A MARINE RESEARCH LAB IN MAINE:
BUILDING COASTAL IDENTITY

by

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ABSTRACT

If the design of a building originates from the place in which it is built, from the social traditions of that place, and from building traditions which are specific to local materials and climate, then it will project an identity different from that of a building with the same program in a different culture.

The question I pose is how far can an approach of regionalism get us toward an architecture which reinforces the particular qualities of life in a specific culture. What are its benefits, what are its limits? The program is a marine research laboratory located on a tidal river in mid-coast Maine. I have chosen the Maine coast as a case study for its strength of individuality and relative isolation from suburban influences. Civilization is marching steadily onward, and Maine will be one of the next places to deal with the cultural entropy which has enveloped the rest of the Nation.

Rather than employ historical quotation or imitation to derive a basis for new design, I distill existing properties such as site orientation, inhabitation of topography, use of materials, building systems, and social organization to their most fundamental principles. From these principles, a design strategy can be developed in terms of a vocabulary of forms, materials, organizations, and orientation which will evoke a sense of place consistent with the regional identity, and can be reinterpreted for new programs and technologies which are necessitated by today's building requirements.

Over time, new possibilities regarding construction materials, glass technology, insulation, heating, air conditioning and water systems have replaced traditional methods of construction common to the vernacular architecture of the region. While many things have changed, certain fundamental relationships between the building and local environment have not, such as wind strength and direction, vegetation, availability of sunlight,
durability of local materials, and local geology and resources, which can still be valuable in the design of a building for this area.

This project, therefore, focuses on understanding what is really important about a particular site or situation, and reinventing a formal expression for that idea which complements the existing experience, while proposing a new way of understanding its qualities.

Ann Pendleton-Jullian.
Assistant Professor of Architecture
Thesis Supervisor
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A Maine Coast Regionalism Considered
The first section of this thesis is meant to provide both the reader and myself with sufficient background knowledge of the Maine coast in general, as well as the particular architectural issues at hand, that an informed discourse may take place. I have selected appropriate topics and condensed the information to provide a basic overview of the events, politics, and resources which have brought Maine to it's present situation.

After an understanding is had of the area from a historical point of view, I have provided a series of images and sketches of architecture specific to the coast, and text explaining why I find these buildings and structures interesting, representative of the culture's values and routines, and therefore appropriate to the thesis. These are followed by examples of buildings constructed recently (within the last twenty-five years) which I believe respond to their environments, site, and culture in a fundamental way, and can serve as sources of inspiration for this project. These are not limited to one specific culture or architectural style, and therefore provide a more universal applicability than would be afforded by limiting oneself to one region.

Finally, I have gathered a series of articles representing various viewpoints on the subject of regionalism, and have presented them in outline form, which describes the main points of each author as they are written. I have chosen viewpoints with which I agree to some extent, though not entirely in any case, and which provide a range of interpretations as to the place of a regionalist approach in the architectural discourse of today, as well as it's future prospects as a way of putting meaning back into architecture.
Geological and Climatic conditions,
Human History of Maine
The character of human inhabitation of mid-coast Maine is very much tied to its natural resources, such as pine forests, granite deposits and fertile fishing grounds, as well as the expressive geological and topographical nature of the landscape. Therefore, I think it is useful to spend some time exploring how this landscape, unique along the eastern seaboard, came to its present state.

Those who have ventured along the shores of Maine cannot help but notice the distinct directionality of the folded rock forms which jut into the sea. At some locations the rock is tilted sideways, projecting from the earth in long, thin, parallel sheets of different color, opacity and texture, though always displaying the years of wear from water sculpting its surface. The earth's surface is folded into a series of parallel hills and valleys, most evident in the region surrounding Bath, Wiscasset, and Damariscotta, running northeast to southwest from well inland to the most distant islands such as Damariscove. This interesting feature was created over 400 million years ago by plates of the earth's crust colliding and buckling the surface like a tablecloth in front of a skidded plate. As sedimentary rock from the ocean floor was lifted and fractured, granite from within the earth was forced upward to fill the voids, giving rise to the rock we see today, which is primarily a brownish gray color, with streaks and blobs of the more transparent, near white granite which seem to ooze from the bedrock. As the softer sedimentary rock erodes, the granite remains protruding, and the highly figured, contoured, surface we see on so much of the shore, results.
As the glaciers receded around 10,000 years ago, the land was flooded by the rising ocean, and many of the valleys, such as the Damariscotta River, became tidal rivers and narrow inlets, divided by long peninsulas¹. By this process, the land and the water became intimately tied to one another, a condition that would continue though the relatively recent condition of human inhabitation.

The climate of coastal Maine is quite different from areas even twenty miles inland. Though extremes of temperature are rare (it doesn't often fall below zero in the winter or get hotter than eighty-five in the summer) the coast is in many ways a difficult and at times brutal environment. The primary determinant in the local weather conditions is the ocean, specifically the gulf of Maine, and the various atmospheric conditions it spawns. The gulf of Maine is perhaps the most distinct body of water on the East Coast, nearly separated from the rest of the Atlantic by Nova Scotia, Cape Cod, and a ridge of shallow banks extending from one to the other. Feeding into the gulf is the

Nova Scotia current, a back current of the Gulf Stream which slides down the shore of Canada toward Maine, and carries frigid waters with it. This, combined with the multitude of rivers which empty into the gulf, create a marine environment which is colder and less salty than neighboring areas. The Gulf stream skirts the outer reaches of the Gulf of Maine, and when the warm water collides with the cold, great banks of thick fog are produced which drift toward land and envelop anything in their path\textsuperscript{2}. Without the aid of radar and the most recent developments in satnav equipment, marine travel under these conditions is all but impossible. Indeed, on the many inhabited islands and peninsulas of the coast, the weather is one of the largest determinants of day to day routines. As one author points out,

"... it reduces you to a little part of a much bigger world. From all but the most stupid or arrogant (and out there the two are almost interchangeable) it commands respect."\textsuperscript{3}

During the spring and fall months, nor-easters whip the ocean into a frenzy, building twenty foot waves and driving cold, damp winds off the water through the coastal region. These storms put residents and their architecture to the test, because "No matter how tight your house may be, or how many layers of clothing you try to put between yourself and the cold-fingered rain, you feel a northeast gale to your bones."\textsuperscript{4} Throughout most of the winter, the wind whips strongly and steadily from the North or Northwest, while the more gentle, cooling winds of summer generally come from the Southwest. Given that Maine has over 2500 miles of coastline, not including more than 3000 islands, the weather created by the sea plays a major role in determining how life operates for many of Maine's inhabitants.

**Economic / Industrial History**

The past three hundred years of Maine coastal history has been the story of the rise and fall of several industries, including fishing, lumbering, quarrying, and shipbuilding, which have alternately defined and fractured the self-image and ways of life of those caught in their sway. The culture that has

\textsuperscript{3} Conkling, Philip W., p.1.
\textsuperscript{4} Conkling, Philip W., p.2.
emerged is the direct result of this past experience in terms of its personality and its interaction with the sea. Even the physical presence of the society, its architecture and ships, have been influenced heavily by the availability of local materials and craftsman. I think it is invaluable therefore, to look at how these resources have been exploited, manufactured, crafted, transported, and employed by others.

Fishing provided the first impetus for ships from England and Europe to cross the north Atlantic from Iceland to Newfoundland, and eventually to Maine. The banks off these shores are some of the most productive fisheries in the world, and the ability to reach them quickly, clean and dry the fish caught, and return to Europe was the motivation behind the establishment of the first outposts on the islands of Maine. Indeed, because they were closer to the fishing grounds than the mainland, the outer islands such as Damariscove, Monhegan, and Matinicus were the first land to be settled, followed later by the larger islands and eventually the mainland as more space and year-round agriculture became necessary. A man named Humphrey Damarill was the first to set up a permanent settlement in Maine, on the island now named Damariscove in his honor, at the mouth of the Kennebec river. For various reasons having to do with the mixing of nutrients and spawning, the locations where the many rivers of the coast empty into the Gulf of Maine provide the most productive fishing grounds, and thus were favored by settlers as early communities. Furthermore, these deep rivers provided transportation inland, as well as protection from ocean storms, resulting in the establishment of the towns which exist today such as Bath, Brunswick, Damariscotta, and Wiscasset.

Throughout the 1800's, Southport Island was one of the largest fishing ports in America, and served as the home of a fleet of schooners which caught mackerel and cod for eating, and menhaden, which were used for fertilizer and oil. During the sixteen and seventeen hundreds, a large percentage of the population played some part in the fishing operation. The island of Vinalhaven, in Penobscott bay, provides an example of this:

"...the fishing industry grew each year until 1860, when the Civil War disrupted markets. At that time 75 to 100 vessels, most of them schooners, were part of the fishing industry. Four steam freighters were used to haul the cured fish to Boston. Several hundred more were employed ashore building boats, outfitting the vessels, supplying bait, and pursuing the time-consuming
process of curing the fish. In all, something like 700 islanders on Vinalhaven, out of a population of 1200, made their living from the sea.”

