Studio Anne Holtrop

ETH Zürich

HS21

MATERIAL GESTURE:

CHANGE

Towards Hydroscopic Design

Olafur Eliasson, RIVERBED, 2014. Water, blue basalt, basalt, lava, stone, wood, steel, foil, hose, pumps, cooling unit. Installation view: Louisiana Museum of Modern Art, Humlebæk, Denmark, 2014. Photo: Anders Sune Berg. Courtesy of the artist; neugerriemschneider, Berlin; Tanya Bonakdar Gallery, New York / Los Angeles.

CONTENTS

DESIGN STUDIO

When we take all aspects of the material into consideration – the geology, the sourcing, the industry, the different properties, the craftsmanship, the specialised techniques and the cultural significance – we can deploy the full potential of the inherent qualities of the material itself and our way of working it in what we call MATERIAL GESTURE.

In this design studio, you will define your gestures of making and working with material(s) through research and experiment, and in response to the topic of the studio. You are required to produce an architecture that results from your specific engagement with the material and the spatial condition you construct with it. The architecture that results from this approach does not reference or represent something, but simply attempts to exist as a physical spatial reality in its own right.

Your research should be supported by the knowledge made available by our studio, and engaged through you with the use of available resources and facilities at departments of the ETH and from external specialists / fabricators.

Throughout the whole semester, and for your final presentation, we require that you work with physical (fragment) models of your building in the actual material(s). It is important, in this design studio, not to make a complete building, but to show and support the found values of the material engagement in a spatial way, based on the full potential of the inherent qualities of the material itself and your way of working it.

MATERIAL GESTURE: CHANGE

Towards Hydroscopic Design

This semester, in response to the topic of durability, we will focus on water. We will research water as an agency continuously shaping our environment and reacting to and forming other materials. At the same time, water will also be seen as the crucial element shaping the work of an architect.

Our relationship with water is complex and contradictory. Water is vital to all forms of life and to the genesis of matter, organic and inorganic. And yet it remains relatively invisible, and as a design agent, underestimated.

Architecture today is, to a large extent, about controlling water, whether in the atmosphere, in the soil, or in a building. Condensation, rainwater penetration and unwanted moisture can damage a building and impact on

its longevity. An architect's response to the durability of a construction and its materiality generally consists of designing resistance against weathering caused by water. Our society increasingly demands controlled, standardised comfort: the building envelope separates indoor and outdoor climates and ecologies; the vapour barrier keeps window openings airtight and ensures the high performance of thermal insulation. In turn, the pesticide-applied plaster prevents mould growth on the façade.

Seen in a wider territorial frame, analogous to its role for architecture, the control of water following the Industrial Revolution has been crucial to the creation of the modern rationalised landscapes we now inhabit. It appears, however, that the modern mentalities and techniques of control of water have reached their limits. Today, water stands at the centre of the most urgent environmental challenges—from the melting glaciers, increasing droughts and floods and the demand for (green) hydroenergy, to the struggles over water pollution and access to water sources, water is becoming increasingly precious, scarce and politicised.

In this semester, we offer the possibility to reimagine the notion of durability by reconsidering our fraught relationship with water. In a movement from

hydrophobic to hydroscopic design of buildings and environments, we will embrace the fundamental and unique characteristics of water and its influence on the changing states of matter and ecologies in the territory and architecture.

The sites we will study and travel to are situated in the Valais, from the slopes of Jungfraujoch to the Rhone River. Following the trail of water, we will encounter extraordinary places—convergence of glaciers, geological formations, a water reservoir and a dam, a hydroelectric power plant, a rare crystal and mineral site, riverbed movements, an active stone quarry, a salt mine and the largest debris flow measuring system in the world.

Studio Anne Holtrop

Prof. Daniel Mettler, Prof. Daniel Studer

ASSIGNMENTS

Within the topic of ‘CHANGE: Towards Hydroscopic Design’, from a MATERIAL GESTURE perspective, we have identified three subtopics; you are to choose one to place at the core of your project and expand on.

Subtopic 1

STATES AND MIXES

With changes of temperature, water oscillates between different states, solid, liquid and gas. In the given site of this semester, water is potentially present in all these states:

ice,

water

and vapour

are conditions that can strongly influence the nature and ageing of matter and therefore can be fundamental actors in the process of construction and the life of a building. Water is, in fact, currently the most common ingredient to mix and treat all sorts of materials in order to give them a certain performance or workability. Materials behave differently when exposed to water through permeability and their qualities can be altered by drying processes. Given the local sources and physical conditions of the site, how can we reconsider and alter certain mixes in order to privilege different performances from the conventional ones and produce other spatial qualities?

Subtopic 2

TRACES OF WATER ON MATTER

This subtopic assignment focuses on water as an agent to build form via collision and collection. Through its speed of flow and pressure of volume, water has the ability to form and deform a material. Either by addition – think of

medial moraines built via glacier convergence,
reservoir sedimentation deposits and irrigation channels
collecting vital water for crop growth
– or by subtraction –
think of rockfall due to permafrost melt,
glacial moulins and river erosion.

Depending on its composition and temperature water can also change the colour, texture and behaviour of materials. Taking into consideration the constant flow and harnessing of water in the selected site and its range of states, how can we embrace water's inherent ability to leave traces on matter in order to make architectures and design spaces?

Subtopic 3

THE SILENCE OF WATER

Our brains interpret the noises we hear, the sound of water is a non-threatening sound; it doesn't divert attention and it works to calm people. For our perception, more important than volume is the character of the noise; the sound of water doesn't stimulate the threat-activated vigilance system because the noise varies considerably in volume but with intervals followed by crescendos, and is a smooth rhythm that rises and falls, in harmony. The sound of water is a white sound, which has the same sound intensity at all frequencies and has the same decibel level. White noise has a sort of invisible shield:

a barrier for other sounds
coming from the environment that remain
as if camouflaged by the repetitiveness and monotony of a single sound,
characterised by the absence of periodicity
in time and constant amplitude
over the entire frequency spectrum.

On the market, there are acoustic white noise generators, which are used to cover background noise in offices or restaurants, and to promote relaxation. How can we build with water and be embraced by its sound? What are the spatial and acoustic conditions related to materials and construction techniques that allow us to benefit from the intrinsic sound properties of this material?

EXPERTS

NICOLE DE LALOUVIERE

Nicole de Lalouvière is a doctoral fellow at the Institute of Landscape and Urban Studies (LUS), Department of Architecture (D-ARCH), ETH Zürich. She is part of the Chair of the History and Theory of Urban Design, led by Prof. Dr. Tom Avermaete. Nicole's doctoral research focuses on the irrigation channels (bisses / Suonen) of Canton Valais as a form of 'landscape commons'. Nicole holds an undergraduate liberal arts degree from Colgate University (Hamilton, New York), where she majored in architectural history. She graduated from the University of British Columbia (Vancouver) with a Master of Architecture and received the thesis prize for work on design futures for Diego Garcia (British Indian Ocean Territory). She has also spent time studying art history in London and architecture at the Royal Danish Academy of Fine Arts in Copenhagen. She has practiced as an architect and landscape architect at MAD Architects (Beijing), PUBLIC (Vancouver), Hapa Collaborative (Vancouver), Vogt Landschaftsarchitekten (Zürich), and Baumschlager Eberle Architekten (Zürich). Nicole co-authored the book chapter "Search and Research: The Mols Landscape in Denmark" with Günther Vogt, published in Your Glacial Expectations (edited by Studio Ólafur Elíasson, Thames & Hudson, 2017). She is a co-author with Günther Vogt, Nicola Eiffler, Gijs Rijnbeek, and M.K. Smaby of the book Wunderlust, Wanderkammer (Lars Müller Publishers, 2016). Her work has been published in the Journal of Alpine Research and gta papers, and shown in the Critical Care exhibition at the Zentrum Architektur Zürich (ZAZ).

SAREM SUNDERLAND

Sarem Sunderland is a landscape architect and researcher, based in Zürich and Munich. He is part of the Chair of Landscape Architecture of Professor Günther Vogt, at the Institute of Landscape and Urban Studies (LUS), Department of Architecture (D-ARCH), ETH Zürich. He currently writing a doctoral thesis on the relation between hydroelectric infrastructures and landscape in the Alps, within a SNSF

research project on industrialisation in the Alps. Sarem holds a Bachelor in architecture from EPFL (Lausanne), and obtained his Master cum laude in landscape architecture from TU Delft. He has practiced as a landscape architect at Krebs und Herde Landschaftsarchitekten (Winterthur) and Ganz Landschaftsarchitekten (Zürich). He was a guest critic on several occasions at EPFL (Lausanne) and the Bartlett (London). He is a member of the collective la-clique and a board member of the Swiss Federation of Landscape Architects for the regional group of Zürich. His academic interests span from landscape history and theory to water, infrastructure, and subversive urban practices.

SEBASTIAN BEHMANN
(Born 7 October 1969) is a German architect and the long-time collaborator of Danish-Icelandic artist Ólafur Elíasson. Behmann heads the department of design at Studio Ólafur Elíasson and is the co-founder of Studio Other Spaces, an office for architecture and art that Elíasson and Behmann established in 2014. Educated in architecture at the TU Dresden, Behmann began collaborating with Elíasson in 2001. Together, the two have designed numerous architectural works. Theseinclude pavilions, installations, international exhibitions, and Fjordenhus in Vejle, Denmark (2009–18), the first major building designed entirely by the architectural team at Studio Ólafur Elíasson. Behmann was the responsible architect for the façade design of the Harpa – Reykjavik Concert Hall and Conference Centre (recipient of the 2013 Mies van der Rohe Award), whose shimmering glass façades were developed by Studio Ólafur Elíasson in collaboration with Henning Larsen Architects. Other architectural projects by Elíasson for which Behmann was responsible include Cirkelbroen (The circle bridge) in Copenhagen (2015); Your rainbow panorama, for ARoS Aarhus Kunstmuseum (2011); Serpentine Gallery Pavilion 2007 in London (with Kjetil Thorsen); and The blind pavilion, the Danish Pavilion at the 50th Venice Biennale (2003). Behmann was also involved in numerous exhibitions of Elíasson's work, including The weather project, Tate Modern, London (2003); Take your time, MoMA San Francisco (2007) and New York (2008); Your body of work, Pinacoteca do Estado de São Paulo (2011); and Innen Stadt Außen, Martin-Gropius-Bau, Berlin (2010). Recent projects with Studio Other Spaces include Future Assembly, an imagined more-than-human assembly for the future inspired by the UN, currently on show at

Venice Biennale di Architettura; the design of Lyst Restaurant (2019) in Vejle's Fjordenhus; Common sky (2019–), a contribution to the reinvention of the Albright-Knox Art Gallery in Buffalo; a permanent work of art for the 15th and 16th floors of the Morland Mixité Capitale building in Paris (2015–2021); and the Meles Zenawi Memorial Park in Addis Ababa, a campus including five buildings, several pavilions and a park (2013–2021).
studiootherspaces.net
olafureliasson.net

GIUSEPPE IELASI
Born in 1974, Giuseppe has lived near Milan since 1990. He started playing guitar in 1988 and worked for many years in the area of 'improvised music' (long term collaborations with Renato Rinaldi, Thomas Ankersmit, Michel Doneda, Ingar Zach, Dean Roberts). Between 1997 and 2006, he performed live with Taku Sugimoto, Jerome Noetinger, Mark Wastell, Martin Siewert, Nmperign, Brandon Labelle, Nikos Veliotis, Alessandro Bosetti, Gert-Jan Prins, Phill Niblock, Oren Ambarchi and many others. From 2007 on, his work has been mainly studio-based, working on compositions for cds and records, theatre and film. He abandoned the guitar, and his solo shows are now based on multichannel diffusion and recomposition of pre-existing pieces and fragments, to create complex site-specific audio works. He collaborated with Austrian video artist Michaela Grill (US tour in 2007, participations at the Rotterdam Film Festival, Evolution Festival in Leeds, FilmSoundFilm in Marfa, TX) and is regularly performing and presenting installations with Renato Rinaldi and Armin Linke (ZKM Karlsruhe, Villa Romana Florence, Goethe Institut New York and Rome, various festivals). He plays in Bellows (with Nicola Ratti), whose "Handcut" was included in the 'best of 2020' list from The Wire magazine, Oreledigneur (with Renato Rinaldi) and Eselsohr (with Jennifer Veillerobe) and as a duo with Andrew Pekler. In 1998, he founded the "Fringes Recordings" label, closed in 2005, and co-founded "Schoolmap Records" in 2006. Currently he co-curates SENUFO Editions with Jennifer Veillerobe (www.senufoeditions.com). Giuseppe Ielasi appeared in many festivals across the globe and toured extensively in Europe, the United States and Japan, and released music on his own Senufo Editions, as well as 12k, Erstwhile, Alga Marghen / Planam, Entr'acte, Dekorder, Editions Mego, Shelter Press, Black Truffle.

LABORATORY OF HYDRAULICS, HYDROLOGY AND GLACIOLOGY (VAW), ETH ZÜRICH

Water and ice are our passion at the Laboratory of Hydraulics, Hydrology and Glaciology (VAW). We work in the domains of river engineering, glaciology, numerical modelling and hydraulic engineering. Our fields of activity are inland waters, hydropower, glaciers, natural hazards, river restoration, and river infrastructure. We contribute to the availability of clean and renewable electricity, to the protection against floods and cryospheric hazards, to sustainable watercourses and to the generation of new knowledge in the corresponding fields.
In research, we aim at being at the international forefront in hydraulic structures, eco-hydraulics, fluvial systems, glaciers, and ice sheets. Our research findings constantly enter into teaching, where we are highly motivated to educate the next generation of engineers and researchers with state-of-the-art knowledge, methods and tools. We also emphasize the transfer of our research results and technical developments to industry, practitioners and decision-makers. To do so, we regularly organize events such as workshops, seminars, conferences and continuing education courses, often in collaboration with partners from authorities, industry and professional associations. Our research, teaching and consultation services are based upon mutual respect and ethical behavior. The Laboratory of Hydraulics, Hydrology and Glaciology (VAW) comprises two chairs: The chair of hydraulic structures, led by the director of VAW, Prof. Dr. Robert Boes, the chair of glaciology, headed by the vice director of VAW, Prof. Dr. Daniel Farinotti (assistant professor tenure track (APTT). The two chairs are administered by a shared secretariat. VAW is also the host of the titular professorship by Prof. Jürg Schweizer, head of the WSL Institute for Snow and Avalanche Research SLF in Davos.

ENA LLORET-FRITSCHI

Ena Lloret-Fritschi is an architect with interest in shaping concrete without the need for traditional formwork. She is currently a PostDoctoral researcher in a bridge position between the Chair of Gramazio Kohler Research and the Chair of Physical Building Chemistry of Professor Robert Flatt, leading the Concrete Cluster. Her work is embedded in the research strand Mouldless Shaping with concrete within the DFAB or the NCCR, ETH. Ena is an alumna of the Architectural Association in London and Royal Academie of

Art Copenhagen (Design Academie) and has practised as an architect at Querkraft, Dietrich Untertrifaller and OMA. Her introductory lecture highlights how controlling the hydration of concrete can unlock new methods of shaping concrete. In particular, using Digital Casting and Robotic Spraying Systems, new unconventional formworks, made of millimetre thin recyclable materials, can shape reinforced concrete structures with less material and less formwork. Thus, promise for more sustainable construction with concrete in the future.

