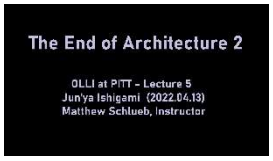
2022.04.13 Lecture Notes 1:00

Lecture 5 – Jun'ya Ishigami



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Exploring scale (**Bigness**)
Rem's **S, M, L, XL** (1995)

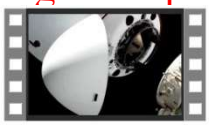
This weekend (Friday, 4/8) **Axiom Mission 1** (Ax-1) **Space X Falcon 9** Block 5 rocket launched first commercial passengers from **Kennedy Space Center**, Florida (LC-39A pad) to **International Space Station** (ISS).

Arriving in space, same social customs, welcomed by ISS crew, hugging, ...
Architectural space on Earth or off-planet, will still be defined by human activities.
However, how will architecture be different in space?

Gaudí's Estereostàtic model for the **Colonia Güell church** (1898-1908), **gravitational** forces studied in tension, **inverted** to determine compression forms.
We think of space in three dimensions, vertical Z-axis oriented by pull of gravity centered in the Earth, on which we inhabit.

In Zero-gravity, no Z-axis. Orientation is variable, to an arbitrary ground plane.
Still the social creature desire for group photo, but with **inverted** people.

ISS designed by **Engineers**, solving for the physical/material challenges of space, not by **Architects**, designing for a human-centered environment.

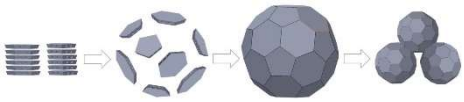


What is architecture off-planet? No differentiation between walls and roof, simply distinction between inside and outside. And, thresholds to move between.

Axiom crew of four is there now, for a week, conducting zero-gravity experiments, one of which is from **MIT Media Lab's Space Exploration Initiative Lab**, titled **Tessellated Electromagnetic Space Structures for the Exploration of Reconfigurable, Adaptive Environments (TESSERAE)**, which is a multi-year program (2019) exploring self-assembly methods for in-space construction.

"Can we free space architecture from static, single-use module design and instead enable dynamic, modular space structures, self-aware, autonomous control of space structures that 'grow' and evolve over the course of a mission?"

BuckMinsterFullerene ("bucky ball") modules from polyhedral mosaic shell that utilize a natively embedded sensing and quasi-stochastic guidance, navigation and control to detect bonds and actuate electromagnets to facilitate self-assembling, multi-functional structural tiles, to enable a new class of rapidly reconfigurable, adaptive spherical architecture minimizing surface area (and launch cost) while maximizing inhabitable.



The modular TESSERAE tiles pack flat for launch, when deployed in zero-gravity, form a robotic swarm of autonomous and self-assembling units.

Prototypes on Ax-1 with sensing and electro-permanent magnets monitoring diagnostics into the quality of bonds between tiles, confirming modeling.
https://www.nasaspaceflight.com/2022/04/axiom-1-docking/

[Osaka Expo Tower by **Kiyonori Kikutake** (1970), one of twelve architects assembled by **Tange**, architect of the international exposition masterplan.]
TESSERAE based on **Kenzō Tange**'s teachings as 1959 visiting professor at MIT, on **Metabolism architecture** (CIAM '59), a new prototype for urban design with more human connection in super-scale cities.

Pre-fabricated dwelling capsules attached to a vertical 'artificial land' tower,
An infrastructure for a self-contained city, manufacturing, housing, blending megastructures with organic biological growth, the capsules undergo self-renewal every fifty years, city/tower growing organically like branches of a tree.

Kenzō Tange's own home (1951-53) skeleton structure raised off ground, made of traditional Japanese (organic fiber) materials, timber and paper. Designed based on tatami mat module, largest rooms flexible to be separated into three smaller rooms by fusuma sliding doors.