From the years 1830 to 1860, the tonnage of fish taken from Maine waters had quadrupled, and Maine had become the second largest supplier of fish in the United States. Whole communities had grown up around the fishing industry, and its impact carried far beyond those who went out on the boats. Fishing had become a way of life. Towns built along the bays and rivers consisted of piers and wooden barns perched above the water to receive the fish, store equipment, and supply bait. In many cases, such as Damariscotta, the main street of the town ran parallel to the shore, with rows of commercial buildings on either side of the street, behind which lay the town pier and the bay. A direct relationship was created between the inhabitants of the settlement, their sustenance, the boats, the fish, and the sea.

5Conkling, Philip W., p.58.
6Conkling, Philip W., p.53
The civil war, however, brought an end to the prosperity of the fishing culture on the Maine coast. First, the interruption of the market for fish in the South caused an overabundance of supply, leading prices to fall, and hence a downturn in profitability. Furthermore, and perhaps more important, the federal government ended a fishing subsidy program which was established in 1789 to counteract the loss of the British West Indies market after the Revolution. By taking away this bonus of four dollars for each ton of fish caught, the government turned a marginally profitable business into a losing business, and the industry would never recover. Within a few decades, there were only a handful of fishing vessels left in operation. A whole way of life which had developed over two centuries had been wiped out in a matter of years. The demoralization felt by Mainers and the mistrust of those in control of their destiny would not soon be forgotten. Today, fishing in Maine is primarily recreational, while lobstering has maintained it's profitability due to the uniqueness of the product and the individualized fishing technique which allows a lobsterman with a hundred traps to compete with the largest lobster pounds. The connection of the
fisherman of the past and his community to the sea has been maintained among the lobster men cooperatives in small coastal towns like South Bristol, where gray shingled sheds still pitch out over the mud flats, and the floating docks of the lobster pound serve as the social gathering place for waterborne members of the community.

Beginning during the heyday of the fishing industry, and continuing beyond it's decline, the development of granite quarrying helped stabilize the economy of coastal Maine from the early 1820's through the turn of the century. Many of the islands of Penobscott Bay are created from large granite domes, including Vinalhaven, North Haven, and Hurricane Island, and have stone of exceptional quality. Islands and coastal quarries were favored because the extremely heavy stone could be transported far more easily and cheaply by ship to east coast cities than by the rough inland roads. The granite boom began in the 1850's when many cities began building breakwaters and granite wharves, requiring a steady supply of readily accessible stone.

Stone cut from Maine quarries during the years 1860-1900 built such impressive buildings as the Cathedral of St John the Divine, the New York Public Library, the Philadelphia Post Office, and the Annapolis Naval Academy. By the late 1800's, there were over 100 quarries on the islands alone, and granite surpassed farming as the state's largest economic provider. As with the fishing industry, though less comprehensively, a network of support services sprang up to provide the quarries and their workers with supplies and tools. The Chebeague Island company, for instance, in Casco Bay, was the lone provider of granite hauling vessels for a period. There were more than fifty of the sloops sailing between the mid-coast and the cities of Boston and New York by 1870, at which point a load of 60,000 paving blocks wasn't unusual. This tremendous weight often spelled disaster for the boats, and many ended up on the bottom. Some of the largest solid blocks of stone ever cut were quarried in Maine. A single column for the St John church was sixty-four feet long, eight feet in diameter, and weighed 600,000 pounds.

What proved to be temporary mining towns of as large as 2000 people sprang up in a matter of years, usually very close to the quarries themselves, and

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7 Conkling, Philip, p.88
8 Conkling, Philip, p.92.
controlled by the mining company. When the industry dissolved in the early 1900's, these towns disappeared as quickly as they had come.

There are three primary factors which led to the decline of the Maine granite industry. Cement had been invented in the late 1800's, and the ease of building with this new material, as well as the modern implications of it's use in the early 1900's, spelled the end for large granite buildings. In addition, the most prolific years of government public building contracts, one of the largest uses of top grade granite, had passed, and private use of the material wasn't sufficient to make up the difference. Finally, with the expansion of the railroad system across the country, and throughout New England, transportation of stone by ship became less advantageous, and other sources nearer to the jobsite became competitive.

So as with the fishing industry, the time had come when Maine was left behind by the rest of the country, and one of their primary sources of

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9Tombstones and Paving Blocks
Grindle, Roger; Courier - Gazette, Inc, publisher, Rockland, 1977, following p.84
income and pride had vanished. The towns catering to the granite industry were just that, and didn't have the deep-seated social qualities of the older fishing villages. Their disbandment and desertion left ruins behind, often with all the mining equipment still in place, but didn't disrupt the basic social organization. Mineral deposits still provide a source of income for the state's inhabitants, though it has shifted from granite to sand and gravel, which is plentiful inland. Limestone was and still is mined, and can be baked in ovens to produce the ingredients for cement, plaster, and mortar. This was an especially appropriate use for the stone considering the amount of wood available in Maine to fire the kilns during the late 1800's.

Though there have been times of great prosperity and despair, the future of the people of Maine has always been controlled by others, sometimes speculators from the Massachusetts colony, sometimes the US government, and often by political upheaval. The reliance of Maine on others to buy it's resources, it's only true means of income due to it's remoteness from trading centers, has caused it's people to view nature as it's only dependable ally. This resulted in a distancing of Mainers from the rest of
New England, and an introverted society which developed its own social customs, patterns of living, and peculiarities. Typically, Maine people do not readily follow trends in popular culture, including design, and prefer a more honest existence tied to the land which has sustained them. Many aspects of Maine life have, through repetition and refinement, become deeply embedded in the environment to the point that the landscape has become a part of the culture, not a setting in which it takes place. The lighthouses which dot the coast are one example of this integration, as is the lobsterman on his daily routine, through rough seas, rain, or snow.

"The lines of his little craft, developed out to generations of practical experience, craftsmanship, and untutored aesthetic sense, are as clean and graceful as a clipper's, suited perfectly to the job and the waters in which she works. Coming alongside one of the buoys, the lobsterman makes a sure-handed sweep with his hook and hoists the buoy aboard. Then in what seems like one fluid motion, he heads his boat upstream or into the current, cuts his engine to just the right amount of power to counteract the flow of water, flips the line over the winch and hauls in the pot, quickly sorts out the keepers from the culls, rebait, heaves the pot over the side, pays out the line, lets drop the buoy, gives more throttle to the deep-throated competent but unobtrusive engine, and steers for the next buoy... Two or three minutes during which man, machine, and nature have acted as a unit that is an unspeakable, tireless pleasure to behold again and again for its flow, its grace, its integration." 10

The past thirty years have brought new challenges to the Maine coast. Maine is consistently among the lowest states in the nation in per capita income, and typically last in New England. As land increased in value during the past few decades, and more and more people have chosen to move away from the pollution and crime of the large cities, many of the regions of the coast have experienced the buying up of land for second homes and businesses which cater to the tourists. This rise in tourism, now the coast's primary source of income, results in the interaction of the once self-contained culture, and the "Maine Yankee" with the ever offensive and insensitive weekend traveler from Massachusetts, Connecticut, or New York.

10 Clark, Charles; p.183
Bath shipyard - one of the few industries on the coast to be in continuous operation since the shipbuilding heyday of the late 1800's
Program Precedents
In this section I will analyze several examples of recent buildings which house a program for a marine research laboratory. Some, such as the Darling Center in Maine, the marine lab at Santa Cruz, and the Oregon Institute of Marine Biology are based on teaching labs, and must cater to the needs of students as well as researchers. Among these, two contain housing for staff, students, and visiting researchers, as well as the amenities one would expect to find in a dormitory setting, such as a common dining area, kitchen, and lounge. I will present each laboratory in terms of its purpose (i.e., teaching, research, types of research), its physical organization by way of plans, square footages, etc., and any notable design features demonstrated in the building. These labs were chosen from a long list for their scale, appropriateness to the project at hand, and innovative design solutions to this specific problem.

