Containers and Flows
Investigating systems of spatial construction in an aquarium

Benjamin Kou
Bachelor of Arts
Clark University, Worcester MA 1993

Submitted to the Department of Architecture in partial fulfillment of the requirements for the degree Master of Architecture at the Massachusetts Institute of Technology, February 1999.

signature of author:
Benjamin Kou,
Department of Architecture
January 15, 1999

certified by:
Ann M. Pendleton-Jullian,
Associate Professor of Architecture
Thesis Supervisor

accepted by:
Hasan Uddin Khan,
Visiting Associate Professor of Architecture
Chairman, Departmental Committee on Graduate Students

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Thank you.
thesis supervisor:

Ann M. Pendleton-Jullian,
Associate Professor of Architecture MIT

thesis readers:

Chris Luebkeman
Assistant Professor of Building Technology MIT

Bobby Poole
Principal, (CSP) Chermaeff, Sologub, Poole Boston, MA
Containers and flows
For my parents -

Hong Kong Oceanarium
Containers and Flows
Investigating systems of spatial construction in an aquarium

by Benjamin Kou

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abstract

This thesis focuses on the design of an aquarium on the waterfront of Victoria Harbor in Hong Kong. The aquarium serves as a public ‘event’ which aims to educate and inform the visitor about regional environmental conditions and their effects on global ecological systems. The design incorporates the notion of ‘information flows,’ addressing the relationship between the movement of the visitor through the architectural space and the movement of information sustained by the architecture. Acrylic technologies which function as the threshold between water and air, provide the opportunity to investigate the way in which information is layered and disseminated in this specific program.

The aquarium aims at reconciliation between the harbor front development and the water’s edge, becoming the physical filter between the aquatic ecosystem and the civic community. If we consider the aquarium building type as a ‘living machine’ (i.e., one that needs to sustain life), it can then be described as having a symbiotic relationship with the organisms it sustains. The aquarium can then be considered as a ‘container’ or sampling of the greater global aquatic ecosystem, encapsulated by a flowing membrane of circulation reciprocating with Hong Kong’s urban fabric.

The thesis proposes that architectural space can be (re)defined at the interface between nature, technology and the body.

thesis supervisor:
Ann M. Pendleton-Jullian,
Associate Professor of Architecture MIT
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final presentation boards *reduced from ISO A1 boards*

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introduction

Video still from the thesis presentation
It is quite clear how the waterfront fabric has been cut off by road networks.

Fish farming ‘containers’

Hong Kong vernacular facades can also be viewed as a series of ‘containers’.

Endangered Chinese White dolphins
from: http://userh.k.linkage.net/pulle/dolphin4.jpg

It is necessary to view environmental education as an integrated part of a global co-operative phenomenon. As we witness changing global environmental conditions it is imperative to remind ourselves that changes in regional environmental conditions have far serious global effects over time.

The regional ecological conditions in Hong Kong are of great concern, especially because of the harbor reclamation outlined in ‘metroplan.’ Hong Kong is a city in flux. Ingrained in its infrastructure are a series of networks comprising the life cycles of the city. The omnipresent changes in the city infrastructure have recently been heightened by the changes in government and urban topology. There is a need to offset the rapid ‘reclamation’ and to focus on a regenerative ap-

1. Metroplan: The Selected Strategy Executive Summary: Hong Kong 1990
2. I sometimes wonder why it’s called ‘reclamation’? When it’s the sea that is being filled. Especially in Hong Kong. The city needs to ‘reclaim’ some sea.
In 'Montage 1938' the final definition to the nature of montage was: Sequence A, made from elements of the film's theme, and Sequence B, put together from the same source, will, when juxtaposed, generate an image in which the content of the theme is most clearly embodied.

from: Eisenstein, S.M., Towards a Theory of Montage.

method of inquiry

The experience of moving through an aquarium can often give one the feeling of being immersed in a film. In film, the movement, information sound and light are fused into a linear strip of film space. Where as in an aquarium, one experiences the parallax effect. In researching film and architecture I came across a book, Montage and Architecture by Sergi Eisenstein which was informative in regards to this approach. The image |4.0| from Eisenstein's book, provided me the opportunity to interpret and research the modes in which the representation of the spatial experience can be captured using this method. |4.0| (I) shows us that the eye will not perceive the subject matter in a sequence from left to right but in a movement towards or away from the eye, as in |4.0| (II). Film space is constructed in a linear sequence but perceived in layers. If these layers are delaminated to create space between them, the diagram can be expanded to represent the experience in an aquarium where the sequential process of movement occurs in layers from one program space to the next.

If the layers in |4.0| (II) can then be represented by volumes of space, the effects of depth can be multiplied. The parallax effect occurs as a result with physical movement and this interested me because of the depth effects aquariums attempt to achieve. This layering also allows for the incorporation of a new layer, that being 'technology'. At threshold between the perceived and perceivable, lies the opportunity to disseminate information about the subject matter. The aim of incorporating this was to make technology become 'transparent' and to therefore heighten the architectural experience while reducing the problems which aquariums face today. That being reflections from back lit information graphic displays.
Interpreting the sketch as a physical movement in (I), and visual movement in (II) provided a clear diagram of how I could approach the integration of movement and information.

