SUSTAINABLE ARCHITECTURE
IN RESPONSE TO NATURAL PHENOMENA
SERIES 1 – 8
1985 – 2006
SHOEI YOH, HAMURA

SHOEI YOH + ARCHITECTS
"Analogy of Community by 3D Wood Truss Gymnasium"
German steel globe joints were applied to connect 7000 young cedar wood trunks which were cut seasoned for forestry purpose. Those timbers have been usually abandoned and left in the mountains except this rare case. My 3D Wood Truss Gymnasium overwhelming the limit of 3000 square meter was approved by for the first time the ministry of construction of Japan in 1987, thanks to the computer analysis which was not possible without our innovative epoxi adhesive interface between soft wood and hard steel bolt. Examinations of thousand samples proved that both tensile and compressive force transmittance was assured for calculation to prove enough safety. As a result the safety was obtained by choosing each wood member to satisfying the required strength one by one. The diversity of each member is similar to the community members, tall or short, fat or skinny.

Through computer simulation, we found, even if the most important members were damaged, missed or broken for some reason such as typhoon or thunder strike, the related neighboring members immediately start bearing the load which missing members were bearing before. Neighbor helps you in trouble.
One for all, all for one.
The sustainable community design of the least emission is found here.

"Optimum 3D Forms"
My 3 dimensional topological structures look like free form sculptures of the recent eye catching architecture in the world. On the contrary the flat thickness of Oguni Dome made of 3D Truss is artificial to employ various wood members. But they are not arbitral definitely.
1991, my discovery of a beautiful topological 3D optimum form of the roof in Toyama which the heavy weight of snow automatically created became my life long theme. The contrast between the optimum 3D form and the artificial flatness shows an extreme result of the Homogeneous and the Heterogeneous structure.

"Responding the Natural Phenomena"
It is now possible to create any arbitral form of architecture like a sculpture, however, the sculptural forms must be distinguished from the optimum forms based on ecological natural phenomena. The optimum form is no doubt ecological and even economical in these days. The recent sculptural forms of architecture play a role of visual attraction in the cities. The diversity of various forms of architecture is not necessarily a result of ecology but visual impact or an identifying expression as signboard.
We must be aware of the dignity of the Master Architects and their inventive ideas and aesthetics as well as romanticism.
I have been admiring Dr. Paul MacCready who created the man powered air planes called Gossamer Condor and Solar Challenger 30 years ago. We can see an ideal relationship of Man, Nature and Technology. Our technology in our hands would make us possible to develop and realize our dream, a fascinating beautiful world, unlike some buildings in Dubai, Shanghai, Beijing or Las Vegas, a kind of the night mare in desert, “Phantom”.

"Birds Sanctuary"
The property of my Aerial City with 400% density in Yokohama in1992 is to be a bird sanctuary without any surface transportation except boat or yacht. Walking and cycling would be the only human activity. Would it be ecological, wouldn’t it be? Symbiosis is realized without any sacrifice or compromise in the Aerial City of 2050.

Shoei Yoh Hamura
1-1
NATURAL RAW MATERIALS
Hand made Community Facilities in Wood and Bamboo

To save energy and resources, and to sustain a community which produces material, we build an architecture by themselves and for themselves in their own neighborhood.

TENSILE STRUCTURE TO UTILIZE THE ONE-WAY FIBER

Sea&Island Expo, Hiroshima 1989

BAMBOO STRUCTURE
(untreated bamboo)

- $F_c \leq 334 \, \text{kpsi}$
- $E = 1.17 \times 10^7 \, \text{kpsi}$
- $F_b \leq 1270 \, \text{kpsi}$

WOOD STRUCTURE
(PLYWOOD FIBER-FILLED [untreated bamboo])

- $F_{max} = 575 \, \text{kpsi}$

Sea&Island Expo, Hiroshima 1989

Bamboo Shelter, Fukuoka 1989

Bamboo Shelter, Fukuoka 1989

Oguni Dome, Gymnasium, Kumamoto 1988
This structure attempts to internalize the cultural and contextual forces within its forms, uniting disparate elements—local craftsmanship with advanced technology, bamboo with poured concrete—in order to create a bending, folding and undulating form that reflects the cultural position of the community and functions as a monument to their lives and works. Although not officially recognized as a building material in Japan, the structure was conceived to be built with bamboo inspired by the local bamboo factories.

In addition to his plan to use local materials, Yoh had hoped that the community center would, at least in part, be built with community participation, and this required that the construction process be kept as simple as possible.

Members of the design team worked together with local craftsmen to literally weave a simple bamboo grid like a gigantic expanse of chair caning.