From the book, **In Praise of Shadows** (1977), **Jun'ichirō Tanizaki** describes the Japanese house: "In making for ourselves a place to live, we first spread a parasol to throw a shadow on the earth, and in the pale light of the shadow we put together a house. There are of course roofs on Western houses too, but they are built to create as few shadows as possible and to expose the interior to as much light as possible. There are all sorts of reasons for the deep Japanese eaves. The fact that we did not use glass, concrete, and bricks, for instance, made a low roof necessary to keep off the driving wind and rain. The quality that we call beauty, however, must always grow from the realities of life, and our ancestors, forced to live in dark rooms, came to discover beauty in shadows, ultimately to guide shadows to beauty's end."
[End of Architecture, lecture 1, 2018.10.19]

From the dawn of humanity, interior space has been filled by firelight, by torch, candle, oil lamp or sunlight. Shadows dancing on walls and ceiling, as they did in the caves of our ancestors. Space was filled with the scent and sounds of the flame, until the **1893 Chicago World Fair** illuminated **City of Light** (Tesla's 12x 1K HP AC generators), now interiors are steady, static, artificial light, shadows tamed still,

soot vanquished, whitewash expelling the darkness, a quest toward purity, sterility, vacuum, where all trace of life is washed clean with antibacterial soap,

easing humanity into entropic dissolve.

Flex House (Record Houses 2022, **Johnsen Schmaling Architects**, Sacramento) **American Institute of Architect** showcasing best residential design of the year, "a dwelling for our uncertain times." Mix-Use. Bioswale. Inverted floors. Sliding glass doors. 22 inch deep walls, insulated ventilated cavity, screen sun.

1922 Sears mail-order house (**Osborn model #2050**; priced $1,163)
(Alicia Dallago, Memorial Drive, McCandless, PA)
Spanish mission-style in stucco with red brick trim and accents. The front porch features wood columns resting on large concrete and brick piers.

Electrical, plumbing and heating systems have been updated to modern standards, remnants of the early knob-and-tube wiring are still visible in the basement, which contains original coal-fired boiler that provided steam heat to the home's radiators.

"It still amazes me that so much of the original house was unchanged," she said. "The windows and storm windows still have the original 'wavy' glass that was used back then and the hardwood floors, 8-inch baseboards and the woodwork have not been painted or modified in any way."

Sears Houses from a century ago, are timeless, because their spaces are designed not for appearance, making a statement, but for living, human-centered.

As **Frank Lloyd Wright** used to say, "The reality of a room, is to be found in the vacant space enclosed by the roof and walls, not in the roof and walls themselves."
[**The Book of Tea**, gift of Japanese Ambassador, **Imperial Hotel in Tokyo**]

A sun porch off the dining room the homeowner says "is my favorite place in the house to spend time." While restoration and maintenance of a 100-year-old house can sometimes be frustrating and pricey, the homeowner says, "It's worth it."

https://triblive.com/local/north-hills/preserved-1922-sears-mail-order-home-in-mccandless-provides-glimpse-into-the-past/
http://www.searsarchives.com/homes/index.htm

FLW's **Fallingwater** (Mill Run, PA, 1937)

"We are talking of an entity when we speak of an organic building;
we are not talking of a shell being set up and appurtenance men cutting it half down in order to get their work into it – then the plasterer coming in, daubing it all up – the painter coming in to patch up defects, and so on. And this new thought demands first a general simplification in the process of building.
The architect must learn to think 'in simples' before he can build a modern building worth building. Soon, however, we came up against the fact that it is useless to attempt to free humanity by way of (organic) architecture so long as humanity itself is inorganic." [**The Future of Architecture**, Wright, 1953]

Last week, question asked for example of a building made of biological materials.
Mogus Residence (Parker, PA, 2005-2011) made of natural organic materials.
Desire to live off the land, house built of reclaimed and site-sourced raw materials.

Pre-Civil War oak, hickory, and locust timbers reclaimed from Amish barn.

Octagon family room, corbeled logs of **Athabaskan Navajo** Hogan (SW, 1KYA)
Packed mud against entire wood structure, passively cooled by thermal mass.
East facing door to welcome rising sun.

Willow and birch branches for railing and handrail.

Model for future architecture:
resourceful methods
on-hand materials

Straw-bale walls, covered in earthen clay plaster.