The film strip depicted to the left, is from a short video I created for the final presentation. Its significance lies in the fact that it blends the three different elements of which my thesis is composed. The urban component, the building component and the exhibit component.

The thesis ultimately became an investigation of how to successfully merge these 'components' into a spatial representation that reflected all three simultaneously. The video, provides the sense of the phenomenological aspects in the exhibits: layering the city and people with fish in the ocean. The building represents a spiraling film strip which has been delaminated to form program spaces. Each one overlapping with the next via the circulation. As visitors move from the external urban condition to the internalized exhibit condition they pass 'through' the building which operates as a physical filter, mediating the two conditions. Again, this occurs through the circulation and sequencing of the exhibit path. A dynamic blending of these different conditions result, placing emphasis on the architectural implications of the 'edge', as well as the importance of this project as a cultural institution in Hong Kong.
site

then
Site area

1. Hong Kong Island
2. Kowloon
3. Lantau Island
4. Chek Lap Kok Airport
The site - HMS Tamar

The site is known as HMS Tamar, due to the military use by the British Forces during British occupation. The importance of this locale lies not only in its historic significance, but due to its relationship with the urban context and proximity to Victoria Harbor.

The initial reclamation in Hong Kong were concentrated around Victoria Harbor and date back as far as 1887. From the following series of aerial photographs, the movement of the waterfront edge can be traced quite clearly. The site remains as a 'constant' over this time frame and for the purpose of illustrating the movement of the edge it can be used as a 'marker.'

1924

This 'mosaic photograph' from the HMS Pegasus mission in 1924 shows the waterfront from Central to Wanchai with the tip of the Kowloon Peninsula to the top of the photograph. The dark portion of the photograph covering the HMS Tamar site was missing at the time when this mosaic was spliced together. Conveniently, this dark area clearly demarcates the site used for this thesis. The photograph also shows that the site actually projected into the harbor at this time.

3. Hinge, The Shape of Things To Come, Hinge Marketing Ltd., Hong Kong, 1995
1945
This RAF Royal Air Force aerial shows the Naval Dockyard with reclamation in progress to the east and west.

Note: no survey photographs of this kind had been taken since 1924 due to WWII

1975
1945 to 1975 marked the time frame for the filling of the Wan Chai district, east of the Tamar site. The aerial shows just how much the edge had moved into Victoria Harbor.

1983
This aerial photograph shows the extent of the reclamation planned for the Central and Wan Chai district, until the late 1990s. To the left one can see the Hong Kong and Shanghai Bank, in the initial phases of construction.
Site context showing the north side of Hong Kong Island and the Kowloon Peninsula.

Site map outlining the area of images | 15 | and | 16 |
Before the agreement to reunify Hong Kong with China in 1997, the Tamar site was one of the only plots of "land" or more suitably, "sea" which remained unscathed by the rapid reclamation going on around it. However, as this military land was slowly released to the new government, the site was deemed to be filled. At the time of writing this thesis, the site is currently being used as a car park while plans for the construction for a new government building proceed.

The site measures approximately 180 m by 180 m. Its southern edge anchors to Harcourt Road which is the major vehicular route from Central to Wan Chai. Pedestrian access to the admiralty metro station is also to the south. To the west is the Prince of Wales building and to the east is the Hong Kong Performing Arts Center.

At the lower edge of the photograph, the beginnings of an urban park can be identified by the organic landscaping. This park provides the link from the Tamar site to the Hong Kong Park, situated in Central to the west. The urban park system in Hong Kong plays an important role in providing the public another way of circulating in the city, as well as a place for recreation.
"Metroplan" proposal for development of Central and Wan Chai districts including thesis site.

Site plan showing thesis proposal alternative, including current sea wall condition.
At the urban level this thesis proposes an alternative to the current land use development plan proposed in 'metroplan'. Although the aquarium is a 'stand alone' building, its strengths exist in the value it has as an urban cultural institution and its relationship to other public buildings on the waterfront. Its link to the urban fabric by connecting bridges and urban parks creates a focal point for public access to the waters edge. The proximity to the admiralty metro station also provides a convenient transportation link for visitors. By creating an urban park on the waterfront and a marina between the aquarium and the Hong Kong Convention center the waters edge is intensified by the aquarium acting as a pivot between the 'city and the sea.' This urban gesture attempts to 'hold' the edge condition in order to prevent the harbor from getting narrower. By positioning the aquarium at this site, it serves as a landmark building which extends the flows of public circulation routes to the waters edge via the urban park system. The aquarium also remains part of the existing urban fabric unlike the Convention Center which seemingly juts out into the Harbor.