The flat structure was then suspended over the site in much the same way a tent might be raised. The bamboo structure became pliant and netlike and, the team of architects, constructors and community members deformed without distortion keeping square grid the bamboo into the necessary form. The undulating cage like form was then covered with steel fiber mixed concrete.

A temporary post was removed in four weeks. The smooth forms of the building now sit within the landscape like a gigantic inverted flower.

Text by Quaderns Corrected by architect
NATURAL RAW MATERIALS

Hand made Community Facilities in Wood and Bamboo

UCHINO COMMUNITY CENTER FOR SENIORS AND CHILDREN 1995

Providing accommodation for aged people together with a children’s centre, this complex comprises a multi-purpose facility to promote communication between senior and youngest citizens. A partition-free space, with the exception of private rooms, extends to encircle an oval-shaped lawn plaza. In contrast to the flat surface of the floor, a variety of ceiling heights which correspond to the expanse of each area was produced in the space. Accordingly the roof form that appears to be irregularly formed was logically derived from structural calculations in which the ceiling height was modified in proportion to the distance between each pair of opposing columns at the periphery. The square-gridded bamboo lattice in the roof was distorted to create a three-dimensional curved surface. Used as a formwork mould during the concrete casting process, having withstood the tensile forces of the pour, the bamboo lattice was left as an interior finish.

EAVES substitute Tensile Tie Bar for dome and vault.
NATURAL RAW MATERIALS

KANADA CHILDREN TRAINING HOUSE 1994
NATURAL OPTIMUM FORMS
Responding to Natural Phenomena

GALAXY TOYAMA 1990–1992
To minimize the structural material similar to the nature

1. Fixing some supporting points under the plane truss.

2. Inputting self-load and live-load.


4. Making truss depth corresponding to the stress diagram.

Experiment of Phonoelasticity

PATENT PENDING

Multi-impulse Rail Tunnel 1992
We introduce Toyama and Odawara projects as examples of aquatic architecture. There is clearly a more fluid and open system of aqueous urban space being formulated. We propose unpredicted participation of architectural form with external forces. Our project participates in an emerging sensibility of Complexity and Compliancy in Architecture, where heretofore external contingencies become intensely involved with question of form and space. This type of intense involvement is characterized by affiliations and alliances of form with programmatic, structural and cultural forces. Unlike the now familiar appeal of architecture to Contradiction, superrpositions or accidental collisions, compliant systems are capable of engendering unpredicted connections by vicissitude. This Logic of viscosity develops stability from differential and fluctuating forces. The flexing relations of vicuous spaces such as these are extremely complex, rigorous and precise, yet they are not reducible to any single or holistic organization. This complex resistance to reduction to either unity or contradiction distinguishes a plant sensibility from either the universal spaces of Modernism or the arrested formal conflict of Deconstruction. This irreducible complexity is engendered by the supple anexact yet rigorous geometries of smooth transformational systems.

The Odawara roof structure is irreducible to any single uniform dimension. Its particularized and differentiated contours present an image, which is seemingly between geometric exactitude and arbitrary figuration rather than deriving from the contradiction of decoration with structure (curiously present in both the conflicting forms of Decorative and the Post-Modern disjunction of Venturi's decorated sheds). The roof of Odawara project employs a particularized, difformorphic and supple topological surface capable of fluid transformation. Rem Koolhaas's Tokyo Bay competition entry and the main hall of his Rotterdam Kunsthall should be compared with our projects. The precision and clarity of these continuous yet heterogeneous roof systems should be distinguished from the reductive homogeneity of Mies van der Rohe's Berlin National Gallery. The Odawara project employs a particularized, difformorphic and supple topological surface capable of fluid transformation. Rem Koolhaas's Tokyo Bay competition entry and the main hall of his Rotterdam Kunsthall should be compared with our projects. The precision and clarity of these continuous yet heterogeneous roof systems should be distinguished from the reductive homogeneity of Mies van der Rohe's Berlin National Gallery. The root of Odawara project employs a particularized, difformorphic and supple topological surface capable of fluid transformation. Rem Koolhaas's Tokyo Bay competition entry and the main hall of his Rotterdam Kunsthall should be compared with our projects. The precision and clarity of these continuous yet heterogeneous roof systems should be distinguished from the reductive homogeneity of Mies van der Rohe's Berlin National Gallery. The root of Odawara project employs a particularized, difformorphic and supple topological surface capable of fluid transformation. Rem Koolhaas's Tokyo Bay competition entry and the main hall of his Rotterdam Kunsthall should be compared with our projects. The precision and clarity of these continuous yet heterogeneous roof systems should be distinguished from the reductive homogeneity of Mies van der Rohe's Berlin National Gallery. The root of Odawara project employs a particularized, difformorphic and supple topological surface capable of fluid transformation. Rem Koolhaas's Tokyo Bay competition entry and the main hall of his Rotterdam Kunsthall should be compared with our projects. The precision and clarity of these continuous yet heterogeneous roof systems should be distinguished from the reductive homogeneity of Mies van der Rohe's Berlin National Gallery.

