SEA EXPLORATORIUM

INTERACTION HABITAT

Key Largo, Florida

an architectural thesis by:
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THESIS COMMITTEE

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ABSTRACT

This project stems from a deep admiration of the water and all its beauty both above and below the surface. The sea exploratorium is located in Key Largo, Florida, but could be situated in any coastal region actually. This particular site is so unique because of its coral reef formations and their beauty. The entire site is an exploratorium with the habitat, activities, and the connections linking the various components. There are four locations incorporated into the entire scheme, but only one is focused on in the final design, that of the islands, and habitat. The program calls for a one week visit to the island habitats and to exist within the environment while at the same time making as small a degree of impact in the ecosystem as possible.

INTERACTION is the key issue of my thesis— to interact in as many different ways as possible both physically and visually. By experiencing gravity, movement, sight, and proportion; in, on, and under the water, the exploratorium provides an awe-inspiring acknowledgment of the actions and reactions of this ecosystem.
CONCLUSIONS

In my final conclusion of my thesis, I referred to the poem by Henry van Dyke:

Our life is not a mere fact;
it is a movement, a tendency,
a steady, ceaseless progress
toward an unseen goal.
To desire and strive
to be of some service to the world,
to aim at doing something
which shall really increase
the happiness and welfare
and virtue of mankind —
this is a choice which is possible
for all of us; and surely
it is a good haven to sail for.

My interpretation of this poem directly reflects my thoughts about the appropriateness of the project. Our lives and lifestyles are moving and will always be moving sometimes in directions we're not quite sure of but hopefully always in progression of a goal. There are those who take charge of some of these goals for the welfare of all. These goals may be a cure for a disease or solving a housing problem facing our ever growing population. Indeed these are virtuous ethics
to the wellness of mankind. Whether we wish to participate
is purely by choice but someday it may be our only choice.
Certainly it is a valuable existence to reach for.
GOALS

/HYPOTHESES.
GOALS

In completing my fifth and final year at Ball State University, I have gone through three ten-week quarters: Autumn, Winter, and Spring. Autumn quarter started with the thesis proposal to data collection, research, programming, and schematic design. Winter quarter focused on design development from the schematic designs. Then, continued from winter quarter, the spring quarter conducted final revisions and then the final project and written documentation. My thesis title, a sea exploratorium, was created in response to a need for awareness, interpretation, and personal fulfillment of experiencing the underwater beauty. I developed an interest for a need to incorporate the underwater world into the minds of man through physical and visual interaction. In this world, which holds few restrictions, man is allowed to explore and to discover with great freedom. From various interviews and observations at aquariums and zoological gardens—a need for an awareness to this part of nature is expressed. To enforce an awareness of an environment, which is packed full of beauty results in discovery and exploration of this environment. The palette of colors which exists in this world is world! The colors of organisms, creatures, platyfish, and the water itself produce an elegant scene of a flawless artist. The sea exploratorium is also a valuable tool for the public's education in a unique setting of creative activities for sea-bordering communities. The specific community chosen for my project is Key Largo, Florida, which is surrounded by magnificent coral reef formations. Coral reefs are a main emphasis in the context of this sea exploratorium. With the diversity of organic form and the contributing hue of the underwater world, coral reefs and the creatures they harbor provide
a perfect setting for interacting. The hypotheses formulated in order to support my thesis are:
(a) if underwater environments can be experienced or even habituated then a new dimension in the design of these environments is created
(b) if water related elements are used in the transition and interpenetration between land and water as well as offer distinct paths of movement, then these components can add to the diversity of both landscape and urban setting.
(c) if a see exploratorium is created; then, a unique co-existence between man and water organisms can become alive in order to enhance the underwater environment.

A habitat within an exploratorium-imagine living underwater. A habitat totally submerged into the beauty and life of the sea. Interaction is the key issue of my thesis project.
To interact in as many different ways both physically and visually....travel for discovery could be a motif for this interaction. Always finding a new image through discovery in order to uncover new entities and avoid stagnation is one of the main goals of the project. Whether it is a self discovery within the underwater world or a discovery of the life and forms found there depends on the person and the level of awareness they are obtaining.

three sub-issues to interaction

1) awareness...........habitat
2) discovery...........exploratorium
3) education...........research

