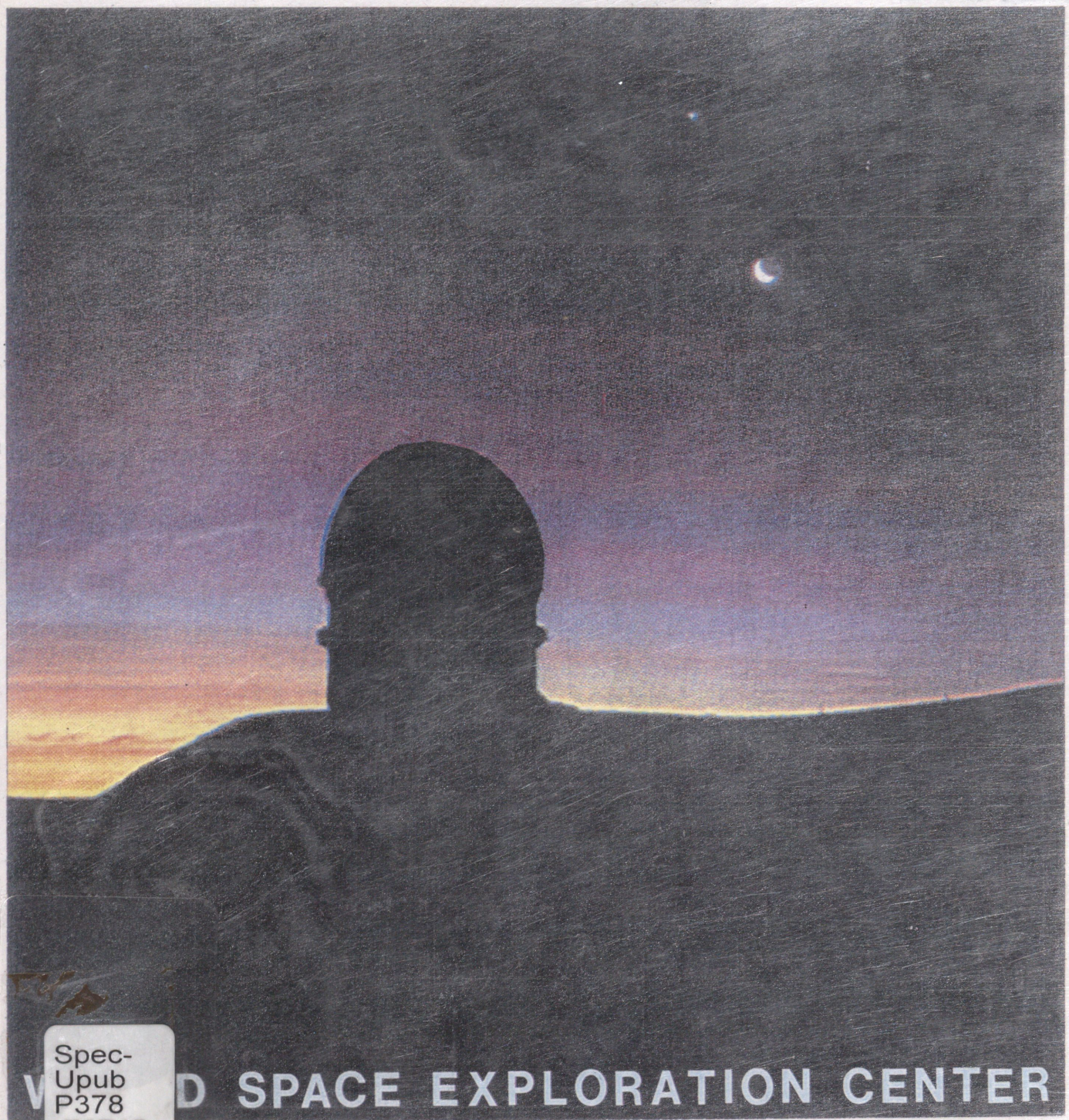
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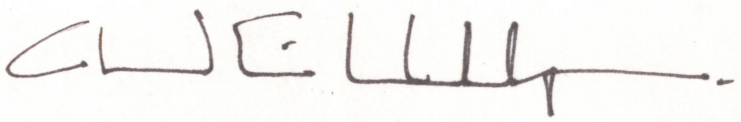
# WORLD SPACE EXPLORATION CENTER

by

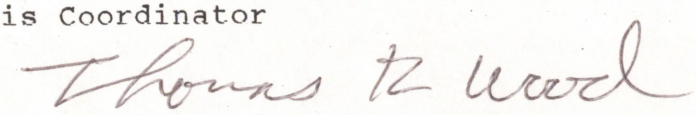
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A professional paper submitted in partial fulfillment of the requirements for the degree of

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6/7/91
Date

## DEDICATION

To my parents...