FLAVIO ANSELMETTI

Flavio Anselmetti is a geologist and professor for Quaternary Geology and Paleoclimatology at the University of Bern, Switzerland. After graduating from the University of Basel, he moved to ETH Zürich and the University of Miami (USA) to complete his PhD. After five years in Miami, during which he also conducted consulting for the petroleum industry, he returned to the ETH Zürich and became assistant professor focusing on research involving marine and lacustrine sediments and their role as paleoenvironmental archives. His research includes studies on natural hazards such as earthquakes and tsunamis, paleoclimatology and human-environment interaction. In 2007, Anselmetti moved to the Swiss Federal Institute of Aquatic Science and Technology (Eawag) in Dübendorf, where he was leader of the Sedimentology group. In 2012, Anselmetti moved to the Institute of Geological Sciences at the University of Bern, Switzerland, where he became full professor and where he is currently managing director.

ILA BEKA & LOUISE LEMOINE

Video-artists, filmmakers, producers and publishers, Ila Bêka and Louise Lemoine have been working together for the past 15 years mainly focusing their research on experimenting new narrative and cinematographic forms in relation to contemporary architecture and urban environment. Focusing their interest mainly on how the built environment shapes and influences our daily life, they have developed a very unique and personal approach which can be defined, in reference to French writer Georges Perec, as an “anthropology of the ordinary”. Presented by The New York Times as the “cult figures in the European architecture world”, Bêka & Lemoine's work has been widely acclaimed as “a new form of criticism” (Mark) which “has deeply changed the way of looking at architecture” (Domus). Selected by the Metropolitan Museum of Art in

New York (The Met) as one of the "Most exciting and critical design project of the year 2016", elected "Game Changers 2015" by Metropolis Magazine, selected as one of the "100 most talented personalities of 2017" by Icon Design, in 2016 they have been selected among the participants of Mextropoli in Mexico City. Their films have been widely presented in major biennials and international cultural events such as The Venice Architecture Biennale (2008, 2010, 2014), The Oslo Architecture Triennale 2016, the Seoul Biennial of Architecture and Urbanism 2017, Performa 17 in New-York, among many others. Their films are also frequently exhibited in some of the most prestigious museums and international cultural institutions, such as the Metropolitan Museum of Art in New-York, the Louisiana Museum of Modern Art in Copenhagen, the Barbican Centre in London, the CAPC museum of contemporary art in Bordeaux, the Museum of Modern and Contemporary Art (MMCA) in Seoul, or the Canadian Center for Architecture in Montréal, Canada.

SHANTENA AUGUSTO SABBADINI

Shantena Augusto Sabbadini is a physicist, philosopher and a scholar of Chinese classics. As a physicist he worked at the University of Milan on the foundations of quantum physics and at the University of California on the first identification of a black hole. He has been scientific advisor of the Eranos Foundation, an East-West research center founded by C.G. Jung and Olga Froebe-Kapteyn in 1933, and presently directs the Pari Center, an international institute located in the small medieval village of Pari, Tuscany. He is the author of Pilgrimages to Emptiness. Rethinking Reality through Quantum Physics, Tao Te Ching: a guide to the interpretation of the foundational book of Taoism and The Original I Ching: The Eranos I Ching Project.

BIJOY JAIN / STUDIO MUMBAI

Bijoy Jain was born in 1965 in Mumbai and earned his Master of Architecture from Washington University in St. Louis. He worked in Los Angeles and London before returning to India in 1995, the year he founded Studio Mumbai. His work explores the boundaries between art, architecture, and material. His studio operates as an interdisciplinary group of architects, engineers, master builders, artisans, technicians, and artists across continents. As a collective, they are involved in the research and development of projects, using process and time as an integral part of their expression. Water, air,

and light being the basis of all materiality in the synthesis of the work.

RAPHAEL HEFTI

Raphael Hefti (1978, Zürich) is an alchemist of sorts, seeking to enact dramatic transformations on whatever material he's chosen to work with on a given day.
He originally worked in electronics, before moving on to study industrial design, photography, and art, and he credits his fascination with mechanics and scientific processes—and what happens when they go away—to long hours spent experimenting in the workshop. Hefti's material transformations have included a series of mirrors made from deliberately non-reflective glass, industrial steel exposed to such harsh temperatures that it shatters, and his "Lycopodium" photograms that capture the light emitted by fiery explosions of plant spores.
"For me the idea of performance is related intimately to the idea of production," Hefti says. "Often the situation I work in has its own sense of choreography—from the dunes of a beach to the machinery of a factory floor."

INSTITUTE FOR COMPUTER MUSIC AND SOUND TECHNOLOGY (ICST), ZURICH UNIVERSITY OF THE ARTS

The Institute for Computer Music and Sound Technology brings together scientists and artists from various professional backgrounds: mathematics, engineering, audio engineering, psychoacoustics, computer science, generative art, media art, musicology, music theory, performance and composition.
This rich mix encourages projects examining the relationship between technology and musical practice, exploring critically the tradition of contemporary and electroacoustic music using methods of both classical and artistic research.
ICST's research areas include interfaces and augmented instruments, network-based composition and performance systems, performance, interactive movement and music, musical notation and representation, sonification/acoustic ecology and immersive and virtual environments.
Results are presented in the form of software, hardware, publications, conference contributions as well as through compositions and artistic projects. The tools for the practical use of the surround technology Ambisonics developed at ICST have received international acclaim.
Since 2007, Germán Toro Pérez is the head of the institute.

DRY MATERIALITY: UNSATURATED

Architects tend to be idealists, and not dialecticians.

I propose a dialectics of entrophic change.

Lara Almarcegui, ABANDONED RIVER PARK, Musac, Leon 2013
28

“Here at MUSAC, there is another project called Abandoned River Park, which is a projection of images and text exploring a strange piece of open ground in Leon...I decided to work with this land because it’s an incredible place geographically, and on top of that, the vegetation is really striking. The open ground in La Lastra has a very interesting story because, firstly, it is sort of artificial, it was made from landfills from the river. The river meandered and sprawls over a huge area of land, which was taken from the river in the 1960s at a time when there was a tendency to channel rivers and fill in the meanders, stretching them out taking land from them. Today this would be unthinkable because what you have to do is give rivers more land. So this land was completely artificial and was declared municipal property by decree, and this land was then given by the town council to the La Lastra industrial estate when it was being developed at the end of the 1990s. So, the areas of the estate increased by over 200,000 m² which was to be used as a green area, a park called River Park, it was designed by Abalos & Herreros in a very ambitious, interesting project... but the project was never carried out due to lack of funding and, of course, political will.”

Lara Almarcegui, ABANDONED RIVER PARK, Youtube, 5 mins, 2013

Lara Almarcegui, CONSTRUCTION RUBBLE OF SECESSION'S MAIN HALL,

Vienna, Austria, 2010
30

3.

What is the difference between materials and debris, if, strictly speaking, they are two presentations of the same substance, if both can be equivalent to the same building, if they can be physically and chemically equivalent? On the one hand, the difference is between potential energy and its loss or use. What we ingenuously call "raw materials" are, in reality, the product of an exhaustive labour of separation, extraction, and purification, symbolized by the heat that has to be used in calcining[4] stones to produce lime and cement. In that sense, the line demarcating raw materials from debris involves a fall from the pure to the impure, a loss of energy that expresses itself in the tendency of matter to reach a state of equilibrium in terms of thermodynamic disorder. Thus, in order to "prove the irreversibility of eternity," Robert Smithson imagined an experiment in entropy that consisted in a sandbox divided half into black sand and half into white, upset by a child running through it until it was evenly mixed; when the same child ran in the opposite direction, he or she would not separate the sand into its original components, but rather produce an even more disordered mixture.[5]

The distinction between material and debris, therefore, involves a representation of time. Materials are inclined toward the future; debris both blurs and outlines its past. Even linguistically, the term "debris" alludes to a break or to damage.[6] Materials and fragments thus suggest the "before and after" of architecture. These, to use a concrete metaphor, are the "three states" through which construction materials pass.

It is in relation to such a cycle that Almarcegui's system requires the introduction of construction materials themselves to complete the interventions, guides, and explorations that reflect on the moments of disuse and anticipation of built space. Logically, these materials appear not precisely as materials, but rather as witnesses. Almarcegui positions them in such a way that they analyze and simultaneously compete with built structures, so that they appear destined to reject their purpose and activity. They become elements of study and expectation. As shocking to common sense as it might seem, they become materials in a state of contemplation.

Since 2000, when Almarcegui set a pile of construction materials beside a water tower in Phalsbourg, in Lorraine, France, a pile that was equivalent to the material making up the structure itself, Almarcegui's *Construction Materials* series has been normalized as the offering of a redundant display of architecture itself. Building materials confront an edifice without being assembled or articulated. They thus establish a kind of analysis of the existing building, submitting it to a living comparison with a potential double, an unrealized twin, an anti-formal, anti-sculptural, and profoundly analytic equivalent, adjacent to it in space. It is, in effect, the figure of the material authority of the built structure reduced to its ingredients, lacking a design, a use, or a soul.

Certainly, these *disjecta membra* suggest ruins and destruction, but the path by which they allude to the demolished goes by way of the unrealized. Their analogy with wastelands is founded precisely upon recalling the moment at which those resources were only a potential.

Almarcegui's strategy of exhibiting construction materials found its most effective expression in making apparent both architecture and the power of appearances in art exhibition halls. This would become the logical space in which Almarcegui would locate that branch of her parasitic operation.

In the last decade, Almarcegui has taken a variety of art exhibition halls by storm, occupying them with sand, stones, cement, metal rods, glass, cables, iron, mosaic, and all sorts of materials, in a sort of physical de-construction of the architecture of museums and galleries. At institutions like the Burgundy Regional Art Collection (FRAC Bourgogne), in Dijon, 2003; the Centro de Arte Contemporáneo in Málaga, 2007; the Vienna Secession building in Austria, 2010; and TENT Rotterdam, 2011, in the Dutch city where Almarcegui lives and works, the artist has drawn comparisons between exhibition spaces and the raw ingredients of the exhibition halls themselves, paradoxically underlining the convention of their invisibility. From a methodological standpoint, these interventions operate by allowing the public to contemplate redundancies that are presented as opportunities to compare various substances and quantities. The most dramatic effect of this analytic procedure, however, is on the order of temporality.

Lara Almarcegui: SPANISH PAVILION, 55th International Art Exhibition: La Biennale Di Venezia. Agencia Española De Cooperación Interancional Para El Desarrollo, 2013

Those mounds and pyramids of gravel, the ordered lines of plaster walls, and the panels of drywall used for prefabricated walls all produce an ambivalence within temporal succession. In their clash with the standing, fully functioning building, they propose a sort of virtual or hypothetical vacant lot. They evoke an imaginary empty space prepared for construction, where materials, not yet constituted as built space, await their use. They establish a phantom of the potential that has been abolished by the building process. It is a mechanism filled with subtleties for generating a potential time.

4.

One obstacle to appreciating what is at play here is to be found in the rhetoric of site-specific art, where the technical, historical, mythological, or communitarian implications of the question "Where?" seem to obscure the devilish subtlety of the "When?" Here it is necessary to emphasize the systematic character of Almarcegui's interventions, the underlying reason that her work forms a well-defined set of series developed in an internal, geological, detailed, anti-spectacular, methodical, and insistent manner. How is it that, in the wake of an intervention that consists of a project of a ruin, or the ruin of a project, what had to be "present" becomes redefined?

One of the decisive implications of the institution of the museum is to make historicity available to debate and observation. The strategy of interfering in the space of the art gallery by suggesting its architectural demise is, moreover, one of the many old phantoms that haunt the museum. In 1796, Hubert Robert, who, together with Jacques-Louis David had played a decisive role in organizing the collections nationalized by the French revolution into the Louvre's narrative of the history of world art, decided to apply classical Greco-Roman aesthetics to the exhibition space. He projected the picturesque of Antiquity's ruined landscape, which he had refined in his journeys through Rome, Naples, and Pompeii in the 1760s, onto the very artistic-historical machinery that he had helped to produce. In paintings like *Imaginary View of the Grande Galerie in the Louvre in Ruins* (1796), Robert represented the museum – whose stock of treasures had been fed by the destruction of the *ancien régime* and by the accumulation of social and cultural ruins of the past, replete with its own spoils – by projecting it onto an imaginary future in which the present would acquire the melancholy of Antiquity. Since then, this image of the debris-strewn gallery has been a symptom of the museum's character as historicizing machinery. It is the necessary disturbance of a cultural object whose fundamental purpose is to model temporality. Didier Maleuvre expresses this with amazing precision:

> The ruin is not solely an appearance of history. It is history sculpting its own appearance in concrete form. [...] By representing the museum as a ruin at the time when the museum is a brand-new invention, Robert puts the caesura of historical distance into the picture of art's exhibition. [...] The Louvre becomes a ruin as soon as it becomes a museum because all museums are essentially tied to the dialectic of ruins.[7]

That ambivalence is one of Almarcegui's most notorious qualities: a solidarity between, and paradoxical mix of, the ruin and the future project. As Peter Osborne has recently noted in a highly illuminating article about project-art[8], this imbrication was clearly prefigured by Friedrich Schlegel. Indeed, for Schlegel, what differentiated between ruins as "fragments of the past" and projects understood as "fragments of the future" was only the direction of temporality:

> The feeling for projects – which one might call fragments of the future – is distinguishable from the feeling for fragments of the past only by its direction: progressive in the former, regressive in the latter.[9]

When Almarcegui brings unused construction materials into the gallery, she activates that machinery of implied ruins in a highly paradoxical way. The disturbance is total: in lieu of a future that transforms the present into a melancholic and respectable Antiquity, she alters the present so that it is suffused with ephemerality. Moments in time that should function as a narrative end up being interposed between reality and its mere potential. Rather than project a prestigious past in the form of the ruin, they return the space to a moment prior to its realization, in effect proposing the hypothesis that the artistic space should never have been erected, or that the open space should never have been ruined. They counterpoise the uncertainty of what was to the imprecision of what has been planned.

