DESIGN I: eleven individual explorations
Hybrid Space

The barge is a vehicle to experience the Elizabeth River as a hybrid landscape, where large scale ecologic and industrial processes occur.

The form of the structure references the scale of its surroundings. While the structure has the ability to create some degree of enclosure, it is built to allow the natural elements to permeate the barge.

A sectional strategy is employed to allow access to the water, and to reveal the processes and life of the benthic layer.

Strategies employed in the wetlands will allow visitors to become involved in ecological processes at a tangible scale, whether through harvesting decaying plants or providing a native plants nursery for the shores of the Elizabeth River.

One element of the sectional strategy is the construction of a stair/aquarium from Plexiglas which will contain submerged aquatic vegetation and estuarine life.

Opposite the stair/aquarium will be a window into the water of the Elizabeth, allowing students to see her murky color, and understand its relationship to the tannins in the Great Dismal Swamp.

The Elizabeth River is a dialectic - a landscape created by the intersections between Chesapeake Bay and Great Dismal Swamp, salt and freshwater, between land and sea, between ecology and industry.

The form and educational strategies of the barge will embody this dialectic, allowing students to open to the multiple processes which occur on the river.
The Learning Barge is didactic architecture that functions at multiple scales; most clearly, it must have meanings at the scale of the river and the visitor. Creating narratives that describe how the barge is to be understood is an important first step in determining its physical form. By programming narratives rather than spaces, the barge becomes part of its educational goal, not just the site for it. These narratives include, the barge as a:

- **lens**, making large things small and small things large. The barge is a mediating device that brings global issues to the size of the students and exposes hidden life within the river. The same place can be understood in dramatically different ways depending on the lens that is used.

- **display**, against the backdrop of the city, it is a marker of the work being done to clean up the river; within reach of curious hands, it is a place that has three dimensional value and interest.

- **threshold**, providing transitions through path, light and sound that remove visitors from the environment of the everyday in order to re-present it to them.

- **filter**, that sorts through the muddied relationship of industry, culture and nature. Both the physical filtering of water and the conceptual filtering of information can break down opaque wholes into their usable parts – revealing hidden processes.
Project Intentions

To represent the ground / background / field / site of the Learning Barge in such a way that the figure of the barge is transformed by this context.

The barge is a work of environmental design that engages, amplifies and reveals the historical and present ecology of the Elizabeth River.

Two crucial aspects of this story are the “legacy” contamination in the soils of the river, and the current regeneration efforts achieved by the efforts of volunteers.

Use the barge as a transformative space for children’s environmental ethics.

The barge design, fabrication materials and operation should clearly embody an attitude towards material production, using renewable resources for its energy needs.

Spatial / Program Ideas

Spatial issues operating on the barge:

Facilitating contact with the water.

Transitioning from the barge surface, at minimum six feet above water, to a contact zone one foot above water.

Using the “river as sink,” a traditional pollution model, as a formal element.

Interfacing solid forms with fluid, such as is evident on the river bank.

Exploring the spatial compression and multi-tooling typical of boats / houseboats / nomadic structures.

Using the darkness below deck as an asset, perhaps as a “lab” for science on materials pulled from the river.

Wind power on the barge seen in light of tanks containing carbon based energy.

Sediment contamination at Money Point.

The barge at the Elizabeth River Project docking site. Proposed wetland on board represented alongside volunteer efforts re-vegetating Paradise Creek shoreline.
The studies explore the Learning Barge as movable as both an object and a collection of objects or onboard components. Adaptable architecture has the ability to alter itself to suit the diverse needs of its users, in this case the need for a place that supports education, wetland planting operations, conferences and even fundraising events. The barge must also adapt to the sun and changing tidal conditions. As a collection of objects it must have the ability to be both open and closed to a spectrum of activities and conditions. These models explore these ideas in a multitude of ways.

Sliding walls and movable storage partitions create adaptable space, while solar panels with a tracking system allow the barge to settle into its site. Operable floor grates allow use of the space above the greywater garden, while facilitating the opportunity to descend into the garden for “bottom grabs”. The garden may be extruded above deck to allow views of the rich benthic zone.

Access to the water is studied in both inboard and outboard solutions, such as cutting the deck and lowering a mobile gangplank to the water’s surface for educational activities as well as easy access from boats. Natural ventilation is studied as the primary means of cooling the spaces utilizing the breeze off the river’s surface.

Layers of Interior/Exterior space wrap around a central service core, with storage above and mechanical below. The permeable border between interior and exterior space promotes ventilation, while a solar roof provides power for the barge and shelter from the sun. Eaves overhang a stair to the lower deck where an enclosed space can be used for secure storage of electronic equipment and batteries for the solar power system. There is the possibility of an additional learning environment below deck. An open deck facilitates experiential learning on the barge facilities.

Two gardens have very precise functions, one purifying greywater and the other growing plants harvested annually for methane production to heat the barge in the cold winter months. A ramp allows access to the lower level where visitors can witness the abundant life hidden below the surface of the water garden. An open steel grate system covers the wetland allowing full occupation of the deck, as the gardens still perform the filtration function required of them. These gardens do not represent the natural environs but recreate the functions that these environs perform for us.