If words could truly describe my feelings...

Thank you.

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# INTRODUCTION

## INTRODUCTION

In antiquity it was discovered that there was a majestic regularity in the motions of the heavens. The ancients, unable to comprehend these motions viewed them with great awe and worshiped them in the religion of astrology.

As the centuries have passed many phenomenal discoveries have been made pertaining to our universe and we our now just beginning to understand it, and our place within it. The knowledge we have is but a speck in the cosmos... what awaits is infinite.

Walk outside this evening and look to the heavens... Another world to comprehend... Another place to be... Consider the enormous scale... Infinite? Consider each star you see as a sun for a distant solar system... Consider the billion stars within the reaches of the Milky Way Galaxy... Consider the 100 billion other galaxies that

coexist with ours in this universe... Are we the only form of life in this entire realm?.. Do other earth-like environments exist out there?.. What does their world look like...

I wonder...

## WHAT LIES BEYOND

I dreamt as far as man can go,
A boundless realm of thought I know.
Beyond the scope of rationed minds,
Where space and time are not defined.
The only thing to hinder here,
Is in our minds; and known as fear...

## POETRY RESPONSE

While philosophers search the boundaries of epistemology to discover what lies within the capacity of the human mind, a creative few dreamers have already answered the question. What lies within the boundaries of man's thought is, quite simply, infinite. To the creative thinker, infinite thought is not only obvious, but also imperative to creativity. If thought were bound by rational restriction, "true creativity" could not exist.

The concept of a "true creativity" is not a new ideal for modern man, it is a concept that has been pursued by thinkers for centuries. Current popular thought on the subject suggests that "true creativity" can be obtained through a structured analysis of existing works. We study the Parthenon, the Pantheon, and the great Cathedrals in our search, but our rational analysis provides

no sense of the human experience.

Where then does the answer to "true creativity" lie? It lies for the creative dreamer in a realm beyond rational thought, in a dimension where no boundaries exist. Where is this boundless dimension of "true creativity"? Is it within our grasps? If thought is infinite, true creativity is surely within our minds... and ultimately then, within our grasps.

Why then do we all not experience this "true creativity"? There is only one force that is able to suppress creative thought, and it too lies within the human mind. That force is fear... Fear of the unknown, Fear of failure, Fear of rejection... a fear if not overcome will stifle any creative attempts.

## THESIS DIRECTIVE

This thesis project is the beginning of an exploration into the conceptual making of architecture. As I begin this search I will discover avenues of opportunity I did not know existed... beyond these lie still more undiscovered paths leading to infinite possibilities in creation and experience.

Among the infinite possibilities that exist in the realm of architecture are questions as to how architecture is created. This question has been central to the educational process of architecture, as well as the professional practice of architecture.

From this question my thesis project has evolved. From poetry you have experienced my feelings on human potential in creativity. Now, from a reasoned approach, I will attempt to form a foundation upon which a creative process may be

built.

I will explore what I believe to be the fundamental questions relating to creativity :

1. How do we perceive?

2. Where is the starting point?

Within the discussion of these former topics I will draw conclusions to the presented questions. The conclusions I draw will serve as the foundation for my creative process, and the basis from which a building will evolve.

It is my intention at this point to have no formal concept of building, but rather to hold a clear and open mind as I seek a solution.

# PHILOSOPHY

## PERCEPTION

It may be stated with little objection that the fundamental tenet of architecture is to physically and psychologically control our environment. But, how does one control their environment? It would seem that in order to control our environment we need to have an understanding of how we experience it. Do we understand how this perception occurs?

Currently two opposing theories dominate the study of perception. Time has come to settle the debate. Structuralism vs. Gestaltism. As logical opposites, one must prevail if perception is to be understood and our environment is to be manipulated through our architecture.