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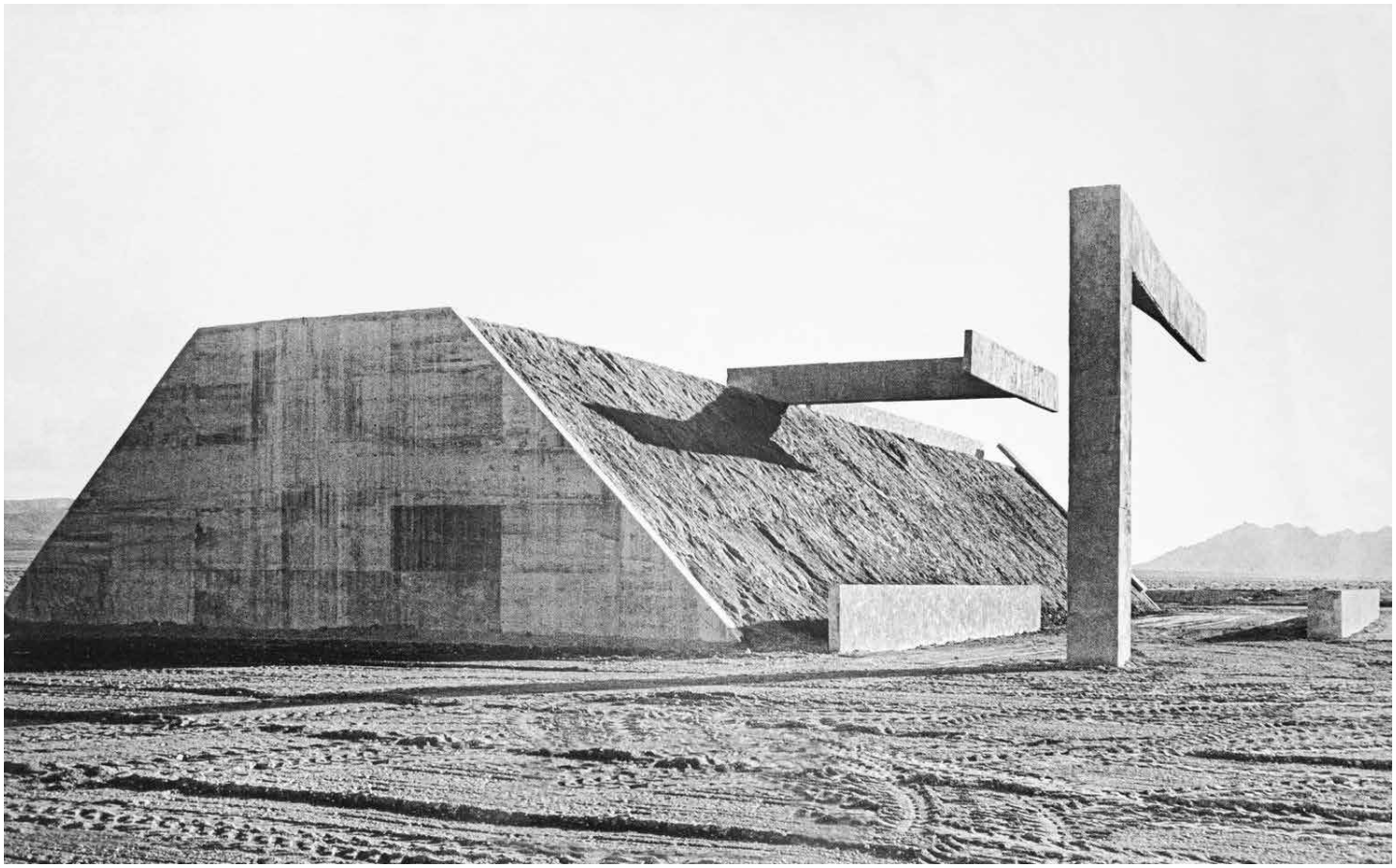
5.

It's not by accident that Georges Bataille, in May of 1929, chose the word "architecture" to open his so-called "critical dictionary," which, in a simulation of erudition and academic respectability, peppers the journal *Documents* (1929-1930). The complex critique of the machinery of civilization that Bataille proposes understands architecture as the symbol and agent, physiognomy and materialization, of authority and earthly domination, and even of "the predominant taste for authority, whether human or divine."[10] In Bataille's article, Denis Hollier argues, architecture, once "the image of social order, now guarantees and even imposes this order."[11] One of architecture's principal operations, as something that no longer *signifies* but rather *brings about*, is to exercise the general task of containing "the disorderly elements":

> In practice, only the ideal being of society, that which orders and prohibits with authority, expresses itself in what are architectural compositions in the strict sense of the term. Thus, the great monuments are raised up like dams, pitting the logic of majesty and authority against all the disorderly elements [*les éléments troubles*]: it is in the form of cathedrals and palaces that Church and State speak and impose silence on the multitudes.[12]

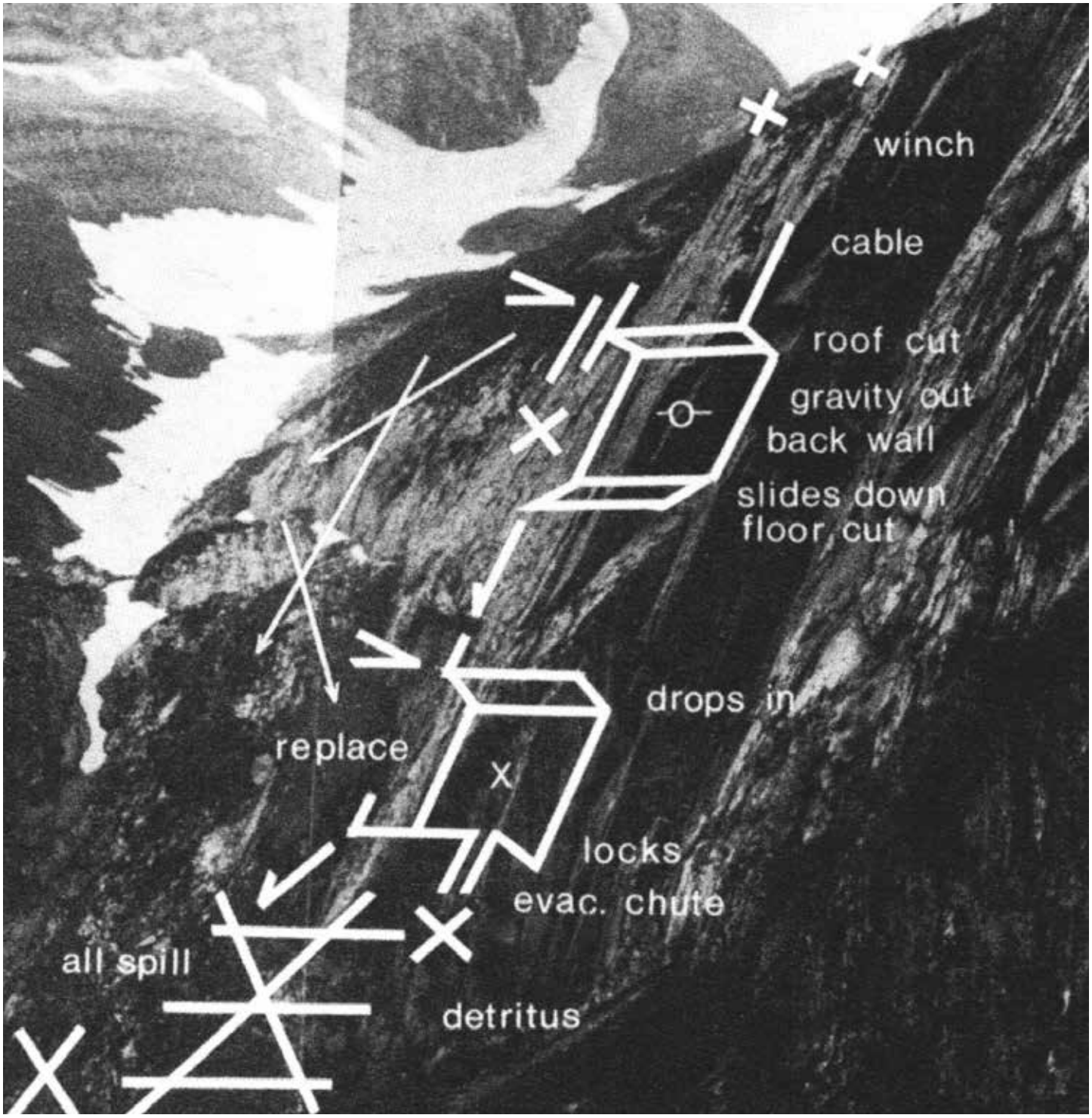
One way of understanding Almarcegui's work is to categorize it as a meticulous attempt to study, demarcate, and reflect upon the territoriality of the "disorderly elements" that Bataille designates as the antagonists of architecture. Her demolitions, excavations, abandoned buildings, and wastelands express that "disorderliness" as the activity, residue, and diversity that architecture and its authoritarianism would seek to abolish. Almarcegui's works composed of construction materials propose a different order of approach to that anti-architecture. They propose to revisit the moment when the struggle between order and entropy has been rewound and is not yet realized. The form in which those works retain their disorderly content derives precisely from the indecisiveness and indeterminacy of their temporality. This is what is converted into a disorderly element.



Michael Heizer, CITY, Nevada, USA, 1972–2020
34

“I think American landscape art is one thing. but my work doesn’t have anything to do with that, it has to do with material. When I bought a property in Nevada, I bought it because I had done studies and found sands and gravels that could make concrete, and clay soils that could be useful for soil-cement, and running water. These were all raw materials. ... If you bought an acre of land in that part of the world you were buying all the material you could use in a lifetime.”

Michael Heizer, SCULPTURE IN REVERSE, 1984



Michael Heizer, VERTICAL DISPLACEMENT, working diagram,

Appenzell, Switzerland, 1970
36

Pino Pascali, CAMPI ARATI E CANALI D'IRRIGAZIONE, Rome, Italy, 1967–68
37

Raphael Hefti, DR. SATTLER: SO, WHAT ARE YOU THINKING? DR. GRANT: WE'RE OUT OF A JOB. DR. MALCOM: DON'T YOU MEAN EXTINCT?

Basel, Switzerland, 2020. Air conditioning system, stainless steel: alloy X6CrNiTi18-10, exposed to temperature changes over the course of 8 years, simulating around 5,000 years of ageing.

WATER IN MOTION

A land of streams! Some, like a downward smoke,

Slow-dropping veils of thinnest lawn, did go;

And some through wavering lights and shadows broke,

Rolling a slumberous sheet of foam below.

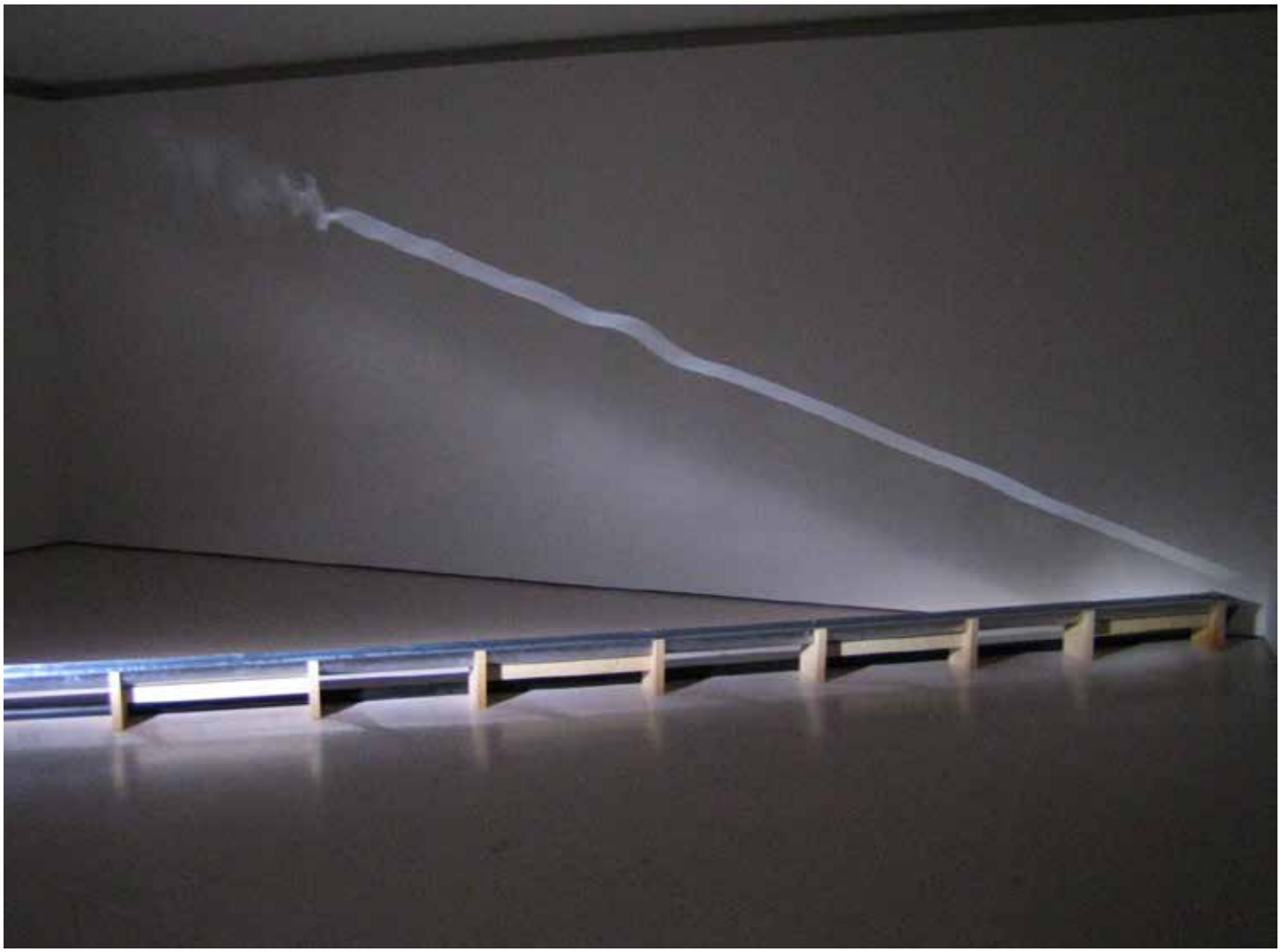
They saw the gleaming river seaward flow

From the inner land: far off, three mountain tops,

Three silent pinnacles of aged snow,

Stood sunset-flushed: and, dew'd with showery drops,

Up-clomb the shadowy pine above the woven copse.