AWARENESS: as an awareness of an environment, that is packed full of natural beauty is enforced by exploration of perhaps mystical-like surroundings. The palette of this flawless artist is made known in five possible ways:
observation, attentiveness, consciousness, knowledge, and sensibility. By lodging in the underwater world, people can become aware of the various aspects of life which already exist and could exist there, and hopefully see how they can become a part of this world. Recreating physically, socially, or therapeutically in the underwater brings one's
state of mind to a decisive acknowledgement of an awareness to certain characteristics such as gravity, movement, sight, and proportion. By discovering this existence one must first seek and then find in order to learn the existence and finally reveal what one has learned. Also to explore, investigate and travel. The exploratorium is made up of habitat as well as research facilities with the whole connection-linkage organization. Also, the exploratorium of discovery is to provide the experiencing of life and life forms underwater in relation to each other, to man, and to the environment. It provides an opportunity to interact visually and and physically.

EDUCATION: the chief researchers of facilities from for example, University of Miami can occupy a brach which is located within the entire awareness-discovery-education process of this ecosystem.
SKETCHING/IMAGING

A series of sketches were created to illustrate preconceived images of components in and among their environments. In John Zeisel's book *Inquiry by Design*, he talks about "Imaging of the Design". Designers working on an actual project do not just sit down and 'design'. One hypothesis about the nature of images is that they are deductive constructs...essential to scientific progress; that is, these visions of a solution in principle developed early on a design process parallel researchers working hypotheses. Just as working hypotheses are refined during scientific exploration, images are developed during design activity.

A need for an image study was evolved after establishing relationship characteristics. After all the image is a natural perception. The architecture I am creating and have created is a functional environment as well as a reflection of the poetic spirit sketched in the landscape. One particular image investigated was the lighthouse. A tower element found as sort of artifacts already existing within my site. What is a lighthouse? An identifier to place—a beacon to passers by. To reminisce on the lightkeeper and his family; they often lived within the light vertically, rising above and sometimes among the waves. Some of these lighthouses were of stone rising out of the rocky coasts as if all one element floating on the sea. Others, more structurally projected as the lighthouses on my site. The light at Carysfort Reef is the most significant and one recorded in the history books. Getting back to the lightkeeper's family. They often were out at sea so to speak for months sometimes a period of a few years. They planted gardens and made rock gardens out of shells which they collected. This was one unique lifestyle taking place from history.
The pier was another component image examined. All sea vessels or ports have some kind of direct connection to the water and land. A bridge is a con- connection sometimes housing water as an aqueduct, or people as in apartments, or most commonly boardwalks so one may stroll along as freely as the car. In this design issue of connection, the pier, bridge, or tunnel all serve to connect the human to water from land, to below surface from afloat, or from water to land.

An entrance image was explored. That of a landing or arrival. Individual docks or piers are used for public anchorage to shore or more privately as your own little harbor to your seaside habitat.
Arrival to these activities & their environment
park area

people zone

beach
Activities: practical, utopian

- Underwater Vacations
- Hotel
- Viewing Chambers
- Entry → Sea Chambers
Relationships between man / sea!

a. historical
b. recreation - leisure
c. research - habitats
   aquaculture (growing plant life for consumption)
d. exploration - underwater "parks"

Historically

- Shipwrecks - "sunken treasure"
- Pirates
- Animals

Recreation

- Sports - competitive
  - leisure
- Social - strolls along the beach
- Therapeutic - exercises
  - swimmastics
Research

marine habitats - manmade vessels underwater
aquaculture - farming under water
growing a garden under water

Exploration

leisure scuba diving
treasure hunting
talking & watching fish (communicating with)
Relationships between sea/land!

1. structure
2. transportation
3. nature
4. beauty in 'scape

Structure:
- bridge
- dam
- pier
- lighthouse
- aqueduct

Transportation:
- boat
- barge
- ship
- submarine
- surfing
- sink
- float
- rise
- move
- sea plane
- sea port
- sea walls

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Nature

fish
plant life - seaweed, moss
tides
currents
waves
breeze

Seashore
shells
sea gulls

Beauty

sun's reflections on waves (sunset)

* beaches
underwater life → colors of nature
Contextual elements for any SEASTORE

- sea anemone - beautifully colored radially marine animals, found on rocks on seacoast.
- sea board - coast line and its neighborhood; seashore
- sea borne - carried on the sea or on a vessel
- sea breeze - sea toward land
- sea coast - shore or border of land adjacent to sea
- sea girt - encircled by the sea
- sea level - mean tide (measured from)
- sea port - town with harbor
- sea side - land adjacent to sea
CONTEXTUAL:
* context - setting
  * contexture - weaving of parts into one body
  * structure, style

activities
  sandcastles
  swimming
  music
  talking
  relaxing
  boating
  surfing (wind)