"The basic premise of the Structuralist's theory suggests that perceptions can be understood by identifying the elementary parts of an experience."(8 p.94) This premise implies that our

perceptions are based solely on an understanding of the parts, with no reference to the whole. It would follow from this premise that in order to experience an object, say for example table salt, we would need only to understand it's constituents, namely sodium (a corrosive metal) and chlorine (a poisonous gas). This concept seems somewhat enigmatic. The parts alone have no relationship to one another, or to salt for that matter, until they are combined.

This criticism of the Structuralist approach has developed into a fundamental principal of the Gestaltist's theory. Gestalt theory opposes Structuralism by suggesting that the parts and the whole are perceived radically different from one another, ie. the whole is different from the sum of the parts. If we look back at the table salt example, as perceived by the Gestaltist, we see this concept of whole as different from the parts more clearly. To the Gestaltist, the salt itself has a perceived overall quality, or whole, that

does not exist in its components. ie. the salt has a quality that neither sodium nor chlorine possess.

Armed with this basic knowledge of the two theories of perception, we must now investigate them as they apply to perception in an architectural model.

In an architectural experience the Structuralist maintains his or her view that the whole is experienced as a sum of the parts. Now, for a moment, accept the Structuralist view of perception. Look up... take note of what you see, or for that matter what you read. Each piece is of critical importance. To the Structuralist each part, every brick, block, and bolt must be recognized and understood to perceive the space. Can this be true... or even possible?

The Gestaltist theory on the other hand maintains that the space you previously considered was perceived instantly as a whole, shapes were assigned and connections were made. The individual parts were not lost, the bricks, blocks and bolts

all contributed to the space as a whole and produced an emergent quality the parts alone did not possess.

It would seem rather implausible in the realm of perception in architecture that the individual parts are more important than the whole. Think back to the first paragraph, sixth word of this discussion. Is the word more important than the concept of the paragraph?

I feel, as the Gestaltists, that the whole contains a quality not found in its parts. This quality lies beyond the scope of rational thinking, and hence beyond the Structuralist. This quality is the feeling and emotion that is the essence of experience in our lives.

My thesis will proceed with the Gestalt theory guiding my view of perception as I seek to capture its quality within my thought.

## INTUITION

When we begin, where do we start? What is the source of our first point and corresponding line?

"There are three techniques typically recognized as the theoretical basis for beginnings in architecture:

1. The logical. A scientific perception of issues and methodology most often accomplished by reducing the design opportunity to a series of discrete elements, rationally conceived and resolved.

2. The arbitrary. A form of simulation in which the design concept has no original relationship to the design opportunity. The solution is preconceived transculturally and transformally, imposed on the object of design and adapted to the facts and contingencies at hand.

3. The intuitive. A reasoned knowing without

the rational processes, intimately conceived within the realities of the design opportunity." (9 p.1)

The logical approach as beginning, stems from the Structuralist theory of perception. A logical design process reduces the whole to a series of individual parts. Each part is conceived from a pragmatic foundation, resolved rationally, and reassembled to produce the whole. This approaches Structuralist premises, and purely rational foundation conflict with my previous conclusion that dismissed the structured approach. Therefore, it must be regarded as implausible for this particular endeavor.

The arbitrary approach as beginning suggests a methodology that abandons conditions inherent, literally and metaphorically, within the design opportunity. The preconceived solution offers no relationships to site, context, or society. The idiosyncratic form is imposed upon the object of design and adapted to the facts and contingencies

at hand.

This approach seems plausible from a purely creative perspective, but applied to the reality of architecture, its feasibility is debateable. A design process which relies on purely idiosyncratic notions seems to reject the premise of architecture as our environment, and assumes a premise of architecture as my environment. The arbitrary approach, in this sense, rejects society and its importance to the creation of architecture. Therefore, stemming from my belief that architecture cannot exist without society, I must reject the arbitrary approach as a foundation for this endeavor.

The intuitive approach as beginning proposes that the foundation of the creative process lies within pure reason. Pure reason, thus understood, has no implication of rational thought, rather it is a concept that transgresses the rational thought process. Pure reason is an a priori concept, it is a sense of understanding... an existence of

knowledge... an insight. Pure reason is the modem by which problems are creatively solved. It is the aha! in the mind.