Ólafur Elíasson, THE BODY AS BRAIN, Kunsthaus Zug, Switzerland, 2005

For the third part of his ongoing five-year project at the Kunsthaus Zug in Switzerland, Eliasson installed a wooden channel of approximately 300 meters, which diverted the Burgbach, a small stream, through the museum. The Burgbach traversed roads, the city wall, a park, and the museum garden. Within the museum, the channel split in two, one branch flowing down past a spiral stair to the ground floor, leading to a dead end, where the light from a projector reflected the movement of the rippling water onto a wall. The other branch continued outside again. At the end of the diversion, the water was channeled back into the stream. The diverted stream thus connected the Kunsthaus Zug to its natural surroundings.
olafureliasson.net

Olafur Eliasson, RIVERBED, 2014. Water, blue basalt, basalt, lava, stone, wood, steel, foil, hose, pumps, cooling unit. Installation view: Louisiana Museum of Modern Art, Humlebæk, Denmark, 2014. Photo: Iwan Baan. Courtesy of the artist; neugerriemschneider, Berlin; Tanya Bonakdar Gallery, New York / Los Angeles. © 2014 Olafur Eliasson

Riverbed Reflections / Olafur Eliasson

I am sitting in what looks like a landscape. I walked up here from below and sat down, and now I am looking down the slope in front of me. The landscape is relatively monochromatic. It is a grey, rocky landscape, and there is not a lot of difference among the stones; they all seem to have come from the same place. But there is much more in the landscape than that – there are steps, there is the noise of the water, and the noise of people walking. There is also the quality of the light, the humidity, and the atmospheric conditions. And all around it there are white walls. The landscape is inside a museum, and it is an artwork that I made, titled *Riverbed*. • It is all obviously artificial, something I invented. In a funny way, the landscape is almost dead. There are no signs of life other than the water flowing through it, which creates a kind of narrative. You enter the exhibition at the end of the river and walk upstream, against the flow. There is a feeling that there might once have been more water in the room, that the rest of the landscape was underwater too at some point, or else it might soon be underwater again. It resembles a riverbed that has almost dried up, and there is really not much left other than the rocks. • People enter *Riverbed* and most are quite astonished by what they see. Once they start walking through it, there is usually a moment of hesitation in which the viewers negotiate between what they see and how they move. This is an interesting moment because maybe what they see creates an expectation of how it will feel to move through the space, and this is then different from how it actually feels. You would not really predict this experience to be so destabilising, but it is. Visitors feel the need to spend a little time reorganising their pace, their movement, and they actually look down a lot while moving through the space. When they are standing still, they look up and around them, but when they begin moving, they look down. • This is what *I* see when I walk through the artwork. Since I made it, I see a lot of things that others might not see, such as the way the footprints of the people who walked here before actually affect how others move through it. I wonder what other people note when they look at it. Since the exhibition opened I have come here a few times to watch people. I do this because when I work on an exhibition, I become blind to some extent, and watching people allows me to experience the exhibition through their eyes, to recalibrate my vision, so that I can see what I have lost the ability to see. Although I like to think that I can predict what visitors will see, the truth is, I cannot. Once the work is in place and the exhibition opens, I hand over the vision of the artwork to somebody else. • To stand next to a person and put yourself in that person's place is not only about vision; it is also about trying to mirror that person, to imitate their movements, gestures, attitude. That is why I occasionally try to do exactly what another visitor is doing. I tried this in *Riverbed* with a child and with an elderly person. With the child, I was sitting a short distance away and watching her – she was there with a group of other children. When an elderly person came into the space, the child said to the elderly person: 'You are too old for this!' I am very curious why a child would say such a thing. What is it about the situation that made the child think, this artwork is for me, or, I am the right age for this artwork? What was it in her education or history or social context that suggested to her that one person has the right to see a show and another one does not? In a way, it is scary that a child feels comfortable determining who is allowed in and who is not. • When I create a work for a specific place, I always try to understand the local conditions. I came to Louisiana as a child. My father was a painter and he brought me here when I was quite young. Louisiana represented something very different from my everyday life. It was a place that confirmed that it was possible to have dreams that were totally unrealistic or outside my normal experiences. When I was invited to do a show here, I was incredibly excited, both because of the very intimate relationship I have long had with this museum and also because it gave me an opportunity to investigate artistically a legendary institution. Louisiana is so good at evaluating how it functions as a museum that it is actually difficult to make a critical statement about it. You have to be really quite tough if you want to make a dent in it or if you want to destabilise it a bit. • When I talk about destabilising the museum, I am referring to a kind of critical enquiry, asking for example: To what extent is what people experience here predefined? To what extent does

it conform exactly to what they expect? Is it all just affirmative? To what extent do people come here to get something that is pre-digested and organised for them? Where is the critical friction? Where are the exhibitions that hurt and in which people get lost? It is very difficult to find a place in society where, under controlled circumstances, you can go visit your own pain, doubt, or uncertainty. In our society, uncertainty is not as valued as being certain, for sure. If you want to be a success you have to be certain. This means there is a tendency to marginalise and exclude uncertainty. Doubt is considered counterproductive. Many museums have adopted the success criteria that are dominant in the rest of society, but shouldn't the museum be a place where different criteria can be celebrated? The museum needs to tell people that going to the museum is not like going shopping – you have to work. You have to give something of yourself. If you give something, you also get something. • One of the ways of challenging the museum that I started thinking about was to actually exhibit the museum itself. *Riverbed* is more than just a landscape with some rocks and a stream in it. It is a museum with a work of art in it, and the work of art and the museum are inseparable. In that sense, *Riverbed* is not just about adding something to the museum; it is also about the relationship between the museum and the world. Is the museum a reality machine that is part of the world, or is the museum separate from the world? Do you step out of the world and into the museum to escape the world for a little while? You have these two models, where some would say that in order to be a truly contemplative and liberating place, the museum needs to be a step away from reality. I disagree: I think that when you enter the museum, you should see it as a way of stepping deeper into reality, of amplifying your interaction with the world. • In the case of *Riverbed* I would say that the museum and the work of art are intimately connected. I would not have made this work in the same way for another location. The work arises in the meeting of the two, landscape and museum, or even through the tension that results when the two meet. Louisiana reflects a certain idea of art; it is built around certain principles, created specifically for the display of paintings. It was designed on a relatively domestic scale, reminiscent of a private residence, and it is very Scandinavian. There are a lot of features and details, such as the bricks, which feel very traditional and reminiscent of local building styles, and the nuances of the light. The quality of construction is very high, exhibiting an emphasis on craftsmanship. It reflects a kind of bourgeois architectural ideal that provides a standard of good taste in design. A lot of things that are displayed here are things that you might want to own, although they are certainly beyond what you could potentially afford. So while the domestic quality of the museum creates a contemplative, yet approachable environment, it may take the edge off of the truly radical artworks that are on display. • Louisiana reflects a modernist ideal of uniting architecture and nature. There is a certain compatibility between the rocky landscape of *Riverbed* inside the building and the architecture of Louisiana, nestled into the surrounding park. It seems almost like a continuation of the landscape outside. You come here and you walk through it and it feels very contemplative. • On the other hand, it is also almost like the aftermath of a catastrophe – as if a river had burst into the museum and left this incredibly huge and almost scary landscape. If you did not know otherwise, you might say, My god, the museum is in ruins! So in contrast to the contemplative reading, there is also something catastrophic about it. There is an ambiguity: When is the work contemplative and when is it disturbing? I think we take for granted that since it is an exhibition, it is not meant to be stressful. Why would you want to make an exhibition that is disturbing? It must be contemplative. • But the fact is, a museum is a public space that is often filled with a crowd of strangers. When the space is packed, then the experience can become stressful rather than contemplative. On an average day there are some 1,500 visitors to the exhibition, and on weekends, it is totally packed. When there are so many people in the space at the same time, they start to synchronise – they start walking at a similar pace, and they also tend to follow the same routes. This social synchronisation gets in the way of contemplation, because contemplation requires you to focus on how you feel, to choose a spot or a stone or an area upon which to focus, and to become very slow. When there are fewer people in the room, there is much greater diversity in how people move through the exhibition. When they are alone or in the space with only a few others, they move very fast and then very slowly; they may stop, and then go very fast again. They ping-pong between being highly focused and more pragmatic. • While I think that we should nurture the contemplative side of the individual experience, I am also very interested in works of art that create collective experiences even in cases when those experiences might not necessarily be entirely positive. I think this is when a museum gets interesting – if it can host a lot of people and yet allow them to be individual in their perception of the world. This is a challenge of course. It is much easier to have one person who says, Oh, my god, this is great! But it is something else to have fifty people in a room and to try to see if they feel, to some extent, capable of developing their own opinions. Can a museum be hospitable? Can it say, You are welcome here; we like you and we trust you? I think that this is actually possible in *Riverbed* on a good day; the artwork makes the museum more welcoming. • At the end of the day, it comes down to trust. The strongest museums are the ones that trust themselves and their audiences and that do not put up signs telling visitors what to do or how to view and read the art. These are museums that are truly comfortable with art and have confidence in the authority of art – meaning that they consider art to be more important than the institution. If the audience feels trusted, you feel it immediately when you come into the museum. If you feel that, then you have confidence in yourself and you become involved in an exhibition. • *Riverbed* causes discomfort, but it is not a huge discomfort, because I am not asking people to climb Mount Everest. This discomfort lies not in the feeling of having to walk through a not-so-comfortable landscape, but in being pushed to change the way you move. First you may think, Now I'm lost; I've lost touch with my normal way of doing things. After a while, though, you actually find a new way of moving – it is not very new, just relatively new. There is a little shift. I have often worked with this in my artworks, disrupting the functioning of some senses – your motor skills, sense of balance, the relationship between sound and movement and vision – so that you think that you have lost your normal systems of guidance. But we recalibrate very quickly and it actually turns out that you can move anyway. Walking uphill, finding your path, making sure you don't fall, reconstructing your way of walking, physically balancing. Can you feel comfortable destabilising yourself on purpose? That recalibration of physical presence, I think, should be in every museum at all times. • We take it for granted that the way our senses show us our surroundings is natural, but the truth is, the senses are actually dependent on cultural circumstances, so we should not assume that what we see is necessarily real; the interaction we have with our surroundings is actually contingent. The way we engage with the world is dependent on conceptual or physical models of the world that we create. It is based not on truth, but on our social values, beliefs, culture, how we grew up, what has influenced us, what has created us. It is not necessarily any more real than anything else. • It is important to recognise, then, that the landscape I am presenting in *Riverbed* is, of course, not real nature – it does not pretend to be a piece of nature. Under these stones, there is wood. It is a construction, and it is inside a museum. The museum, in turn, is constituted by its visitors, which is why museums should trust their visitors to take authorship, to become creative. When we walk through an exhibition, we do not *take in* the exhibition; we *produce* it. • By extension, I would say that we all create models of the world within which we live; your reality is the way you choose to approach and construct your model. We are all capable of reconsidering the way we engage with the world, realising that it is something we co-produce. The authorship of reality lies in you.

Louisiana as a museum encourages challenges from outside because the energy that courses through the building – as a biotope – is so clearly linked to an idea of beauty. Architecture lends nature a hand, and vice versa. Even though the museum's founder, Knud W. Jensen, established the institution under the motto, 'Don't forget to renew your ability to wonder', the role that art has been assigned at the beginning of the new millennium – as a mass phenomenon – might seem completely numbing. So, how does an artist reinvent an institution like this while staying true to the values he is actually celebrating: community, a feeling of connection and of participation? • *Riverbed* is Olafur Eliasson's work, but it is also the end product of a series of conversations between the artist and myself, mainly about two things: first, what the work should not be, and second, how it would affect people. On the one hand, the work should have the power to direct attention to the museum's architecture, to the spaces that through the years have provided the walls and floors for hundreds of exhibitions and thousands of artworks. It succeeded at that, I believe, because Eliasson took such a radical tack, intervening so dramatically in the museum buildings that they became visible as a frame. We punched new doorways in the otherwise sacrosanct walls because Eliasson's landscape continually rose towards the ceiling, making the original passage from room to room impossible. On the other hand, Eliasson did not want this radical intervention in the building to be read simply as a traditional avant-garde assault on the institution. • It was a tough balance to strike, but the artist succeeded because the bigger picture, the sprawling interior landscape completely dispelled the notion that it was just a gesture. The gesture disappeared behind the real thing: thousands of rocks gathered from Iceland. The sensational aspect of the gesture – getting 'permission' to all but wreck the galleries – quickly subsided thanks to the beauty of the whole landscape. There was also beauty in its simplicity: *Riverbed* was an engineering and technical challenge, to be sure (a stress test of the museum's capabilities), but at the end of the day it was a wonderfully plainspoken work. The associations it sparks could be extended both in the direction of the oddly indifferent regularity of nature and the ruinous fate of architecture – as if a great ceiling had collapsed. • What did people say? In addition to the contingent of people who *never* get over the fact that art can be made from stuff that already exists in the world, there were many sceptics. Their scepticism involved the natural suspicion characteristic of the egalitarian Scandinavian societies, the fear of being duped. Hans Christian Andersen's *The Emperor's New Clothes* is a basic narrative about this complex. Thus, the museum's task was not, for once, to make sure that certain narratives register with the audience, but rather to control expectations and their flipside, the suspicion of an apparent scam. We tried to communicate that there was *no* hidden meaning behind it all – *sous les pavés, la plage? Non, rien!* – what you see is what you get. We may have succeeded in getting some visitors to sense the actual anatomy of the museum visit by leading them through Eliasson's landscape: we wander and nothing is handed to us, unless we are willing to make ourselves available. • What did people do? That is a bit trickier. We may be witnessing a new type of audience these years, one that has a hard time managing the fact that the same thing – the same matter – should be treated differently depending on whether it is located inside or outside the art institution. For someone who is not trained in Duchamp, it can be hard to see that difference as anything but a kind of abuse of authority, almost like a trap you walk into if you show undue respect. What is it, after all, that you are respecting if you suddenly start treating the stones of the field as gingerly as if they were diamonds? It is the institution people are respecting, and if one does not feel part of it in advance and, particularly, is unfamiliar with its rules, it does, admittedly, feel like a strange constraint is suddenly imposed amidst the free expression of so-called free art. In the first days of Eliasson's exhibition, we experienced what we might call 'interventions' by the audience that bordered on destructive, aided by a local radio station, whose presenter encouraged people to vandalise the exhibition. Most of the audience, however, occupied the landscape with a kind of loving interest – children playing, teens Instagramming, and seniors holding onto their hats. In turn, the museum got smarter about its audience – through art. • *Riverbed* was a great experience that turned out to embrace both the elementary meeting of simple categories like landscape, matter, image, and architecture, and all the meta-reflections related to exhibitions or artworks that put the art institution, its vocabulary and codes of behaviour and interpretation, front and centre. Over the course of the exhibition, the work's social power became visible, as well. Perhaps that was precisely what the artist had been hoping for, and the museum director dreams of, but that neither of them could guarantee would happen. But it did. People tottering through museum galleries on an unstable, skiddy, noisy ground – unable to let their eyes escape and find rest in pictures on walls that were nothing but white, empty surfaces – turn to each other a bit more than usual in the art space, where we are normally alone, together.