**Coastal Marine Lab, U.C. Santa Cruz, 1972**

This lab complex was designed to study marine mammal management in the Pacific coast environment. This includes the study of porpoises, seals, sea lions, and whales, as well as marine estuaries, and birds. Located about three miles from the UC Santa Cruz campus, the lab provides space for twenty-one faculty, twenty-eight graduate students, and undergraduates in the Marine Studies department. The program required flowing saltwater capabilities, tanks for housing marine mammals, a bird aviary, and several large outdoor observation ponds. In addition, the design guidelines stated that the building should have a minimal impact on the local environment, both ecologically and architecturally.
Figure 14  Final Project Site Plan

Site plan and organization of UCSC marine Lab\textsuperscript{11}

\textsuperscript{11}Environmental Impact Report on the Coastal Marine Laboratory, UCSC, 1975 by the Environmental Assessment Team, Board of Environmental Studies, UCSC, p.51
<table>
<thead>
<tr>
<th>Programmatic Element</th>
<th>Parking required</th>
<th>Square Ft</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Buildings</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Educational Facility</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-- library, meeting room, admin. offices</td>
<td>5</td>
<td>4100</td>
</tr>
<tr>
<td>lecture hall, visitor center, waiting etc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research &amp; Teaching Lab</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-- (15) marine science labs, 1-4 persons</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-- (2) large teaching labs, 30 students</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-- support facilities: prep room, collections, storage, cold room, etc.</td>
<td>19</td>
<td>11,560</td>
</tr>
<tr>
<td>Secondary Lab Spaces</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-- Specialized environmental rooms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-- food storage, equipment, tools</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-- staff offices</td>
<td>5</td>
<td>5,600</td>
</tr>
<tr>
<td>Caretaker's Housing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-- 2-3 bedroom house</td>
<td>2</td>
<td>1,000</td>
</tr>
<tr>
<td>Subtotal:</td>
<td>31</td>
<td>22,260</td>
</tr>
<tr>
<td><strong>Pools &amp; Animal housing</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pinniped &amp; Aquarium Facilities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-- Aquarium setup building</td>
<td>5</td>
<td>2,600</td>
</tr>
<tr>
<td>-- Pinniped runs (several) with pools</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outdoor Tanks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-- (4) 25' diameter pools, 5' deep, concrete</td>
<td>--</td>
<td>10,200</td>
</tr>
<tr>
<td>Large Observation Tank</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-- 300,000 gallon with (2) sub-tanks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-- Observation Tower, above</td>
<td>5</td>
<td>12,100</td>
</tr>
<tr>
<td>Fish Research Pond</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-- 100' x 50' x 4' deep; food storage</td>
<td>2</td>
<td>5,000</td>
</tr>
<tr>
<td>Avian Facility</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-- Open space subdivided into large cages</td>
<td>3</td>
<td>5,200</td>
</tr>
<tr>
<td>-- Food Storage, small lab space</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subtotal:</td>
<td>15</td>
<td>35,100</td>
</tr>
</tbody>
</table>
The design of this laboratory underwent many iterations and reviews by the clients, each time attempting to improve the relationships between the parts from a functional standpoint, as well as the impact of the buildings on future site development or on the environment. Following is a sample of some of the design features which resulted from this process:

1. Maintain a linear arrangement of buildings requiring flowing saltwater in order to keep the saltwater distribution system as simple and economical as possible.
2. There is no dockage on site, researchers must keep boats at the Santa Cruz marina, and bring samples from there to the lab.
3. Visitor's center dropped from final plan due to parking requirements and interruptions to researchers and students caused by such a facility.
5. Pinnipeds noisy. Place this building far from offices & living areas.
6. Truck access to Pinnipeds and other tanks, paving necessary to these.
7. Sea caves on site (8' tall by 100' deep) used for saltwater intake and outflow. Less environmentally damaging and less susceptible to breakage if underground.

Darling Marine Center, University of Maine

The Darling Center was established by the University of Maine to provide their marine studies program with a saltwater - accessible lab for the study of coastal and marine environments. This includes the study of lobsters, fish, estuary / oceanic nutrients, food web components, the impact of dragging on the ocean, and plankton blooms, to name a few topics. There is a large flowing saltwater lab on the water, as well as a number of renovated farm buildings half mile inland on the 100 acre site, which serve all the other needs of a full time teaching and research lab. These include housing, administration, a wood and metal shop, a library, kitchen, dining area, lecture
hall, and several labs loosely related to marine studies, though not integral to
the marine lab. The facility houses eight full time faculty, many more part
time, visiting researchers who rent out lab space, and fifteen full time
graduate students who either live on site or nearby. The next few pages
contain approximate plans and a program of the lab.

General lab work area, second floor

Typical lab work suite, 10' wide by 18' long
University of Maine Darling Center Plans (approximate)  scale: 1"=20'-0"
**Darling Marine Center, Selected Program**

<table>
<thead>
<tr>
<th>Programmatic Element</th>
<th>Square Ft</th>
<th>Spatial Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Library (12,000 vol.)</td>
<td>900</td>
<td>adj. to offices</td>
</tr>
<tr>
<td>Computer Cluster (requested)</td>
<td>300</td>
<td>near offices</td>
</tr>
<tr>
<td><strong>Housing</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-- Faculty</td>
<td>(5) @ 400</td>
<td>upper campus</td>
</tr>
<tr>
<td>-- Student (Dorm rooms)</td>
<td>(12) @ 150</td>
<td>upper campus</td>
</tr>
<tr>
<td><strong>Group Dining</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-- Kitchen</td>
<td>300</td>
<td>near housing, more seating</td>
</tr>
<tr>
<td>-- Seating</td>
<td>1000</td>
<td>flexible space, kitchen</td>
</tr>
<tr>
<td><strong>Lecture / assembly</strong></td>
<td>800</td>
<td>control point, spread around</td>
</tr>
<tr>
<td><strong>Administration</strong></td>
<td>1000</td>
<td>near student housing, public</td>
</tr>
<tr>
<td><strong>Lounge / activity room</strong></td>
<td>600</td>
<td></td>
</tr>
<tr>
<td><strong>Lab Space</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wet lab</td>
<td>2500</td>
<td>running sea water, 1st floor</td>
</tr>
<tr>
<td>Visitor work suites</td>
<td>(5) @ 200</td>
<td>adj. to wet lab, windows</td>
</tr>
<tr>
<td>Behavior rooms</td>
<td>(3) @ 250</td>
<td>envir. controlled, no light</td>
</tr>
<tr>
<td>Boiler room</td>
<td>160</td>
<td></td>
</tr>
<tr>
<td>Algae growing room</td>
<td>160</td>
<td>no outside light</td>
</tr>
<tr>
<td>Walk-in rooms</td>
<td>(2) @ 64</td>
<td>in wet lab, self-contained</td>
</tr>
<tr>
<td>Teaching classroom</td>
<td>800</td>
<td>running sea water</td>
</tr>
<tr>
<td>Lab work space</td>
<td>(5) @ 350</td>
<td>Second floor, open space</td>
</tr>
<tr>
<td><strong>Specialized lab space</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-- Electron microscope</td>
<td>300</td>
<td>off lab work space, dark</td>
</tr>
<tr>
<td>-- Darkroom</td>
<td>225</td>
<td>upper campus, too remote</td>
</tr>
<tr>
<td>Specimen preparation</td>
<td>200</td>
<td>adj. to elec. mic., work space</td>
</tr>
<tr>
<td>Grad student offices</td>
<td>(8) @ 100</td>
<td>on hill, should be near lab</td>
</tr>
<tr>
<td>Water reservoir room</td>
<td>200</td>
<td>gravity fed to lab</td>
</tr>
<tr>
<td>Technician offices</td>
<td>(2) @ 150</td>
<td>adj. to lab</td>
</tr>
<tr>
<td>Researcher Offices (requested)</td>
<td>(5) @ 120</td>
<td>next to visitor work space</td>
</tr>
<tr>
<td><strong>Storage</strong></td>
<td>400</td>
<td>distributed through lab</td>
</tr>
<tr>
<td><strong>Support Facilities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boat maintenance</td>
<td>1125</td>
<td>on hill, garage door, office</td>
</tr>
<tr>
<td>Scuba shed</td>
<td>1000</td>
<td>near boat access, shower</td>
</tr>
<tr>
<td>woodworking / metal shop</td>
<td>450</td>
<td>on hill</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td>21,548</td>
<td></td>
</tr>
</tbody>
</table>
Design Features and staff suggestions for improvement

1. The buildings of the campus are too far apart from one another to encourage researcher and student interaction and collaboration. Combining the various parts of the lab space into one building would help, as would bringing all of the housing together.

2. The general lab working space on the second floor, currently one large open space with five research units, is too loud and distracting for everyone. More privacy needed. Cross ventilation, natural light, is appreciated.

3. Electron microscope room needs to stay cool, dry and unsalty.

4. Salt water reservoir on second floor to feed wet lab below by gravity.

5. Concrete floor throughout wet lab and supporting spaces. Trench drains in lab floor, water from specimen tanks flows continuously onto floor.