6. See comments by Julian Beinart in the final presentation.
7. The thesis video shows how the Tamar site is the only location where the waterfront edge remains open to the harbor.
Final site model showing the relationship of the aquarium to its urban context.
Final site model showing the relationship between the public waterfront buildings and Victoria Harbor.
"design is not a linear process" - Ann Pendleton - Julian

design integration
Containers and flows
Concept sketch for integration of exhibit with building

Biome distribution

Orientation
The images in this next section serve only to document the key elements in the approach to integrate the different 'levels' of this thesis. Once a general reaction to each 'level' was established, the process required a constant shifting between them, in order to achieve a balance which could then be developed.

urban

The fundamental urban issues are, the connection of the building to the existing fabric and the relationship to the waters edge. The architectural gesture towards the urban condition occurs within the lower four floors of the building which I have defined as the 'podium' where the horizontal plates fold to create the auditorium and the introductory ramp sequence. The auditorium folds towards the sea while the ramp folds towards the city. | 23 |

building

From the urban 'level' the circulation and exhibits combine to form the aquarium component. The transparency of the urban component contrasts with the translucency of the aquarium component. Architecturally, the project can be conceived as a series of overlapping layers which contain the different 'levels' of the project. The circulation becomes the mediator between the building 'containers.' The circulation 'tube' also serves the building services, providing a spiraling 'duct' which feeds into the internal structure.

exhibit

The relationship between the exhibit design of the aquarium and the building provided an opportunity to utilize a cinematic approach. The exhibit boards (p. 62 - 68) describe each different exhibit, relating to both the area in the world being represented and place within the 'locale' of the building. The relationship between the visitor and the fish was also explored through the overlaying of information. The movie attempts to illustrate the potential use of technology to map information onto the very surface the viewer looks through.

The thesis video best represents the concept of 'information flows.' Also see commentary (p.45 - 46)
1:2000 m sketch model 1

This model in conjunction with a few earlier iterations formed the overall site approach to the issue of maintaining an edge condition discussed earlier. The concern of an already polluted harbor, forced the question of how to create a public space that might provide an overall strategy for the redevelopment of the site. Model 3 shows, that the edge condition was still under deliberation in regards to its exposure to the harbor. The decision was made to maintain the waterfront park, to provide a destination point outside the aquarium. This creates a waters edge that wraps around the building form, allowing a complete view of each facade.

1:2000 m sketch model 3

This model was crucial in the development of the internal building concept. Dealing with the notion of the 'containers,' where the building skin wraps around the volumes of program. The building envelope was developed from this concept into a 'rain screen.' The use of glass panels delaminated from the surface of the building provides means for ventilation to occur. The envelope was also conceptualized as a taught skin which could be used as a screen to be projected upon. This would imply that a constantly changing facade could disseminate information about the happenings in aquarium.9

9. See commentary in final presentation. p. 47
Sketch model 1:1000 m south east view towards the harbor
The integration of the circulation with the program became the focus of the next few studies.

This model was key element in the process of investigating how the ‘urban component’ of the aquarium connected with the circulation of the aquarium. The lower four floors were always conceptualized as being ‘visually open.’ While the aquarium component provided some sense of mystery behind its enclosure of translucent glass.

Juxtaposed with the aquarium component, a clear parti was developed between the different programmatic elements of the building with the circulation tying the two together.

The process of programming a 90,000 m² mixed use building was dealt with by using a collage technique of program pieces to ‘de-mystify’ the building. The process was more successful in section than in plan, but this exercise formed the bases for the overall distribution of the program.
Biome distribution map used for defining the regions of focus for the exhibits

The colored circles refer to the exhibit boards and the specific areas of focus for the exhibits
exhibits - a brief overview

The exhibits were based on a cinematic experience, taking the visitor on a journey from the local region of Hong Kong, around the surface of the world and into the ocean depths.

The introductory exhibits were based on explaining the local conditions of Hong Kong and the effects of development and pollution on local marine species and the environment. The circulation route leads the visitors to an auditorium where there is an introductory show. If the visitors want to go directly to the aquarium they have the option to bypass the auditorium into the main circulation.

The perimeter of the building contains the first aquarium exhibits, the coastal exhibits. As the visitors ascend the building in an anti-clockwise direction, they move through a sequence which takes them through the coastal exhibits from the south to the north. When the visitors reach the highest floor they move into the building and the exhibit shifts to terrestrial forest exhibits. The visitors then embark on a clockwise downward spiral through the canopies of the world's rainforests down to the forest floor. At this juncture they move back out to the coastline through a river exhibit and enter the underwater coastline exhibits before descending into the coral reefs. The coral reef exhibits lead into the ocean exhibits where the circulation follows the ocean currents as the visitors travel through the sequence of oceans: Indian Ocean, Polar Oceans, Atlantic Ocean, Pacific Ocean. After reaching the ocean floor, the visitors pass through the ocean tank and descend to the lobby via an escalator.
Computer generated plan cuts through a massing model to show the relationship of program to circulation. Numbers correspond to the different floors of the building.
1:200 m working model

The lower floors (L02) (L01) contain the restaurant, retail, Life Support Systems (LSS) and mechanical spaces. These floors provide the mixed support for both programs.
The lobby level (00) and level 1 (01) contain the auditorium, introductory exhibit and LSS exhibit tanks. Architecturally, these two levels create the fold between the city and the sea in the building. The fold can be seen with the auditorium floor sloping toward the sea, while the introductory exhibit ramp slopes towards the city. 10

10. See elevation studies (p. 32-33) and final renderings (p. 70-79)
1:200 m working model

The second floor (02) contains the continuing ramp sequence and the 'floating' administration offices, seen on the south face of the building. This completes the urban part of the building defined as a **podium** or plinth element, which derives itself from the city.\(^{11}\)

*see presentation boards.* | 48 |

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\(^{11}\) During the process of making the site model I realized just how many buildings had a podium. This space is used mainly for retail and restaurants and becomes the element of the city which defines the true footprint of buildings which demarcate the fabric.
1:200 m working model

Level 3 (03), the **transfer slab** contains the mechanical zones and circulation linking the ‘oceanarium’ component of the building to the ‘urban’ component. This level provides a structural slab for the shifting of structural load from the oceanarium component which uses mainly walls, to the urban component which uses mainly columns.
1:200 m working model

Levels 03 - 08 contain the coastal exhibits on the way up the building and from 08 - 03 the coastal exhibits and oceans exhibits on the way down.