CON-NECT-ED-NESS, Danish pavilion, Venice Biennale, 2021

All life depends on water. Water exists everywhere on the planet in a dynamic system that the exhibition in the Danish Pavilion connects to. Water is invited in stages, sensed, and then flows out of the pavilion again. Through living bodies, evaporation, photosynthesis, and percolation, people and water engage in a mutual process of becoming; we meet and influence each other. The water in the pavilion is collected rainwater – who knows where it has been before and where it will go next? Who knows what other bodies, countries, and centuries it has passed through? For far too long we have understood development to mean linear processes, hierarchical structures, and the liberation from attachment. The cyclical flow and immanent boundlessness of water tie past, present, and future together and preclude any possibility of isolating ourselves from each other. The water carries time, disaster, life, the others. It flows through our shared spaces.
labiennale.org/en/architecture/2021/denmark

MIT Self-Assembly Lab & Invena with Tencate, BUILDING WITH WAVES:

GROWING ISLANDS AND COASTLINES THROUGH WAVE ENERGY

Venice Biennale, 2021–ongoing
50

As climate change progresses and sea levels continue to rise, island nations and coastal regions face a growing risk of going underwater. With more than 40 % of the world's population living near coastlines, it is imperative to find novel approaches to address this mounting threat. Through research on self-assembly and self-organisation this project proposes to collaborate with the natural forces of ocean waves and the accumulation of sand to be able to grow sandbars, islands, and beaches over time. Typical attempts to fight coastal erosion rely on static physical barriers or continual coastal dredging, which attempts to resist constantly changing natural forces. Here, the goal is instead to work with the forces of nature, harnessing waves to build rather than destroy. Realised with collaborators in the Maldives, Building With Waves presents and deploys submersible devices that utilize wave forces to accelerate and guide the accumulation of sand in strategic locations. By adapting the shape and placement of the devices to seasonal changes and storm directions, the approach aims to grow sand topographies naturally and sustainably. If this approach is successful, it has the potential to change the long-term viability of island nations and coastal regions.
selfassemblylab.mit.edu/growingislands

Robert Smithson, SPIRAL JETTY, Utah, USA, 1970
52

ENTROPY MADE VISIBLE, 1973,
Interview between Robert Smithson and Alison Sky.
Entropy Definition (Oxford English Dictionary): Lack of order or predictability; gradual decline into disorder.
Robert Smithson: O.K. we'll begin with entropy. That's a subject that's preoccupied me for some time. On the whole I would say entropy contradicts the usual notion of a mechanistic world view. In other words it's a condition that's irreversible, it's condition that's moving towards a gradual equilibrium and it's suggested in many ways. Perhaps a nice succinct definition of entropy would be Humpty Dumpty. Like Humpty Dumpty sat on a wall, Humpty Dumpty had a great fall, all the king's horses and all the king's men couldn't put Humpty Dumpty back together again. There is a tendency to treat closed systems in such a way. One might even say that the current Watergate situation is an example of entropy. You have a closed system which eventually deteriorates and starts to break apart and there's no way that you can really piece it back together

ROBERT SMITHSON: THE COLLECTED WRITINGS, 2nd Edition, edited by

Jack Flam, The University of California Press, Berkeley and Los Angeles,

California; University of California Press, LTD. London, England; 1996

again. Another example might be the shattering of Marcel Duchamp Glass, and his attempt to put all the pieces back together again attempting to overcome entropy. Buckminister Fuller also has a notion of entropy as a kind of devil that he must fight against and recycle. Norbert Weiner in The Human Use of Human Beings also postulates that entropy is a devil, but unlike the Christian devil which is simply a rational devil with a very simple morality of good and bad, the entropic devil is more Manichean in that you really can't tell the good from the bad, there's no clear cut distinction. And I think at one point Norbert Weiner also refers to modern art as one Niagara of entropy. In information theory you have another kind of entropy. The more information you have the higher degree of entropy, so that one piece of information tends to cancel out the other. The economist Nicholas Georgescu-Roegen has gone so far as to say that the second law of thermodynamics is not only a physical law but linked to economics. He says Sadi Carnot could be called an econometrican. Pure science, like pure art tends to view abstraction as independent of nature, there's no accounting for change or the temporality of the mundane world. Abstraction rules in a void, pretending to be free of time. One might even say that the whole energy crisis is a form of entropy. The earth being the closed system, there's only a certain amount of resources and of course there's an attempt to reverse entropy through the recycling of garbage. People going around collecting bottles and tin cans and whatnot and placing them in certain compounds like the one over on Greenwich Avenue across from St. Vincent's Hospitals. Well this seems to be a rather problematic situation. Actually right now I would like to quote from Georgerscu-Roegen, The Entropy Law and the Economic Process, about what he calls entropic bootlegging. It's an interesting conception I think. This is what he says about recycling waste materials.

"This is what the promoters of entropy bootlegging fail to understand. To be sure, one can cite numberless scrap campaigns aimed at saving low entropy [low entropy in his definition is raw materials before they're processed into refined materials. In other words raw ore would be low entropy and high entropy would be the refined material such as steel]... by sorting waste. They have been successful only because in given circumstances the sorting of, say, scrap copper required a smaller consumption of low entropy than the alternative way of obtaining the same amount of metal. It is equally true that the advance

of technological knowledge may change the balance sheet of any scrap campaign, although history shows that past progress has benefited ordinary production rather than scrap saving. However, to sort out the scrap molecules scattered all over the land and at the bottom of the sea, would require such a long time that the entire low entropy of our environment would not suffice to keep alive the numberless generations of Maxwell's demons needed for the completed project."

In other words he's giving us the indication that recycling is like looking for needles in haystacks. Now, I would like to get into an area of, let's say, the problems of waste. It seems that when one is talking about preserving the environment or conserving energy or recycling one inevitably gets to the question of waste and I would postulate actually that waste and enjoyment are in a sense coupled. There's a certain kind of pleasure principle that comes out of preoccupation with waste. Like if we want a bigger and better car we are going to have bigger and better waster productions. So there's a kind of equation there between the enjoyment of life and waste. Probably the opposite of waste is luxury. Both waste and luxury tend to be useless. Then other's kind of middle class notion of luxury which is often called "quality." And quality is sort of based on taste and sensibility. Sartre says Genet produces neither spit or diamonds. I guess that's what I'm talking about.

Alison Sky: Isn't entropy actually metamorphosis, or a continual process in which elements are undergoing change, but in an evolutionary sense?

Smithson: Yes and no. In other words, if we consider the earth in terms of geologic time we end up with what we call fluvial entropy. Geology has its entropy too, where everything is gradually wearing down. Now there may be a point where the earth's surface will collapse and break apart, so that the irreversible process will be in a sense metamorphosized, it is evolutionary, but it's not evolutionary in terms of any idealism. There is still the heat death of the sun. It may be that human beings are just different from dinosaurs rather than better. In other words there just might be a different situation. There's this need to try to transcend one's condition. I'm not a transcendentalist, so I just see things going towards a... well it's very hard to predict anything; anyway all predictions tend to be wrong. I mean even planning. I mean planning and chance almost seem to be the same thing.

Sky: I with the architectural profession would recognize that. In their grand masterplan schemes

for the world, architects seem to find the "final solution" to all possible situations.

Smithson: They don't' take those things into account. Architects tend to be idealists, and not dialecticians. I propose a dialectics of entrophic change. There is an ongoing aspect of things that fascinates me like my recent involvement with Central Park (see "Frederick Law Olmsted and the Dialectical Landscape", Artforum, February 1973). You see that photograph there showing a pit in Central Park. Now you might say that's a kind of architecture, a kind of entropic architecture or a de-architecturization. In other words it's not really manifesting itself the way let's say Skidmore Owings and Merrill might manifest itself. It's almost the reverse of that, so that you can observe these kinds of entropic building situations which develop around construction. That pit will eventually be covered, but it's there right now with all its scaffolding, and people have been confused by that pit, they think it has something to do with the Met [Metropolitan Museum of New York]. There's a lot of graffiti on it attacking the Met, but it's really the city.

Sky: It's ironic that we've been able to perpetuate this attitude of set design solutions throughout the world. Traveling through Europe you can go for miles and it all looks exactly alike and like everywhere else. Mimic Lefrak City architecture is covering the earth. How did this manage to take over as opposed to the opposite view exemplified in places like Rome where there are no two buildings, angles, textures, etc., the same. Ruins melt and merge into new structures, and you get this marvelous and energetic juxtaposition occurring – with accident a large part of the whole process.

Smithson: Well, Rome is like a big scrap heap of antiquities, America doesn't have that kind of historical background of debris. But I'd like to mention another mistake which is essentially an engineering mistake and that's the Salton Sea in southern California, which happens to be California's largest lake. It happened back during Teddy Roosevelt's administration. There was a desperate attempt to try to reroute the Colorado River. The Colorado River was always flooding and destroying the area. There was an attempt to keep the Colorado River from flooding by building a canal, in Mexico, and this was illegally done. This canal was started in the delta of the Colorado and then it was rerouted back toward Mexicali, but what happened was that the river flooded into this canal and the canal overflowed, and fed back into the Imperial Valley

which is below sea level. So that this thirty mile lake was created by this engineering mistake, and whole cities were inundated, the railroad also was submerged, and there were great attempts to try to fight back this deluge, but to no avail. Since then, people have come to live with this lake, and recently I was out there I spent some time in Salton City which is a city of about 400 people. And another example of blind planning is this maze of wide boulevards that snake through the desert. Now it was the idea that they would turn this into a huge retirement village or whatever, maybe a new Palm Springs, but the bottom fell out of that so that if you go there now you just see all these boulevards going all through the desert, very wide concrete boulevards and just sign posts naming the different roads and maybe a few trailer encampments near this city. It's impossible to swim in the Salton Sea because barnacles have grown all over the rocks. There is some water skiing and fishing.

There's also a plan to try to desalinate the whole Salton Sea. And there's all kinds of strange schemes for doing that. One was to bring down slag from the Kaiser Steel Company, and build a dike system. So that here we have an example of a kind of domino effect where one mistake begets another mistake, yet these mistakes are all curiously exciting to me on a certain kind of level – I don't find them depressing.

Sky: There's an inherent energy level present in an accidental or mistake occurrence. I was listening to a discussion of the I.M. Pei buildings near Washington Square Village, and apparently in the two towers owned by New York University an attempt was made at "total control." Even the curtains were specified so as not to disturb the "esthetic resolution" of the building façade. The third tower is not owned by N.Y.U. and houses the people replaced by the construction. There people were free to choose their own curtains and you get an incredible diversity of styles and colors which I find much more dynamic. Ironically the white curtains so carefully controlled have since faded to different tones of white so the process occurred anyway.

Smithson: Right. It's like the Anchorage earthquake that was responsible for creating a park. After the earthquake they set aside a portion of earthquake damage and turned that into a park, which strikes me as an interesting way of dealing with the unexpected, and incorporating that into the community. That area's fascinated me quite a bit. Also, the recent eruptions outside of Iceland.

At Vestmann Islands an entire community was submerged in black ashes. It created a kind of buried house system. It was quite interesting for a while. You might say that provided a temporary kind of buried architecture which reminds me of my own Partially Buried Woodshed out in Kent State, Ohio where I took 20 cartloads of earth and piled them on this woodshed until the central beam cracked. There was a problem from one of the local papers. They didn't really see that as a very positive gesture, and there was a rather disparaging article that went under the heading "It's a Mud Mud Mud World."

But basically I think that those preoccupations do escape architects and I'm thinking of another problem that also exists, that of mining reclamation. It seems that when they made up the laws for mining reclamation they wanted to put back the mines the way they were before they mined them. Now that's a real Humpty Dumpty way of doing things. You can imagine the result when they try to deal with the Bingham pit in Utah which is a pit one mile deep and three miles across. Now the idea of the law being so general and not really dealing with a specific site like that seems unfortunate. One person at Kennecott Mining Company told me that they were supposed to fill that pit in; now of course one would wonder where they were going to get the material to fill that pit in.

Sky: Did you ask them?

Smithson: Yes, I mean they said it would take something like 30 years and they'd have to get the dirt from another mountain. It seems that the reclamation laws really don't deal with specific sites, they deal with a general dream or an ideal world long gone. It's an attempt to recover a frontier or a wilderness that no longer exists. Here we have to accept the entropic situation and more or less learn how to reincorporate these things that seem ugly. Actually there's the conflict of interests. On one side you have the idealistic ecologist and on the other side you have the profit desiring miner and you get all kinds of strange twists of landscape consciousness from such people.

In fact there's a book that the Sierra Club put out called Stripping. Strip mining actually does sort of suggest lewd sex acts and everything, so it seems immoral from that standpoint. It's like a kind of sexual assault on mother earth which brings in the aspect of incest projections as well as illicit behavior and I would say that psychologically there's problem there. There's a discussion of aesthetics in this book Stripping from the point of view of the miner and from the point of view of the ecologist.

The ecologist says flatly that strip mines are just ugly and the miners says that beauty is in the eye of the beholder. So you have this stalemate and would say that's part of the clashing aspect of the entropic tendency, in other words two irreconcilable situations hopelessly going over the same waterfall.
It seems that one would have to recognize this entropic condition rather than try to reverse it.
And there's no stopping it; consider the image that Norbert Weiner gives us – Niagara Falls.
In fact they even shored up Niagara, speaking of Niagara. They stopped Niagara for a while because it was wearing away. And then they put these steel rods into the rock so that it would maintain its mutual appearance.
Sky: Have they been able to stop it?
Smithson: They did stop it.
Sky: From wearing away?
Smithson: Well, it's still there.
It didn't fall spare yet. Niagara looks like a giant open pit quarry.
In other words it has high walls which offend people greatly in the strip mining regions. There are defects called "high walls" that exist in the strip mining areas and there's a desire on the part of ecologists to slope these down.
The cliffs all around Niagara suggest excavation and mining, but it's just the work of nature. So there's constant confusion between man and nature. Is man a part of nature? Is man not a part of nature? So this causes problems.
Sky: There is definitely some sort of perverse fascination attached to the process of inevitable and impending destruction that will occur either in your own environment or be observed vicariously because people persist in living at the bases of volcanos, on earthquake zones such as the fault line which is supposed to destroy all of California, on top of sinking landscapes such as Venice which is a city built entirely on rotting wooden pilings and will eventually fall into the sea.
Smithson: Well, that may be something that's human – that's human need. It seems that there's almost a hope for disaster you might say. There's that desire for spectacle. I know when I was a kid I used to love to watch the hurricanes come and blow the trees down and rip up the sidewalks.
I mean it fascinated me. There's kind of pleasure that one receives on that level. Yet there is this for something more tranquil – like babbling toward mining regions and volcanic conditions – wastelands rather than he usual notion of scenery or quietude, tranquility – though they somehow interact.
Sky: I think man turns to the wooded glens in the last moments for the most part. He probably wouldn't like to admit it but I don't think it's

of prime importance to him – from a fascination viewpoint. I mean he really hasn't done much to protect these pockets of tranquility. At the last moment, after it's almost all destroyed he starts screaming "put up the trees" but only in a token gesture sense. That's always the answer, especially in public spaces in a city like New York – stick up a few isolated trees.

Smithson: Well, it seems that in a city like New York where everything is concrete here's this craving to stick up a tree somewhere.

Also in regard to the origin of parks in this country it's interesting to note that they really started as graveyards. There's something in the mid-19th century that's called the "rural graveyard movement" where there was an attempt to get away from the dreary little churchyard graveyards. They introduced a kind of sylvan setting so that nature would intermingle with the graveyards, and they developed a whole funerary school of art you might may. I know for a fact over near Fort Lee there are all these vaults – little pyramids, you know, for the dead.

There is an association with architecture and economics, and it seems that architects build in an isolated, self-contained, a historical way. They never seem to allow for any kind of relationship outside of their grand plan. And this seems to be true in economics too. Economics seem to be isolated and self-contained and conceived of as cycles, so as to exclude the whole entropic process. There's very little consideration of natural resources in terms of what the landscape looks like after the mining operations or farming operations are completed. So that a kind of blindness ensues. I guess it's what we call blind profit making. And then suddenly they find themselves within a range of desolation and wonder how they got there. So it's rather static way of looking at things. I don't think things go in cycles. I think things just change from one situation to the next, there's really to return.

