as a means of recording earthquakes, the valley configuration is circular, 800 feet in diameter. Finally, because the soil in the valley is so soft, it can be easily recompacted or pushed up. Therefore the tiles may not return to their initial position, and thus retain a history of earthquake action.

This new, somewhat fragile membrane in effect replaces the existing valley, and thus forms the new boundary with the ocean. Thus, the existing valley is partially excavated to the boundary of the circle, as a man-made bay. Out into this new bay is projected a walkway, pierlike on one side, and a wall on the other. This orientation of this wall reveals the dominant wave direction, and serves as a protective boundary protecting, to some extent the road. Moreover, this wall directs some of the waves into the bay, in effect amplifying them.

While the waves terminate at the circle, the water is continuous under the valley. To reveal the water table, a circular pool is excavated from the valley. In an earthquake, this pool serves another purpose, as a measuring stick in a
sense. While the earthquake is occurring, the entire valley is in a state of violent upheaval. When it is over, the water in the pool returns quickly to a placid water table level, while some of the small slabs of the valley floor remain permanently altered. By retaining some of the valley as effectively unchangeable, one generates a measurement off which successive deformations can be compared. Finally, the pool can reveal tidal changes to the water table. In the pool is a circular wall upon which a salt trace will be left as the tide changes. This wall is animated by reflected light off the pool, and serves as a backdrop to an informal amphitheater on the East hill.

Hovering above the valley are six small research "buildings," large rooms, 30 feet by 50 feet cantilevered 300 feet off the mountains and supported by cables. These research nodes behave as horizontal pendula, modeled after similar devices, (at a much smaller scale) used in seismometers to record earthquakes. They are each connected with a pinned joint to a large concrete cylindrical shell, located at various positions and elevations in the hills. During an earthquake, the buildings themselves will not move. However, the shells to which they are attached certainly will move as they are connected to the ground.

(42) Top, transcurrent faulting affected an orange grove in California, 1940.
(43) "Slip pile" structure of floor slabs on individual piles inside caissons.
The resultant inertia will cause the nodes themselves to oscillate. Given their heavy mass and length, they can be expected to have long periods of oscillation, and thus they would be in motion for several days after an earthquake. As they move, they scribe arcs articulated in the valley floor with vertical elements spaced every 13 feet or 5° of the arc.

Each pair of cantilevers is connected at the summits of the hills with a vertical tower, which serves a dual purpose as a communications/radio tower. These serve a vital programmatic role to receive telemetered signals from seismic centers in a geodetic monitoring station network being established in New Zealand. Furthermore, with the advance of satellite communication, they can connect the center to stations all over the Pacific Rim and the world.

Built in a similar manner as the towers at the tops of the hills, two towers at the base of the hills at the ocean side support a cable-stayed pedestrian bridge at the 100 foot datum established by the sheep paths. Given that the southern end of the valley is excavated to bring the ocean into the site, a bridge becomes justified in connecting the hills, as it crosses over land and water. Moreover, the bridge span is supported in tension by cables, which serves as an intuitive indication of the tension that exists between...
the two hills on the site. In reading the site, diagonal strata were observed on the faces on the hills. Interpreting these strata, one understands the valley as a fragile sedimentary layer, apt to change with relation to the hills. Therefore supporting a bridge on walls in compression offers little evidence of the geological structure of the valley. Supporting the bridge in tension reveals to some extent the geological fragility which characterizes the valley.

This bridge connects the hills at the 100 foot datum, from which all the buildings are accessed. This datum is reinforced with retaining walls along both hills. The buildings themselves are massed within retaining walls. Where possible, walls, particularly East-West oriented walls, extend vertically above the building and the mass is separated from that wall by several feet. This open space is retained as a light well to bring light down into the mass of the building. Vertical access is by towers with elevators and with stairs that run directionally down the face of the hills. Supplemental egress stairs are also included. The elevator towers, are basically a service core, which serves a vital role structurally as a shear collector for base loads. The rest of the structure is basically a ductile moment frame construction that does not actually connect to the external
retaining walls. If necessary, base isolation systems could be easily employed in this system to further reduce the seismic load on the structure. Thus the energy of the earthquake is not as readily transferred in a direct path to the habitable spaces and the buildings should survive earthquakes very well. Specific retaining wall construction is not detailed, however, the site will be terraced to reduce the amount of earth to be retained by the walls, thus requiring a simpler construction. At no point does the building mass more than three stories between the walls.
BRIDGE IN THE LANDSCAPE

"The bridge swings over the stream 'with ease and power.' It does not just connect banks that are already there. The banks emerge as banks only as the bridge crosses the stream. The bridge designedly causes them to lie across from each other...It brings stream and banks and land into each other's neighborhood."

Martin Heidegger "Building, Dwelling, Thinking."

The bridge serves primarily to connect one mountain with another. The very earliest sketches of the site recognized the ability to connect the hills with a bridge, but it was only after careful study of the site that the location along the ocean face of the mountains was selected. In terms of the project, the bridge frames the view of the ocean as one drives along the road, but most importantly, it helps establish a secondary horizontal reference (in addition to the valley floor). The form itself could only be generated in conjunction with the development of the towers, but it is based on several design criteria.

As discussed earlier, the bridge structure must be in tension. This is particularly true given that the span
between the hills is 800 feet. This basically limits the options to a suspension structure or a cable stayed structure. Considering the bridge in context with the rest of the site, it seems more appropriate to employ a cable stayed style, particularly with respect to the cantilever system. Initial attempts tried to establish a strong system of cables in a horizontal tensegral net configuration. Two nets were considered, separated vertically by 40 feet, with the span held between them. Walking along the span, one experienced the tension in three directions. This experience was intensified by the support conditions at either end. The nets were secured at the top and bottom of a massive circular wall. One descended from the 100 foot level, crossed through the wall, and emerged between the nets. Thus to complement the experience of the tension, one was compressed, an experience which became another criteria for the development of the bridge.

The net bridge was quickly arrested by the technical infeasibility of developing so much tension in an essentially horizontal net. The structure behaves like a guitar string; it is under extreme tension in one direction, yet offers little support in the other, and could certainly not survive seismic loading constraints. To counteract this effect, the walls
became taller, to the point that they completely subordinated the landscape and defeated the obvious advantages of a tension structure for long spans.

A cable-stayed system with towers and concentric cable configurations is employed. The towers lean diagonally back, expressing the tension between the hills. The cables anchor into the ground quite far from the towers to give mechanical advantage to the cables. The overall distance between the furthest cables is 1250 feet, whereas the span between the towers is only 500 feet. This also benefits in connecting beyond the immediate site along a coastal path North and South. Thus, the bridge serves not only the pragmatic concerns of the immediate facility. Finally, the secondary criterion of compressing the access to the bridge is achieved by again descending at either end down a long ramp and passing between two slender towers. In conjunction with the other elements on the site, the bridge reveals hidden forces of tension in the landscape. In short, it performs in its site.
REVEALING PLACE THROUGH PERFORMANCE

Bridge in the Landscape
RESEARCH NODES, PENDULA, AND TOWERS

"...strange places cram'd with observation."
- William Shakespeare, As You Like It

The idea of cantilevering over the valley emerged in conjunction with the overall development of the site plan. All attempts are made in the site architecture to reveal the valley as a fragile membrane that will constantly deform in relation to passing earthquake waves. This serves not only as a "performing floor," as poetically intended, but also as a valuable research tool in observing earthquake focusing and behavior. However, in an earthquake, the floor will deform once and principally settle again in a new position. There is a desire to generate a form that will undergo a more sustained deformation as well. Cantilevering over the valley constitutes habitation of the valley but defies connection with the Earth in the valley, which reinforces the concept of fragility. Moreover, cantilevering allows for a critical exchange to be made between the hills and the valley. Most importantly, the cantilevers themselves relate directly to the actions of the earth. An earthquake induces in
them a swing which, given their scale and mass, should be sustained for several days following a seismic event.

The final forms emerged directly from a study of the history of seismometers. The form derives directly from a Press-Ewing horizontal pendulum, which is commonly used as a short-period seismic measuring device. Yet, they are based on criteria that preceded the research into seismic monitoring devices. Even at the first pass, the research center was not connected through a foundation to the Earth. It behaved rather as a ship, essentially "floating" in a large bed of soft sand, and thus free to move with the actions of the Earth. The analogy to a ship was a recurring image in the development of the nodes. It is the basis of the first criteria: that a portion of the overall project should be free to move as the earth moves. There were initial structural considerations that informed this criteria. One reason buildings collapse is that the structural system attempts to resist the earthquake, but is not capable of doing so, and yields to the base shear forces instead. By effectively not trying to resist the seismic forces—a state of extreme ductility at the scale of the building, shearing stresses to not develop in the members and the building should survive. Of course, for this principle to hold, the building has to be relatively
small, or frictional forces will effectively offer too much resistance. Otherwise, the problem is basically inertial and large earthquakes should induce significant forces to move the building.

The second criteria is time-based. Some element of the project should retain some form of memory of the geological event. In the boat scenario, this was accomplished by arms that projected from the building and scribed marks in the sand, however that device did not in any way affect the architecture of the building, or more importantly the experience of being there. It was simply a device, with a specific, though abstract purpose. All of these concerns are well served with a pendulum structure. Pendula record inertial energy and sustain that record for a long time. It is expected that even a moderate earthquake would induce motion in the pendula. Moreover, by extending over the valley, the nodes become an ideal perch from which to observe the overall actions of the valley floor. By indicating the arcs of swing through markers in the valley, a more direct exchange is established. Finally, the booms that hang over the valley help to generate motion throughout the overall site by framing passage and establishing horizontal strata that
activate the section of the hillside. The first element one encounters when approaching the site is a pendulum, visible around a bend in Sponge Bay Road. The road passes directly under two of the booms. Likewise the entrance to the residential building is framed by crossing under a boom. Finally, a boom passes directly under the bridge, and directly over the walkway out into the ocean.

Once the form of the boom is generated, there exists the problem of connecting back to the hillside, with a form that will withstand incredible inertial forces, both from the Earth and from the boom. Initial designs aimed to make the connection back to the mountain at the summit, and thus reveal the height of the mountain. However, this poses stability problems in the overall function of a pendulum. In fact the cable should be pinned about a point closer to the mass than the point about which the boom pivots. Thus, the cable lifts the boom as it swings from center and that added potential energy converts to kinetic energy and maintains a swing. Given a long boom and a heavy mass, that swing could take days to dampen fully and stop.