This approach radically opposes the currently accepted ideologies for creation in architecture. The process of rational thought and logical sequence are rejected by the intuitionist until they become intuitively necessary. He or she asks, what is intrinsically good in rational thought and logical sequence? The fact that they are a process, first one, then two, then three...?

The process of rational thought and logical sequence are analogous to the cogs on the gear of a machine. Their constant motion suggests progress and creation, but the fact remains, the machine produces only that which conforms to its previous instructions. This doesn't appear to be creation.

The intuitive process, and the application of pure reason, eliminates the problem of the machine in the previous example. The machine, it seems, has a fixation on a particular method, ie. its

instructions, and for this reason it is not capable of spontaneous creation. With the intuitive process the machine is freed from its instructions and the results are, although unknown, infinite in possibility.

My fear of the unknown has been suppressed by my desire for "true creativity" and the thought of limitless possibilities. For this freedom in creativity I will follow the intuitive approach as I seek my solution.

# REALITY

## NEED

Current ground- based telescopes are powerful tools for both the continuing investigation of our own planetary system and for new initiatives in the study of star and planet formations and circum-stellar materials.

In the 1960's and 1970's, the National Aeronautical and Space Administration (NASA), initiated the construction of four large aperture optical/infrared telescopes for planetary observation work. These telescopes are used today for the majority of ground-based optical/infrared investigations of solar system objects, and all four are heavily oversubscribed.

Observational support for future space missions planned by NASA will place further demand on these current large aperture telescopes. Missions such as the deployment and repair of communications satellites, space probes, and a

future space station may be seriously delayed or completely aborted if the demand for additional observational support cannot be provided. "In light of current and future demands in the field of space technology, particularly in the field of orbital communication satellites, it is imperative that we initiate plans for additional ground-based observatories." (6 p.55)

Furthermore, technology is improving in the field of astronomical instrumentation at a rapid pace. These technological advancements have increased the capabilities of existing telescopes, and promise even more in the design of new telescopes.

At this time, several federal and private agencies and universities are developing plans to construct telescopes that reflect the existing available technology. Currently, a 10 meter optical/infrared telescope is being designed and built by the University of California and Caltech. Once the scope is completed, it will need a

facility designed to accommodate it, as well as its accompanying support needs.

From this need my proposal for the World Space Exploration Center has emerged.

## OBSERVATORY SITE CONDITIONS

### THE REALITY

The geographical and environmental conditions of an observatory site determine its success, and subsequent value to the science of astronomy.

In the consideration of sites for an astronomical observatory, one has little subjectivity. Due to the phenomenal expense of modern astronomical equipment, upwards of one hundred million dollars in some cases, it is imperative that sites be chosen to insure the success of the facilities.

Due to the these constraints major observatory sites are limited to a handful of preselected areas in Hawaii, Chile, and the Canary Islands. "In these areas, geographic and atmospheric conditions are optimal for Earth-based observing." (7 p.496)

An exploration of why the preceding areas were chosen as viable sites follows.

One of the foremost considerations for locating an observatory is geographical. The first major geographical concern is latitude. "In a zone from 30 - 36 degrees N Latitude for the northern hemisphere, or 30 - 36 degrees S Latitude for the southern hemisphere, approximately 75% of the celestial sphere may be observed." (4 p.14) "The celestial sphere is an imaginary sphere of infinite extent, with the earth at its center, on which the stars, planets, and other heavenly bodies appear to be located." (7 p.496)

The second geographical consideration is elevation. The atmosphere which encompasses our planet is a major hinderance to astronomical observations (see atmospheric considerations). In an attempt to lessen atmospheric hindrances observatories are sited at elevations as high as possible. At higher elevations the atmosphere begins to lose its density, and the resulting thinned air is more conductive to "seeing". Seeing is a term used by astronomers to describe the

relative observing conditions.