Dennis Oppenheim, ANNUAL RINGS, USA–Canada, 1968
62

Michel Blazy, FINAL BOUQUET, Paris, France, 2012
63

Alison and Peter Smithson, THE ECONOMIST BUILDING, London, UK, 1964

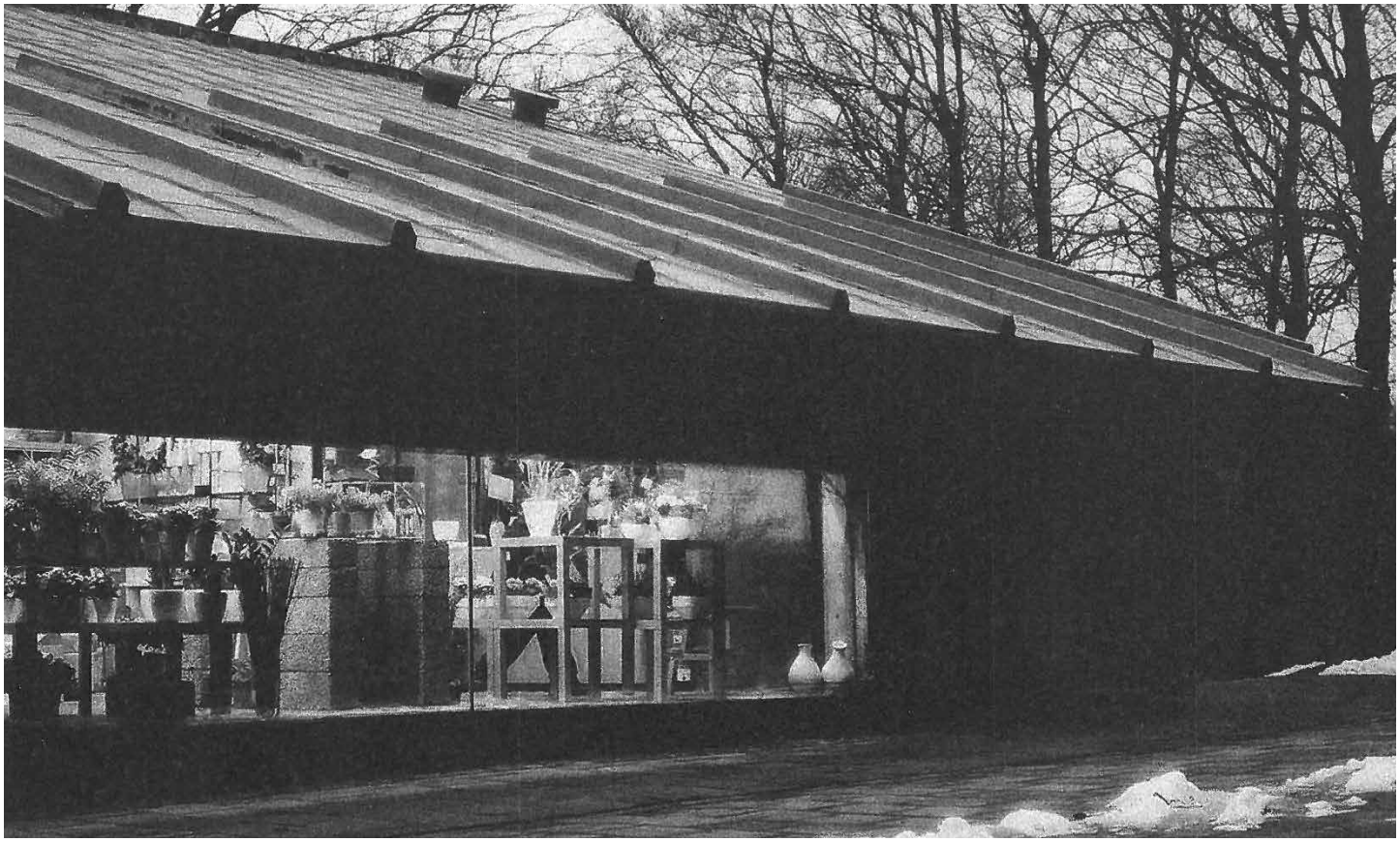
Influenced by the use of Portland Stone on the facades of London churches, the Smithsons decided to use Roach Bed Portland stone for the spandrels and column cappings of the facades of the Economist Building. This white stone is extracted from the highest bed of the sedimentary limestone series close to the surface at Portland Bill. It is very hard and therefore lends itself to machine-cutting. It also contains large fossil fragments and indentations or pockets. Used on the facade of the Economist, it absorbed and collected from the air the final soots from London's fireplaces. Anticipating the deep staining from the pollutants, the facade was detailed to channel rainwater from window sills to the column gutters, at which point the stone was scoured by the effects of rain and up-draught winds and its whiteness renewed. As a consequence, the facade, which originally had little modulation of its structure, acquired great visual depth, understood through the control of the shadows of soot and the scouring of the stone. The recent washing of the stone has sadly diminished this effect.

Salter, Peter, and Lorenzo Wong, eds. CLIMATE REGISTER: FOUR WORKS BY

ALISON AND PETER SMITHSON. London: Architectural Association, 1994

Ólafur Elíasson, REVERSED WATERFALL, Berlin, Germany, 1998

Sigurd Lewerentz, FLOWER KIOSK, Malmö Eastern Cemetery, Sweden, 1969



Sigurd Lewerentz, FLOWER KIOSK, Malmö Eastern Cementary, 1969.

Front façade in early morning. Photograph, Alan Worn

In 1969, six years before his death, Lewerentz completed his last building – the Flower Kiosk at the Malmö Eastern Cemetery – where he had worked since his competition success in 1916, adding the chapels of St Knut and St Gertrud in 1943. The Flower Kiosk's walls are concrete. Affecting the concrete as it set, the weather informed the construction process and its product. Cast against untreated plywood with chamfered edges, a grid of delicate ridges runs across each façade.[35] A copper monopitch roof slopes steeply from north to south, creating a deep overhang towards the road, which protects the long picture window on the south elevation. With no gutter or downpipe, water pours unhindered from the monopitch. In heavy rain a visitor can stand between a curtain of glass and a curtain of water, each altering the view and creating a sense of enclosure. To the sides the edges of the roof are flush with the walls; rainwater stains the concrete, emphasising the ridges. High on the north elevation to the rear, two further windows each consist of a sheet of glass set into a notch in the concrete. The outer face of the glass is flush with the outer surface of the concrete. At each edge, the glass is held in place by two rusted steel clips; the joint between glass and concrete is finished with black sealant. The timber doors are left rough and painted black. Internally, electrical wiring is nailed to untreated concrete walls and the floor is tiled. The ceiling is clad in aluminium, casting a heavenly light onto the flowers, newly cut and dying. Celebrating the weather and the seasons, the story of its construction and decay, the Flower Kiosk cherishes life and acknowledges that death is at hand.[36] Given Lewerentz's earlier reference to the eighteenth-century garden, the Flower Kiosk's internally reflective surfaces, high light and watery cascades suggest a grotto, which derives from the Latin *crypta*, evoking the spirits that reside there.[37]

35 A detail suggested by Bernt Nyberg, Lewerentz's friend and companion late in his life. Ahlin, *Sigurd Lewerentz, Architect*, p. 175.

36 A cumbersome side extension and shelving casually arranged inside and out undermine the purity of Lewerentz's design, which copes badly with these disruptions.

37 Lewerentz, 'Modern Cemeteries: Notes on the Landscape', pp. 44–45. Refer to Worn, pp. 35–36.

After his wife's death, Lewerentz moved to Lund in 1970. Klas Anselm designed a one-room studio, which he hoped would appeal to his tenant. Its blackened walls were wood-composite sheeting coated externally in asphalt and internally in aluminium foil. The floor was pine. There were no windows but three acrylic rooflights were set into the aluminium-clad roof. Two rusty radiators provided heating. A single door opened onto the garden.[38] The studio recalled the language and purpose of the Flower Kiosk. But rather than flowers, dying and displayed, it contained living nature alongside Lewerentz's slow demise:

> *One day a tender plant forced its way up between the floorboards in the middle of the black box. It awakened Lewerentz' wonder and captured his interest. He helped it along, letting it climb up the cord to his drafting lamp and further, and one day saw it reach the ceiling. Thus a bindweed had bored through the black box. Lewerentz was proud that it wanted to live there and he tended it with tenderness and care. A hope for continuation of life had been grafted onto the room, now when he felt his own life slowly running out . . . The epiphany of the bindweed evoked the certainty that he was something very small within something very large.*[39]

38 Ahlin, *Sigurd Lewerentz, Architect*, p. 178.

Studio Mumbai, COPPER HOUSE II, Chondi, India, 2014

vimeo.com/53087257

The last (architectural move) is the inclusion of the element of water, whether in the form of the monsoon rain which is relentless in its action on material and mood, or in the form of the well, the stream and the pool beyond the house. The seasonal 'anxiety' of the ground is addressed in the manner in which the paving is worked out within the courtyard in a continuous linear fashion and in a loose ring around the house, with undulations registering the flow of rainwater as it reaches for the nearest point of exit. The entrance portal of the building is a non-place. Sitting beneath the first upper copper-wrapped container, it becomes a space of pause. In this house, with its hortus conclusus acting both as container and sieve, the exploration of the rites of retreat, passage and exclusion are tested again. The final gesture was housing the massive rock which came as a gift from the owner's mother, leaving it for time to take over, as time inevitably will.
archdaily.com/225365/copper-house-ii-studio-mumbai

Sverre Fehn, PAVILION OF THE NORDIC NATIONS, Venice Biennale, Italy, 1962

Even more than light, in Venice the context is water, whether in the canal or lagoon, mist or rain. Built in a marshy landscape, the sea is the source of the city's wealth. First, because intricate navigational routes through the shallow lagoon protected the city from attack and allowed the development of sea-bound trade. Second, because tourists are drawn to the precarious beauty of a watery city under threat from the rising sea. Evidence and experience of decay are key to Venice's romantic appeal. Protecting the interior, the Nordic Pavilion's transparent roof panels 'pay homage to the rain'. But in a downpour, water trickles down the trees and into the gallery. One photograph, enjoyed by Fehn, shows the doors absent and the concrete floor shiny after a rainstorm. Norwegian architecture confronts the cold and Venetian architecture confronts the flood... the Nordic pavilion expands the dialogue between architecture and nature: "This honouring of sun and rain...is the beginning of a search for a higher order of architecture." Fehn

WEATHER ARCHITECTURE, Jonathan Hill, Routledge, 2012

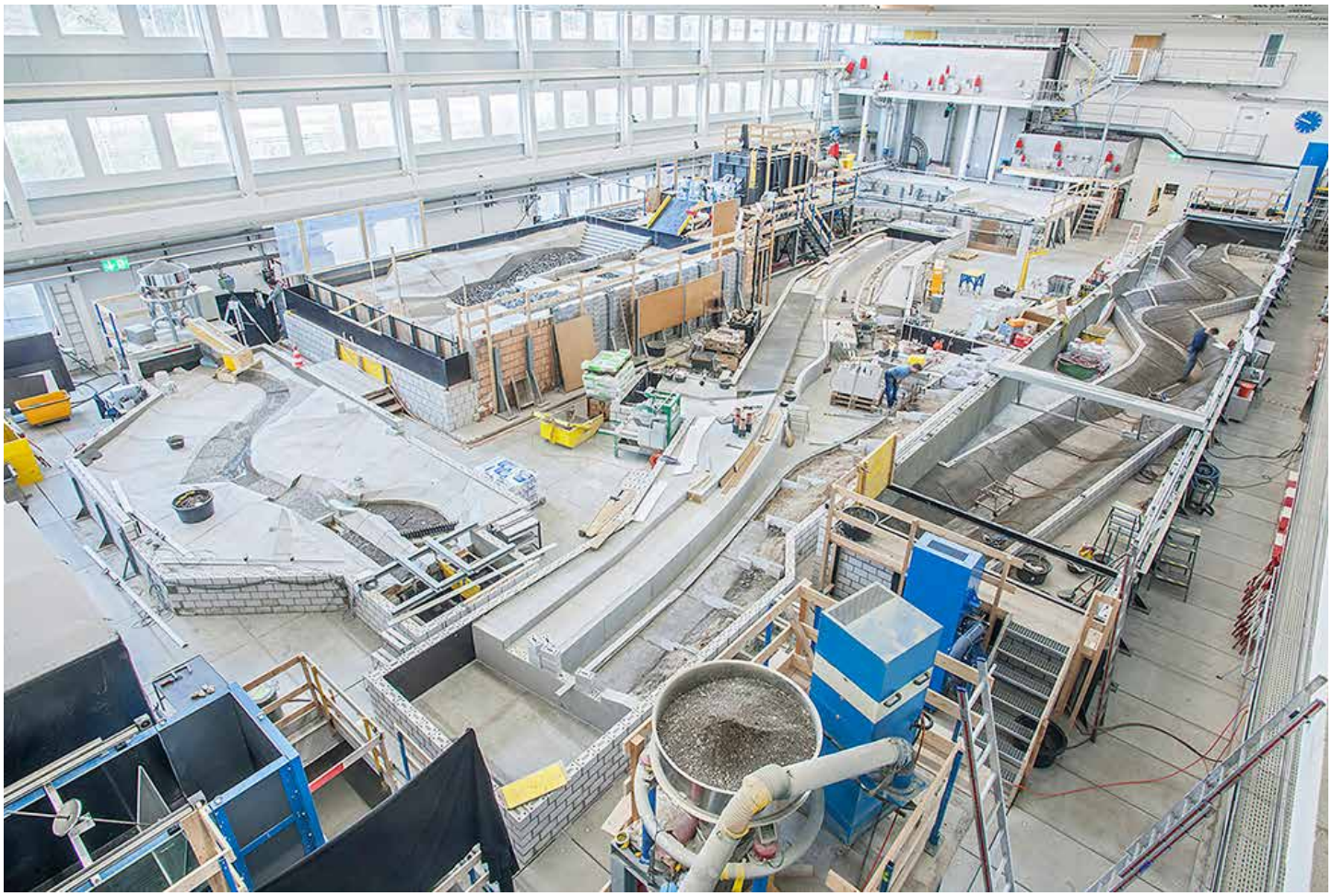





Peter Fischli and David Weiss, THE WAY THINGS GO, 30 mins, 1987

‘If I want to mix a glass of sugar and water, I must wait until the sugar melts. This little fact is big with meaning. For here the time I have to wait is not the mathematical time, which would apply equally well to the entire history of the material world, even if that history were spread out instantaneously in space. It coincides with my own impatience, that is to say, with a certain portion of my own duration, which I cannot protract or contract as I like. It is no longer something thought, it is something lived’ H. Bergson, Creative Evolution

In ‘The Way Things Go’, there are a number of occasions where a barrier of sugar acts as a dam against frothing white liquid for a time, until it becomes saturated, dissolves and then is breached, allowing the liquid to move on. When this breakthrough might occur it is difficult to say, and there is little to do to accelerate this process, even had we been able so to intervene; like Bergson, we must wait, for the sugar to melt. This sense of waiting is not only crucial to how we as viewers relate to this film, as I will argue, but it also contributes much of its humour.