Thus the cable should connect at essentially the same point as the pivot, and in the final form the two share a common structure. This is not to suggest that the cable can

(58) Plaster model of cylindrical boom support

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(59) 1:200 Model of public building (detail) showing cylinder with pulley compressed in rear slit.
(60) Inclined tower, Montréal Olympic Park
not in fact run up to the top of hill. It is merely pinned at the cylinders that support the pivot point. From that point the cables themselves change angles and continue up the hill at a shallower angle, more like the slope of the hill itself, and connect to towers at the top of the hill. The cylinder form is selected for its strength in all directions, and it references the large circle of the valley floor. Its foundation is quite deep and it literally punctures the earth, emerging to pin the booms back. In its final form, it expresses all the forces that act on it. For example, it tapers up from front to back, where the cable is attached. The cable itself is pinned by a pulley held in compression in a slit in the back of the cylinder. This slit serves also to bring light into the core of the cylinder and to allow passage onto the boom/bridge that leads to the research nodes. As the boom swings, to avoid striking the cylinder, it passes through another slit cut horizontally in the path of its swing. Overall, the cylinder is massive, and certainly expresses the strength necessary to counter the dynamic impulse forces of a swinging cantilever.

The towers, likewise express the forces acting on them. Similar in form to the bridge towers, they lean diagonally back, holding the cables and the booms in
tension. Programmatically, in addition to providing an anchor for the cables, they serve as radio towers, with antennas to receive signals from remote seismograph stations and to send and receive signals to and from satellites. In plan, a logical order is established, with each tower anchoring two booms. This also promotes a larger ordering system on the site, with the public building anchored by one pair of booms, the amphitheater a second and the west hill, a third.

Santiago Calatrava once said the plan expresses order, while the section expresses beauty.¹ In the towers, pendula, and research nodes, this facility is explored. While based on a fundamentally rational ordering system which help to generate regions on the overall site, each element is so designed to express in section the dynamic forces that act upon it. That these structures not only refer to their own forces, but react strongly to the Earth’s activity reinforces their role as performing elements in the environment.

Notes:

(62) El Lissitzky: Lenintribune, 1924

(63) Alexandr Deineka: In de Donbass, Tekening Voor Het Tijdschrift "Aan de Machine," 1925

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(61) Communications tower on hill near Gisborne

Next Page >
(64) Site plan (detail) showing pendulum, cylinders, and towers.
BUILDINGS AND AMENITIES

"They dreamt not of a perishable home who thus could build."

- William Wordsworth, *Ecclesiastical Sciences*

While program is underemphasized in the development of this thesis, it is certainly not ignored. Based on visits to existing seismological observatories in New York and in New Zealand, a rough program was generated that is housed in two large buildings on the site. The habitation of the buildings depends more on experiential qualities implicit in the tectonics of the building elements than on the program, but both issues are explored.

Both buildings are defined initially by large retaining walls that cut the hill on three sides, leaving the fourth side open. The containments then step down within these walls, supported mainly by a light secondary column and beam system. Elevator, stair and service cores then act as seismic braces, shear collectors which form a direct path for loads from the top back down to the Earth. The walls themselves act a fingers in the mountain, essentially connected at the 100 foot datum mentioned earlier, then
projected down into the valley. Their geometries emerge both from the contours of the hill and the system of horizontal access and circulation. Vertical circulation is achieved directionally and always associated with a long wall. The stair essentially acts as a wall itself with connections at each floor accessed by bridges to the body of the building. This allows for an open space along that wall. Walls are sited in relation to the sun, such that this major wall acts to direct light down into the body of the building. The fingers are connected at certain levels with bridges and at other levels with floors that sit perpendicular to them. These floors act as registration levels programmatically in the buildings, and they perform that function formally as well.

On the Northern face of the East hill is a more private building which houses some offices, some simple residences (for short term accommodation), as well as the communications core of the center. In all, it contains about 30,000 square feet, divided roughly as follows:

1. **Residences**: 30 @ 400 s. f. (12,000 s. f. total)
   These are basically short term accommodations, similar in program to hotel room suites. They
would include a living room with a western exposure to the valley and the sunset, a bedroom with an eastern exposure to the sunrise, and a small bathroom and galley kitchen.

2. Cafeteria: 4000 s. f. This would serve the entire faculty and staff of the center, which could be approximately 100 to 150 employees.

3. Offices: 6 @ 320 s.f (1920 s. f.) Most of the offices are in the public building, but some administrative functions are housed in the more private building.

4. Meeting/seminar rooms: 3 @ 1000 s. f., 1 @ 3000 s. f. (6000 s. f. total) These would serve for informal gatherings and small colloquia as well, and could be used in conjunction with the larger auditorium in the other building.

5. Communications center: 6000 s. f. Set apart from the other parts of the building is the
communications center, set in its own wing that sits on a wide ledge on the side of the hill, perpendicular to the finger buildings. The communications center is essentially seismically isolated through a base isolation system, as it houses extremely precision machinery. It has a large Northern exposure, and a tall East-West wall that directs light into its core.

On the Southern corner of the East hill, nearer the bridge, is the larger public building which houses offices, a library, an auditorium/lecture hall, and a public information center/museum. This design of the public building was explored more thoroughly than the other building, and much of the discussion will be left to the drawings and model. In total, it contains 45,000 s. f., divided as follows:

1. **Library**: 6000 s. f. The library contains two levels of stacks, one on a mezzanine, and a large reading room, as well as flat files with maps and computer and copy rooms. It has a generous Western exposure and brings light in along its Southern wall.
2. Lecture Hall: 4500 s. f. The 400 seat hall has a simple straight row seat configuration. It is closed on three sides, but allows light through a louvered wall on the North side. These windows can be blacked out with curtains if required, and the hall is treated with acoustic reflectors and a lighting bridge.

3. Public Information Center. 8000 s. f. This small museum sits on four levels, with a main level at the bottom, which doubles as a lobby for the auditorium. It sits entirely between two large walls and is open to circulation and light on both long walls. It includes a large area for press reception: in the event of a major earthquake in New Zealand, the campus would act as an information center, and thus it would certainly attract the press.

4. Offices: 25 @ 320 s. f. (8000 s. f.)

5. Meeting Rooms/lounges: 4 @ 1000 s.f. 2 @ 2000 s.f. Some of these are distributed among the offices to promote informal gatherings and casual exchange.
DESIGN DOCUMENTS

The following pages summarize the design proposal in drawings and models, some of which have already been seen.

Midterm Design (on following pages)

page 66, (72) midterm site plan
page 67, (73) midterm site model
page 68, (74) section across bridge
page 68, (75) section through public building
6. **Workshops, Records, and Archives:** 12,500 s.f. A considerable volume of seismic records are generated annually and these need a secure storage area. Moreover, this facility houses repair shops for equipment and storerooms for supplies. It is contained within its own shell that projects obliquely out onto the floor of the valley. Its roof acts as an open terrace.
(72) midterm site plan
(74) section across bridge

(75) section through public building
Final Design (on following pages)

- page 70, (76) site plan
- page 71, (77) final model
- page 72, (78) schematic plan showing major site directions and moves
- page 73, (79) schematic section showing major site directions and moves
- page 74, (80) site plan detail showing bridge and walkway into water
- page 75, (81) final model detail showing bridge and walkway into water
- page 76, (82) final model detail showing bridge tower
- page 76, (83) final model detail showing walkway into water
- page 77, (84) site plan detail showing pool and valley
- page 77, (85) final model detail showing pool from amphitheater
- page 77, (86) final model detail showing pool and valley
- page 78, (87) site plan detail showing cantilevers, cylinders, and towers
- page 79, (88) final model detail showing cantilever and cylinder
- page 80, (89) site plan detail showing residential building
- page 81, (90) final model detail showing residential building
- page 82, (91) site plan detail showing public building
- page 83, (92) final model detail showing public building
- page 84, (93) site section through bridge
- page 84, (94) locus plan showing section cut
- page 85, (95) site section through public building
- page 85, (96) locus plan showing section cut
- page 86, (97) site section through pool
- page 86, (98) locus plan showing section cut
(78) schematic plan showing major site directions
(79) schematic section showing major site directions and moves
(80) site plan detail showing bridge and walkway into water
(81) final model detail showing bridge and walkway into water
(82) final model detail showing bridge tower

(83) final model detail showing walkway into water
(84) Site plan detail showing pool and valley

(85) Final model detail showing pool from amphitheater

(86) Final model detail showing pool and valley
site plan detail showing cantilevers, cylinders, and towers
(88) final model detail showing cantilever and cylinder
(89) site plan detail showing residential building
(90) final model detail showing residential building
(91) Site plan detail showing public building
(93) site section through bridge

(94) locus plan showing section cut
(95) site section through public building

(96) locus plan showing section cut
(97) site section through pool

(98) locus plan showing section cut
Public Building (on following pages)

page 87, (99) 1:200 model
page 88, (100) Plan, level 5 - Entry
page 89, (101) Plan, level 4 - Library with Mezzanine, Exhibits, Offices
page 90, (102) Plan, level 3 - Offices, Exhibits
page 91, (103) Plan, level 2 - Offices, Exhibits
page 92, (104) Plan, level 1 - Exhibits, Auditorium
page 93, (105) Section through Gallery, Auditorium wing
page 94, (106) Model - North Elevation of offices
page 94, (107) Model - section through office/library wing
page 95, (108) Model - Cut-away view of Gallery space
page 95, (109) Model - Auditorium detail
(101) Plan, level 4 - Library with Mezzanine, Exhibits, Offices
(102) Plan, level 3 - Offices, Exhibits
(103) Plan, level 2 - Offices, Exhibits
(105) Section through Gallery, Auditorium wing
(106) Model - North Elevation of offices

(107) Model - section through office/library wing
(108) Model - Cut-away view of Gallery space

(109) Model - Auditorium detail
CHAPTER FOUR
Tectonics of the Earth
Chapter 4
Tectonics of the Earth

GEOLOGY OF THE EARTH'S CRUST

"How many years can a mountain exist
Before it's washed to the sea"1

- Bob Dylan, Blowin' in the Wind

Nearly all earthquakes are the result of the geological forces that are constantly changing the shape of the earth's crust. That crust comprises only the outer 30 km of the earth, which has a radius of 6400 km. Given the extreme levels of radiation from the center of the earth, its core and mantle, and given the gravitational forces acting on surface masses, the crust is discontinuous, broken up into several large land masses separated by ridges. There are six major plates: Eurasian, Indian, Pacific, American, African, and Antarctic, and five minor platelets: Cocos, Caribbean, Nasca, Philippines, and Arabian. Several actions cause these plates to shift and move about, most notably resedimentation, volcanic action, continental drift,
and mountain formation. As the plates move, they induce elastic stresses in the rocks of which they are comprised. As these stresses build, occasionally, the rocks reach their elastic limit and deform in an explosive activity that induces long period vibration waves in the masses of land. These waves radiate from the source of the explosion and are recorded on the surface as earthquakes. Most of course happen along the ridges at the boundaries of the plates, however, they could happen essentially anywhere, and earthquakes have been recorded nearly everywhere on Earth.