*see presentation boards.* | 50 | 52 | and | 53 | 55 |
Levels 08 - 14 contain the coastal exhibits on the way up the building. Levels 13 - 09 contain the terrestrial exhibits on the way down. Multi-use classrooms and office spaces are dispersed through the interstitial spaces of these floors.

*see presentation boards* 52 | 54 | and | 49 | 51 |
final presentation

jury: from right to left

Ann M. Pendleton - Julian (APJ)
Associate Professor of Architecture MIT

Julian Beinart (JB)
Professor of Architecture MIT

Bobby C. Poole (BP)
Principal, (CSP) Chermayeff, Sollogub, Poole Boston, MA

Sudhakar Thakurdesai (ST)
Senior Vice President, RTKL Associates Los Angeles, CA

Caroline Fitzgerald (CF)
Associate, Ove Arup & Partners Cambridge, MA

Chris Luebkeman (CL)
Assistant Professor of Building Technology MIT

Bill Hubbard, Jr. (BH)
Adjunct Associate Professor of Architecture MIT
note:

The presentation started with a 5 minute film I made which is provided on VHS tape (see resources)

I am including video stills and transcribed commentary from the final presentation in this document because I found it very informative in reviewing the effectiveness of the presentation. Although haunting at times, I recommend recording your content review and final presentation because it definitely serves to make a record of the process of thought as the project is presented. If it fails to help at all, at least it's a good show for mum and dad.

The transcribed commentary from the video footage starts just after I have presented. I have tried to pick up on the major issues which arose and to the best of my ability, have maintained the wording used by the jurors.
Images showing the relative layout of the presentation boards and site model. (p.54 - 69)
Images showing the explanation of the circulation sequence in the 1:200 m working model. (p. 34-39)
You seem to be perpetuating an idea which is fairly unique for cities on water where the large facilities in the city are in fact on the waters edge... this is not true in other cities such as Manhattan etc... where the waters edge is reserved for private use... creating a reserve for public buildings on the water edge is uncommon... and many of those buildings have nothing to do with water like the convention center. Monte Carlo and San Diego have their convention centers on the water edge although this is an odd use... would you argue for more buildings of this kind on the reclamation...

I created the marina and the waterfront park to provide a beginning from either the city or the sea...... my focus on metroplan was to deal with the introduction of a conservation strategy in Hong Kong......

the harbor channel is narrowing getting smaller and smaller... it does make a relationship with the cultural center, space museum... government convention center and performing arts center...... more to make sure people are aware of the narrowing channel.

In some ways uniquely its the largest urban space in the city...... its the densest use of water! I know anywhere in the world so the fact that you travel fro there to Kowloon and back..... it can be very interesting...... its a water plaza if you like with the private buildings around it and the private sector...... that may be a coherent strategy for development...... I just want to know if thats what you thought...... or you were so obsessed with aquariums......

say yes
LAUGHS

Julian, you put it far more eloquently than I...... but yes from day one absolutely.
LAUGHS

Well I think its very interesting...... in addition to the old airport land...... I would be publicly against filling that land!
BH
What are the dimensions of the aquarium.

BK
80 m by 80 m 20 stories high.

BH
I'm just trying to get a sense of how it is to be up against the shore...because the building never meets the ground um um for all the strength of the urban idea I want to know how it feels to be over here..
(points to the area behind the building)

BK
well....the urban park system is really meant to integrate the building with the city, in that....its about the movement around the site.

BH
The idea is urbanistic..the idea for operations in the city....the difficult part is how it would feel physically ..not conceptually ..how would it feel......I'm not sure you can do both........

(a pause)

BP
What was the purpose of the translucent material in the model?
(points to big 1:200 m model)

BK
Oh the rain screen....the skin of the building was meant to act as a surface, architecturally representing a container a tight skin wrapping around the building but at the same time allowing for ventilation of the building to occur....the other purpose was to have a projectable surface where information like the temperature for example could be shown. Anything from information about the climate to shows at night, could be viewable from the waterfront park.

Also, the third part of the investigation was the interaction with the exhibits....being the fish....which I tried to show in the video to show the experience of overlapping and interactivity with the animals in the exhibits......occurring in the oceans exhibits...using the acrylic technologies, which separate air from water and current technologies such......
as smart screens: conductive polymers which are plastics that can emit light...and lets say that if they can emit light they can eventually develop display screen....or current technologies like LCD screens can be embedded in the acrylic panels of the tanks....so instead of using signage systems which are backlit and produce reflections which you don’t want in an aquarium.....utilizing technologies like (HAL - intelligent room) developed here at MIT where a camera can identify the shapes of object...or in this case a fish silhouette...that information can be fed through an information database as the camera monitors a certain zone of the tank....and then that information of a certain fish could be overlaid on the acrylic which the viewer looks through it in real time.....

...and some of that information can be displayed on the exterior surface of the building...