Jun'ya Ishigami (june-hi EEshiEE-gah-mEE) 1:45
MFA in Architecture, Tokyo National Univ. of Fine Arts and Music (2000)

(Cuz-yo Sage-mah)


Kazuyo Sejima & Associates (2000)
Glass Pavilion (Toledo Museum of Art, 2000-2006) maze of large curved glass walls (imported from China), low horizontal form and public open space to interact with the world around the architecture.
Rolex Learning Center at EPFL (Lausanne, Switzerland, 2004-2009) selected over Zaha, Rem Koolhaas, Jean Nouvel, Herzog & de Meuron, Diller Scofidio & Renfro.
New Museum (New York, 2007)
Pritzker Prize with Ryue Nishizawa (2010)

1:50

[10 MINUTE BREAK]

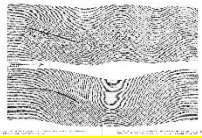
2pm

Jun'ya Ishigami & Associates (2004)

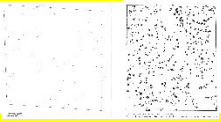
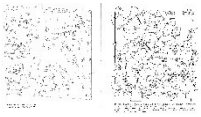
"Re-thinking our methods of constructing architecture (material/building science). In doing so, we will surely discover an expansive new world of another scale, never perceivable before. The scales of space engendered by the natural environment. The liberating feeling of a landscape extending seemingly forever, the vastness of the sky, the lightness of a cloud, the firmness of rain drops. Each has a scale never realizable in architecture until now."

"Architecture has been formulated as a shelter, we might say, in order to separate us from that natural environment – a small sheltering space built within that vast environment. The artificial environment we are creating has grown enormous in extent. So much so, it has even affected the natural environment, and the natural environment in its turn is heavily affecting our artificial environment. As the boundary between these environments, natural and artificial, has grown steadily more ambiguous, a new environment is taking shape. To conceive architecture for this new environment, not as shelter, but as environment, itself."


Magic Table (2006) Like **Zaha** & **Gehry** designing furniture before commissions.
Table as architecture, legs as columns, top surface as roof.
Loaded with tableware, food, plants, pre-stressed curvature to support thinness,
inverting gravitational tensile sag, into compressive arch (**Estereostàtic model**).
31 ft. length, 8.5 ft. width, 1/8 inch thick, 700 kilograms aluminum.
Immateriality created by small touch make gentle sway as if soft paper on water,
So table structure, soft like water surface, make the space (active, **plasticity**).



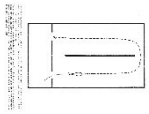
"Buildings designed to resist wind pressure, why not incorporate in structure as a force sustaining the flow of air?" Like the curved surface of a wing.

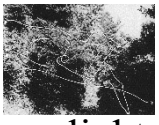
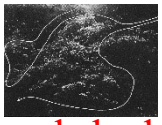
What if that building was like a forest? No walls (glass facades), only columns.
Each different in proportion and orientation. One-room space (2000sq.m), but each time we take a step forward, entire room transforms like a kaleidoscope.
Position of trees in a forest determined by elaborate systems, but creatures living there are unaware why. Present trees/future trees. High density forest/thinned.

Jurassic Era Moenave strata (NEArizona) dinosaur footprints: pace, stride, direction

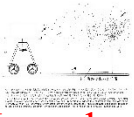
Daurian jackdaw bird: habitual flying to turn back along well-known route to origin



Tropical Betta fish: lured around divider, will follow route even with shortcut

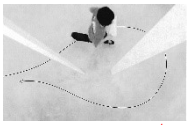
Red Helen Swallowtail butterfly: morning sunlight, summer heat cool shade



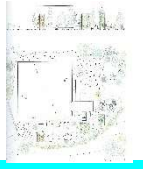
Oxman's Synthetic Apiary (bee hives/wax)
Honeybees: return to hive box location they left, before it was moved (compass)


KAIT Workshop, Kanagawa, Japan (2004-2008)
Youngest recipient of Architectural Institute of Japan Prize (2009)
305 columns feel overwhelming, cumbersome: thin, random, uneven placement.
Abstract flexibility, without need for compartmentalizing different functions, providing fluent circulation and varied ways of appropriating workspaces.
Everyone no longer look in same direction, individually different future.
Architectural form derived from table, with many legs. Glass as perimeter walls.
KAIT Studio/Workplace, Kanagawa, Japan (2013)


White-Cheeked Starlings birds: swarm in group, disregard columns, redefine space

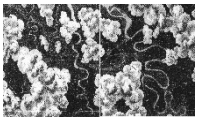



Like Daurian jackdaw bird
and Tropical Betta fish, people follow same route, a stable circulation path

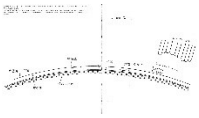



Japanese Pavilion (**11th International Architectural Biennale**, Venice, 2008)
Solo show. Inverted: Interior empty, exterior enclosed with 4 glass greenhouses (interior landscape), precise structural calculations, just barely able to stand, with ephemeral physical presence blending into surrounding environment. Without conditioned air, nor a sealed barrier, reducing feel of artificial environment.