There are three main classes of rocks that comprise the Earth: sedimentary, igneous, and metamorphic. At the surface of the Earth, sedimentary rocks are by far, the most plentiful, covering about 75% of the total land area. This sedimentary layer is only typically one or two kilometers thick and is subject to rapid change. Exposed rocks break up into small fragments due to freeze/thaw cycles, wind and water erosion, and glacial formation and retreat. The general direction of this resedimentation process is from the mountains into and onto the sea floor. Every year, some 400 million tons of sediment are redistributed in this fashion by the Mississippi delta, so it must be understood to be a
significant effect. The result of this resedimentation is that in time, it effectively changes the depth of the ocean, in doing so changes its currents, and through a process of reconsolidation, the sediments form into bands or strata that remain on the surface. These strata retain a record of the geological history of their site, and can be compared with strata elsewhere to determine their age. This process continually alters the shapes not only of coastlines, but of mountains as well, and is perhaps the most constant geological behavior on the earth's surface.

The other classes of rocks, igneous, or lava-based, and metamorphic, or rapidly cooled lava, have their own specific criteria and effects on the crust. Volcanoes exist where there are cracks, or pressure vents in the crust. As temperatures inside the earth convert water to steam, small cracks are opened by the pressure of steam, that eventually swell and fill with molten rock, (lava). Much of this lava cools under the surface to form igneous rock, and it remains beneath the surface until revealed by erosion. Some lava, however, is forced to the surface and erupts in volcanic activity. This too becomes igneous rock when it cools. If the subterranean process encounters overwhelming pressure, some of the rock consolidates as metamorphic rock, which
derives traits both from sedimentary and igneous formations, but with a decisively different structure.

A third geological feature of rock formation is orogenesis or mountain building. Mountain building occurs as a result of resedimentation. As new sediments settle in shallow basins, the increase in pressure due to the new mass deforms and depresses the basin into a geosyncline. Effectively the basin floor comes into closer contact with higher temperatures in the center of the earth, and is further weakened. Under the influence of compressional forces in the Earth's crust the layers of new sediment are folded and buckled to form a new mountain chain. This ultimate redistribution of sediment effectively erodes one continent into the sea, and creates a new mountain range, a cycle which is perpetually repeated. Periods of relatively active mountain building alternate with periods of relative calm during which time major sedimentation occurs. More detail about orogenesis is not known, particularly regarding the source of compressional forces, and this is left widely to speculation.

In time, mountains sediment into larger masses of rock that form continents. These continents essentially float on a sea of molten rock that is trying to expand, and to

(113) Orogenesis: A. sediment is deposited in sea bed, B. geosyncline forms, C. crust compresses and raises a chain of fold mountains
Continental Drift: 150 million years ago, the continents were joined as Pangaea, a super continent land mass. They broke apart, and are still drifting. Transmission of heat to the cooler rock crust. This process, continental drift, is the major cause of disruptions to the earth's crust, and thus the principal cause of earthquakes. Some seismologists suggest that the earthquakes are a cause, and not an effect of continental drift; that the molten lava itself expands into fissures and ridges between plates forcing some rocks to yield as earthquakes, and thus inducing a motion in the plates themselves. In a sense, it is a means toward moving large plates of land similar to how one moves a carpet in a house, by inducing a small ripple and moving it as a wave through the overall surface. This speculative theory has attracted few believers, who prefer to view earthquakes as a necessary outlet for stored energy.

At one time, (about 200 million years ago), the continents were assembled as a single land mass, and through the process of continental drift, have in time moved to the position they occupy now. Geologists speculate that in time, the continents will reassemble in a new form, and a new map of the earth, with a new biological ordering system will ensue. Whatever scenario takes place, the crust of the Earth can be compared to a great playing field. It is broken into a few large masses of land that float on a sea of molten rock. Through processes internal and external to the crust,
these plates are in constant motion, inducing fundamental changes to the bed upon which they sit. This continual process causes thousands of earthquakes a day throughout the world, concentrated mostly at the boundaries of the plates and resulting in a characteristic splintering/faulting of that crust. While earthquakes seem minor geological events at the scale of the entire Earth, they actually redistribute phenomenal amounts of energy, which can have profound effects on the surface of the Earth's crust.

Notes:

1 Dylan, p. 53.


3 Ibid.
Worldwide seismicity. Main seismic belts - circles indicate epicenters of major earthquakes since 1900.
(117) Fault deformations, clockwise from top left:
1 - Typical fault geometry, 2 - Normal fault (divergence zone), 3 - Thrust/Reverse Fault (convergence zone), 4 - Lateral slip/Strike slip/Transform Fault, 5 - Graben Fault Deformation, 6 - Horst Fault Deformation.
"Some force whole regions, in despite
O' geography, to change their site;"
- Samuel Butler, Hudibras

With a broad understanding of the geological character of the Earth's crust, one can at once understand how the slowly accumulating tectonic forces are transformed into sudden bursts of seismic waves. Earthquakes do manifest themselves as waves, and are subject to normal wave amplifications, distortions, and other characteristics. There are actually two major types of waves that comprise earthquakes and several types of faulting that help direct these waves upward to the earth's surface.

A fault is actually a crack in the crust where the various rock strata are discontinuous. These cracks may be caused by compression, tension, shearing, or a combination and manifest themselves as five basic fault types. Normal faults occur in divergent zones, where the crust is fractured by tension. Reverse faults are the result of thrusting, compression, and thus prevail in divergent zones. Transform, strike slip, or lateral slip faults are all names applied to faults generated by shear. Graben fault
deformations are compound divergent faults which generate a trough in the ground. The opposite effect is a Horst ridge deformation, which is a compound fault structure in a convergent zone. In a fault zone, there will be a major fault along a line of fracture and secondary faults developed as rocks were twisted and distorted in a zone, before the strata along the weakest line ruptured to create the main fault. This too is not a particularly sharp fracture, and exhibits substantial splintering and tensional faulting, perpendicular to the main fault.

The first theory about the propagation of earthquakes through faulting was put forth by H. F. Reid based on empirical observations following the 1906 San Francisco Earthquake. His theory, the elastic rebound theory, concluded that regional deformations caused a line of weak rocks to store elastic energy to the point of fracture. This process could continue for a century or more, but eventually, the weaker rocks let go of the energy, as if releasing a coiled spring. The rocks then rebound to their unstrained position, and this deformation is greatest near the line of fracture. The energy releases as an earthquake.

Of course, this theory bears truth of observation at the surface, but it does not explain the true structure at the focus of the earthquake, which can be a few or many hundred
kilometers deep. At those great depths, increased friction that resists elastic deformation and higher temperatures that ease slipping and sliding make it impossible for elastic rebound theory to explain deep earthquakes.¹ Since both shallow and deep earthquakes have similar characteristics, it seems likely that they are induced by the same mechanisms. Moreover, structures along fault zones often exhibit continuous deformation, the result of creep along the fault trace. The existence of a creeping fault further negates the possibility of an elastic response theory, as the fault has no structure for storing energy. Therefore, the elastic rebound theory is put into serious question, yet it has not to this day been satisfactorily rebuffed. Empirical evidence has linked earthquake activity to water pressure, particularly when compared with subterranean volcanic structures. Steam pockets or bubbles may form cavities in the rock structure that in time collapse. This theory has little observational evidence as yet, but it is still pursued. Moreover, wave measurements and extrapolations thereof seem to indicate a general mixing of compressions and expansions at the focus. This scenario seems unlikely if the earthquake is the result of an explosion of a rock or by the collapse of a rock cavity.
There are actually many types of waves that emanate from earthquakes. Four are of primary importance. These are divided into two categories, surface waves and body waves. There are two major body waves, identified as 'P' waves and 'S' waves. 'P' actually means "primary" wave, and are longitudinal or transverse in shape. 'S' refers to secondary waves that are compressional. Longitudinal waves are actually long-period sound waves. They are the fastest, travelling at about 8 km/s and thus the first to reach the surface of the earth, and they have the structure of series of compressions and rarefactions-particles move in the direction of the wave. Slower, but more destructive compressional waves, travelling at 4.5 km/s, move particles normal to the direction of the wave. By comparing the arrival time on seismological records of the P and S waves, one can determine the distance from the focus of a certain seismometer. By comparing records from three seismometers, one can locate the focus, and its corresponding epicenter (the point on the surface directly above the focus, for which the earthquake is named).

Surface waves travel along the surface of the Earth and not through its interior. They tend to oscillate more slowly than the body waves and are identified as 'L' waves, meaning long wave. Of these, there are as well two of
primary importance, Love waves, which travel horizontally, and Rayleigh waves, which travel vertically. As slower waves, long waves are more subject to amplifications and distortions. Moreover, they have more characteristic secondary modes than body waves, and may be measurable up to 8 modes. This is significant because the higher mode waves have shorter wavelengths, and corresponding higher amplitudes. Some 40% of the energy in Rayleigh modes is in higher modes, much less for Love waves. In shape, Love waves are probably sinusoidal, but Rayleigh waves indicate regions of double amplitude within a single period, and seem to have a much more complicated shape.

There are, of course, other anomalies of earthquake waves that affect the types of shaking that occur, and often seismologists can get no closer than vague speculation in describing the true activity that is recorded on seismometers. Waves tend to reflect off denser bodies, which may cause amplifications if reflections are in phase or cancellations if reflections are out of phase. Moreover, waves refract when passing through large bodies of different densities, such as the ocean and the land. Although these refractions are relatively slight, they make it impossible to draw a straight line from the surface to the
hypocenter (focus). Moreover, secondary modes of body
waves may arrive at seismometers at the same time as
surface waves, making it difficult to register true activity.
Fortunately, sophisticated instrumentation record activity in
several directions and at several levels of amplification,
which is of utmost importance in sorting the information.
Furthermore, recordings are transmitted directly to
observatories, which use computers to map the wave
structure. Specifics aside, earthquakes must be understood
as travelling waves with specific periods, amplitudes and
frequencies. To the travelling wave, structures on the
surface are merely particles that are oscillated by the wave.