6. Types of tanks used in wet lab:
   -- (4) 6' diameter x 3' deep cylindrical tanks on floor
   -- (10) 4' x 6' x 5' high racks of water trays, moveable
   -- all tanks and trays require saltwater piping access.
7. Saltwater piping system overhead, not concealed to allow frequent cleanout (daily). Piping PVC to prevent rusting. Access to water every 6' along length.
8. Ten foot ceiling heights minimum in lab.
9. Wood framing, fixtures employed to inhibit rust due to salt air. Exposed framing in lab.
10. All computers, electrical equipment sealed from salt water lab.
11. Conserve valuable wet lab space, put support spaces at perimeter.

Woods Hole Marine Biology Lab

12 Laboratories in Low-Tech Contexts, in Architectural Record, March 1994, p.90
Marine Biology Lab, Woods Hole, Massachusetts

The Woods Hole Marine Biology Lab provides high quality marine specimens to research facilities, and therefore a high percentage of its space is devoted to specimen holding tanks and water filtering equipment. A wide range of marine animals are kept, including fish, crabs, sharks, and squid, and require a range of tank sizes and conditions.

Design Features
1. Saltwater available anywhere on ground floor - exposed piping, PVC.
2. Tanks located on ground floor, labs and offices above.
3. Water reservoir and filtration on top floor - provides natural pressure.
4. Space differentiated into office wing and lab wing.
5. Design consistent with local buildings. Granite with shingle style details, proportions.
Oregon Institute of Marine Biology

The Oregon Institute of Marine Biology lab focuses more on teaching than the previous examples, and inserts modern laboratories into a campus composed of simple, shingled, pitched-roof structures. The buildings are generally narrow enough, less than thirty feet wide, to allow natural cross ventilation as a cooling system in the moderate climate of Oregon. Naturally

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13 Architectural Record, March 1994, p.91
treated shingle siding was chosen, as a local material, for its ability to weather the damp, cool climate without deteriorating. In addition, most of the light fixtures, outlets and lab equipment which would normally be metal have been replaced with wood for similar reasons, especially in light of the concentrated salt environment of the wet lab.

Saltwater is pumped to a cistern on an overlooking hill, which then is fed by gravity to the lab. Plastic piping has been used throughout, and two parallel saltwater systems were run to avoid interruptions in the supply. The piping has been run overhead for easy access, and taps are provided at short intervals along the run. Water flows from the specimen tanks into trench drains, which then leads to a small stream adjacent to the lab which flows to the ocean.

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14 Field Station, Architectural Record, November 1992, p.79
Oregon Institute of Marine Biology -- research and teaching labs\textsuperscript{15}

\textsuperscript{15}Architectural Record, November 1992, p.78
Maine Coast Building Traditions
This portion of my research deals with the architecture that currently exists along the coast of Maine. It will be organized around several themes which relate the buildings to their environment, and seem to be predominant in the architecture of the area. These issues will include the transitions created between interior and exterior, enclosure and exposure, building and landscape, building and ocean, the use of vegetation or site orientation to take advantage of light or wind, the use of materials as a response to the environment, materials or structural systems which guide the form, and the way in which the relationship of people to the ocean is expressed in their architecture. No one building demonstrates all of these characteristics, and a demonstration of their existence is not a proof that they are "rules" of architecture for this area. Instead, this should be seen as an outline of the relationships created between a culture and its environment, through its architecture, which I feel represents the values of that culture.

Used for the storage of ice blocks harvested from the adjacent pond, this rectangular barn in South Bristol demonstrates the simplicity of form and expressive craftsmanship evident in many Maine coast buildings. Its horizontal rough lumber siding and wood shingled roof creates a uniform skin which tightly wraps the structure, only alluding to the interior organization subtlety at the points where the roof changes pitch. Here, there is a barely noticeable seam which runs vertically where two panels of siding meet.
Thompson Ice house – end facing pond
The detail where the siding meets at the edges, a lapping of one board over the other to show the endgrain along one wall face (see sketch), shows the appreciation the builders had for expressing the materials with which they worked, and how those materials were put together. The lack of trim at the edges or base of the building, as well as the continuity of materials, gives the whole structure a taut, abstract character which emphasizes the form of the roof and the volume.

The building meets the ground cleanly, without any indication of a foundation or piers, and without altering the earth in any way. It is as if the building were floating above the ground, only touching down enough to keep it from moving. This turns out to be a common relationship between building and ground along the Maine coast. Rarely do buildings seat themselves down into the earth, perhaps because of the proximity of bedrock to the surface in most cases, but this also allows them to take advantage of breezes flowing underneath when the structure is raised on piers. In the case of the ice house, the idea was to insulate the building as much as possible, hence the siding just touches down. The relationship of building to the trees around it reinforces the concept of natural insulation. To the north and west lie the road and pond, offering little shelter, but to the south and southeast is a dense forest of spruce trees, filtering out most of the strong summer sun. Careful consideration of the potentials of the site, and the straightforward use of simple, local materials, produced a building that is as sensitive to its function as it is expressive of the values of its builders.
In this farm north of Boothbay Harbor, a similar treatment of landscape and siting is evident. Sunlight and warmth were desirable, so the building was located at the northern edge of the field, up against the woods, where the cold north-east winds would be blocked. There is a relatively large amount of glazing on the south face, and the doors open in this direction. The barn, as with the ice house, is not firmly seated in the earth, but steps down with the contours, supported at the corner by fieldstones collected nearby. A large rock, too heavy to move no doubt, sits just in front of the barn, possibly dictating the building’s location. The barn works with the topography and adjusts itself accordingly.
The shifting of buildings in relation to one another as a response to the hilly, rocky, difficult landscape of the coastal peninsulas is demonstrated by the cluster of sheds and barns and garden in the following image. This reaction to the landscape, one of accommodation rather than control, and local topography as a formal organizer, is a common characteristic of Maine architecture.
A cluster of farm buildings oriented according to topography

Unlike most coastal buildings which use natural elements such as trees and hills to deflect strong weather, the shipbuilding loft in South Bristol confronts the ocean and accepts the beating it may receive (photo next page). It is a large, steel framed, corrugated steel sided box of a building, with few windows and the utilitarian character of the boats which are produced inside. The ocean-facing end is dominated by two large garage doors, which lead out onto wooden skids that slope into the water. There is a visible and practical relationship which is formed between the building and the water. Like a steel trawler, the metal loft is designed to protect itself from the salt spray and wind with a closed, hard exterior, but at the same time depends on the ocean as a partner and in some ways client, for its products. The special requirements of the interior determine the structure, environmental conditions determine the exterior, and the two meet at the wooden skids.
The relationship between land and water, building and land, are fundamental to the architecture of the coast. Many buildings create a series of transitional spaces between the two extremes which help ground them to their site, despite a tentative physical meeting. This is demonstrated at the Pemaquid Point light house, which sits perched above the pounding ocean on one of the most exposed points along the coast. The lighthouse and caretaker's cottage, connected by a passageway, form a barrier running northeast - southwest which creates a protected space behind. This is where the entrance can be found, under an overhang, as well as the flagpole and bell. Set alone on the top of a ridge, the house has small windows, clapboard siding, and has practically no built outdoor space.
Around the entire building runs a three foot high white fence, in a rectangular shape, which seems oddly rectilinear in this hilly, open, grassy clearing. Through this fence, the building claims the territory around it, and by doing so, gains a foothold in the landscape. By superimposing an order on the landscape, a sense of containment of space is achieved, and a zone of protection. The interior of the house is man's dominion, outside is the ocean, but within this fence the two co-exist. A detail of the fence's constructions suggests that it is not about ownership in the suburban sense, but about mediation. At each post, a diagonal brace juts outward and down to the ground. This hints at the wind and water that batters the lighthouse, and the necessity of the inhabitants to be aware of their location when venturing outside. One can well imagine how nice it would be to have that fence there, at the cliff's edge like a lifeline on a sailboat, in a northeast gale with pea soup fog.
Two peninsulas south of Pemaquid, at Ocean Point, there are several cottages which have created a similar territoriality using different means. In the first photo, the road runs perpendicular to the shore, upon reaching the water along side the cottage, it turns ninety degrees and passes between the building and the ocean. The grass around the cottage is natural, with rocks and bedrock projecting through. The cottage floor sits six feet above the ground, with dark latticework running completely around it's base, meeting the ground cleanly and following every contour. The house seems to be sitting on the landscape, there are no paths leading from it's steps, no bushes at it's sides, no sign that it belongs to the land. The road, however, implicitly orients the house and gives it a territory which is controlled by it, and therefore makes it part of the landscape, not just an object placed on it.
The house was designed to take advantage of the breezes coming off the water in the summer, when the house is occupied, but also provides a sense of protection from the elements and enclosure in a site which is actually very exposed. Porches wrap around the three sides facing the water, extending the living space toward the water, and projecting the inhabitant psychologically to the islands in the distance. The rear of the house is pushed up against the woods, and is far more closed and planar. The latticework below the porch allows air to circulate beneath, thus cooling the interior of the building. Instead of a railing, the porch is surrounded by a low wall, and covered by a sheltering roof with overhangs, to give a sense of enclosure, and a condition somewhere between interior and exterior. The porch is a horizontal place, which mediates between the verticality of the main house volume and the ultimately planar ocean surface.
Ocean Point cottage -- sketch: materials and enclosure

Another cottage nearby demonstrates a similar appreciation for projecting outward to the horizon, as well as making use of the landscape for protection from the elements, as we saw in earlier examples.