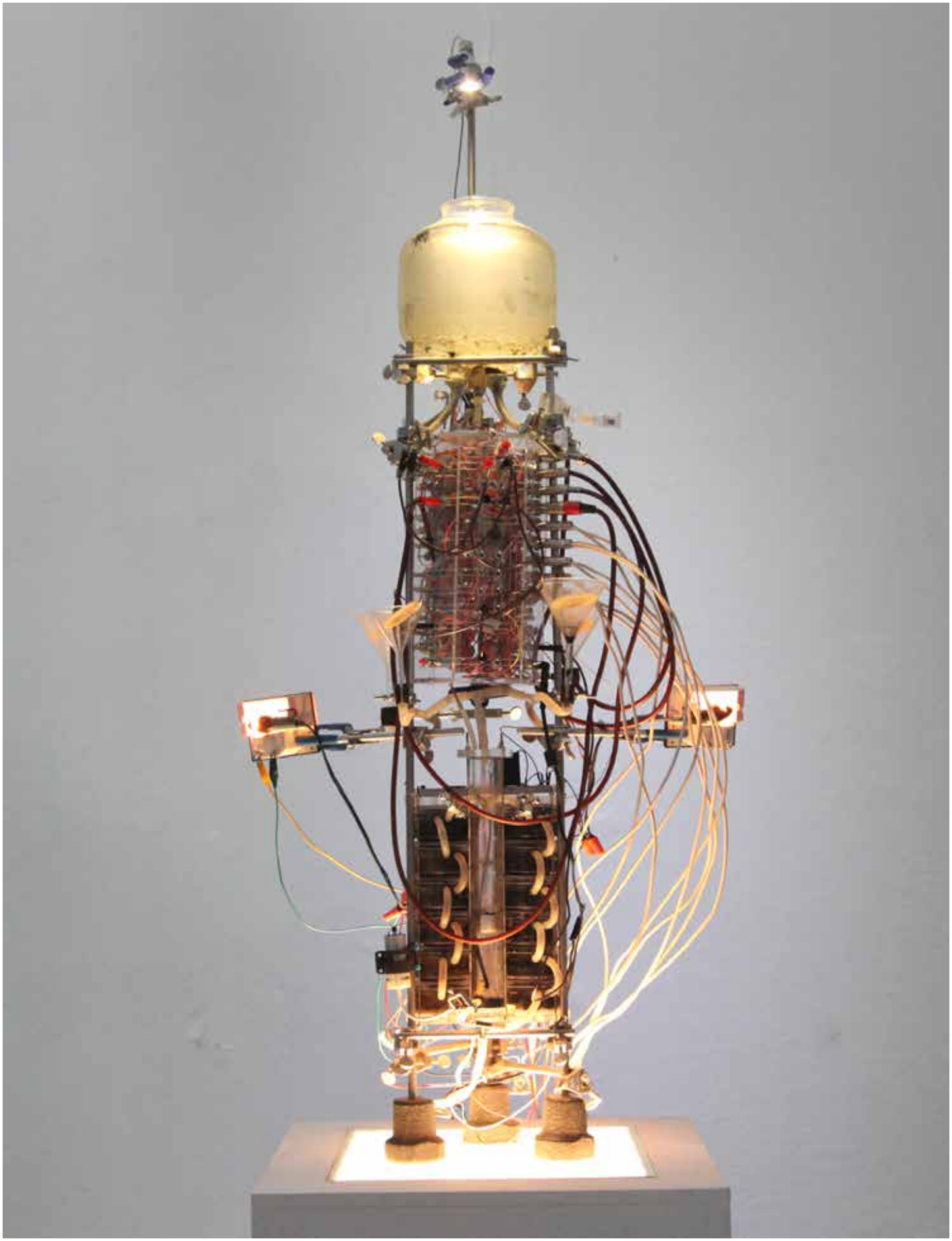


Laboratory of Hydraulics, Hydrology and Glaciology (VAW), ETH, Zürich

(Top Image) Research projects include topics surrounding flood protection, Morphodynamics, Large wood and bed stabilisation.

(Bottom Image) Laboratory experiment on the morphological development of one-sided dynamic river widenings in gravel-bed rivers at VAW.

Many rivers in Switzerland and worldwide are heavily impacted by human interference, for example, by channelisation (i.e, artificial confinement to a narrow riverbed designed for efficient water and sediment conveyance). In addition, the sediment continuum of rivers is interrupted by transversal structures such as weirs or sediment retention basins. The combined effect of sediment deficit and channelisation transformed dynamic alluvial river systems with extensive floodplains into incised, straight rivers with a flat riverbed and little morphodynamic activity. The resulting uniform and static river systems cannot adequately sustain riverine flora and fauna adapted to the high spatiotemporal dynamics of natural river systems. Instead, the flow field is homogeneous, the riverbed is coarse and armored, and connectivity between aquatic and terrestrial habitats is interrupted. Modern river restoration works towards reestablishing dynamic riverine processes such as sediment transport and the associated morphodynamic activity...
The development of dynamic river widenings may be determined by many factors, for example, floodplain erodibility, vegetation growth, or the hydrological regime. Large-scale mobile-bed laboratory experiments representing a one-sided dynamic river widening in a gravel-bed river are conducted at VAW (bottom image). The laboratory results are complemented with numerical modeling using BASEMENT. The numerical model provides data on the hydraulic conditions in high spatial resolution, which allows us to draw more detailed conclusions about habitat availability within river widenings. We interpret our findings regarding both ecological benefits and potential conflicts with other management goals such as flood protection.
vaw.ethz.ch



Gilberto Esparza, MICROBIAL FUEL CELL SYMPHONY
78

BioSoNot is an instrument that translates the pollution levels of different rivers into sound. Formed by modules of microbial fuel cells that generate energy from the metabolism of microorganisms present in contaminated water. These cells function as bio-sensors that measure the bio-electrical activity of bacteria and simultaneously other types of sensors provide data on PH, dissolved oxygen, conductivity, ORP and temperature. These data are converted into analog signals that are interpreted by a synthesizer that translates these values into sound.
gilbertoesparza.net

Philippe Parreno, WATER LILIES, 2012. Waterproof woofers, vibrating plexiglass sheets, amplifiers, audio source. Sound waves are produced by small speakers placed on the floor of the pond which create uniquely patterned circular ripples in the water.

STILL WATER: SATURATED

The globe is divided in longitude and latitude degrees.

And each crossing point has its certain climate, its certain plants and winds.

As an architect, you have to try and

Understand the difference of life in each point.

Andreas Fuhrimann & Gabrielle Hachler Architects, FINISH TOWER ROTSEE

Lucerne, 2013
84

Studio Ólafur Elíasson in collaboration with VOGT, LIFE, Fondation Beyeler, Switzerland, 2021

Materials:
Water,
Uranine,
UV lights,
wood,
plastic sheet,
cameras,
kaleidoscopes,
common duckweed (Lemnar minor),
dwarf waterlilies (Nymphaea tetragona, Nymphaea 'Pygmaea Rubra', Nymphaea 'Ellisiana'),
European frog bit (Hydrocharis morsus-rana),
European water clover (Marsilea quadrifolia),
floating fern (Salvinia natans),
red root floater (Phyllanthus fluitans),
shellflower (Pistia stratiodes),
South-American frog bit (Limnobium laevigatum),
and water caltrop (Trapa natans).
olafureliasson.net

Carlo Scarpa, QUERINI STAMPALIA FOUNDATION, Venice, Italy, 1963
88

In 1963 Carlo Scarpa completed his reworking of the ground floor and courtyard garden of the Querini Stampalia Foundation, Venice, which floods regularly. Rather than introduce measures to exclude the high tide, Scarpa created a layered terrain of steps and troughs to allow water to enter the interior in a specific manner: the "high tide inside the building, is the same as the rest of the city. Only we must contain and control it, use it as a source of light and reflection. Wait and see the light playing on the yellow and purple stuccoes on the ceilings". (C. Scarpa quoted in Manzelle.)

Sverre Fehn, THE ARCHBISHOPRIC MUSEUM, Hamar, Norway, 1979
90

A visit to Morocco in 1952 allowed Fehn to better appreciate the interdependence of culture, climate and architecture. From a distance he 'obtained a better understanding of the Nordic atmosphere: trees, grass, rain, winter, snow - they all acquired a new meaning' (Fehn) Accordingly, the 'walk through nature' is the 'first step towards architecture'. Cutting a path is 'like writing on the surface of the earth... Consequently, building begins with destruction even when an architect is highly attuned to the natural environment. Confirming the dual-nature that he considers to be distinctly Nordic, Fehn asks architects to 'Never consider nature in a romantic way. Always try to create a tension between nature and your intervention'. (Fehn)

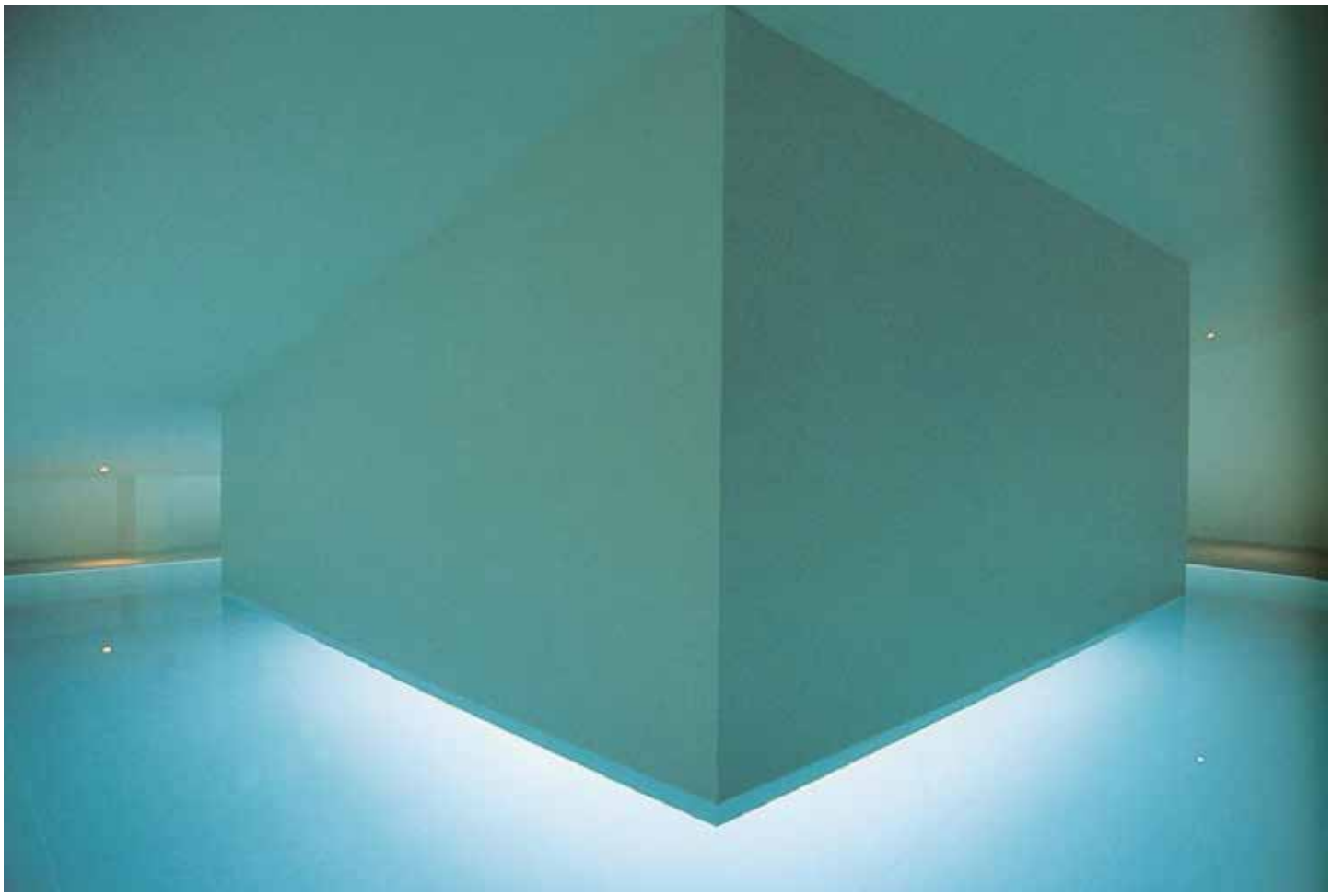
Isamu Noguchi, WATER STONE, Met Museum, New York, 1986
92

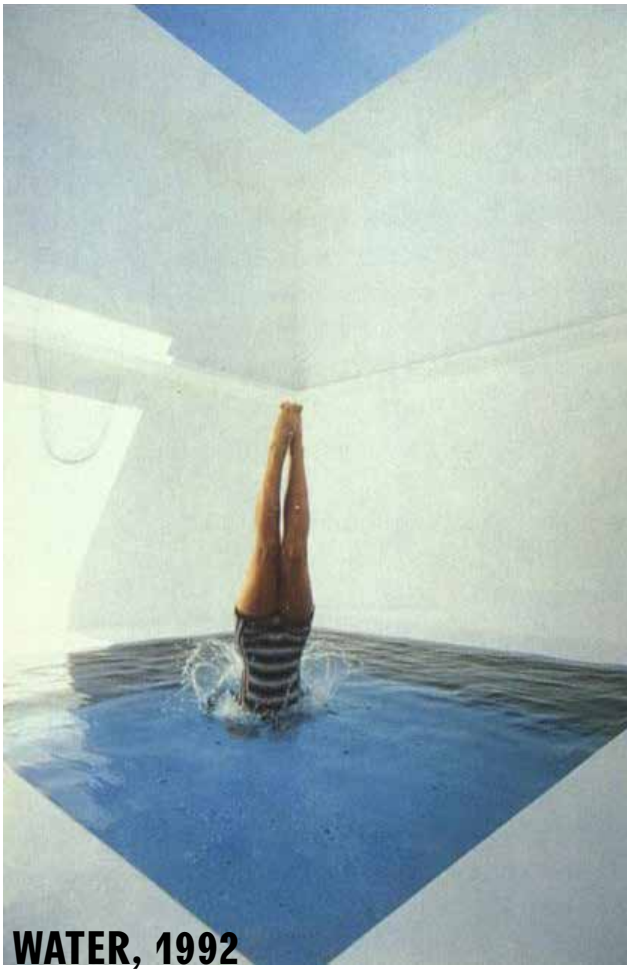
The Water Basin or Chozu-bachi is the symbol of purity both in the physical and also the spiritual sphere, for here in the inner Roji in which is it placed all the 'dust in the world' is finally washed away and the devotee of Cha-no-yu enters another atmosphere. Hence it is the central point of this part of the garden. Moreover the Water Basin of a Tea-room is of a different kind from that used in ordinary gardens, in that it is placed low on the ground instead of on a pedestal. Hence its name 'Tsukubai' or 'Crouching Basin.' It is the conventionalised form of a pool in some secluded valley into which run the mountain brooks.

Sadler, A. L. CHA-NO-YU: THE JAPANESE TEA CEREMONY, Tuttle, 1977.