- Adam Donovan
Visiting the Elizabeth River, we experienced a palpable disconnection between the waterfront and the land. Security and environmental concerns combine to create a fragmented landscape. I see one mission of the barge design to connect the land, water and shore. As a framework for thinking about methods of accomplishing this, I looked for the elements that tied together the “natural” and “man-made” and found it impossible to avoid seeing them as interconnected cycles. A normal wetland or river circulates nutrients and is a balanced system. Industry is a cyclical process as well, however imbalanced it may be.

What are the reasons for and consequences of environmental and industrial imbalances? How can the Learning Barge express the mechanisms of these coexisting cycles while contributing to an awareness of the essential phenomenological conditions of water, shore, and land?

The incorporation of a wetland into the design of the barge is important. No attempt should be made to replicate a fragment of an actual wetland, but the barge wetland should function as a water treatment mechanism. The idea would be to show the cyclical nature of production, consumption, waste and transformation. This should be accompanied with some element of interaction with actual wetland areas, possibly through participation in restoration.

The barge should be as self-sufficient as possible, harvesting rainwater and sun, and wasting as little as possible. Enclosure should be kept to a minimum. Perceptual connection to the water and land would be on more than one level, but sectional manipulation would be minimized to maintain the expansive sensation offered by the barge deck. This would also help to control costs. The industrial character of the landscape and culture would be acknowledged in a way that makes clear the interconnectedness of constructed and naturally-occurring processes.

Zoe Edgcombe
The Elizabeth River is water in process. Tidal flow, temperature, salinity, imports, exports, each changes hourly, daily, yearly. These explorations look at one or a combination of those processes and make them manifest. The architectural interventions become forces and movements frozen in time, or lenses and keys that make those processes visible.

What if all five sites could be condensed? As the barge moves, students realign elements to call out the sun at noon, the north star, the rising of the moon. A giant solar clock tracks the sun as it passes each hour. A cut through the barge reflects the sky above, as a tower projects from the depths. Spaces are created to learn how to navigate on earth with what is above. At night, the structures themselves become sextant and astrolabe.

What if the barge plugged into something else and became new? If the barge had a presence on the land, it could become the generator of process, rather than merely an observer. When the barge changes site, its wetland attaches to one on land, taking on stormwater runoff that is treated and held. Pneumatic panels in the ground translate the energy of hopping children into air pressure, driving pumps that carry clean water back on to the land. The barge becomes a battery, storing energy needed elsewhere, and releasing it at just the right moment.
What if everything the barge needed could be held in one box? As elements are needed, they are pulled or folded out from the central box. The conference table slides over a hole in the barge and unfolds, becoming a water testing laboratory. Windows slide outwards and become interactive maps. Floors unwrap, exposing structure and water below. The movement itself is used to power process. Certain elements generate the pressure needed to move water, create enclosure; nothing exists in isolation.

Solar, pneumatic, hydrodynamic, vegetal, heat, are all types of energy in different states. Plants can be considered organic translations of energy from the sun, from the ground, from water. The energy needed to drive a tugboat is energy from the sun turned to food, turned to animal, compressed and turned to oil. Each manifestation is one moment in this process.

What if other ships could read the barge as they passed? This exploration combines the previous. There is a tower that unfolds to the sun and stars, and a box that explodes into student activity stations. But now, as each piece changes, it becomes a signal representing what occurs within. Areas of the barge flood and dry as the tide ebbs and flows. Window panels are historic photographs aligned with locations on the shore. As each piece is moved, the enclosure is rapidly eroded until the box is less building and more ruin.

- Matt Hural
Emphasizing Sectional Experience

My goals combined a practical solution to fitting possible program elements within the structural constraints of the barge bulkheads, while at the same time emphasizing the sectional experience by excavating below deck and constructing on top of it. The experience of the path was intended to take advantage of these sectional qualities, allowing for visual connections to the various systems at work on the barge and in the adjacent landscapes. Material changes are used to emphasize different types of intervention on the barge. Given its mass and opacity, steel plate would become oppressive as an additive material above deck. To maintain a sense of the deck’s vastness, some transparency should be achieved so as not to clutter the barge’s surface. Due to the rigid, rectilinear quality of the barge’s shape and internal structure, an intervention above the deck might break from that orthogonality by moving in ways oblique or even curvilinear to the structure of the barge itself.

The Hopper barge (above right) allows for greater sectional flexibility without compromising structure.

The deck barge (far right) requires more careful modifications to achieve sectional experiences that penetrate below the surface of the deck.

Wind Power Exploration

The most promising source of electric power for the barge is to harness both solar and wind energy. These two power sources work well in tandem since neither will reach their optimum performance in the Elizabeth River area. For instance, on hot, sunny days, winds tend to be calm and during storms and at night winds tend to pick up in speed.