A cottage carved into the woods, facing the ocean
As this photo illustrates, the building is carved into the dense forest, blocked from the north and east winds, and open to the warm sun from the south and west. By recovering the well defined space around it from the forest, the building has created it's own space in the landscape, a part of the environment which is necessarily related to the house as well as the trees, an intermediary space. It is removed from the ocean by the zone of the road, which links house and people with civilization, and hence the subconscious belief that they aren't alone against the sea. The dock which projects outward with a relentless linearity into the fog, stands in stark contrast to the undulating sea and the rugged rocks below, again focusing the attention of the viewer to the horizon and infinity. The building and the ocean merge with distance.

Sketch of cottage siting, boundaries of road and trees
Although buildings of the coast often meet the ground abruptly and without alteration, the transitions which are created between building and water, and site and water, are many times continuous, flowing, and well integrated. This may be a result of the long-standing dependence of the culture on the water for transportation and livelihood, and thus the necessity to develop built form which mediates between the two. I think the range of approaches taken regarding this aspect of Maine coastal architecture is what makes it unique and interesting.

The warehouse in the following photo, in Belfast, stands as a link between land and water, in terms of building composition, human transportation, and economic vitality. It's a simple pitched roof structure with no openings except at the ends, and is divided vertically into three sections by steps in the red clapboard siding. It is oriented perpendicular to the water and to the railroad tracks which pass just along it's inland end, reinforcing it's directionality.
At one end the railroad tracks represent over-land travel, the movement of heavy materials, and a link with the country's interior, firmly connecting the building with the continent which provides the goods and raw materials that pass through its doors. At the far end of the building, a granite enclosed earthen wharf gives way to a wooden dock and eventually solitary piles projecting from the water.

The simplicity of the warehouse allows the forms at either end to project themselves upon it. Consider the transition which takes place in going from Earth (building), to manmade earth (granite pier enclosing dirt), to ocean structure (dock with piers) to ocean (piers standing alone), and vice versa as the water inhabits the area between the solitary piers adjacent to the wharf.
The footbridge which crosses the harbor at Boothbay (photo following page) treats the water / land relationship differently. Here, the bridge acts as a path which connects the two sides of the harbor. Although constructionally it’s a dock, one doesn’t interpret it as such. It begins as a granite pier, moving along the edge of the water, just as many other paths do. But then it moves out over the water, still on a granite base, which then gives way to wooden decking. In many ways, though, this dock is a street. There are telephone wires and poles which flank it, and at the center is a building which stands perpendicular to the direction of travel, more like a store front than a dock shed, complete with a front porch. If ones turns perpendicular to the traveled direction along the dock, and passes through the porch and shed, you will arrive on the dock for the shed which is at sea level. In this sequence, the idea of "land", "water", and "dock" have been redefined. What was the dock is now the land with respect to the shed and it’s dock. Since the expectation of the end of the pier never comes, it is reinterpreted as a path, i.e.. a route connecting two points, and hence part of the shore. Land and sea again interpenetrate one another.
Northeast of Pemaquid Point, at New Harbor, a granite pier provides a new insight as to how a dock can be interpreted for a different use. The purpose of this pier was to enable the fisherman to get to his boat at low water, and have a steady surface to work from regardless of sea conditions. In addition to these requirements, it had to last, and not be swept away after a few winters. His solution was to construct a granite tower somewhat offshore, and then encase it with wood piles which would support the decking and rails on top. From this platform he could access deep water at any tide, and his platform would not rock and roll. To get to this island, he built a small trussed walkway which extended from shore.
This is an entirely different take on what a dock can be. In previous cases the dock was an extension out into the sea as a linear construction, or a path connecting two points on land. This situation is a path to a destination, a place, which is land inserted into sea for the very purpose of enabling it's builder to interface between the two more easily. Here the boatsman has altered the landscape dramatically as a reflection of his needs, and in doing so has tied the land and ocean together physically as well as metaphorically. In this sense, the house he lives in and the boat he boards are extensions of one another, built aspects of a life which depends on both for survival.
In the small fishing village of South Bristol, at the end of the peninsula defined by the St John's river and the Damariscotta, the importance of the ocean and the inhabitant's interaction with it is most clearly evident in the architecture. In many ways, this harbor acts as an individualized version of the warehouse in Belfast, which so fluidity mediated between the various aspects of land and sea important to it's users. The road connecting the island with the mainland passes over a narrow bridge of land which houses a continuous row of lobstering and fishing buildings, a town lobster co-op and convenience store and gas station (for both cars and boats of course), as well as a small swing bridge which allows the trawlers based there to pass between the "gut" and the ocean. The buildings all cling to the road edge, and extend out over and into the water on either side, with an assortment of piers, decks, docks and pilings. Both the rocks which lie below the buildings and the structural legs supporting all of the inhabitable
space are covered with dark green seaweed, snails, crabs and whatever else has arrived there, making the various parts indistinguishable.

Fisherman arrive by pickup truck early in the morning, pass through the dockside structures, load their boats for the day, untie from the dock, and head out through the bridge for the day. Boaters, sailors, and lobsterman meet and talk on the gas dock of the lobster pound, or get out of their cars as they wait patiently for the bridge to close, discuss whatever is important that day, and go on their way. This little strip of land is where all the activity, all the community, all the interaction of the town takes place. It is where land meets sea. Street, house, shop, and boat exist within fifty feet of one another along it's length; which belong to land and which to water become indistinguishable across it's width.
The final example I will discuss combines many of the elements of we've seen previously, relating building with landscape, street, environment and water. The entrance sequence to this small cottage in New Harbor, wedged between the street and a slope down to the water, is particularly interesting in the way it treats the transition from outdoors to indoors, and how in incorporates landscape, materials, and orientation into this procession.
One enters not through a door in a flat wall, but through a sequence of experiences. The edge of the house is pressed right up against the street, giving a sense of enclosure and protection as one moves along its soft gray shingled wall. A low, overhanging porch with thin columns and a surrounding low shingled wall wrap around the front of the building, toward the water, and continues back to the road, presenting the passerby with direct visual and tactile contact with the private yet inviting space. One enters this space from the driveway, and then indirectly, passing over a suspended walkway which runs parallel to the side of the barn out over the vegetation, and then perpendicular to this direction onto the porch. At this point one is again directed outward by the view, but led forward, through a screen door, into the enclosure of the porch and adjoining rooms of the house. The suspended walkway has the effect of a dock, serving as an arrival onto the "shore" of the house. Landscape flows under building, which hovers above and then re-attaches. The barn and house create a space in between which orient and protect their inhabitants, while at the same time projecting them outward toward the ocean.
It is difficult to specify which attributes makes a building express the character of a place, but through this brief study, several principles recur among the buildings which seem to derive from the place in which they are built and the people who have built them. First is the way in which they relate to the landscape and topography. Many use the dense coniferous forests as protection from exposure to the north east, where most of the violent storms come from. There is a general approach toward building above the ground rather than on or in it, as a response to the presence of water or bedrock below. This also allows for natural ventilation from breezes passing underneath. One side of the buildings are usually more exposed than the others, which is often addressed by porches, overhangs, or contained outdoor spaces. These spaces then create a transition from exterior to interior which parallels the transition from land to water made so effortlessly by many of the buildings engaging the ocean directly. The incorporation of structures into the worlds of both land and water reflect the dependence of the society which uses them on both domains, and their mobility from one to the other.

The vast percentage of buildings are made of locally available materials, such as wood shingles, clapboards, board siding, lumber, and stone. These materials are constructed in simple, straightforward ways to accomplish the task at hand, often exposing the means of construction. The skins of the buildings typically are planar and uniform in material, with small or no overhangs except for protection from the rain on the side facing the water, and windows are only large when sheltered. These are of course just observations, and don't pretend to describe or explain all of the architecture of the area. They are some of the points which I think are important in distinguishing the structures of this locality and culture as a combination of a place, a history, and a way of life.
Design Precedents
In this section I will present several buildings, primarily in the form of images, which draw heavily upon their specific context as a source of inspiration and power. I think this characteristic of these buildings is not so much linked to their locations or clients or programs, but to the architects who designed them. In most cases, the buildings are just one manifestation of the ideas of the person who created them, and any number of buildings by the given architect would have demonstrated the point. In some cases, such as Alvar Aalto, the architect comes from a country with a strong regional heritage of culture and design, which act as a filter and buffer through which new ideas and influences are sifted. For Barragan, it is the love and appreciation of his culture and it's nuances that inform and particularize his designs to the point that they are a part of the society, and differentiate them from those of a German or Swiss.