Notes:

1 Ibid, p. 56.

2 James L. Stratta, Manual of Seismic Design. Englewood Cliffs,

3 Ibid.

LARGE
SHALLOW
EARTHQUAKES
- MAGNITUDE 7-7.7, 1910-1962
- MAGNITUDE 7.8 OR OVER, 1904-1962

(124) Seismicity of the earth. Epicenters of large shallow earthquakes.
(125) Seismogram of a near earthquake
MEASURING EARTHQUAKES

Prospero: "Deeper than did ever plummet sound, I’ll drown my book."

The task of measuring earthquakes is not easily accomplished. When everything fixed to the surface of the earth is moving, there is difficulty in devising a stationary point from which to observe the motions of the earth. Presently, plans are being developed to use low orbit satellites with sonar or radar to penetrate the earth, but ground-based recording will never be replaced. The basic technique uses pendula to develop an inertial frame of reference from which to measure ground shaking. By suspending a weight free from the earth, and connecting it at a single point, the actions of the earth will induce a resultant motion in the pendulum, and these vibrations are recorded. If the pendulum is properly calibrated and tuned, these measurements can be easily converted into shaking data. Several criteria affect the swing of the pendulum. Most important are period, damping, and magnification, and
variations on these criteria have been the basis for a wide range of instruments throughout history.

The period is the time a pendulum requires to make one cycle. It is affected by mass, length of the arm and accounts for drag and other damping techniques. If the period of the pendulum is much longer than that of the earthquake, the passing of an earthquake wave will induce no resultant force on the pendulum. If the period of the pendulum is the same as that of the earth, the magnification of that motion is very large. If the period of the instrument is short compared with that of the earth, the magnification is very nearly one.

Initially, it would make sense to optimize high magnifications, however, in time the inertia of the instrument is great compared with that of the ground, and the corresponding measurements will depend more on the actions of the instrument than those of the ground. To counter this, damping is applied, either through air resistance, or friction, or even with eddy currents in a magnetic field. There is a critical damping factor, which is typically applied, by which the instrument will react to the earthquake, then return to the zero position without additional swings. Given that, for near earthquakes, there is
not much time between the arrival of different waves, instruments must return to zero quickly in order to record the entire seismic event.

Critical damping tends to make natural magnification very small, so usually pendula will include a means of amplifying the displacement that will be recorded. On the first devices, this was achieved through a series of levers, the last of which scratched a mark on a piece of smoked paper. For strong earthquakes, these devices are still in use. The earliest used suspended weights of up to 20 tons, and one of these is still in use today. However, their overwhelming size and the difficulties in housing them have put them out of favor. Smaller devices were developed using mirrors to reflect light onto photographic paper. The mirror caused great amplifications of the swing, without interference of the levers, which absorbed some of the energy and falsified the record. Today, the mechanisms are by in large electromagnetic. The pendulum carries a small pick-up coil, which vibrates between the poles of a magnet mounted to the base of the pendulum, and induces an electric current which is recorded on a galvanometer.

Of course all earthquake waves are directional, so in order to accurately depict the direction of motion as well as
the amplitude, measuring stations will contain many seismometers. Typically, three are required, one oriented North-South, one East-West, and a third will be a vertical pendulum. Moreover, short-period and long period instruments have different critical damping criteria, and many recording stations include both long and short period instruments (for a total of six).

There are many varieties of recording stations. The simplest are bore hole recorders. These units are very small and tend to be included only as parts of arrays and sub-arrays. More typical are small subterranean boxes that house seismometers, radio transmitters, and batteries, and telemeter data to centralized receiving and processing centers. In addition to permanently installed stations, portable seismometers can be placed after a main earthquake to record microseisms and aftershocks. Finally, seismometers can be affixed to submarine vessels that sink and return to ships.

As more is learned about the physics of earthquakes, data from all these types of recording devices is important. It is critical to maintain an accurate seismic history of a region. Today, computers are used extensively to correlate data quickly. However, printed paper records have not yet
proven useless and they continue to be generated. Accurate measurement of earthquakes continues to be a principle concern of geophysicists as they attempt to map the tectonic history of the earth. Although practical instrumentation to measure earthquakes is complicated, the physical principles of inertial measurement are relatively straightforward.

Top left
(132) Sea bottom seismograph. Unit is weighted to sink to bottom of ocean, It takes measurements, then releases its weight, and floats to the surface, where it is picked up by a boat.

Left
(133) Sea Bottom seismograph - interior section.
REVEALING PLACE THROUGH PERFORMANCE
EXperiencing EARTHQUAKES

Third Avocatore: "I've an earthquake in me!"
- Ben Jonson, Volpone.

Modern seismology began in 1862 with Robert Mallet's two volume treatise, The Great Neapolitan Earthquake of 1857: The First Principles of Observational Seismology. Mallet travelled to Italy and mapped zones of damage into four categories that was the basis for felt-intensity scales that are used today, (Rossi and Forel, Mercalli, Modified Mercalli, and the proposed Medvedev, Sponheuer and Karnik). Earlier classification consisted merely of first hand account and subjective observations. Two years before Mallet's trip to Italy, he received a letter from a colleague in New Zealand:

"The house...gave a very extraordinary shake, which seemed to continue, and was accompanied by a fearful noise. I at once jumped up, rushed, as well as the violent motion would permit me, into the front garden, the motion increasing in violence, accompanied by a roaring as if a large number of cannon were being fired near together, and by a great dust caused by the falling chimneys. The motion
at first was a sharp jerk back and forwards in a NE and SW direction, increasing in extent and rapidity, until I got into the garden-say 25 seconds; it was then succeeded by a shorter and quicker motion at right angles, for nearly the same time, still increasing, but appearing to be perfectly in the plane of the horizon. This was followed by a continuation of both, a sort of vorticose motion, exactly like the motion felt in an ill-adjusted railway carriage on a badly-laid railway at a very high speed, where one is swayed rapidly from side to side...".¹

Today, two scales, the Modified Mercalli and the Richter are in common use to quantify earthquake power. The Richter scale is a measure of force, based on an open ended logarithmic scale. Each point on the scale represents 27 times more energy than the preceding point. Magnitude 3 earthquakes are the minimum typically that are "felt," damage occurs above magnitude 5, and magnitude 7 tremors can be devastating in some areas. The highest estimated magnitude has been a Richter 8.9 that would register strongly on seismographs all around the globe. Each year, worldwide, about 20 shocks above magnitude 7 strike, nearly 1000 over magnitude 5, and well over
100,000 are "felt." In all, some two million shocks are recorded on seismographs annually.²

The Modified Mercalli scale, as well as Mallet's and others are merely records of felt-intensity, and are locally variable. The standard today is a twelve point scale, with MM I classifying an earthquake "felt by very few under especially favorable conditions," and MM XII signifying "Damage total."³ The earthquake described by Mallet's colleague would have probably been classified an MM VII.

Of course, that classification is local and is related to specific soil conditions and wave propagation, but it can be used to identify wave patterns and felt intensity maps are drawn as a series of roughly concentric area radiating from the epicenter of an earthquake. Conversely, the Richter scale magnitude measurement is absolute and related to the energy released by the equation:

\[ M_S (\text{Magnitude}) = \log E (\text{total energy}) - 5.24 \]

\[ 1.44 \]

What is most significant about experiencing earthquakes is the sense of fragility that we perceive when an earthquake strikes. The psychological and sociological effects of an earthquake far outweigh the monetary costs of
REVEALING PLACE THROUGH PERFORMANCE

Experiencing Earthquakes

replacing damaged property after an earthquake. This is directly related to metaphysics, which attempts to describe our place in and relationship to reality. When related to performance, this is extremely significant, as performance developed as a cultural tool to aid understanding of our place in reality. In performance, we are asked to confront those energies. In an earthquake, we are forced to do the same.

This is not to suggest that earthquakes always induce a sense of weakness and despair. In fact, survival of an earthquake implies strength, and in many areas, where earthquakes are frequent, a ritualistic renaissance may follow a tremor. People rise immediately to rebuild, exactly as before, in virtual defiance of the forces of the earth. Traditional mythologies have typically characterized the god of earthquakes as an angry god, often related to the god of war. Thus an earthquake was an act of malice, and the corresponding survival was perceived as an act of defiance, as if a benevolent god were aiding the people against the omnipotent tyrant. As building technology improves our ability to survive an earthquake, some of this spiritual energy is lost. This is not to advocate for a return to aseismic engineering, but rather to suggest that

(137) Liquefaction of ground subsoil at Niigata, 1964, caused this building to sink nearly a full story.
metaphysical qualities of earthquakes are an integral part of human existence in seismic zones, and any habitation in those zones ought not deny these forces. Performance, in this sense, serves yet another vital function. It informs our metaphysical understanding of the landscape, as well as its physical behaviors. This is particularly striking in seismic zones.

Notes:

1. Eiby, p. 3.
2. Ibid., p. 75.
3. Ibid., p. 145.
CHAPTER FIVE
Performance
Chapter 5
Performance

THE FIELD OF PERFORMANCE THEORY

"A performance is a dialectic of "flow," that is, spontaneous movement in which action and awareness are one, and "reflexivity," in which the central meanings, values, and goals of a culture are seen "in action," as they shape and explain behavior."1

-Victor Turner, in a preface to Universals of Performance

Recently, there has been a small movement among social anthropologists, cultural psychologists, and traditional entertainment producers to come to a mutual definition of performance, in an attempt to synthesize understanding of what they consider a fundamental aspect of cultural identity. In discovering this synthesis, six particular areas of study are illuminated as the basis for a universal understanding of performance:
1. *Transformation of being and/or consciousness:* Performance can be described simply as a deliberate manipulation of the senses to provide a revelation of being or reality or a transformation of conscious understanding. This transformation can be permanent as in initiation ceremonies, or temporary, as in aesthetic theatre, and can involve both performer and audience. Questions arise from this definition that become the basis for understanding the specific performance: how does this change come about and how is it incorporated into the specific act of performing? At the particular moment of performance, "at this precise juncture of time and space, the problems of representation, imitation, and transformation converge."

2. *Intensity of performance:* A successful performance requires that the performer and audience mutually cross a definite threshold of intensity. Understanding this intensity is to discover how performances build, how they involve or exclude spectators, in short, how space, sounds, movements, actions are managed.
3. *Audience-performer interactions:* Typically the context for a performance is provided by the audience that witnesses or interacts with it. This context has an extremely wide range, from total integration or audience participation, as in many rituals, to the marked separation of performer from audience as in a proscenium theater. Moreover, the equality of audience and performer ranges widely, from total equality in which the audience is knowledgeable in the substance of the performance, to distinct hierarchical separation, which employs surprise and secrecy for performance transformations.