Well I think thats important to what the gentleman is saying (Bill Hubbard) because it has to do with what this surface element is and what its doing in the urban landscape.

....a translucent...image...which is moving....

Its interesting because thats one of the most famous city facades in the world...
The intense idea of information exhibited by a building...it relates to the building...its not coca cola...its the only one thats speaking...the other buildings are rather mute....in a sense it becomes a world landmark because it exports the idea to people visiting Hong Kong.

Conceptually it destroys the edge because it takes the sliver of water and wraps it around the surface of the building.

It speaks to the purpose of a cultural institution...the unity of nature and man...all the issues that the film represented.
ST

Ben I think this is very very impressive you have a lot of very thoughtful ideas here...um I think your idea about the urbanistic approach especially in Hong Kong is a correct one.

The links to the major buildings...appropriate buildings I think...your idea of creating a plinth or base which relates to the urban context is a very good one...where I find um...maybe less successfully achieved is when you talk about the base and talk about the urban fabric connection and retail...........on the one hand............

ST

.....on the other you have moved the building away from the flow and the fabric.....even though the retail will be used by the people who come there....in terms of the fabric maybe you can talk about it.

BK

Yes...I understand your point...the assumption I made was um...one of the main programmatic uses is the aquarium aspect and its proximity to a major transportation hub admiralty....and the idea of linkage with bridges, in that the rest of Hong Kong is becoming linked by these pedestrian footpaths that it becomes part of the urban fabric in that way even though separated.

ST

Its quite a lot of effort...because there is nothing in-between, but it does meet the other buildings with other functions.

The second question I have...and I have no real idea of the aquarium operations ...but I wonder if you could have gone down...could part of that exhibit have gone down?.....so you could see those things in their natural habitat.....just as an antithesis of what you have just as a suggestion?
CL
I'm going to come in on that because I completely agree with that point...that was one point...you've done so much...and there is so much opportunity for development with what you've done here...that would then give meaning to the recreation of the harbor...as you've done up...you could go down as well...the second point...I want to back up a bit...is about shopping in Hong Kong......I've never lived anywhere where people shopped as much as in Hong Kong...it's not only a national sport but a passtime...so the issue of it being disengaged from the fabric would probably be the death in North America but in Hong Kong its becomes a destination point...

BP
It's also specific to this cultural institution...it's special.

CL
Totally.....that's what I mean.....you can pull it off here I think......a few other points I'd like to make.......your opening video is very spectacular for a number of reasons, one it truly captures consciously and subconsciously, the essence of Hong Kong as we know it to date...and the title you chose for your thesis......Hong Kong remains one of the largest container shipping ports in the world.....the imagery with the fish embody these flows....you feel like a sardine sometimes when you walk around these walkways......it's very much a part of you...and so to take that and to embody it in this kind of manifestation is a real trick....and you've embodied it in an elegant way...even the escalators...the longest escalator in the world is in Hong Kong, up to the peak which reverses...the eb and flow and the people there is a lot here that goes much deeper than you can represent for us today...you should be congratulated for pulling that together.

There is also the desire to escape...it points out that there is something lacking...there are few places in Hong Kong where you can escape...not just imax...it's an interior urban park.....where you can learn through doing.

lastly, its about this transparency, culturally Hong Kong has been a closed society...to actually open up a building in this way and give people a window to the world through information about the greater global context.....sends a very powerful message.....
BP
This is an environmental piece...I'd also like to complement you on the beginning of the process of integrating the architectural and the experiential. As you probably already know, once you get into the issues and requirements about space for animals and kinds of spaces they need and all those issues...this is really just the beginning in some sense...the internal aspects this building will be tortured beyond belief once you've begun to understand the detail of all these things but I'd like to compliment you on the balance you've brought to the project so far which is what is really wonderful is that you've got the big notion which will lead to a successful project....

JB
How big is the inner harbor...how would you go down?

BP
Well I was actually going to bring that up...you wouldn't go down...the reason...this is not a natural environment for the animals they've been pushed out long ago.

ST
The reason I asked is because the water is light there. (points to the model)

BP
No it's not
LAUGHS
JB
This is probably one of the most polluted ports in the world you wouldn't see a thing if you went below.....not a dolphin.

BP
You could have a situation...where you would create a natural place where you feel like your going into the harbor.

JB
It would create quite an impact to see the fish and the junk .......
APJ
I'd like to comment on something which this embodies, which is the notion not only of the integration which has occurred but in your thinking how it occurs on many many levels the containers occur at the level of the tank then at the experiential level with the fish and the person, then at the level of the building and then at the urban level and then several different urban levels so there is this series of different containers at each of those levels not just where people look at the fish but the building in the context even when you conceptualized why even Hong Kong why put an aquarium in Hong Kong not why put it in the site in Hong Kong its always been with an eye to integrate those two things and its a very very difficult project you've set for your self on either of those sides but you've chosen both sides and decided to integrate them.

JB
One of the reasons I made suggestions for the public condition on the waterfront because I think the site standing by itself its a very powerful site with messages of fish on the side of it is what the right word...kind of corny in a way because what is the aquarium in the larger life of the world you start to conceptualize all these things about world unity and man and what do you see when you come from Kowloon every day it puts too much burden on this little building I would dissipate that by adding more buildings to take away from the singularity of the thing there is no way you could miss it its a bigger public building than ISOM convention center)

BK
Well this ISOM convention center certainly there have been more photos taken of this building in the last year than any...