If the rationality of a building derives from it's structure, materiality and order, as in the case of Louis Kahn's Salk Institute, it's soul springs forth from the importance and implications of it's location overlooking the sea at the edge of the continent. It stands as a concrete and teak expression of the limits and disillusion of manifest destiny and the California Dream, while providing hope for the future in the undefined horizon.
Louis Kahn's Salk institute for biological studies. The building derives its power from its solitary position overlooking the Pacific, reinforced by a simplicity of form and materials.²⁶

²⁶ Salk Institute . . Louis I Kahn; by James Steele; Phaidon Press, London, 1993
At the Exeter library, Kahn uses the brick colonial houses of New England as a reference for the facade organization, as well as the discontinuity between interior and exterior materials and spatial arrangement. The building is sited in the center of an expansive lawn facing a main street, similar to the way many captain's houses are set in their site's, monumental yet private. The perception of scale is altered through the use of mezzanines at every other level, giving the building the feel of a scaled up four story building. The four faces are offset from the interior mass of the building, creating an inhabitable enclosure zone around the perimeter. A full height open space at the center of the building creates a unifying force, allowing a user at any level to see all the books available, and feel a sense of harmony in the linking of the ground below, with it's large Persian rug and piano, with the sky above. As always, the detailing of concrete and wood is exquisite. The building conveys the sense of dignity and excellence associated with Phillips Exeter, as well as the ideological purity of a sanctuary for study.
Cowplain school, England, by David Morriss of Hampshire Architects -- modern materials and abstract, linear form intensify natural site and recall pasture cowbarn buildings.\textsuperscript{17}

This modernist expression of glass and steel could follow from the Miesian tradition, but also seems perfectly suited to its natural site. Placed linearly along the boundary of the woods and the meadow, the silvery form emphasizes both and the differences between the two. Its highly detailed pieces which fit together seamlessly make a connection to the English tradition of craftsmanship in building, while the placement of the school in the site reminds one, in effect if not in form, of pasture buildings nestled into the landscape. The foreign nature of the materials and technology to the meadow site further emphasize the particular qualities of both; the building would no doubt have been less successful had the architect chosen a more traditional material or expression for it.

\textsuperscript{17} Architecture Review, October 1990; p.36
Rubidoux Studio, Nova Scotia; by Brian Mackay-Lyons -- This little box of a building set on piers reflects the survivalist and corrugated steel could have been collected from the resist the wind. Building elements such as the sliding barn door /shutter, roof ladder, and small window openings derive as much from necessity as formal invention.\(^{18}\)

\(^{18}\) Architectural Review, November 1990,; p.70
The Floro Coastal Museum near Bergen, Norway is expressive of the people's relation to the sea along the rugged Norwegian coast. Two large, heavy, blank buttressed walls form the exposed edge of the building where land meets sea, and create a sheltering, even protective barrier for the rest of the museum. The use of rough materials layered over one another reinforce the idea of a society and its architecture which has been built up over time in response to the environment and its dependence upon it. The building was designed by Kare Frolich and Svein Hatloy, both of Norway.¹⁹

¹⁹ Architectural Review, May 1988; p.35-
House in Vogorno, by Livio Vacchini.
Forms and materials indigenous to the region and culture have been abstracted to arrive at this design. Each material is given its own expression, and the pieces are brought together precisely, clearly defining "base", "living area", and "roof". The building maintains the relationship with the hillside and view common to vernacular houses and sheds of the area, perhaps one of the most important aspects of the culture which inhabits this relentlessly sloping terrain\(^{20}\).

\(^{20}\) Architectural Review, May 1988; p.35-
Saynatsalo town hall, by Alvar Aalto

Court as a place for reflection, intimate by virtue of being raised. A metaphor for island life in this remote region, experiential. Uniformity of brick surfaces provide stability, permanence, austerity of Finnish life. Materials grow out of landscape: local brick, brown wood elements
recall pines, natural landscaping flows through building —pervasiveness of nature in culture, even in town hall, symbol of human organization

Above: Casa Galvez, Luis Barragan  
Below: San Cristobal

21 Town Hall, Saynatsalo . . Alvar Aalto; by Richard Weston, Phaidon Press, 1993
22 A & U , October 1992 ; p.20-
Barragan sought to make connections between modernism, Mexican culture, and his personal ideas of spatial serenity. Heavy walls, water, screens, simplicity of forms, solitary walls, tactile expression of materials, use of strong colors, light modulation, follow from Mexican tradition which inspired his life and architecture. The abstraction of these, including spatial and formal composition, use of plate glass, influence of Corb etc. Culture, way of life, at core of invention. Makes one feel importance of materiality and light to memory, spirituality of society expresses values through these.
Order superimposed on natural terrain, slope. Simple forms, clad in continuous shingle skin, taut, seamless. Emphasizes geometry of forms. Building relates to landscape in manner consistent with traditional Maine architecture. Hovers above ground on piles, vegetation flows underneath. Buildings connected by series of walkways, serve as network of circulation, meeting points, integration with landscape. Building forms face North or South with windows depending on light requirements of spaces within. Simple 2x4 structure, no heat. Balance maintained between geometric order of walkway layout and geometric forms and free flowing

23 Architecture, February 1989; p.63-64 (all photos of Haystack Mountain School)
landscape around and between building pieces. Harmony between natural, vernacular and intentional abstraction.

Haystack Mountain School, view from woods

Plan of walkways and shed structures
Above:
Materials and massing of new museum similar to that of nearby city fabric. Memory of Roman occupation is strong in defining image of place.

Left:
Plan sets up archaeological grid-like system for ordering ruins below. Heavy brick piers create ties between the two ages.

Plan of lower level – shifted grid represents ruins

24 A & U, August 1989 (all photos)
This museum, both physically and metaphorically, grows out of the Roman ruins which underlie it's foundations. Moneo has used a thin brick bearing wall system, and a series of roman arches to evoke through materiality and form the monumentality and weight of a roman structure. By inserting a steel pipe and thin metal decking system, the architects has firmly rooted this building in the present time. The juxtaposition of the heavy brick and the thin steel emphasizes the difference between the materials as well as that of the eras or their creation. Merida has strong ties to it's roman history, and by creating a building which evokes this past while linking it to the present, Moneo has helped reinforce the identity of the city.

These architects and their creations are just a few examples of the possibilities afforded by an explicit or implicit approach to design which
considers culture, locality, and individuality as sources of inspiration. I think the most successful examples have taken some value held by the culture in which they are built, such as an attitude about light, materiality, survival in a harsh environment, or history of place, and have evoked the same feeling in a form not necessarily similar to that of the vernacular, but strong in it's conviction about the value it seeks to express. Some aspect of each of these examples serve as a resource for me in my search for an architectural expression of the coast of Maine.
Regionalist Theory Considered
The Meaning of Regionalism in Architecture
by Pietro Belluschi
Architectural Record, December 1955, pp.131-139

- Regionalism seen by architects as naive, simplistic - denying progress.
- Architecture throughout the world has a sameness, character and meaning are lost.
- No simple description of Regionalism is likely, or accurate
  -- It involves all of man's involvement in his surroundings, culture
  -- "beyond the obvious relationship of buildings to a certain region, the meaning of the term seems to spread and touch an all that man is and believes in, as a creature of his own environment. Architecture, as a reflection of man's longing for order and for adjustment to his natural surroundings, has always been (or at least until not long ago) regional in its essence and character." (p.132)
- Our experience of the world is through magazines, television: processed by media.
  -- We have less direct contact with our society, achieve a universal society.
  -- We see the world at 50 or 200 mph as it passes by. We don't stop to listen or feel - move in an "unhappy restlessness" through "impersonal landscape"
- It is impossible and incorrect to ignore advances in technology, living conditions.
  -- Buildings must still be practical, functional, economical.
- Shouldn't try to "formulate a rigid intellectual program for architecture"
  -- many possible interpretations will coexist for the same condition.
  -- Architecture will always try to draw on the past, we should encourage intervention as long as it is true and real.
  -- Though the present society does come from the past, we must face the challenge of relating buildings to particulars of place and society which exist now, cannot relate it to past.
- "Regionalism at its best cannot be measured or imposed, is not a school of thought but simply a recognition within it's own sphere of what architecture is to human beings, a deep regard for their emotional demands..." (p.138)
Between Traditionalism and Modernism
by Dennis Mann
Journal of Architectural Education, Winter 1985, p.10-