4. *Performance sequence:* All definitions of performance clearly identify performance as deliberate, and the moment of performance as a definite space-time event. Yet, there exists a veritable series of actions or occurrences that are necessary to performance: training, rehearsal, warm-up, the specific performance, cool-down, and aftermath. These phases, whether they all exist in all performances or not, must be understood as integral to the performance, and as clearly affecting the context of the performance.
5. *Transmission of performance knowledge:* The action of transmitting knowledge about performance is critical in all phases of the performance sequence and affects fundamentally both audience and performer. For the audience, vocal or emotional response, such as applause is the means of transmitting knowledge about the performance to the performer. For the performer, training is specifically the act of transmitting and receiving knowledge about performance. It is often extremely important to maintain a historical record of a performance as a means of measuring cultural identity, of training future performers, and as aftermath, of understanding and relating the transformation of being that has or had taken place.

6. *How are performances evaluated?*: This is perhaps the most tenuous criteria for establishing a universal understanding of performance because of the wide range of possible responses to a performance. Again, several questions of evaluation serve as the basis for understanding a performance: for whom is the evaluation made?--performer, audience, or scholar; are there
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The most minimal performance is a differentiating act...which introduces (or is introduced by) an element of consciousness in the function. According to Blau, this state of consciousness is administered by marks of punctuation or "inflections of consciousness." Other theorists have offered alternative nomenclature to describe the process of activating consciousness, such as gestures (Schechner), signs or semiotics (Turner and others) and even "cruelty," (Artaud). Whatever terminology is preferred, performance clearly draws its base on an active transformation of consciousness.

This process is not without purpose. Some suggest performance fulfills an innate curiosity; others conclude it is a means of acquiring knowledge; still others characterize its purpose as communication of information. In all these models, there is an element of exchange. In terms of performance, this exchange is between performer and

standards for evaluation within even one culture?; how is an evaluation communicated to its subject?

Of these criteria, the most basic is the first, which suggests a common ground for all performance in an animated state of consciousness. Herbert Blau writes: "The most minimal performance is a differentiating act...which introduces (or is introduced by) an element of consciousness in the function." According to Blau, this state of consciousness is administered by marks of punctuation or "inflections of consciousness." Other theorists have offered alternative nomenclature to describe the process of activating consciousness, such as gestures (Schechner), signs or semiotics (Turner and others) and even "cruelty," (Artaud). Whatever terminology is preferred, performance clearly draws its base on an active transformation of consciousness.

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audience, both from performer to audience and vice versa. This reciprocity of audience and performer is critical in characterizing performance patterns; performance is indeed a shared social experience. This communication itself exists on two levels: discourse, readable in its own context and a system which invokes a "dynamic set of relationships...determined by the prevailing ideology." In other words, performance communicates both the specific action that is happening and a more interpretive model of what it represents.

This inherent paradox of representation is itself characteristic of performance models. It bears strongly on the Platonic model of theater, situated between mimesis and diegesis, whereby performance conveys information by substituting one thing for another. Considering both convention and the substitution, this paradox demonstrates that performance must construct meaning without sacrificing the presence of the representing object. On stage, this double role is satisfied by the actor, who is at the same time him or herself and the character he or she portrays.

However, performance does not depend on the artifice of a stage, a curtain, et al. The main proponents of performance theory, most notably Herbert Blau, Richard
Schechner, Barbara Meyerhoff, Victor Turner, and Willa Appel, derive information about performance through careful scrutiny of activity in many fields—children at play, tribal ritual, religious sacrament, and of course theatre and staged dance in cultures worldwide. Many sociologists have noted that social structures are themselves theatrical in nature. Our daily lives are governed by interactions, cultural codes, and models that can be analyzed in terms of performance. We frequently engage in direct social ritual, which establishes a cultural convention, to which we can exchange. Thus, a simple greeting "Hi, How are you?" establishes a cultural connection between two or more people and serves as an initiation for conversation. Henri Laborit goes as far as to include performance as a right-brain activity, which liberates us from anxiety-producing inhibitions, as a way of reflecting, through its fictions, the suppressed "Imaginary." 5

Schechner's pedagogical bias is toward performance in ritual, sacrament, and ceremony. Here, too, transformation lies at the heart of performance. In fact it is often not only the signifier of performance, but its fundamental purpose as well, as in traditional rites of
passage. In these performances, the transformation may in fact be permanent, connecting the participant directly with a changed state of consciousness. Likewise, ritual performance depends critically on audience and performer interactions, wherein the audience actually enters the arena of the performers and participates directly in the physical actions of the performance.

In terms of cognition, the observer in all performance represents a specific function, one of the conditions of existence of the performance. In ritual, as noted, it is the observer actant which in fact activates the performance and initiates the overall transformation, which may involve all assembled. In Western theater, it is rather "the silent presence of the observer," which is "syncretically integrated into the stage reality...that enables the performance act or performance behavior to occur." The role of the observer consumed Bertolt Brecht's reconception of the theater as the "epic theater." He believed the silent observer judged the actions of the characters and stressed rigid separations of actor and character as an aid to objectivity in this judging. Thus, his plays centered on narrative, rather than action, and demanded a much more active role of the audience, even in a conventional, silent situation.
The interaction between performer and audience is necessarily linked. By in large, performance is perceived in whole or in part, as an entertainment and as a pedagogical tool. Thus, both pleasure and knowledge are innate characteristics of performance. Theater is not limited to semiotic/cognitive experience. Rather, it has a double form of intellectual appeal: primary, with respect to expectation, feeling, pleasure, and sensation, and secondary, with respect to logic and memory. Performance theorists are presently attempting to link the theory of focalization, regarding attention stimuli, and the theory of emotional response. Thus, they find that "the experience of the performance can be described, not in terms of communication, but of active participation: focalization of attention through signalling devices and frameworks of enunciation set up by the stage, inferences based on the rhetorical strategies proposed." 

This observation concludes much active research into performance theory. While no extremely specific definition of performance is possible, theorists have identified particular criteria which comprise performance universally. Of these, the most fundamental are the
presence and interaction of an audience with the
performers, the fundamental transformation of the human
conscious mind when confronted with a performance, and
the use of direct physical activity as a means of
performance, (performance can never be a strictly mental
act). While there is no specific universal "purpose" for
performance, theorists agree that it exists both as
entertainment and as instruction. By in large, performance
is a viable cultural means of connecting us to inner forces
and energies that define and shape our conception of
reality. This metaphysical basis for performance
necessitates its presence. Whether it is encouraged
through attendance of a staged play, through participation
in social ritual, or through experience of natural and built
phenomena, this connection to the inner forces of reality
establishes a critical balance between ourselves and
nature and between ourselves and each other, and it
sustains a necessary respect for these relationships.
Notes:


4 Ibid.


7 Ibid., p. 15.
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(147) A practice rasa
Antonin Artaud and the Theater of Cruelty

"What is interesting in the events of our time is not the events themselves, but this state of moral ferment into which they make our spirits fall; this extreme tension. It is the state of conscious chaos into which they ceaselessly plunge us, and everything that disturbs the mind without causing it to lose its equilibrium is a moving means of expressing the innate pulsations of life."

-Antonin Artaud, *The Theater and its Double.*

No discussion of performance theory can ignore the impact of Antonin Artaud and his manifestos on performance in *The Theater and its Double.* In response to the societal anxiety of Europe between the wars, Artaud proposes an activist, aggressive theater that pursues direct confrontation with emotional stimuli. This is far removed from the "storytelling psychology," that had characterized theater in Europe since the Renaissance. His is a theater of violence, of terror, of direct action, of screaming, of chanting, of dancing, far more ritual than representation: "...here, the theater, far from copying life, puts itself whenever possible with pure forces. And whether you accept or deny them,
there is nevertheless a way of speaking which gives the name of 'forces' to whatever brings to birth images of energy in the unconscious, and gratuitous crime on the surface.\(^3\)

Artaud believes performance exists at the extreme of mental stability. Only by activating the senses and the conscious mind to the limit of their thresholds, can performance be truly generated. At that moment, there is a transformation that takes place, whereby the spectator experiences the same emotional extreme that the actors themselves engage in. Thus, at that moment, the audience enters into the performance actively, and this engagement is total and transformative. Obviously, this theory anticipates the generalized definition of performance that is widely accepted today, wherein conscious transformation is the basis for performance activity.

However, Artaud would never accept that performance exists accidentally. For him, it is indeed premeditated, rehearsed, and altogether staged. His inspiration is the Balinese theater. He was deeply affected by the use of oversize puppets, of mime, of a strongly gestural symbolic language, and by the substitution of guttural exclamations and arhythmic pulses for dialogue.
and measured structure. Intensity is certainly sacrificed to order and structure, and thus he carefully abandoned any ordering system, such as stage and house seating that would establish a boundary between performer and spectator. In his own staged work, far inferior to his manifesto ideals, the audience massed in a loose circle. The performers, using masks, puppets, and elaborate costumes and lighting, would surround the audience and run around the central areal, in a whirling, hypnotic frenzy. This somewhat loose structure does not defy the ability of the performance to "tell a story." Like ballet, which does not depend on words for storytelling, Artaud's theater bases its stories on sustained levels of energy and intensity. His work is likewise devoid of character. Puppets and masked characters do interact with each other. Small cycles are established, as are mimetic patterns. Like the Balinese theater, a sign system develops, to which the audience eventually can directly relate. Some words are used as well, but also arranged in patterns that are less a dissertation and more a stream of consciousness language. This system of signs also manifests itself widely today in contemporary performance theory. Semiotics are accepted by many theorists as a critical means of non-verbal
communication, which is a necessary component of visual staged performance. Characters express themselves in words and gestures. To these communication tools, Artaud adds direct, violent action. "I propose then a theater in which violent physical images crush and hypnotize the sensibility of the spectator seized by the theater as by a whirlwind of higher forces." 4

Artaud writes clearly of the purpose of performance in society as well. His essay, "The Theater and the Plague" labels performance a cultural event centered on human interactions, particularly in crisis. He writes, "Like the plague, the theater is a formidable call to the forces that impel the mind by example to the source of its conflicts." 5 Artaud hopes that by activating the mind, he can affect a fundamental change in perception and attitude regarding these conflicts. Culturally, his is a response to the dire frustration in Europe between the world wars—his manifesto was first published in 1938—where anxiety about identity and society manifested itself in crisis. At the societal level, that condition was apparent and decisive, but at the individual level, that anxiety was submerged with little outlet. "If the essential theater is like the plague, it is not because it is contagious, but because like the plague it is
the revelation, the bringing forth, the exteriorization of a depth of latent cruelty by means of which all the perverse possibilities of the mind, whether of an individual or a people, are localized. Artaud's theater forces this externalization of latent emotional energies by pushing the conscious mind to the limit of mental stability (in theory), and then offering a necessary emotional touchdown. By inviting the spectator into the cruelty onstage, the emotional resolution becomes direct and personal for each member of the audience. Thus, while not specific about the physical sources of anxiety and conflict, theater proposes a metaphysical resolution of that imbalance. Artaud writes: "Whatever the conflicts that haunt the mind of a given period, I defy any spectator to whom such violent scenes will have transferred their blood, who will have felt in himself the transit of a superior action, who will have seen the extraordinary and essential movements of his thought illuminated in extraordinary deeds-the violence and blood having been placed at the service of the thought-I defy that spectator to give himself up, once outside the theater, to ideas of war, riot, and blatant murder." 