CF
I think your building is bolder when I saw you model I said this is a very very boid building.
So the video tape ran out...a few more comments were made and then as quickly as it had started...it was over.
final presentation boards

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30 U1 1:10,000 m context plan (03 of 04) p. 55
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Final renderings of plans, elevations, axons and perspectives

Site model: 34 to 43

1: 200 m working model: 22 to 27
Panoramic view used as backdrop for site model.
View showing the urban park at admiralty leading to the site

View showing the urban park system wrapping around the site on the waterfront
The marina and inner "locked" harbor
Aerial from the south west
E1  
**Biome Distribution**

Regions of focus for exhibit sequence

- Arctic
- Boreal
- Temperate
- Sub-tropical
- Tropical
- Tropic of Capricorn
- Equator
- Tropic of Cancer

Percentage of land mass occupied by ecosystems (excluding ice):

- Tundra: 11%
- Boreal forest: 17%
- Temperate forest: 13%
- Temperate deciduous: 3%
- Savannah: 10%
- Tropical rainforest: 6%
- Mountains: 19%
- Desert: 3%
- Scrub: 3%

---

E3  
**Ocean Currents**

Flow indicators of major currents in the oceans

- Arctic Ocean
- Pacific Ocean
- Indian Ocean
- Atlantic Ocean
- Antarctic (Southern) Ocean

Map of major ocean currents:

- North Equatorial Current
- South Equatorial Current
- Gulf Stream
- Japan Current
- Norwegian Current
- Labrador Current
- Antarctic Circumpolar Current

---
story board
programmatic sequence through building

harbor view restaurant
retail
L1:
life support systems

L2:
mechanical
life support systems
city

filtration systems
example of flows in a typical closed filtration system

key
1. 
2. under-pool flow (flow through filtration)
   - air is removed. the air is then removed and go to the pool. the pool has clean water. it
   - then the clean water is then sent to the next step.
3. ozone generating equipment
   - use a high pressure air blower. it is then removed and go to the next step.
   - when the ozone is then removed. it will be used to remove the dirt and the dirt is then cleaned.
4. pumps
   - helps to keep a steady flow of water and also to remove the dirt. the water is then removed and go to the next step.
5. ozone generator
   - generates the ozone. the ozone is then removed and go to the next step.
6. biological filtration
   - uses a group of bacteria which convert the waste water to water. the waste water is then removed and go to the next step.
7. building status
   - helps to keep the building clean and also to keep the water clean.
8. sump
   - helps to keep the water clean and also to keep the water clean.
The regions of focus for the forest exhibits are six major rain forests from the swamp to the forest floor.

- Amazon (Brazil)
- Congo (Africa)
- Asia (India, China)
- Pacific Northwest
- Southeast Asia
- Australian (Australia, Indonesia)

These regions are shown on the map in the orientation area. The exhibits explore life forms and natural cycles, highlighting how these ecosystems are interdependent and interact with one another. The exhibits change in response to the seasons, showcasing the diverse wildlife and plant life found in each region.
The region in focus for the coastal exhibits are as follows:

1. Interior: coastal
   - Larger scale objects
   - Species: black-footed puffins

2. Coastal (rocky coast)
   - Species: cowbirds, kelp gulls, mewkings

3. Forest floor (biotic/abiotic)
   - Species: mosses, lichens, ferns

4. Marine: rocky coast (plates + boulders)
   - Species: intertidal species

5. Marine: coastal (soft bottom)
   - Species: rocky coast

Forest floor exhibits:

11. Forest floor exhibit

10. Coastal exhibit

09. Coastal exhibit
"A thin strip where the land ends and the sea begins, a
narrow buffer zone between the marine world of the
ocean and the terrestrial world of the land."

1. Atlantic (eye level)
   South pole, South Poles
2. Cord of Chile (eye level)
   South temperate

---

The regions in focus for the coral exhibit are:
1. Indo-pacific (adult)
   Region: Coral
   Species: Sponges, sea fishes

---

The regions in focus for the ocean exhibit are:
10-11. Indo-Pacific (adult)
   Region: Coral
   Species: Sponges, sea fishes

---

The regions in focus for the ocean exhibit are:
12. Indo-Pacific (open ocean)
   Species: Sharks, rays, and turtles
Final ramping through the open concave exhibit which terminates in the lobby space.
level -02 (L2)

01 harbor view restaurant
02 kitchen
03 life support systems
04 mechanical /life support systems
05 gallery

t toilets
entry level 00

06 multiple use auditorium
10 entry
11 information/ticketing
12 lobby
13 stair to aquarium circulation
14 overlook to restaurant
15 viewing platform
16 column of fish exhibit
17 hall of dolphins
18 gallery
19 escalator from end of exhibits
level +01

06  multiple use auditorium
13  stair to aquarium circulation
19  escalator from end of exhibits
20  auditorium control booth
21  (circulation) to exhibit sequence
22  orientation exhibit
level +02