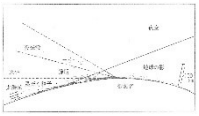
Botanist Hideaki Ohba selected plants with slight fluctuation to landscape, to seem quite ordinary, as a progressive approach to the environment. Architecture itself becomes equivalent to the plants. Comparable scale to the built environment.
Architectural ruins merge into landscape, landscape emerges into architecture.



Pioneer Balloonist **Thomas Scott Baldwin** drawing clouds overlayed with land

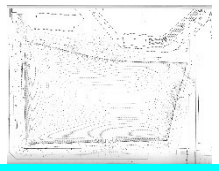


Earth's layer of atmosphere has a thinness, proportional to large curvature radius

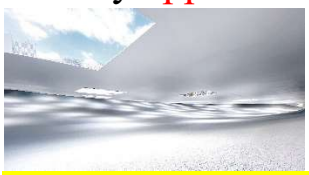


High altitude Noctilucent Clouds: sun at horizon, sunlight below clouds, like waves

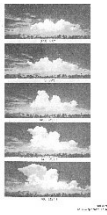
"Largest space on our planet able to be encompassed in a single view is the landscape extending to the horizon. Even if a bigger space could be made as a single room, the curvature of the Earth would cut off the far distance."
"Contemplating spaces in terms of the largest units of space on the planet may help us find ways of creating environments on a new scale, transcending that of previous artificial environments such as buildings."



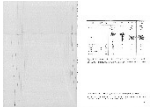
Plaza at KAIT, Kanagawa, Japan (2008-2020) 100m long, 60m wide, 2.3m high, 12mm thick single steel sheet, without central support. Catenary curvature, ground and sky appear to merge on horizon, creating sense of infinite space.



No wall, just roof, to create/define space.



"How much justification can there be for permanence in architecture within the natural environment?" Just as clouds change shape, architecture can gradually change depending on various conditions and stable qualities found in surrounds.



Minutely detailed structure resembling dandelion seeds floating in the air.


"World takes on an entirely different scale when we move vertically, compared to when we move horizontally. When you walk 30 meters through town, the scenery around you changes little. Yet, when you ascend a 10-story building to a height of 30 meters, you will see scenery completely unlike that seen at ground level."

Dense, flat foliage: incident radiant is absorbed in upper third. Narrow: throughout.

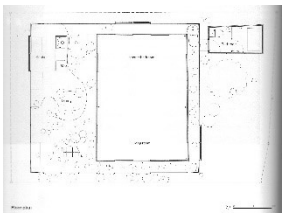
Water vapor condenses in air to form cloud, rain, to fall. Size, velocity.

"To construct architecture at such a scale, to eliminate the boundaries between empty space and structure, this will require thinking of architecture as air: all around us, endlessly spreading, filling space as it goes."

Carbon fiber sheets rolled into pipes of 900um diameter, smaller than raindrop.
What if an architecture could be made of this structure, mostly empty space?
"Density reduces infinitely until structure forming building is as rarified as vapor"


Architecture as Air: Study for Chateau la Coste (12th Venice Architecture Biennale, 2010) Curated by **Kazuyo Sejima**, as first woman Director of Architecture.
Golden Lion for Best Project

Tohoku University Associate Professor (2010)



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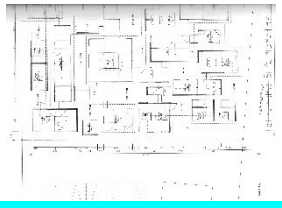
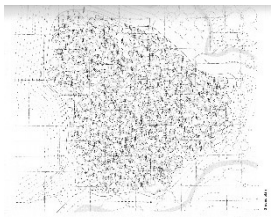
Gehry asphalt flr

House with Plants, Tokyo (2010-2012) 15mm thick non-structural perimeter walls. Earthen floor (Japanese ***doma***: cooking pit) and ***niwa*** (garden) invert inside/outside, plants/nature between exterior and house



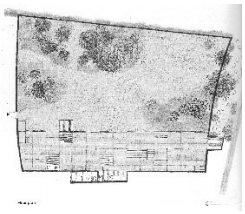
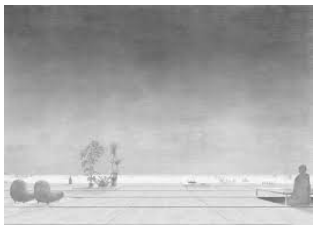
Home for the Elderly, Akita, Japan (2012-) suffering from senile dementia, traditional houses create familiar environment. 40 houses salvaged around Japan. Proportions determined by ***tatami*** mats (modular, **Metabolism**).