The third geographical consideration deals with seismic activity. "Due to the extreme precision and sensitivity of modern astronomical equipment, areas with a high degree of seismic activity or potential activity, are, for obvious reasons, disregarded as potential sites." (4 p.14)

Another major consideration in the selection of an observatory site is atmospheric. The most obvious atmospheric consideration is weather: "clouds, wind, and precipitation render optical telescopes virtually useless." (5 p.195) "An optimal site would have a pattern of little or no major weather activity, and 300 or more clear nights per year." (5 p.197)

A second atmospheric consideration concerns temperature. Once again, due to the precision and sensitivity of astronomical equipment, a stable mean temperature with few extremes is imperative. "Significant temperature variations cause expansion and contraction which can seriously damage optical

equipment." (5 p.198) Temperature also has an effect on the human level. Since the telescope is exposed to the elements while it is in use, the astronomers operating the scope are also exposed. For this reason mild climates are typically chosen to facilitate bearable working conditions for the astronomer.

The third atmospheric consideration deals with the mean relative humidity of the region, or how much water vapor is contained in the air. "Water vapor in the air diffracts light from celestial objects and blurs the "seeing" ability of the telescope." (5 p.196) The greater the relative humidity, the more significant this diffraction becomes. Therefore an area with low relative humidity should be sought.

## THE HYPOTHETICAL

It is my intention to approach the design of the World Space Exploration Center with the utmost realism. However, due to the distant locations of viable observatory sites, and my unfamiliarity with contextual issues associated with them, I have chosen to reject them for this thesis.

I have instead choosen to use a hypothetical site. The site is modeled based on a local mountain peak which meets several of the pragmatic site considerations for observatories. However, its geographical location remains less than optimal for a feasible major observatory site.

Therefore, I have kept the site intact and moved it to a geographical location which better suits the project.

The geographical location I have choosen is Mauna Kea, Hawaii where several ground-based telescopes currently exist.

## THE TELESCOPE

The telescope is the fundamental object of concern in the design of an astronomical observatory. For this project I have chosen to employ one of the most technologically advanced telescopes that has been developed.

That telescope is the 10-meter Keck Telescope which was designed by the University of California, and Caltech. The telescope employs a 36 segment mirror to obtain it's 10-meter refracting aperture.

The telescope in this project will serve its pragmatic function of observing as well as being the metaphorical inspiration for the creative process.

## PROGRAM

Universal Space Exploration Center

The program requirements of astronomical observing facilities vary considerably with the scope of the facility and its relative location.

In this thesis project I have elected to approach the facility as a major world observing and research center open to astrophysicists of all nationalities. Additionally, it will serve as an educational facility for students of astrophysics as well as the public. Implicit in this decision is the following program.

### SEMI PRIVATE

| | |
|---|---|
| Telescope Enclosure ..... | 6,400sf. |
| Laboratory Facilities ..... | 1,500sf. |
| Library (Reasearch Storage) ..... | 500sf. |
| Offices 6 @ 100sf ..... | 600sf. |

| | |
|---|---|
| Infirmary | 200sf. |
| Restrooms 2 @ 100sf | 200sf. |
| Kitchen Facilities | 500sf. |
| Dining Facilities | 1,000sf. |
| Food Storage | 300sf. |
| Bathroom Facilities 2 @ 200sf | 400sf. |
| Resident Apartments 6 @ 500sf | 3.000sf. |
| Lounge | 600sf. |
| Transient Dormatories 6 @ 500sf | 3,000sf. |
| Lounge | 500sf. |
| Storage | 500sf. |

**PUBLIC**

| | |
|---|---|
| Tramway | |
| Apex Station | 1,500sf. |
| Entry / Reception / Information | 800sf. |
| Restrooms 2 @ 250sf | 500sf. |
| Waiting Area | 400sf. |
| Museum | 4,000sf. |
| Televisual Auditorium | 700sf. |
| Observational Equiptment Storage | 1,000sf. |

Public Observing Area ..... 2,000sf.

Observing Lounge ..... 400sf.

Auditorium 100 seat ..... 2,500sf.

Storage ..... 1,000sf.

**BASE STATION**

Entry / Reception ..... 400sf.

Restrooms 2 @ 150sf ..... 300sf.

Power Generation Facility ..... 3,000sf.

Storage Facility ..... 1,000sf.

**MISCELEANEOUS**

Mechanical ..... 3,000sf.

Circulation ..... 25% gross sf.

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**TOTAL PROJECT ..... 41,700sf.**

# WORK CITED

## WORK CITED


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