- Matthew McClellan
This scheme explores the connection between the barge and the land. It operates from the idea that there is inherent reciprocity between our own constructions and ones found in nature. Ideally, these are harmonious situations that coexist, both as nature. This scheme anchors the barge into its surroundings with a literal connection from its deck to the ground of the shore. The model, loosely based on conditions at Money Point, shows a ramp leading from the barge to the ground, over the water between them. There is also an “arm” or small ramp structure that protrudes from the opposite side of the barge, over the River, to afford the opportunity for children and other visitors to get very close to the water while being as removed as possible from where they have come.

This scheme suggests that the program allows students to cross this edge between water and land, recognizing that the two depend upon one another seamlessly, each permeating the other. More specifically, this would include the literal transport of young plants from a barge nursery to land, so that students may contribute to the regeneration of conditions in the landscape that may have been erased. This new vegetation would contribute to the efforts of many to restore habitats and bring to the River more closeness between man’s building and the building of nature.

- Katherine Pabody

Left is a transverse section cut through the barge and the ground to which it connects via a ramp. The line where the two sides of this drawing meet is the water’s edge. Only half of the barge and an equally sized section of land are shown, in order to emphasize the significance of passing between them, over the water.

Facing page, top are two views of a site model. A ramp bridges the space between the barge and a depression in the ground that is of equal area to the barge. This space between is marred and changed by the varying water level of the River, due to its tidal fluctuations. The depression in the ground represents a piece of land that could be transformed by the visitors into riparian habitat, using plants grown on the barge.

Below is a drawing that shows half of a longitudinal section cut through the barge in water. The central of five levels upon the barge is marked by a cut in its side, which allows the water of the river to move over the deck as conditions awake. Shown below the barge is a floating oyster cage that is accessed from the lowest level of the barge. Students would participate in the periodic transport of oysters that have been grown in the cage to reefs farther into the Bay.
This exploration takes advantage of the subtractive and additive barge section to allow people to experience didactic elements in a sectional and processional way. One enters the barge at deck level and then ascends via ramp, passing platforms/containers of: filtering oyster beds, wetlands, green roof, recycled/re-used roof/floor material, solar water heaters, and photovoltaic panels. As one descends, the lower portions of the wetland, green roof, and oyster beds are visually accessible and a sheltered space is available for gathering or inhabiting. As the “terraces” ascend, the progression from ground/water to sky occurs abstractly along the procession.

This idea also relates to interlocking/compact space by allowing people to experience didactic elements in a sectional way. The roof becomes a main element. The two sections of green roof and photovoltaic panels slope toward a channel, collecting and conveying rainwater into a “water channel” on one side. In this, gray water is collected and filtered with wetland plants. Relating to this space is a sunken classroom with amphitheater, accessed by a ramp, where the students can see light-filtering panels above, water channel to one side, and the river to the other side. The deck level along the edge opposite the water channel is a place for students to stand next to the water and experience the edge of the barge looking out to the Elizabeth River.
Taking inspiration from the numerous cranes and loading docks of the port, the challenge was how to transform the flat deck of a barge into a dynamic surface with a sense of motion reminiscent of the busy Elizabeth River.

- Jayme Schwartzberg
This initial barge design is informed by ideas of Balance, in both a literal and philosophical sense. Concepts of balance pervade many aspects of the project, from the equilibrium of water and the physical balance required of a barge, to the theoretical balance of an educational program. Perhaps most importantly, the idea of balance is at the heart of a healthy, functioning natural environment, and is the fundamental goal of ecologically sensitive initiatives such as recycling; the same initiatives and processes about which the students will be educated. This design is based on a 32’ x 94’ barge with a uniform, unchangeable central spine.

Formal
Classrooms, one enclosed and one covered, are placed on either end of the barge and linked by perimeter paths. The configuration accommodates two, 25-person classes that rotate between the two rooms. The perimeter paths also function as entry points onto the barge. One path ramps down 3.5 feet to provide low-level access to the barge from a boat. The outdoor classroom consists of 2 16’x24’ spaces, one of which is a terraced seating area sloping down to meet the level of the ramp landing. The enclosed space is approximately 32’x20’. The overall spatial idea was to provide several learning “environments” while promoting even circulation throughout the barge, seeking physical and spatial balance.

Conceptual
The barge organization has a didactic purpose in terms of how it structures the learning process. If we see the educational agenda of the learning barge as a balance between observation and participation, the design must reflect this balance. The enclosed classroom will house the observation component, in which displays, charts, and other “flat” material is exhibited. The outdoor classroom will hold the more participatory components, where students will become physically involved in the processes and get their hands dirty. Furthermore, the central area enclosed by the classrooms and perimeter paths will function as a learning garden of native ecological activity, or a microcosm of the larger surrounding environment. Thus the perimeter spaces on the barge provide students the opportunity to look outward and observe the existing conditions, while the central space with its reduced scale allows for more immediate participation with the elements that comprise the larger environment. By reducing the scale, the systems at play will become more comprehensible to the students. The central space will contain several native wetland planted areas, a living oyster bed, and a thru-hole to the river for bottom grabs and crab traps. 

-Clark Tate