06  multiple use auditorium
19  escalator from end of exhibits
20  auditorium control booth
22  orientation exhibit
23  administration lobby - accessed by elevators
24  administration offices
25  meeting room
Composite section taken through the entry ramp along the north south axis and through the center of the building.
Final renderings of the building form showing the integration of the circulation with the envelope.
North east perspective
resources

hardware:
Power Mac G3 266 MHz
256 MB ram
16 GB hard drive
miro motion DC 20 video capture card

Power Mac G3 240 MHz
136 MB ram
8 GB hard drive

software:
Adobe Illustrator, Adobe Photoshop, Adobe Premiere, Adobe Pagemaker, Form Z

fonts:
Syntax Univers 45 Light
thesis video:
"look for it on VHS"

title:
"From City to Sea"

length of videotape:
5 min 10 seconds

sound:
High Fidelity Stereo music track: "Are we Here?", Orbital, 1994

tape format:
Standard VHS format

video sources:
"Secrets of the Ocean Realm" series, PBS Home Video, 1997
- Mountain in the Sea
- City in the Sea
- Cathedral in the Sea

Hong Kong video footage by the author, 1998

additional Hong Kong footage from:
Hong Kong geography

**location:**
Eastern Asia, bordering the South China Sea
Geographic coordinates: 22 15 N, 114 10 E
Map references: Southeast Asia

**area:**
total area: 1,040 sq km
land area: 990 sq km
comparative area: six times the size of Washington, DC
total: 30 km
border country: China 30 km
Coastline: 733 km
territorial sea: 3 nm
International disputes: none

**climate:**
tropical monsoon; cool and humid in winter, hot and rainy from spring through summer, warm and sunny in fall
terrain:
hilly to mountainous with steep slopes; lowlands in north
lowest point: South China Sea 0 m
highest point: Tai Mo Shan 958 m
Natural resources: outstanding deepwater harbor, feldspar
Land use: arable land: 7%, permanent crops: 1%, meadows and pastures: 1%
forest and woodland: 12%, other: 79%, Irrigated land: 20 sq km (1989)

environment:
current issues: air and water pollution from rapid urbanization
natural hazards: occasional typhoons
Geographic note: more than 200 islands

text edited from http://www.emulateme.com/geography
indian ocean geography

**location:**
body of water between Africa, Antarctica, Asia, and Australia
Geographic coordinates: 30 00 S, 80 00 E
Map references: World

**area:**
total area: 73.6 million sq km
comparative area: slightly less than eight times the size of the US; third-largest ocean (after the Pacific Ocean and Atlantic Ocean, but larger than the Arctic Ocean)
note: includes Arabian Sea, Bass Straight, Bay of Bengal, Great Australian Bight, Gulf of Oman, Persian Gulf, Red Sea, Strait of Malacca, and other tributary water bodies
Coastline: 66,526 km

**climate:**
northeast monsoon (December to April), southwest monsoon (June to October); tropical cyclones occur during May/June and October/November in the northern Indian Ocean
and January/February in the southern Indian Ocean
terrain:
surface dominated by counterclockwise gyre (broad, circular system of currents) in the southern Indian Ocean; unique reversal of surface currents in the northern Indian Ocean; low atmospheric pressure over southwest Asia from hot, rising, summer air results in the southwest monsoon and southwest-to-northeast winds and currents, while high pressure over northern Asia from cold, falling, winter air results in the northeast monsoon and northeast-to-southwest winds and currents; ocean floor is dominated by the Mid-Indian Ocean Ridge and subdivided by the Southeast Indian Ocean Ridge, Southwest Indian Ocean Ridge, and Ninety East Ridge

lowest point: Java Trench -7258 m
highest point: sea level 0 m

environment:
current issues: endangered marine species include the dugong, seals, turtles, and whales; oil pollution in the Arabian Sea, Persian Gulf, and Red Sea
natural hazards: ships subject to superstructure icing in extreme south near Antarctica from May to October

geographic note:
major chokepoints include Bab el Mandeb, Strait of Hormuz, Strait of Malacca, southern access to the Suez Canal, and the Lombok Strait

text edited from http://www.emulateme.com/geography
**Arctic Ocean geography**

**location:**
body of water mostly north of the Arctic Circle
Geographic coordinates: 90 00 N, 0 00 E
Map references: Arctic Region

**area:**
total area: 14.056 million sq km
comparative area: slightly more than 1.5 times the size of the US; smallest of the world’s four oceans (after Pacific Ocean, Atlantic Ocean, and Indian Ocean)
note: includes Baffin Bay, Barents Sea, Beaufort Sea, Chukchi Sea, East Siberian Sea, Greenland Sea, Hudson Bay, Hudson Strait, Kara Sea, Laptev Sea, Northwest Passage, and other tributary water bodies
Coastline: 45,389 km

**climate:**
polar climate characterized by persistent cold and relatively narrow annual temperature ranges; winters characterized by continuous darkness, cold and stable weather conditions, and clear skies; summers characterized by continuous daylight, damp and foggy weather, and weak cyclones with rain or snow
**terrain:**
central surface covered by a perennial drifting polar icepack that averages about 3 meters in thickness, although pressure ridges may be three times that size; clockwise drift pattern in the Beaufort Gyral Stream, but nearly straight line movement from the New Siberian Islands (Russia) to Denmark Strait (between Greenland and Iceland); the icepack is surrounded by open seas during the summer, but more than doubles in size during the winter and extends to the encircling land masses; the ocean floor is about 50% continental shelf (highest percentage of any ocean) with the remainder a central basin interrupted by three submarine ridges (Alpha Cordillera, Nansen Cordillera, and Lomonsov Ridge)

lowest point: Fram Basin -4,665 m
highest point: sea level 0 m

**environment:**
current issues: endangered marine species include walruses and whales; fragile ecosystem slow to change and slow to recover from disruptions or damage