- Considers paradigms of architectural education - how they influence attitudes of architects toward vernacular building traditions.
- Architecture should identify with the people it is serving, not the architect or advancement of society per se.
  -- Houses in New Mexico "explosions of individual expression gone awry. Every house was unique, an extension (call it flaunting) of its owner's implacable ego. The design idiosyncrasies of each dwelling slobbered all over themselves." (p.10)
- Household one of strongest elements in society, determined by traditions and rituals of space and activities.
  -- "familiar shapes and traditional forms are meaningful because they are associated with cultural patterns."
  -- "architects should help people achieve, realize and celebrate those rituals and patterns."
- We look to the past but are dragged into the future, must confront it.
- Modernism favors "built solid", or "insulated object" and "outer angle" signifying flowing space and dynamism, whereas traditional building favors "inner angle", structure of space over object.
- Three approaches to design, options:
  1. Design good buildings, not original, within codes of society. Focus on what people expect, don't try to change it. Architect as implementor of rules of society.
  2. Modernist paradigm: architect re-creates rules of society and designs buildings or a new way of life, an "improved" one. Architects usually chose this paradigm when creating a vernacular because it is taught as an agent of change. All options not considered.
  3. Create and architecture which is understood and accepted because it is derived from existing social frameworks, but explores new social, economic, technological changes, proposes new forms.
- Architects must learn that there are options, and when to apply each to a given situation when appropriate - don't get locked into one paradigm.
Regionalism and Invention
by Lawrence Speck
Center, 1987, pp.8-19

- "Regionalism...views architecture as a means to the end of cultural vitality and expression"
- Draws parallels between architectural regionalism and creation of Jazz from New Orleans roots. Drew from range of sources: black culture, French, Spanish, and location to arrive at a new style. Painters draw from similar sources, power of art form "is from its particularity and reality"
- Precedent in architecture of place determining building style
  -- Hagia Sophia fuses eastern and western types.
- Innovation and progress come from "a renewed awareness of long-standing particularities of a place" Italian renaissance an example.
- Gaudi as a modernist with roots in a region, craft, trades employed.
  "Through the architecture one can feel the exuberance and passion of the culture".
- Wright: taliesin north and west as different responses to regions
  -- West is built in and out of earth, texture, color, massing - inventive.
  -- Made something of elements long overlooked and undervalued.
- Aalto invented a new regionalism - not a style but a sensibility for building in his place.
- Barragan knew Mexico, built based on traditional forms, massing, building systems
  -- Incorporated modernism from Corbu into his context
  -- "Barragan is extending a tradition, not freezing a tradition."
- Kahn used imagery of building tradition to inform invention
  -- Kimball museum employs horizontals of plains, Texas "porch" front.
    Forms of grain elevators in vaults, light and shade modulated to acknowledge strong sun.
  -- Exeter library behaves as New England building.
- Lesson from these five architects, that "powerful and salient invention often emanates from a deep and trenchant perception of the particulars of a place"
Ten Points on an Architecture of Regionalism: a Provisional Polemic
by Kenneth Frampton
Center, 1987, p.20-

- People no longer impressed by "newness" or advances in technology, days of avant garde are over. New social structure defined by consumerism pushed by multi-national corporations - leads to universalization of culture. Drive for newness never seems to last - everything important already happened.
- Post Modernism "cannibalized lexicon of eclectic historical references, freely mixed with modernist fragments and formalist banalities, serves as the superficial gilt with which to market architecture." Puts it in realm of a commodity.

Ten Points
1. Regionalism not tied to vernacular, regionalism is a critical, thus carefully studied, endeavor -- not random and determined by custom as is vernacular. It should lie beyond style, free of pre-determined aesthetic decisions.
2. Modernism should be viewed as a point of departure rather than a dead end. Certain spatial concepts are liberating, valid. Cultural complexity and richness of Modern movement evidenced by works of Wright, Aalto, Barragan, Utzon etc.
3. What constitutes a region?
   -- Climate, locality a start
   -- Discourse within a region exists, architecturally and culturally
   -- creation of a "school" a fabrication, but has creative force in its own right.
4. "We have begun to lose our capacity to distinguish between information and experience." Lead us to read buildings as images rather than experientially.
5. Concept of Place gives way to just Space in modern society -loses specificity.
6. Buildings need to be related to, grounded in topography - it is the basis with which we begin to define "building". Typology has to do with culture, history, but not with a specific site.
7. term "architecture" should mean the expression of the way a building is rooted in nature, climate, time, as well as the way it is put together.
8. Buildings are in contact with nature, light, air etc. - modern systems seek to deny this. Organization of spaces and use of traditional means of lighting, ventilating can help root a building in its place.

9. Architecture experienced by all senses, not just vision. Tactile should be emphasized.

10. Two types of critics of Modern movement:

   -- Neo-historian, think that Modernism has been discredited, should be abandoned.

   -- Those that see Modernism as liberating, way of the future.

• Regionalism as middle ground. Considers past in making architecture of place, and sees the implementation of this in terms of all influences on a given location. Acknowledges that modernization will continue, and that this must be considered.
The Design
The site for this project is on the Damariscotta River, a large tidal river in the heart of mid-coast Maine. This location is particularly suitable in that it is surrounded by elements of traditional and future Maine life. Five miles upriver is the town of Damariscotta, a small village once supported by fishing, lobstering and shipbuilding, now by tourism. Seven miles away is the boating and sailing center of Boothbay Harbor, one of the focal points of summer tourism.

General location of site - about 50 miles northeast of Portland, Maine
Site location relative to Damariscotta River
The particular site is also in immediate contact with the elements. The ten acre site along the river culminates in a 2-3 acre peninsula that extends 500 feet out into the river, nearly halfway across, and is continued by a small island and a series of rock ledges. This vantage point makes the site very visible to a large portion of the river, and vulnerable to its wind and waves. Though it's a river, there are still ten to twelve foot tides which reveal an entirely different landscape every six hours. The end of the peninsula is a conservation easement meant to protect an osprey colony there, as well as the summer home of about fifteen harbor seals. Adjacent to the site is the mostly buried remnants of a brick making facility including a clay pit and kiln used in the early 1800's to supply Boston and the Back Bay with bricks. At the mouth of the river lies the working fishing village of South Bristol, home of several fishing trawlers that work George's Bank, and many lobster men. I think all of these references to a rich past as well as an emerging future make this site appropriate for this exploration.

Program

I have designed a group of buildings which will house a marine research center operated by the University of Maine to study the ecology of the Gulf of Maine and its tidal rivers. This program includes approximately 15,000 square feet of laboratory space, housing and living areas for six to eight visiting or resident researchers, office space, a boat repair shed, and some form of built access to the water. The program is presented on the following page.

I believe this project is suitable to the issue at hand because it is by its nature concerned with the interaction of the environment with the society, and therefore its architecture, that lives by it. As a modern building type, it is a good test of the applicability of past architectural themes to new programs. The programmatic requirements of a laboratory provide a rich diversity of functional and support spaces which could be seen as analogous to much of the working architecture of Maine's coast. The goal of this project is to explore the extent to which the characteristics of one can inform the other, in light of the fact that the spatial and technological requirements have changed dramatically over time.
**Marine Research Laboratory Components**

**Wet Laboratory**
- Wet lab 2000 2000
- (5) Marine science research suites
  - Lab space 225 1125
  - Office 125 625
- (8) Grad student offices 100 800
- (2) Technician’s offices 150 300
- (2) Behavior Rooms 250 500
- Algae culture room 150 150
- Sample Prep 150 150
- Electron microscope room 200 200
- Darkroom 200 200
- (2) Walk-in environment control 64 128
- Teaching classroom 800 800
- Support space (freezer, centrifuge, sterilization) 800 800
- Water reservoir room 200 200
- General storage 400 400

**Lab Subtotals** 10870

**Administration / Educational areas**
- Administrative offices
  - Reception / waiting 150 150
  - Manager 150 150
  - Clerk 150 150
- Meeting/ Conference room 300 300
- Supply storage 75 75
- Work room (work table, copy machine etc) 150 150

**Support Areas**
- Woodworking / Metal shop 450 450
- Library 900 900
- Computer cluster 400 400
- Scuba setup & storage 500 500
- Boat maintenance shed 800 800

**3,050**
Living Quarters for Researchers and Caretaker

- (4) faculty housing units
- Common kitchen / dining facility
- (8) Grad student housing
- Lounge

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Total Square Footage = 19,975
Site model showing overall project organization
Top: model of lab building        Bottom: housing model
View along axis from lab to housing
Large scale model of a section through lab: focus on materials and building systems
Detail of southwest elevation: lab stair running along exterior of wall
Research suites at upper level receive natural lighting, open to wet lab below.
Top: Reverse angle
Bottom: partial model of housing bar, elevational study
One of the most important issues this thesis investigates is the degree to which some approach toward regionalism can inform the design process. It has been demonstrated that the range of proposed solutions to this problem, at least theoretically, are varied and sometimes in conflict. It is therefore necessary for me to adopt a position - or more precisely, an explanation of my working procedure.