Botanical Garden Art Biotop/Water Garden, Tochigi, Japan (2013-2018)
Trees cleared for hotel, replanted in adjacent fields.
Rental farms artificial scenery (maximize crop yield), blend with existing scenery.

Dug out ponds barriers (walls) between occupiable courtyard gardens ***tsubo-niwa***.
Curated natural landscape as architectural, exterior as interior place/space.

House and Restaurant, Yamaguchi, Japan (2013-) dig series of wells, concrete filled and earth (moulds) removed, to make caves inverted from the solid ground.
Zaha's artificial landscape, rebuilding **The Peak** granite mountain.
No wall, no roof, subtraction of form to create space as space.
Living area made of random functional spaces (bedroom, kitchen, …)

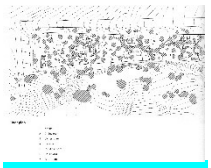



Family House, Japan (2013-) grandmother's house, rebuilding from memory, horizontal paddy fields in south oriented garden, continuous into ***tatami*** room. Downward curving shed roof eaves below line of vision, to be one with ground. Boundless low window 25m long, 1.3m high. Scenery and memory merge.

Harvard University Visiting Professor (2014)
Princeton University Visiting Professor (2015)
Academy of Architecture of Mendrisio Visiting Professor, Switzerland (2016)
Oslo School of Architecture and Design Visiting Professor, Norway (2017)
Columbia University Adjunct Assistant Professor (2017)



Chapel of the Valley, Shandong, China (2016-) reinforced concrete curving walls, 45m height, 1.3m width, 22mm to 180mm thick walls, widening chapel lets in light, with narrow entry in darkness, open to sky (no roof), yet to slender to let in rain. No roof, just wall, to create/define space.
"Just as walls and ceiling partition a building to create rooms, **rain** creates small spaces amid the greater expanse of the landscape."



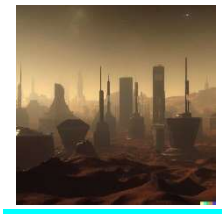

Hotel Null Stern (Swiss Alps, 2009)

Eight Villas, Dali (2016-) living spaces within existing arrangement of stones. Each 500sq.m villa occupying a stepped terrace of the meandering riverbed. Architecture without enclosure, natural stone megaliths (columns) define space.

"Up until the twentieth century architecture placed humankind at its center. But now we have to see humankind as part of nature. So, the human scale must not be the only scale for architecture. We need to think of a new scale. (Planetary) …Then we can think of things from an animal's scale or a plant's scale and that leads us to introduce a new type of scaling into architecture." Megaliths to feel small, humble.



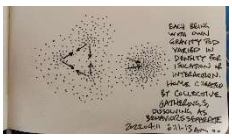

Nakagin Capsule Tower (Tokyo, Japan, 1972-2022.04.12 **yesterday start demo**)
Kisho Kurokawa, architect Modular to adapt easily, yet not human-centered.



AI generated architecture on Mars, using a single text prompt (2022.04.06)
Technology creating architecture – from computer's perspective, not human.
Does nonhuman-centered, material-based architecture require an architect?

NASA seeking volunteers for Human Exploration Research Analog (HERA), to live and work for 45 days inside mock spacecraft, simulate deep space travel, to study the effects of isolation and stress/conflict behavior between crew.

Astronaut crews inhabiting confined spaces (**continual interior containment**) for long durations of space travel and off-planet habitation, **behavioral health** is the second greatest risk factor after radiation exposure, to become multi-planet species. Human-centered architectural space designed for emotional needs will be as essential as the engineered material building systems for physical needs.



What is the future of Architecture, off-planet?
Each being (person, pet, plant, ...) with own Gravity/Light/Energy atmosphere/pod, varied in density of air, vapor, biomass, thermalmass, ... for isolation or interaction.
Home created by proxemic gatherings, dissolving as behaviors/activities separate.
Architectural space/threshold: interface between concentration and entropy.