**geographic note:**
major chokepoint is the southern Chukchi Sea (northern access to the Pacific Ocean via the Bering Strait); strategic location between North America and Russia; shortest marine link between the extremes of eastern and western Russia, floating research stations operated by the US and Russia; maximum snow cover in March or April about 20 to 50 centimeters over the frozen ocean; snow cover lasts about 10 months

text edited from http://www.emulateme.com/geography
atlantic ocean geography

**location:**
body of water between Africa, Europe, Antarctica, and the Western Hemisphere
Geographic coordinates: 0.00 N, 25.00 W

**area:**
total area: 82.217 million sq km
comparative area: slightly less than nine times the size of the US; second-largest of the world's four oceans (after the Pacific Ocean, but larger than Indian Ocean or Arctic Ocean)

**climate:**
tropical cyclones (hurricanes) develop off the coast of Africa near Cape Verde and move westward into the Caribbean Sea; hurricanes can occur from May to December, but are most frequent from August to November
terrain:
surface usually covered with sea ice in Labrador Sea, Denmark Strait, and Baltic Sea from October to June; clockwise warm water gyre (broad, circular system of currents) in the northern Atlantic, counterclockwise warm water gyre in the southern Atlantic; the ocean floor is dominated by the Mid-Atlantic Ridge, a rugged north-south centerline for the entire Atlantic basin

lowest point: Puerto Rico Trench -8,605 m
highest point: sea level 0 m

environment:
current issues: endangered marine species include the manatee, seals, sea lions, turtles, and whales; drift net fishing is hastening the decline of fish stocks and contributing to international disputes; municipal sludge pollution off eastern US, southern Brazil, and eastern Argentina; oil pollution in Caribbean Sea, Gulf of Mexico, Lake Maracaibo, Mediterranean Sea, and North Sea; industrial waste and municipal sewage pollution in Baltic Sea, North Sea, and Mediterranean Sea

geographic note:
major choke points include the Dardanelles, Strait of Gibraltar, access to the Panama and Suez Canals; strategic straits include the Strait of Dover, Straits of Florida, Mona Passage, The Sound (Oresund), and Windward Passage; the Equator divides the Atlantic Ocean into the North Atlantic Ocean and South Atlantic Ocean

text edited from http://www.emulateme.com/geography
Pacific Ocean geography

**location:**
body of water between Antarctica, Asia, Australia, and the Western Hemisphere
Geographic coordinates: 0 00 N, 160 00 W

**area:**
total area: 165.384 million sq km
comparative area: about 18 times the size of the US; the largest ocean (followed by the Atlantic Ocean, the Indian Ocean, and the Arctic Ocean); covers about one-third of the global surface; larger than the total land area of the world note: includes Bali Sea, Bellingshausen Sea, Bering Sea, Bering Strait, Coral Sea, East China Sea, Flores Sea, Gulf of Alaska, Gulf of Tonkin, Java Sea, Philippine Sea, Ross Sea, Savu Sea, Sea of Japan, Sea of Okhotsk, South China Sea, Tasman Sea, Timor Sea, and other tributary water bodies
Coastline: 135,663 km

**climate:**
planetary air pressure systems and resultant wind patterns exhibit remarkable uniformity in the south and east; trade winds and westerly winds are well-developed patterns modified by seasonal fluctuations; tropical cyclones (hurricanes) may form south of Mexico from June to October and affect Mexico and Central America; continental influences cause climatic uniformity to be much less pronounced in the eastern and western regions at the same latitude in the North Pacific Ocean; the western Pacific is monsoonal - a rainy season occurs during the summer months, when moisture-laden winds blow from the ocean over the land, and a dry season during the winter months, when dry winds blow from the Asian land mass back to the ocean; tropical cyclones (typhoons) may strike south-east and East Asia from May to December
terrain:
surface currents in the northern Pacific are dominated by a clockwise, warm-water gyre (broad circular system of currents) and in the southern Pacific by a counterclockwise, cool-water gyre; in the northern Pacific, sea ice forms in the Bering Sea and Sea of Okhotsk in winter; in the southern Pacific, sea ice from Antarctica reaches its northernmost extent in October; the ocean floor in the eastern Pacific is dominated by the East Pacific Rise, while the western Pacific is dissected by deep trenches, including the Marianas Trench, which is the world’s deepest

lowest point: Marianas Trench -10,924 m
highest point: sea level 0 m

evironment:
current issues: endangered marine species include the dugong, sea lion, sea otter, seals, turtles, and whales; oil pollution in Philippine Sea and South China Sea

geographic note:
the major choke points are the Bering Strait, Panama Canal, Luzon Strait, and the Singapore Strait; the Equator divides the Pacific Ocean into the North Pacific Ocean and the South Pacific Ocean; dotted with low coral islands and rugged volcanic islands in the southwestern Pacific Ocean.

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Jacob, Michael and Louie for helping at the final presentation.

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