The study of a region and the body of architecture it has produced must be used more as a subconscious reference for design, rather than a guide or direct influence. Conscious, careful study of a place, through first hand experience, with the intention of understanding the social, climatic, and physical attributes and conventions, will undoubtedly leave an imprint which, if allowed, will manifest itself intuitively in the design process. If the link between conscious regionalism and a design solution becomes more explicit, it too easily becomes a quotation of what already exists. The fine line between the two approaches is what makes the problem interesting and challenging. Applying these ideas to this project, the intent is to design a relatively large building with a modern program in a natural landscape without becoming vernacular. This requires the maintaining of a strong intellectual idea, which while originating from the site circumstances in some fundamental way, becomes the guiding principle of the design.

The site chosen has several strong physical features, which serve as a starting point for the design. Immediately apparent as one walks the terrain is the directionality of the land and rock, especially at the water's edge. Here the rock is turned on edge, and fractured into parallel sheets as it extends into the river. The dense groves of 100 foot white pines with their tall, straight trunks, and the relative absence of smaller vegetation create a vertical field which serves as a screen between oneself and the water. The mere fact that from the site one has a 270 degree view to water and the horizon in the distance creates a strong sense of horizontality which complements the verticality of the trees. Finally, and perhaps most important, is the degree of interaction between water and land on this site. In an area of just over ten acres there is about 1800 feet of frontage, not counting all of the smaller ins and outs of the scraggy shoreline. This means that there is more edge than solid land. Anywhere one goes on the site one is confronted with the shore, as is the case with the coast of Maine in general. Indeed, this is the dominant characteristic of this land, and serves as the starting point for the design. The fact that the
program is for an institution which is intimately linked to the water further strengthens the argument that the building must respond in some strong way to the intersection of land and water.

A singular building placed in the landscape is by its nature a point in space with a radial relationship to the surroundings, with little direct experience of movement through those surroundings. It is my desire to present the inhabitants of the design with a fundamental experience of the site, more specifically the edge between water and land. Therefore, an approach was taken which seeks to reinforce this experience by stretching the building mass out along the shore. At the eastern end lies the housing and common facilities in a bar which extends out into Fitch Cove, while to the west the laboratory, administration, and teaching areas extrude themselves in a layered series of volumes along the shore toward the point. This creates two nodes of activity and inhabitation which interact through the distance between them. This path or distance becomes the experience of the building, and is inherently tied to the interplay between land, building, and water.
Model showing siting of building mass

The building form contains, defines and takes part in spaces at many scales over the water. (See diagram on following page) At the smallest scale, the stepping of the building form in plan and section allows an intimate interaction between the inhabitants and the water, in the form of shoreline rocks and tide pools directly visible or accessible from the structure, and water access by boat from the various docks attached to the building. The small natural cove contained by the two ends of the building and the bridge between serves as the next level of water inhabitation, and may be accessed by small boat under the walkway or from shore. This area / volume of water is equally a part of the river as it is controlled by the lab, serving as a area of exchange between the two. Fitch Cove, the inlet onto which the building is attached, is about a quarter of a mile across, and is small enough that one can easily see across it and take shelter in it by boat, but is also large enough that the lab building is just one element along it's shore, one member of it's community. The largest dimension visible from the site is up the river to the opposite shore about a mile away. At this distance, houses are not entirely visible, and the parade of boats heading toward the ocean or back to town are
almost completely detached from events in Fitch Cove. At this scale the river is the dominant feature, and everything else is subsidiary.
By taking part in these various orders of magnitude, the laboratory center ties itself into the local community on the water as well as the larger system of waterways and the cultural dependence on them. The water becomes the primary means of interaction between the parts of the building, just as it does between the different parts of the culture.

While the building form is extruded along the edge, it must still operate as an institute, that is, a self-contained entity. Therefore, one building system is employed which ties the whole project together, yet allows for a variety of readings and experiences of "edge" across its breadth. The lab is comprised of a series of parallel concrete walls which are punctured at various places to create space, allow views and access. A secondary system of wood infill walls are employed in the other direction, perpendicular to the shore, to accentuate the two orientations. The dominant bearing walls enhance the directionality of the site, while the openings in them create the opportunity to move perpendicular to the edge, and the chance to move one layer closer to the water or land, to experience one more layer of the transition between the two. As with the rock or the shoreline, it is easier to move along the grain of the site, and elevation changes occur when one moves across the grain.
The various level changes provide a range of possibilities for locating oneself relative to the horizontal reference plane of the water. One enters the lab about sixteen feet above water level, moves up or down the stars projecting out over the water to either docks or second floor research suites. One has the range of motion from water's edge to a treetop vantage point. Similarly, one may move down a half level to the wet lab, and down again to the exterior holding tank and walkway connecting the buildings. The housing provides a similar range of experiences, though shifted ninety degrees.

The directionality of the laboratory wing's walls are carried through to the housing, except where the compressed and punctured walls of the lab necessitated movement perpendicular to their direction, the expanded and rhythmic spacing of the structure of the housing bar promote an experience of space extending along the shore rather than outward. Here the main
circulation is along the spine perpendicular to the walls, and the housing units are inserted into the framework like boats at a dock. Alternating rhythms of light and dark, enclosure and openness are punctuated by stairways leading upward a half level to the faculty housing suites. These suites step over the corridor to provide an uninterrupted view up and down the shore. The strength of the form jutting into the river combined with the inhabited nature of the units, and their expression of individual identity on the facade give multiple readings to the form. Is it a pier, a dock, a ship or a colony? An intentional ambiguity exists which blurs the distinction between land and water forms.

Section through housing pier showing corridor and units
The bridge, then, is the element which ties the two experiences together, and anchors the whole complex in the larger environment. The directional axis set up by the link serves as a means of orientation for inhabitants, with the hearth of the common dining area at one end, and the sunset at summer solstice on the other. Between these two lie the exterior holding tank and the entry space of the lab building, both pivotal transitionary points along the path. The hearth and sunset are read as destinations or constants, with the activities of the day located somewhere in between. Movement occurs along this axis, sometimes shifting off to one side or the other for a particular purpose, but always returning, with an eventual journey of some 500 feet. (see following diagram)
Orienting axis through building and landscape
Lab entry (from land) perspective
Lab interior view along walls
The building systems, lighting, massing, and details of the lab and housing form push forward the ideas behind the concept. As mentioned before, between the masonry bearing walls are a system of infill wood panels which separate volumes and provide screening. Some of these walls are a sandwich of steel and plywood, firmly anchored at the edges to the concrete, providing resistance to lateral loads not accounted for in the bearing wall structure. Spanning between the walls are a series of steel trusses designed to accommodate various secondary systems such as infill walls or drainage systems for the flowing saltwater lab.
Truss designed to incorporate drainage for flowing sea water system
The central wall is actually a double wall with a space between, and serves as a reference for the rest of the composition. It is in this interstitial space that many of the mechanical systems are housed, running the length of the building.

Natural daylighting is introduced wherever possible. The climate of Maine is such that overheating is rarely a problem, so a systematic approach is employed to allow direct sunlight to enter the buildings through the southwest walls which are heavily glazed.
The light then strikes the massive masonry walls and stores the heat for release in the evenings. In addition, light is reflected downward into the wet lab area through a skylight which runs along the length of the outside wall. In this manner, daylighting is achieved without the admittance of large amounts of ultraviolet light not desired because of difficulties with algae growth in the tanks. The office suites are open to the south-west with only a minimum of screening and partitions, and have a more constrained exposure to the north, the source of strong cold winds. Finally, a heating system could be used which exploits the river as a continuous source of energy for a heat pump, and further intensify the interaction between building and environment.

It should be evident that the design at the smaller scales is about a clarity of construction and its parts. Bearing walls are clearly differentiated from infill walls, and the intersection between the two is expressed by a small gap containing the steel angles which give shear resistance. The trusses express tension and compression by employing struts or cables where appropriate, and the secondary systems such as flowing saltwater and partitions are incorporated in a unified way. This attitude toward assemblage stems from both original ideas about the edge and man's presence in nature, as well as the honest and explicit use of natural materials so often found in the architecture of this area. In concluding, this exploration has demonstrated to me that it is possible to create a building which is sympathetic to the the values and particularities of site, culture, and program without resorting to an explicit regionalism. What is required is a strong commitment to observation, rationalization, transformation and imagination.
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