Marina

shells

seaweed

concession

groups of people

beach

land

Parking Lot

STORE

sea

pier
Glass wall

Aquarium wall

First level - "Living", "Sleeping"

Boat-type structure open on top
Windows on bottom

Houseboat concept with above and below water habitation

Floating devices to allow awareness of the ocean's waves and current.
IMAGE / FORM

Inside a hump, or on a ridge, dwellings with a coral reef.

Valley dwellings similar to fish habitats concealed under ledges and back in caves.

Dwelling below the surface - to burrow within.

Organic forms resembling coral form. To dwell in a "coral reef" - bringing water into your environment as well as bringing you into water.
INTERACTING W/WATER

Physically

directly

swimming
snorkeling
scubadiving
exercise
water skiing
bathing

indirectly

fishing
boating
canoeing-boating

Visually

viewing from:

shorelining
boat
towers
submarine
pier
bridge
habitat

Psychologically

dreaming
exploration
habitating underwater
world
"talking" w/ the fish

INTERPRETING the sea

mangrove trails
island expedition
tunnel promenade
underwater journey
MOVEMENT
Recreation (physical)

Playing tennis in the ocean

(social) Zones

rotate

view

space

material

pool
Molasses Reef

Old Spanish anchor approx.
8' long keel adjacent.

Overhanging ledge provides
orientations for large fish

Usually 5 or 6 can be seen
at a time.

Shallow water:

diving and
snorkeling (snaps)

Excellent for
snorkeling & diving.

Good location for
fishing or appreciating
the soft reef slope.

Increased coral cover includes

a sand bowl of underwater
ledges around
perimeter provide
cover for many small
organisms.

Iron shipwreck w/ anchor

a swim through
tunnel hole in the wall
next to coral ridge

Coral Ridge is a
foal hole for schools
of many-rose snapper.
"Hanging Cave" have the option of passing through Cave on either the left or right side of COLUMNS.

Coral formation — Christmas tree — Cave

Coral Ridge marks entrance to short swim-through tunnel.

Good diving near historic landmark.

Ancient melior 200 years under large coral head.
285 ft. long steel freighter grounded as a result of a torpedo and a collision with another vessel in 1942.

This superstructure has been salvaged but a large portion of the hull, which continues to attract a multitude of colorful fish, still remains.
Well-developed Elk Horn Coral colonies.

Centrally located Reef very popular for snorkeling

Calm water on shore side during prevailing winds provide excellent conditions for snorkeling and exploration.
Shallow spur with steel barge between these buoys. A length of old chain connects clumps of coral. This chain is supposed to have fallen from the Range.
Carysfort South
Carysfort Reef

Identifier:

112 ft. tall lighthouse constructed in 1852 marks this spectacular reef.

- Scuba
- Snorkeling
- Elk horn coral

Dense coral areas prevent entrance directly into reef, must enter at sides.

Shallow elk horn reef which is elongated and mild in navigation.
LEVELS of INTERACTION
INTERACTION CRITERIA LEVELS (MAX. → MIN.)

- **Barrier**
  - Water's Edge
  - Buffer Zone
  - Human Scale

- **Splash Water Barrier**

- **Barrier Is Punctured**

**Levels**

1. Non-Existent
2. Limited
3. Focused
4. Limited Surface
5. Maximum (Specific Times)
6. Maximum (All Times)
Coral, a tiny sea creature we know for their skeleton, live in the same place all their lives. Group skeletons form ORERS or islands which are called atolls when they form a ring w/a lagoon in the center. These three types in particular live on reefs of warm seas: humps w/many ridges, organ-pipe, and branching tree.

Coral is a calcium carbonate or limestone plus a mixture of coloring usually black, yellow, red but most common is white.

In case you were wondering, the largest reef is the Great Barrier Reef of Australia. Coral grows best outside of the reef. Strong currents bring in tiny marine life which to feed on.
AN UNDERWATER CIVILIZATION

There are over 1000 species of coral and closely related primitive animals that build the living reef—the underwater civilization whose existence provides the basis for all sea life. Reefs are the natural habitat for sponges, small tropical fish, shrimp, and shellfish, and offer a safe harbor to many creatures who would have no chance for survival in the hostile open sea.