Finally, in discussing Artaud, one must understand the specific subject matter of his plays. While Artaud
himself staged renditions of Shakespeare and other Elizabethan dramas, "stripped of their text and retaining only the accoutrements of period, situation, characters and action," he concentrated his themes on more striking and shocking texts. For example, he proposed staging Leon-Paul Fargue, Marquis de Sade, or even Georg Büchner's Wozzeck. He also proposed staged fables from the Zohar, the story of Bluebeard, the Fall of Jerusalem in the Bible, and plays that invited interaction with elements of the cosmos. This latter preoccupation consumed him as he felt it indicated a great deal about the reinvention of mental conscious reality. He writes: "These ideas which touch on Creation, Becoming, and Chaos, are all of a cosmic order and furnish a primary notion of a domain from which the theater is now entirely alien. They are able to create a kind of passionate equation between Man, Society, Nature, and Objects." The goal of this equation, is, in his words "organically reinvolving man, his ideas about reality, and his poetic place in reality." This metaphysical inquiry into performance is arguably Artaud's greatest contribution to performance theory. It invests performance with a necessary role in society, elevating it above mundane explorations of character and situation, which
characterized Western theater into the twentieth century. Artaud clearly influenced Beckett, Schechner, Blau, many later performance artists, and even performers in other arenas, such as John Cage.

Artaud bases his performance on fundamental principles that are frequently referenced in the work of modern performance theorists. It exposes the human mind to an extreme of sensory impulse and causes it to transform its very state of consciousness in order to resolve the arhythmic stimuli. That this resolution is cathartic identifies in performance a vital societal purpose as a means of addressing latent anxieties. In short, performance reveals through externalization, hidden forces and energies, and in so doing, invites their resolution. His is a modernist appeal to base performance on social benefit, a necessary outlet in his day, and concept certainly not devoid of timeless exposition.

"In a word, the theater must become a sort of experimental demonstration of the profound unity of the concrete and the abstract."11
Notes:


2 *ibid.*, p. 76.

3 *ibid.*, p. 82.

4 *ibid.*, p. 83.

5 *ibid.*, p. 30.

6 *ibid.*

7 *ibid.*, p. 82.

8 *ibid.*, p. 100.

9 *ibid.*, p. 90.

10 *ibid.*, p. 92.

11 *ibid.*, p. 108.
“Every act comes from a realization. There's no such thing as acting on impulse. There again the intellect is lurking in the background”

- Bertolt Brecht

In marked contrast to Artaud's decree of direct action as a means of instruction in the theater, Bertolt Brecht demands a reconception of theater based on the narrative, whereby the audience is specifically distanced from the performers, and their role is one of judgement, rather than entrancement. Born into the same European chaos as Artaud, Brecht served briefly in the German Army in World War I and reacted intellectually against ruthless capitalism, nationalism, and pseudo-greatness that characterized Bismarck's Reich. His reaction was Marxist, and his means of reaction was his writing: poetry, novels, and plays. It was his plays that most furthered his propagandist aims in Marxist communication, and to support his work, he developed a rigid theory about performance that manifested itself in a series of writings, published as Brecht on Theater, 1938 to 1954.
He based all of his theories of theater on the term *Verfremdung*, which has been interpreted both as estrangement and as alienation. In his work, this seems to mean little more than "making strange." He says: "An estranging image is one which allows the object to be recognized but at the same time makes it seem strange." The implication here is that once the world is presented as strange, it arouses in the spectator the desire to alter it. He specifically denounces Aristotelian theater, in which, he claims, "the spectator was purged of fear and pity and rendered a harmless member of society whose feelings were used up in the witnessing of purely theatrical events." Brecht reacts with the "epic theater," which encourages the narrative over the active. The relation, then between actor and spectator is not a drawing in, rather, a confrontation, whereby the actor then demands decisions from the audience. This theater champions reason over feelings and claims that man is an object of investigation and is alterable. Suspense is created by the process itself, not in awaiting the outcome of it. At each stage there are questions and judgements. Each scene is a total scenario, not simply existing for the sake of another. In all, Brecht is adamant about man's ability to forsake fatalism and
tragedy. He writes, "Man must be shown as capable of avoiding tragedy."\(^4\)

To achieve this epic theater, Brecht was concerned "to avoid anything beautiful, lyrical, or at all moving. He denied emotion, as he denied beauty, as an indulgence that could not be afforded while suffering still existed elsewhere. Only rational thought would serve to change the human situation as he saw it."\(^5\) To promote "rational thought," he developed a new style of acting that required his actors to distance themselves from their characters, just as the audience was expected to do. The actor's job was to show the character to the audience, not just experience it for himself and let the audience witness it. He writes: "[the actor's] feelings should not be fundamentally the same as those of his character, so that the feelings of his audience do not become fundamentally those of his character. The audience must have complete liberty here."\(^6\) He would often ask his actors in rehearsal to speak their lines in the third person to practice this technique of critical distance.

Yet this production technique does not guide the entire estrangement process. Brecht writes it into the structure and language of the plays themselves. Often, he would double scenes in an effort to present them as events
to be analyzed, not merely experienced. He would, as in *The Caucasian Chalk Circle*, seat a narrator at the side of the stage for the duration of the play, or as in *The Mother* and *The Threepenny Opera*, characters would introduce themselves, then explain what they were about to present. Most importantly, Brecht stressed the entertainment aspect of performance. If the audience is entertained, they will want to engage in rational thought about the story presented. Of course, all of his characters are flawed, but by entertaining the audience, he invites them to generate resolutions to the problems. He writes of entertainment: "Society can derive enjoyment even from the asocial, so long as it displays vitality and greatness... Even a river that has catastrophically broken loose can freely be enjoyed by society in all its glory if society is able to master it: for then it belongs to society." In short, he hopes that society will derive pleasure in bettering itself. "All attempts at refashioning society give us a feeling of triumph and confidence and provide us with a pleasure at the possibilities of change in all things." 

Here again reverberates metaphysical qualities of performance, yet with a decidedly humanistic bias. Although Brecht's methods of inciting evaluation and
change in society are in marked contrast to Artaud's, the overall goal is the same. By stressing narrative and estrangement, Brecht establishes a critical distance, and thus a discernible objectivity in his audiences. He imparts them with the task of replaying the scenes his actors have described with the goal of understanding them and improving their outcomes. In this manner, Brecht incites a conscious transformation of understanding, through fundamentally intellectual means. This is not to deny the role of action in this undertaking. Brecht employs entertainment as a catalyst in accessing his audiences, and thus he relies even on song and dance to engage his spectators, (as in The Threepenny Opera). Once interested in the story, his audiences, he hopes, will strive to correct the flaws of his characters, and in doing so, affect the overall structure of society as a whole. This balance of entertainment and instruction is critical in the history of performance theory, and has lasting impact today.
REVEALING PLACE THROUGH PERFORMANCE

Notes:


5. Gray, p. 64.


8. Ibid, p. 137.
PERFORMING ARCHITECTURE

"Our souls, whose faculties can comprehend the wondrous Architecture of the world"

-Christopher Marlowe, Tambourlaine

With a cursory understanding of performance theory historically and at present, one can attempt to discover a relationship between performance and architecture. In fact, performance in architecture is identical with performance in other media, in so far as it is based on the same criteria, and it shares the same goals. Performance in architecture incites a transformation of conscious understanding of that architecture and of the environment in which it is built. Through a direct process of exchange and reaction to the forces that impel a site, performing architecture reveals submerged or hidden forces and energies, and informs habitation with respect to those forces. As Artaud would suggest, it is the goal of the architecture to inform a reasoned association with the cosmos, to discover "[man's] poetic place in reality."¹ This would suggest that architecture fulfills the metaphysical qualities of existence just as do other forms of performance. It may not be strictly
as Brecht suggests, a matter of then altering and improving nature and society, but certainly we can derive "a feeling of triumph and confidence and...pleasure at the possibilities of change in all things."²

This proposition for architecture synchronous with the forces of nature is not wholly without precedent. Some architects such as Tadao Ando and Luis Barragán explored these potentials frequently in their work. Both employed very strong, direct elements that depended upon the natural forces for vitality. Ando revisits a basic comprehension of light frequently. The tectonics of his walls express the dimension, material, and direction to develop light as a dynamic and life sustaining force. Barragán too addresses light with his massive walls, but he is also particularly concerned with color and water, both static and moving. A veritable exchange happens between his architecture and the spaces it inhabits. Walls enclose and express serenity, but at the same time, walls provide an limitless canvas for the actions of light as it moves, reflects, refracts.

Other specific examples of performing buildings which informed and inspired this thesis proposal are:

1. Eero Saarinen's **M.I.T. Chapel**: Although the building as a whole is less interesting than

(160) Luis Barragán, Los Clubes - Mexico City, Mexico. 1963-4.
the play of light on the walls from the moat, that "performance" of light is precisely what consecrates the building as a spiritual experience. Inside the chapel, one is confronted by a continuous circle which is perceived to be a massive containment until the play of light reveals it as a thin membrane, thus transforming our conscious understanding of the building. What is particularly significant about this performance is that it is both deliberate and continuous.

2. Jean Nouvel's **Institut du Monde Arabe** in Paris. Once again, a simple form is transformed by the action of light, which it controls. A tight metal box is enlivened by the expansion and contraction of light through its moving apertures.