Text by Greg Lynn
SIMULATED NATURAL LANDSCAPE

SEA&ISLAND EXPO, HIROSHIMA 1989,
Instant Landscape Design for 100 Days
BIRDS SANCTUARY WITH 400% HIGH RISES CONNECTING AND PARKING BY ELEVATED HIGH WAY IN THE AIR 1992

UNITE D'HABITATION, YOKOHAMA

YOKOHAMA BAY BRIDGE

HOTEL DIMARYP

TRIDENT CROSS

LE GRAND CUBE

DAIKOKU PIER

HANEDA AIR PORT

SKY WAY
Highway, leisure from one building to another building in air. In a clean
No noise, against pollution.
Pedestrian are not stressed at traffic signal and simply walking a low energy-wood, 
sailing, river-kiosk, ramp and washing.

BIRDS SANCTUARY
Gigantic high rise, high density building as infra-structure make it possible that whose
ground of the site is tangent by cleaning all the road in the air at the same time.
Obtained the floor space of 0.73% the percentage is only 0.13% 0.17% all the site is
left green in nature.
Covering engaging in the vector, spreading foliage all over, restaurant and nature plate here
and there like parrots for the urban citizens to enjoy the
birds sanctuary in a city.

YOKOHAMA DAIKOKU PIER, AERIAL CITY
SUN BLESSED CITY
COMPLEX A

TORANOMON - AZABUDAI (TOKYO)

BACK-TO-BACK layout buildings (patented in 1974)
Amenity without nuisance
  SOUTH side: healthy and warm dwelling
  NORTH side: gentle and stable sunshine without glare
    Suitable for office, library, studio, gymnasium, museum, etc...
No more wasting solar heat gain

HIGH DENSITY = efficiency, convenience and diversity
Substantial public service for babies, mothers and seniors
Co-existing without compromise (like old cities)
Intimate community in neighborhood

MINIMUM SHADOW for neighboring habitants
+
MAXIMUM OPEN SPACE for celebrating community's festival

...Welcome back to city
NATURAL PHENOMEN ART
OBSERVATORY TOWER
Fog, Mist, Rain, Stream, River, Waterfall, Snow, Rainbow, Cloud, and Shooting Stars Performing Arts

PROSPECTA TOYAMA 1992

Prospecta '92 is a memorial building for the first Japanese Expo, held in Toyama in 1992. Temporarily this structure served as one of the Exposition pavilions, however now it serves as an example of how architecture can be endowed with life. It allows the visitors to become at one with nature. The theme for the exposition was the metamorphosis of "water", as Toyama is well known for its crisp water from the snowy mountains.

The building is an observatory which is designed for the pure appreciation of natural phenomena and the beautiful landscape. It stands on four large concrete columns, two excising stairways. The viewer is able to see snowy mountains as well as various natural phenomena like rainbows, fog, clouds, lightning and shooting stars, in a cubic frame which helps natural perception. Instinctive perception and intelligent understanding of nature through natural perception has been Yoh's lifelong theme.

Water is life and the circulation of water is mysterious: rain, waterfall, cascade, river, the sea, evaporation, clouds and snow, the way rain reflects sunlight forming rainbows, and how people perceive that the irregular forms of fog are dancing in accordance with the music that is performed; some people even see the illusion of a dragon dancing.

The movement of natural phenomena is supposed to affect our instinct rather than intelligence. The more intelligent we are, the less instinctive we tend to be. Whilst recovering such senses we feel that time is very short, as we are supposed to be syncopeing movement as a part of natural phenomena.
NATURAL PHENOMEN-ART OBSERVATORY TOWER
PYRAMID of SEA, FERRY TERMINAL 1992
NATURAL PHENOMEN-ART MUSEUM
80 Interactive Art Collections of Fire, Bubble, Crystal, Magnet, Whirlpool, Wave, Pattern, and Gravity
SAIBU GAS MUSEUM FOR PHENOMEN-ART 1989–2006
NATURAL BUBBLE
GLASS CANOPY
Pre-Stressed Tensile Fire Resistant Glass

Glass Station 1993
Like a gigantic soap bubble or a bending tennis racket, Yoh’s undulating laminated glass canopy covers a gas station situated at the entrance to the small lumber-producing town of Oguni, near Mt. Aso. This glass-and-concrete structure, completed in 1993, can be seen as a not-too-distant relative of Yoh’s Oguni Dome, which was constructed in the same town some five years earlier. Viewing both of these structures allows us to understand how Yoh’s work with roof structures has developed into a complex mixture of natural inspiration, technological innovation, and an acute interest in challenging the capabilities of materials and mixtures of materials.