There are three basic types of coral reefs. Fringing reefs are connected to shore in shallow waters. Barrier reefs are separated from the shore line by channels or lagoons. The atoll is a form of reef which is not connected to any land mass, but forms a low island in deep water.

The master builder of these finely balanced civilizations is a tiny soft bodied primitive animal called the coral polyp. The true coral are classified in the phylum—those animals characterized by calcareous (limestone) skeletons.
The polyp itself is a hollow cylinder containing an oral cavity surrounded by stinging tentacles. Often the tiny polyps remain in hiding in bright light, but when exposed they look like flower buds. Each polyp builds its own protective container of lime. Colonies of polyps grow together and billions of these skeletons are the foundation of the reef. As the polyps die off, they leave their skeletons and these eventually build up as new colonies of living animals grow on top of the old limestone skeletons.

Individual polyps can range in size from a pinhead to a foot in diameter. Reproduction is from a fertilized egg producing a coral larva which is only thousandths of an inch in length. The coral larva or planula is covered with fine hairs and is free swimming and after hatching it can move through the water for up to ten days in search for a place to grow. The young larva is flexible and can easily change shape. Those planula that survive, spread out on the surface of their new home and immediately begin to secrete an outer skeleton that anchors the larva permanently to its home. The larva soon becomes a polyp and grows into a hollow pedestal with tentacles. The tentacles are equipped with nematocysts—stinging mechanisms which lash out to paralyze the prey. The tentacles secrete a mucus which help s them
grab the victim and pass it on to the center—the mouth of the polyp.

Coral polyps are basically carnivorous animals similar to the anemones. Most feed on minute plankton that is brought to the mouth by water currents. However, some of the large polyps actually capture even living fish, grabbing the fish with the tentacles and then passing the paralyzed fish from tentacle to tentacle until it is passed through to the mouth.

Development of the coral polyp ranges from the simple to the complex. Within the polyp cavity the walls are indented around the tube. The base of each indentation secretes limestone to build the radial stony partitions—septa—of the coral cup. Some corals, i.e., fungia, do not develop beyond this stage and the coral is merely one polyp with its radiating septa around it. Many corals have more advanced growth forms including development of an individual polyp or branching and multiplication of polyps. A single polyp may enlarge and form lobes and take on an elongated flower-like shape or a convoluted pattern forming the coral cup with the growth and shape of the polyp. Along with individual growth, the polyp can branch to form other polyps and thus multiply, forming a branched structure when the polyps are loosely connected or a compact mass, i.e., star corals, if
the polyp mass is branched and has small cups, which have grown off from the main polyp, over the entire surface.

The rate of coral growth is only one-half inch a year among some species. Collectors harvesting coral, damage the reef much faster than it can grow, yet reefs in sizes that awe the senses tenaciously exist in the warm waters of the world. Reefs vary in size and density: some are many miles in size and others are very small. Temperature, light, water salinity, nutrient and oxygen content of the water, all set up critical parameters for building reefs. Coral polyps can survive in waters from 61 F to 97 F., but the optimum reef building temperatures are in the narrow range of 73 to 77 F. In addition to critical temperatures all other conditions must fall within a very narrow environmental set of limits.

There are many species of coral and together they build the coral reefs which, even though produced by simple primitive animals, provide the foundation for a complex and interdependent society which is the support of all sea life.
Habitat is supported at sea floor to allow different structural formations, therefore, allowing habitat spaces.

Platform allows movement w/ water flow.

Series of spheres suspended from main floater.

"Coral city" village — Reef theme #6

Tunnel streets for easy traffic of divers underwater.
SITE ANALYSIS
EXISTING SITE CONDITIONS...

LOCATION MAP

SITE GENERATOR

MAJOR COMPONENTS

ACCESS/EGRESS OF SITE

MAJOR WINDS

CORAL CONCENTRATIONS

CIRCULATION WITHIN SITE
**Existing Site Conditions**

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### Notes
- This chart outlines the existing site conditions, including mean monthly temperature, monthly sunshine, mean monthly precipitation, relative humidity, wind direction and speed, sea surface temperatures, wave height, and surface currents for the months of January (J), February (F), March (M), April (A), May (M), June (J), July (J), August (A), September (S), October (O), November (N), and December (D).
Major Components

- Islands
- Campsite
- Reefs
- Lighthouse
- Research
Access / egress of site