3. Le Corbusier's **Notre dame du Haut at Ronchamps**. At Ronchamps, it is the "random" deep penetration of the walls and the manipulation of path through the building
which celebrates the movement of light throughout the day. However, Ronchamps achieves its greatest drama during a rainstorm, when water is trumpeted through a system of spouts and gutters, and very directly displayed in a rather erotic show.

4. Frank Lloyd Wright's Kaufman House also displays the motion of water, but his is a placid treatment, far removed from the vulgarity of Le Corbusier's sculpted gutters. Not only the visual aspect of water flowing through the building, but the aural sound of the waterfall defines the building's sense of place.

5. Tadao Ando's Kara-za, a movable theatre constructed of scaffolding in Tokyo. Ando attempts to synthesize performance and audience by assembling a frame in which audience and performer are equally constrained. The frame is very light and the motion of the actors causes vibrations. The
frame is penetrable at any point so that the actors may appear anywhere. In fact the audience enters through a bridge to the covered performing area. Around it is an uncovered ring around which the actors move. They can be heard but not seen. They also pass beneath the audience. Finally, light enters the frame everywhere and it too plays a part in the overall environment.

6. I. M. Pei's **John Hancock Building**: While certainly fulfilling Aldo Rossi's genus locus function in Boston, the Hancock Tower also reveals its direct orientation through a vertical sliver oriented due West. While the overall building expresses little about its orientation related to the sun, this sliver is directly illuminated by the setting sun each day, and glows typically a vivid color at sunset each day.

7. Santiago Calatrava's **Torre Montjuic** in Barcelona, and **Passerelle de Créteil**.
Calatrava finds in natural phenomena a direct influence on his work. Moreover, he aims to express lines of force and transmission of strains in the forms he develops as structure. Thus his architecture strives to achieve a dynamic quality that does not merely represent the forces present, as in Gothic overconstructions, but rather reveals these forces as they actually exist. For example, members under strain are reduced in size to the minimum quantity of steel necessary, cantilevers are diagrammed through slanting sails and oblique crutches, and forces are concentrated in articulated pivots. To this, Calatrava adds an honesty and simplicity of material, and careful attention to siting and dimension that reveals his architecture only through performance.

8. Stonehenge: While one can interpret Stonehenge as merely a device, and not an architectural artifact, its sculptural impact on its environment and its spatial sense do
consecrate it a built habitable and indeed architectural place. That its architecture is wholly defined by the actions of the sun reveals its true performance in the landscape.

Of course, there must be other examples of performing architecture, but these are perhaps the most striking. In each, elements present forces, rather than represent them, and in so doing, reveal a dynamic quality that is in constant dialogue with the earth. This is the true essence of performance in architecture.

(168) Luis Barragán, Satellite City Towers - Mexico City, Mexico, 1957.

(169) Stonehenge

Notes:

1 Artaud, p. 92.

2 Brecht, Verusche, Volume 12, p. 137.
CHAPTER SIX
Conclusion
Chapter 6
CONCLUSION

"I stood unwound beneath the skies
And clouds unbound by laws
The cryin' rain like a trumpet sang
And asked for no applause." ¹

- Bob Dylan, Lay Down Your Weary Tune.

Like a performer on the stage, architecture makes a dynamic connection with its audience. Ideally, it presents us with a series of equations and relationships that help to display our relationship with a site and with the forces of the Earth. Beyond a mere representation of these forces, architecture presents them and celebrates them. If this scenario seems strange, it is because too often, architecture denies us this dynamic understanding of nature and the world. Too often, buildings provides us only prepackaged conditions and experiences. It has been the goal of this thesis to explore a means of establishing relationships between a building and the environmental forces that define and shape its site through a critical application of performance theory to architecture.
By in large, performance is a viable cultural means of connecting us to inner forces and energies that define and shape our conception of reality. It attempts not to control these forces, but rather react and respond to them. Whether it is encouraged through attendance of a staged play, through participation in social ritual, or through experience of natural and built phenomena, this connection to the inner forces of reality establishes a critical balance between ourselves and nature and between ourselves and each other, and it sustains a necessary respect for these relationships.

"Is good now, no?
-Yes, I think so."
- Fernando Domeyko Perez, 1993.

Notes:

1Dylan, p. 120.
REVEALING PLACE THROUGH PERFORMANCE

(170) The End
APPENDIX 1
MAPS OF NEW ZEALAND

For general information and to reference places cited in the text, several maps of New Zealand are included on the following pages:

page 164, (171) North Island
page 164, (172) South Island
page 165, (173) North Island topographical
page 166, (174) Poverty Bay district map
page 167, (175) Gisborne City map
(173) North Island topographical
Maps of New Zealand

(171) North Island

(172) South Island
(174) Poverty Bay district map
(175) Gisborne City map
APPENDIX 2
EARTHQUAKES OF NEW ZEALAND

This list gives the principal earthquakes to have struck New Zealand in recent history. This list includes all earthquakes believed to have measured magnitude 6, \(4 \times 10^{13}\) Joules.

1460 Wellington. Possibly magnitude 8. Known in Maori legend as Hao-whenua, the land swallower.

1773, May 11 Queen Charlotte Sound. Captain Furneaux of the Adventure records that his party "felt some two shocks of an earthquake but received no kind of damage." This was the first New Zealand shock to be reported by a European observer.

1826 Fiordland. Based on uncertain tradition of sealers and whalers, a very large earthquake appeared at that time.

1843, July 8 Wanganui. Magnitude not less than 7.5. Large landslides and widespread damage.

1848, Oct. 16 NE Marlborough. Magnitude 7.1. Intensities reached MM X in the Wairau valley, and serious building damage in Wellington was experienced. Many destructive aftershocks followed.

1853, Jan 1 New Plymouth. Magnitude 6.5. Largest shock in Western New Zealand

1855, Jan 23 SW Wairarapa. Magnitude 8.1. Destructive in Wellington. Damaging in Wanganui

1863, Feb. 23 Hawke Bay. Very strong. Severe damage in Napier

1876, Feb 26 Oamaru. Very strong for East South Island


1891, June 23 Mouth of the Waikato River. Magnitude 6.5.

1895, Aug 18 Taupo, Magnitude 6.5

1897, Dec 7 Wanganui, Magnitude 7.


1904, Aug. 9 Cape Turnagain. Magnitude 7.5
<table>
<thead>
<tr>
<th>Date</th>
<th>Location</th>
<th>Magnitude</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1914, Oct. 7</td>
<td>East Cape</td>
<td>7.5</td>
<td>Damage in Gisborne</td>
</tr>
<tr>
<td>1914, Nov 22</td>
<td>East Cape</td>
<td>6.5</td>
<td>Not an aftershock of Oct. 7 quake.</td>
</tr>
<tr>
<td>1917, Aug. 6</td>
<td>North Wairarapa</td>
<td>6.5</td>
<td></td>
</tr>
<tr>
<td>1921, June 19</td>
<td>Hawke Bay</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>1922, June 19</td>
<td>Taupo</td>
<td></td>
<td>Earthquake swarm with many aftershocks</td>
</tr>
<tr>
<td>1929, Mar. 9</td>
<td>Arthur's Pass</td>
<td>6.9</td>
<td></td>
</tr>
<tr>
<td>1929, June 16</td>
<td>Buller</td>
<td>7.8</td>
<td>Many deaths, very destructive</td>
</tr>
<tr>
<td>1931, Feb 3</td>
<td>Hawke Bay</td>
<td>7.9</td>
<td>Napier destroyed. 240 square km uplifted. 256 deaths.</td>
</tr>
<tr>
<td>1931, Mar. 5</td>
<td>Poverty Bay</td>
<td>6.3</td>
<td>Damage in Gisborne</td>
</tr>
<tr>
<td>1932, Sep. 16</td>
<td>Wairoa</td>
<td>6.8</td>
<td>Damage in Gisborne</td>
</tr>
<tr>
<td>1934, Mar 5</td>
<td>Pahiatua</td>
<td>7.6</td>
<td></td>
</tr>
<tr>
<td>1942, June 24</td>
<td>Southern Wairarapa</td>
<td>7.0</td>
<td></td>
</tr>
<tr>
<td>1942, Aug 1</td>
<td>Southern Wairarapa</td>
<td>7.1</td>
<td></td>
</tr>
<tr>
<td>1950, Feb. 5</td>
<td>Southern Otago</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>1950, Aug 5</td>
<td>Fouveaux Strait</td>
<td>7.3</td>
<td></td>
</tr>
<tr>
<td>1953, Sept 29</td>
<td>Bay of Plenty</td>
<td>7.1</td>
<td></td>
</tr>
<tr>
<td>1958, Dec. 10</td>
<td>Bay of Plenty</td>
<td>6.9</td>
<td></td>
</tr>
<tr>
<td>1960, May 24</td>
<td>Fiordland</td>
<td>7.0</td>
<td></td>
</tr>
<tr>
<td>1966, Mar. 5</td>
<td>Gisborne</td>
<td>6.2</td>
<td>Some damage in downtown Gisborne.</td>
</tr>
<tr>
<td>1968, May 24</td>
<td>Inangahua</td>
<td>7.0</td>
<td>Serious damage</td>
</tr>
<tr>
<td>1974, Nov. 5</td>
<td>South Taranaki</td>
<td>6.1</td>
<td></td>
</tr>
<tr>
<td>1976, May 5</td>
<td>Fiordland</td>
<td>6.5</td>
<td></td>
</tr>
<tr>
<td>1977, Jan 18</td>
<td>Cook Strait</td>
<td>6.0</td>
<td></td>
</tr>
<tr>
<td>1979, Oct. 12</td>
<td>Puysegur Bank</td>
<td>6.5</td>
<td></td>
</tr>
<tr>
<td>1984, Dec. 31</td>
<td>Bay of Plenty</td>
<td>6.3</td>
<td></td>
</tr>
<tr>
<td>1985, Sept 26</td>
<td>East Cape</td>
<td>7.0</td>
<td>Serious Damage in Gisborne.</td>
</tr>
</tbody>
</table>
REVEALING PLACE THROUGH PERFORMANCE
APPENDIX 3
GEOLOGICAL TIME LINE

The following table shows the geological history of the Earth. The Earth's crust is assumed to be 4500 million years old.