For the Glass Station he used a mixture of glass, stainless steel, polyester film, aluminum channels, structural silicone, perforated stainless-steel sheeting, and concrete. In order to construct his strikingly amorphous, parabola-shaped canopy and simultaneously meet local safety Ordinances mandating a completely fire-resistant structure, The Benedict us award jury observed in 1994 that the glass is “ideal in its capacity to apparently stretch and maintain its shape over the parabolic planes of the canopy.”

Four poured-in-place concrete arches, each of different heights and depths, were set along the edges of the wedge-shaped site, and a lattice grid of 22-millimeter-diameter, pretensioned steel rods and aluminum channels was stretched between the arches like the strings of a tennis racket, then bolted to the concrete structures. The rods and channels created the parabolic, curved frame into which the glass and perforated stainlesssteel sheet was precisely cut to fit into the concave surfaces. The grid was then mounted to the top range of the aluminum channels and fastened with structural silicone joints. Yoh not only incorporated this sort of flexible joint on many of his previous projects that incorporated glass, steel, and aluminum lattice, but he introduced and developed this technique because of its ability to absorb the movement caused by thermal changes.

Yoh used a combination of 8-millimeter-thick laminated glass and a 0.3-millimeter-thick sheet of perforated stainless steel to filter the sunlight below the canopy. A polyester film was also placed between the glass roofing and the metal support structure to provide additional safety in the case of any broken glass.

Text by Anthony Iannacci
Sensible and Tolerant Habitation in Ambiguous, Ambivalent, Ambience of Japan

Ono city Civic Center, Fukuoka Prefecture, 1996-2006

Yoshu Primary School and Ono Community Center consist a Civic Center at the heart of an ancient city of Ono with a 400 year old ancient castle on a top of the hill risen up alone in the middle of a huge basin surrounded by heavy snow mountains.

The castle and city was planned 400 years ago by the Lord Nagashika Kanemori and the whole city has been burned 7 times by fire and recovered 7 times preserving original city planning of the strict grid pattern of streets and water channels behind houses in one way.

Its such history and chilly climate, the GENUS LOC I captured a modernist like me and gave him an opportunity to re-discover the metaphysical ambiance which is ambiguous and amiable mainly because of half closed and half open sliding doors ( fusuma and shoji etc) dividing or connecting the rooms through out the building and, as well as inside and outside.

I am now confident that old traditional Japanese sentimentism among people and the deep sympathy to nature would have been brought up in such an ambiance constantly for hundreds of year owing to the mild climate to appreciate and to respect with awe the natural beauty of 4 seasons.

It is hard to visualize such a soft ambiance unlike the hard architecture to be found in the world.

The hardness is derived from the strict separation of all rooms by sliding doors which keep the individualistic independent privacy.

On the contrary Kurokawa called it White Gray,"Tosakai wrote "MA to describe the physical composition of the third space or a space in between. I would call it an "Ambience of Japan", an idea of the Japanese Mentality, a sense of absence or presence.

I would rather call it "Fluidity of air" as a physical expression of an ambiance, which I have been struggle with for many years.

Civic center is for children and seniors to enjoy studying, playing and gathering on foot living within an ancient town, half a mile square area.

Air conditioning has been converted to radiating devices which is warm in winter and cool in summer utilizing the underground water temperature which is constant all the year round.

The traditional "Passive Solar System" of 4m deep soils as wide as 300m surrounding the building to cut direct heat gain of summer day light with a shaded a veranda (shumi-nya) as a cushioning inter modates free open spaces between the major class rooms and vast field outside.

The traditional Module of 3", 4' has been and will be most effective for altering the floor plan for next century and even for production of all sliding doors in the future.

Flexible and free open plan has been a theme of Modernism has not it?

It is found here.

Fluidity of air under a huge roof and on a extended flat floor would be extremely neutral ambiance.

It's a common space to be shared by young and old.

Teaching young is learning old.

Playing is learning at the same time.

Painting is an enjoyment of expression what you have in mind.

Singing a chorus is a collaboration of all citizens.

Old and young cities need the children who are going to be brought up among a traditional community just like a big family.

Design and Photograph by Shohei Yoh Hasegawa
 Underground Water Radiating Cooling and Warming System

Summer
17°C

Winter
10°C

Radial Well underground heat pump

地中熱利用システムの概要

洗面等水温の冷暖房のエネルギーに利用します

Cool Water Radiation

Warm Water Radiation

Fan Coil