<table>
<thead>
<tr>
<th>YEARS AGO</th>
<th>ERA</th>
<th>PERIOD</th>
<th>DURATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 million</td>
<td>Tertiary or Cainozoic</td>
<td>Pliocene</td>
<td>10 million years</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Miocene</td>
<td>13 million years</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Oligocene</td>
<td>15 million years</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Eocene</td>
<td>20 million years</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Palaeocene</td>
<td>10 million years</td>
</tr>
<tr>
<td>70 million</td>
<td>Secondary or Mesozoic</td>
<td>Cretaceous</td>
<td>65 million years</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jurassic</td>
<td>45 million years</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Triassic</td>
<td>45 million years</td>
</tr>
<tr>
<td>225 million</td>
<td>Primary or Palaeozoic</td>
<td>Permian</td>
<td>45 million years</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Carboniferous</td>
<td>80 million years</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Devonian</td>
<td>50 million years</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Silurian</td>
<td>40 million years</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ordovician</td>
<td>60 million years</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cambrian</td>
<td>100 million years</td>
</tr>
<tr>
<td>600 million</td>
<td>Pre-Cambrian or Eozoic</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## APPENDIX 4
### MAJOR PERFORMANCE THEORISTS

The chart below summarizes the major theorists who have made contributions to the field of performance theory:

<table>
<thead>
<tr>
<th>Repertoire/Status of Text</th>
<th>Function of Actor</th>
<th>Concept of Space</th>
<th>Aesthetic Philosophy of Production</th>
<th>Relationship to Spectator</th>
<th>Relationship to other Art Forms</th>
<th>Theatrical Activity Descendants</th>
<th>Principal Theoretical Works</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diderot (1713-1784)</td>
<td>score (plot)</td>
<td>relationship between emotion and expression</td>
<td>mimetic</td>
<td>theory concerning the condition of passion</td>
<td>contemplation (no participation)</td>
<td>connection with poetry</td>
<td>Le père de famille</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lessing, Engel, Morelli, Stanislavski</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Theatre Libre (1887)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Theatre Antoine (1896)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Odéon (1906)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Causerie sur la mise en scene (1903)</td>
</tr>
<tr>
<td>Antoine (1858-1943)</td>
<td>Naturalistic repertoire (Ibsen, Strindberg)</td>
<td>member of ensemble, renewal of acting (direct style)</td>
<td>mimetic; detailed reconstruction of everyday reality</td>
<td>historical realism</td>
<td>fixed price; cheap seats; darkened comfortable auditorium contemplation</td>
<td>importance of mood, atmosphere, lighting effects; unity of stage effects</td>
<td>Theatre Libre (1887)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>verism, rejection of convention</td>
<td></td>
<td></td>
<td>Theatre Antoine (1896)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Odéon (1906)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Causerie sur la mise en scene (1903)</td>
</tr>
<tr>
<td>Fort (1872-1960)</td>
<td>symbolist and poetic repertoire</td>
<td>symbol</td>
<td>symbolic; pure performance</td>
<td>idealism; symbolism</td>
<td>object of suggestion</td>
<td>use of dance and plastic arts in theatrical performance</td>
<td>Théâtre d'Art (1890)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lagné-Poe Rouché</td>
</tr>
<tr>
<td>Stanislavski (1863-1938)</td>
<td>naturalistic repertoire; text to be lived</td>
<td>crucial importance of acting</td>
<td>mimetic and pure performance naturalism heighten by stylistm</td>
<td>synthetic realism to serve needs of the actor</td>
<td>emotional appeal</td>
<td>dominance of the actor</td>
<td>Moscow Arts Theatre (1898)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Strasberg, Grotowski</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>An Actor Prepares (1926)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Building A Character</td>
</tr>
</tbody>
</table>

*De la poésie dramatique* (1758)
*Paradoxe sur le Comédien* (1773)
*An Actor Prepares* (1926)
*Building A Character*
<table>
<thead>
<tr>
<th>Repertoire/Function Status of Text</th>
<th>Function of Actor</th>
<th>Concept of Space</th>
<th>Aesthetic Philosophy of Production</th>
<th>Relationship to Spectator</th>
<th>Relationship to Other Art Forms</th>
<th>Theatrical Activity Descendants</th>
<th>Principal Theoretical Works</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meyerhold (1874-1942)</td>
<td>symbolist repertoire</td>
<td>acting techniques derived from historicism biomechanics</td>
<td>importance of the forestage</td>
<td>constructivism</td>
<td>return to convention</td>
<td>social and political function of theatre</td>
<td>creative role of spectator</td>
</tr>
<tr>
<td>Craig (1872-1966)</td>
<td>text replaced/ dominated by mise en scene</td>
<td>Ubemarionnette suppression of feeling</td>
<td>schematic decor, stylized perspective</td>
<td>symbolism</td>
<td>art of suggestion</td>
<td>symbolic awareness, intellectual response</td>
<td>Wagnerian synthesis</td>
</tr>
<tr>
<td>Appia (1862-1928)</td>
<td>text conveyed by actor's body</td>
<td>patterns and rhythm of moving bodies</td>
<td>set design to enhance actor's</td>
<td>rejection of realism</td>
<td>shared experience of beauty</td>
<td>fusion of means of expression</td>
<td>few productions (Wagner, Claudel)</td>
</tr>
<tr>
<td>Copeau (1879-1949)</td>
<td>dominance of text</td>
<td>actor as professional team work</td>
<td>bare platform</td>
<td>&quot;illustrate the truth of the work&quot;</td>
<td>educate the audience</td>
<td>synthesis of all arts</td>
<td>Vieux Colombier (1913)</td>
</tr>
<tr>
<td>Brecht (1898-1956)</td>
<td>new style of playwriting narration, fable montage</td>
<td>dialectician mediator; new acting style</td>
<td>historized presentation of contradictions in contemporary reality</td>
<td>epic theatre rejection of illusion and empathy</td>
<td>social didacticism alienation</td>
<td>reflection of real world</td>
<td>Mother Courage</td>
</tr>
<tr>
<td>Artaud (1896-1948)</td>
<td>renewed attack on the text</td>
<td>freed from psychology and literature meaning through physicality</td>
<td>progression toward the empty space total spectacle</td>
<td>all-powerful mise-en-scene</td>
<td>cruelty, therapeutic remodeling of life</td>
<td>vision of a culture where there is no gap between form and reality</td>
<td>poor theatre</td>
</tr>
</tbody>
</table>
APPENDIX 5

BIBLIOGRAPHY

Performance Theory:


Bibliography


Earthquake Theory:


Bibliography


Architectural Precedents:


**New Zealand:**


Clark, R. H. *New Zealand from the Road: Landforms of the North Island*. Auckland: Heinemann Reed, 1989. 177 pps.


APPENDIX 6  
FIGURE AND PHOTO CREDITS

All work by author unless noted.  
Please refer to Bibliography to reference author citations

1Fence under compression. (p. 3) Royal Society of New Zealand, p. 28.


5Railway Buckling, (p. 12) G. A. Eiby, back cover. photo by Ross Land.


7Maori flute, (p. 15). Brake, p. 184

8Maori map, (p. 16). courtesy Gisborne Historical Society, Sheila Robinson, curator.


13Sheep shearing, (p. 19), Robinson p. 29.

14Sheep Dipping, (p. 19), Robinson p. 27.

15Gisborne 1885, (p. 19), Robinson p. 43.

16Breakwater work, (p. 19), Robinson p. 45.

27 Main seismic belt, (p. 28) SANZ 4203: 1984 Fig. 4.

28 Geological Section, (p. 29) after Stevens, p. 21.

29 Gisborne geological map, (p. 29) Lands and Survey Geological Survey Map, 1:25000.


42 Orange grove, (p. 42) Elby, p. 54. photo by David Scherman.


57 Galileo's cantilever (p. 53) Hopkins, p. 104.

62 El Lissitzky, (p. 57) Stedelijk Museum, Plate 119.

63 Alexandr Deineka, (p. 57) Stedelijk Museum, Plate 355.

65 Tadao Ando Festival, (p. 59, Ando, p. 108.

66 Tadao Ando Rokko II, (p. 60) Ando, p. 55.

67 Tadao Ando Festival, (p. 61) Ando, p. 112.

110 Wellington fault, (p. 97) Stevens, p. 24, photo by D. W. Mackenzie.

111 Plate boundary, (p. 98) Stevens, p. 18.
112 Tectonic plates, (p. 99) Eiby, p. 65.

113 Orogenesis, (p. 100) Eiby, p. 39.


115 New Zealand Geology, (p. 102) postcard from DSIR, 1989.

119 Splintering of faults, (p. 106) Stevens, p. 25.

120 Longitudinal and transverse waves, (p. 107) Eiby, p. 19.

121 Love waves, (p. 108) Eiby, p. 22.

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123 Particle motion in Rayleigh waves, (p. 109) Eiby, p. 23.

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126 Telemeter station, (p. 113) Eiby, p. 15.

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132 Sea bottom seismograph, (p. 117) Eiby, p. 73.

133 Sea bottom seismograph section, (p. 117) Eiby, p. 73.


135 Deep focus earthquakes, (p. 120) Eiby, p. 126.
136 Shallow focus earthquakes, (p. 121) Eiby, p. 126.


139 Napier in 1920's (p. 123) postcard of the Friends of the Hawke’s Bay Cultural Trust, Napier.

140 Napier after the earthquake of February 3, 1931. (p. 123) postcard of the Friends of the Hawke’s Bay Cultural Trust, Napier.


146 Perception cartoon, (p. 135) Bob Kliban.


149 Gladstone Road, (p. 138) courtesy Gisborne Historical Society, Sheila Robinson, curator.

150 Gladstone Road, (p. 139) courtesy Gisborne Historical Society, Sheila Robinson, curator.
151 Hall's Building, (p. 140) courtesy Gisborne Historical Society, Sheila Robinson, curator.

152 Collett's Garage, (p. 141) courtesy Gisborne Historical Society, Sheila Robinson, curator.

153 Peel St, (p. 142) courtesy Gisborne Historical Society, Sheila Robinson, curator.

154 Peel St, (p. 143) courtesy Gisborne Historical Society, Sheila Robinson, curator.

155 Grey St, (p. 144) courtesy Gisborne Historical Society, Sheila Robinson, curator.

157 Mother Courage, (p. 147) Schechner, 1985, p.147, photo by Clem Fiori.

158 Galileo, (p. 149) Willett, p. 172.

159 Tadao Ando Kara-za, (p. 151) Ando, p. 92


165 Tadao Ando Kara-za, (p. 155) Ando, p. 92
166 Calatrava, Torre Montjuic, (p. 156) El Croquis, June 1991.

167 Calatrava, Torre Montjuic, (p. 156) El Croquis, June 1991


171 North Island map, (p. 164), Wheeler, colorplate 1

172 South Island map, (p. 164), Wheeler, colorplate 2


REVEALING PLACE THROUGH PERFORMANCE