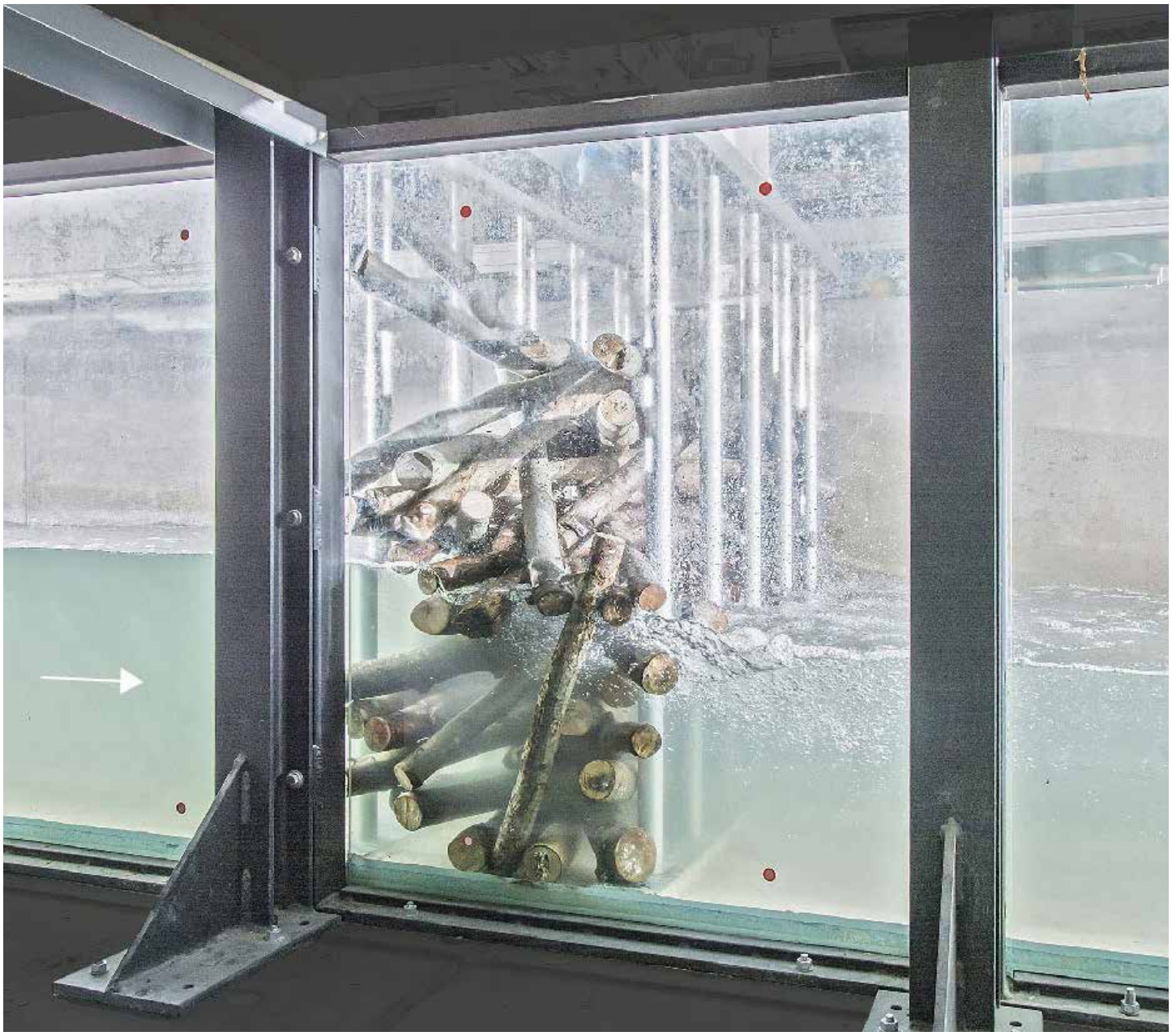
The Traditional Japanese Water Basin

Carsten Holler, GIANT PSYCHO TANK, 1999
94





James Turrell, HEAVY WATER, 1992



LABORATORY OF HYDRAULICS, HYDROLOGY AND GLACIOLOGY (VAW),

ETH, Zürich
96

Flume experiments on backwater rise due to predefined channel-spanning logjams with solid bed at VAW. Transported large wood in rivers may lead to accumulations (logjams) at shallow water areas or at river infrastructures (e.g., bridges or weirs). Such logjams generate important riverine habitat by increasing the upstream water surface elevation, i.e., backwater rise, and creating an upstream pool with slower, deepened water. Depending on the number of transported logs and the flow conditions, resulting backwater rise can provoke a flood hazard leading to inundation or structural damage. Therefore, the prediction of backwater rise due to logjams is required to inform river restoration as well as flood hazard assessment efforts.
vaw.ethz.ch

Ludwig Mies van der Rohe, FARNSWORTH HOUSE, Plano, Illinois, 1951.

The Farnsworth House in the Fox River flood in 2007
98

The Fox River House

Unlike the Barcelona Pavilion, the Farnsworth House does not create multiple reflections that entangle the viewer in self-reflection. Directed towards uncultivated nature, the raised view across the Fox River is romantic but for the glass enclosure. Mies's statement – 'If you view nature through the glass walls of the Farnsworth House, it gains a more profound significance than if viewed from outside' – suggests a concern for the visual and a disinterest in the complete experience of nature, which many critics recognise in his designs.[135] But the dialogue between architecture and nature at the Barcelona Pavilion has often been ignored and there is also another way to understand the Farnsworth House. Nature is seen on all sides as in a panorama rather than a picture. But rather than commanding, the viewer feels exposed. Since the Farnsworth House was first occupied, nature has regularly intervened to emphasise the vulnerability of the interior.

135 Quetglas, pp. 134–35. Tafuri and Dal Co, p. 157. Evans, 'Mies van der Rohe's Paradoxical Symmetries', p. 258.

At first the damp meadow grass was left long and uncut, allowing mosquitoes to proliferate in summer.[136] In the 1947 model exhibited at the Museum of Modern Art, New York, a mosquito screen enclosed the upper terrace. But it did not please Mies and was not in place in early 1951. Farnsworth added a screen later that year after her relationship with her architect deteriorated.[137] With delicate silk curtains and the foliage of the maple tree the principal protection from the sun, the Farnsworth House is often uncomfortably warm in summer. Aided by an electric fan in the floor, some cross-ventilation is possible when the entry doors to the west and hopper windows to the east are open and the wind is blowing in the right direction. In winter the underfloor heating is insufficient, while excessive condensation collects on the single-glazed walls and stains adjacent surfaces. Given the size of the kitchen and principal room, the Farnsworth House can comfortably accommodate between one and twenty people. In winter such a crowd may be an asset, providing extra warmth, while in summer it interrupts airflow, making the internal temperature even more uncomfortable. Attempting to defend the design, Schulze notes that domestic air conditioning was unusual in the 1940s and people in the Midwest 'were long accustomed to enduring summer heat in their homes'.[138] But they lived in brick or timber houses with small windows; not a glass house.

136 Today the meadow is cut to a lawn to reduce mosquitoes.

137 The screen was designed by an assistant in Mies's office, William Dunlap, with Mies offering advice without Farnsworth's knowledge. Schulze, *The Farnsworth House*, p. 17.

138 Schulze, *The Farnsworth House*, p. 15. Refer to Vandenburg, pp. 15, 21.

At certain times of the year the Fox River is benign. Palumbo decided to celebrate his purchase by swimming across the river to the house: 'but I didn't realize that during the summer months, the water level in the Fox River falls quite dramatically. If it comes up to one's waist that's as far as it goes! . . . Swimming

138 Palumbo, in Goldberger and Palumbo, p. 23.

the Fox became instead, fording the Fox.'[139] As the architects' enquiries suggested a maximum flood of 0.9m above the meadow, the upper terrace was placed at 1.6m. Standing in the meadow, the visitor's eye level matches that of the terrace, creating a new horizon. The undercroft is more apparent than photographs suggest, and a black service stack is visible in the shadow. For much of the year the undercroft is barren, while in autumn the wind forms eddies of leaves. At other times, waves are watery and a greater threat. In 1954 the Fox River flood peaked at 2.8m above the meadow and 1.2m above the internal floor, ruining carpets and furniture. Faced in primavera wood-veneer, the central core fortunately survived. In 1996 the river rose 0.3m higher still, cracking two of the glass walls and destroying the wood-veneer, carpets, furniture and fittings. In 1997 a second renovation by Lohan was commissioned, which allows the wood-veneer panels to be dismantled and stored high within the house. Floods above the internal floor-level are now a common occurrence. Submerging the upper and lower terraces, the flood creates a further horizon that parallels the Barcelona Pavilion's horizontal symmetry.[140] Evans acknowledges that a reflection may disrupt or complete an image. The flood destroys the building fabric but restores the Farnsworth House, which is reflected in its mirrored surface.

Myron Goldsmith, Mies's employee on the Farnsworth House, claims responsibility for not placing the floor above the flood.[141] But Maritz Vandenburg partly attributes the rising flood to 'the outward expansion and paving over of Chicago's environs, the volume of water run-off increased and flood-levels began to rise dramatically in the 1950s'.[142] The Fox River flood undermines distinctions between the human and natural worlds, as well as those between the urban and rural.

A Difficult Beauty

Farnsworth made clear her criticism of her architect and her house. In 1951 she sued Mies and he sued her. Citing the house's constructional and environmental failings, she claimed that Mies had falsely represented himself as 'a skilled, proficient and experienced architect'.[143] Sixty-five at the completion of the Farnsworth House and the architect of many buildings in Europe and the United States, Mies was indeed an experienced architect, knowledgeable in construction

140 Evans, 'Mies van der Rohe's Paradoxical Symmetries', pp. 261–266.

141 Goldsmith, interview with Keith Harrington, quoted in Lambert, 'Mies Immersion', p. 508.

142 Vandenburg, p. 26.

143 The case was finally settled out of court to Mies's advantage but Farnsworth paid him less than he demanded. Kendall County Circuit Court, Yorkville, Illinois, summary of the case proceedings, quoted in Friedman, p. 140.

144 Tugendhat, p. 7; Hammer-Tugendhat, 'Is the Tugendhat House Inhabitable?', pp. 29–34.

145 Another failing was caused by roof insulation placed below the waterproof membrane, common practice at the time of the Farnsworth House's construction. Warm, moist air rising to meet the cold surface of the waterproof membrane caused staining, mould growth and diminished insulation. This failing was one of those addressed in the 1972 restoration.

146 To alleviate the problem, Lohan added a raised travertine hearth in his 1972 restoration. Schulze, *The*

and services. The Barcelona Pavilion was unheated but the Tugendhat House had a sophisticated and unobtrusive heating and ventilation system. Noting that 'the air-heating device worked wonderfully' Grete Tugendhat remarked: 'technically the whole building was planned by Mies down to the last detail, quite perfect', an opinion confirmed by her daughter.[144]

Mies failed to predict the rising flood. But he most likely knew that the Farnsworth House would suffer from condensation, glare, overheating and excessive cold,[145] and that the absence of a hearth to the fireplace would have 'the unhappy effect of creating a wild circulation of ash throughout the interior'.[146] Mies may not have cared, conceiving the Farnsworth House as an unyielding Platonic form and allowing daily life no influence on his design. Alternatively, he may have considered its environmental 'failings' to be necessary to the experience of the Farnsworth House, contradicting his statement that architecture and nature should be kept apart.[147] Certainly, many architects have said one thing and done another. The soft browns of timber and travertine affirm Mies's request not to disrupt nature 'with the color of our houses and interior fittings'. But the pink suede Barcelona chairs he intended for the Farnsworth House would have made 'the house look like a Helena Rubenstein studio', as Farnsworth remarked.[148]

Like the Barcelona Pavilion, the Farnsworth House is one of the best-known examples of the modernist open plan, for which the traditional Japanese house is identified as a precedent.[149] A flexible and flowing spatial organisation is often cited as their principal similarity. As important but less recognised is the low level of thermal and sound insulation that their open internal volumes and delicate elevations provide. In the traditional Japanese house, windows are faced in opaque rice paper, oiled to become waterproof. Paper accentuates senses other than the visual but condensation on the glass walls of the Farnsworth House may have a similar effect, to be made, adjusted and erased by the user. In both houses, the heat source and thermal insulation are equally ineffective. The warmth of the stove in the traditional Japanese house is as limited as the Farnsworth House's underfloor heating.[150] Acknowledging Mies's interest in Japanese architecture, Arthur Drexler remarks that in the traditional Japanese house 'Winter was held to offer an experience of difficult but rewarding beauty.'[151] These words are as applicable to the Farnsworth House except that a 'difficult but rewarding beauty' is not only found in winter.

Is beauty the only appropriate term, however? Recalling the evening she

147 Elsewhere, as at Haus Esters, Krefeld, 1930, Mies designed oblique views that blur the relationship between architecture and nature.

148 Edith Farnsworth, 'Memoirs', ch. 13, unpaginated, quoted in Friedman, p. 143.

149 Gropius, p. 120.

150 The traditional Korean house, which was less well known to early modernists but has similar spatial qualities and papered windows, uses underfloor heating. Social cohesion in Japan and Korea, informed by the prevalence of Confucian values, ensures that a social boundary need not necessarily be physical.

151 Drexler, *The Architecture of Japan*, p. 11 and p. 41.

152 Schulze, *The Farnsworth House*, p. 18.

153 Palumbo, p. 8.

first discussed the house with Mies, Farnsworth concludes that 'the effect was tremendous, like a storm, a flood, or other act of God'.[152] The Farnsworth House's vulnerable interior heightens awareness of nature's sublime effects, as in Palumbo's recollection of 'an electric storm of Wagnerian proportions illuminating the night sky and shaking the foundations of the house to their very core'.[153] But when the Fox River becomes a roaring torrent and bursts its banks nature is less docile, putting the sublime in such danger that a safe distance may be replaced by the sheer proximity of terror.

THE WEATHER OF OUR HOUSES

Mies is regularly described as a leading modernist architect but his opinions frequently diverged from modernist orthodoxy. He dismissed functionalism and acknowledged the changeability of use, enjoyed the appearance of tectonic order more than its literal expression, promoted continuity as well as innovation, appreciated nature and prioritised spiritual needs. Modernist architecture is widely described as didactic. But citing Kent, Soane and Le Camus de Mézières, Tafuri offers an alternative modernism indebted to the 'relative value' and 'edifying play' of the picturesque.[11] The landscape that Tafuri identifies as the inspiration for modernism's 'ambiguous objects' was readily available to Mies due to the collaboration of Schinkel and Lenné on the Prussian royal estates at Potsdam in the early nineteenth century. The later development of the picturesque in German-speaking territories helps explain its conjunction with romanticism, which Soane shared to some extent. Rather than consistently advocating a particular philosophical position, Schinkel was informed by the evolving ideas of German nationalism, idealism and romanticism. Idealism's influence led German romanticism to emphasise the mind's ability to construct reality, placing less emphasis on the direct experience of wilder nature that fascinated English romanticism. Differentiating monuments, buildings and cities from plants, rivers and mountains, Schinkel describes architecture as 'complete in and of itself'.[12] But he remarks that architecture is like nature in that it develops according to a purpose: 'Architecture is the continuation of nature in her constructive activity. This activity is conducted through that natural product: Mankind.'[13] Influenced also by Alexander von Humboldt – a frequent visitor to the Court Gardener's House – Schinkel was concerned to promote the beneficial and

11 Tafuri, *Theories and History of Architecture*, p. 82.

12 Schinkel, quoted in Bergdoll, 'The Nature of Mies's Space', p. 75.

13 Schinkel, quoted in Bergdoll, *Karl Friedrich Schinkel*, p. 208.

14 Baudelaire, 'What is Romanticism', p. 53.

poetic interdependence of the two worlds within the overriding natural order.

Baudelaire associated romanticism with the northern mist.[14] But the north and the south inspired Schinkel as much as his mentor in romantic classicism, Friedrich Gilly, and their successor, Mies. Indebted to the Court Gardener's House, the Barcelona Pavilion's allegiance to the picturesque, and also to romantic classicism, is evident in the dialogue it constructs between architecture, nature and perception. The Pavilion is a creative stimulus to use precisely because it has no specific function and lacks many of the familiar environmental characteristics of a building, such as adequate heating and lighting. Rather than a conventional building, it can be occupied like a garden, in which uses are seasonal and the weather is always apparent.

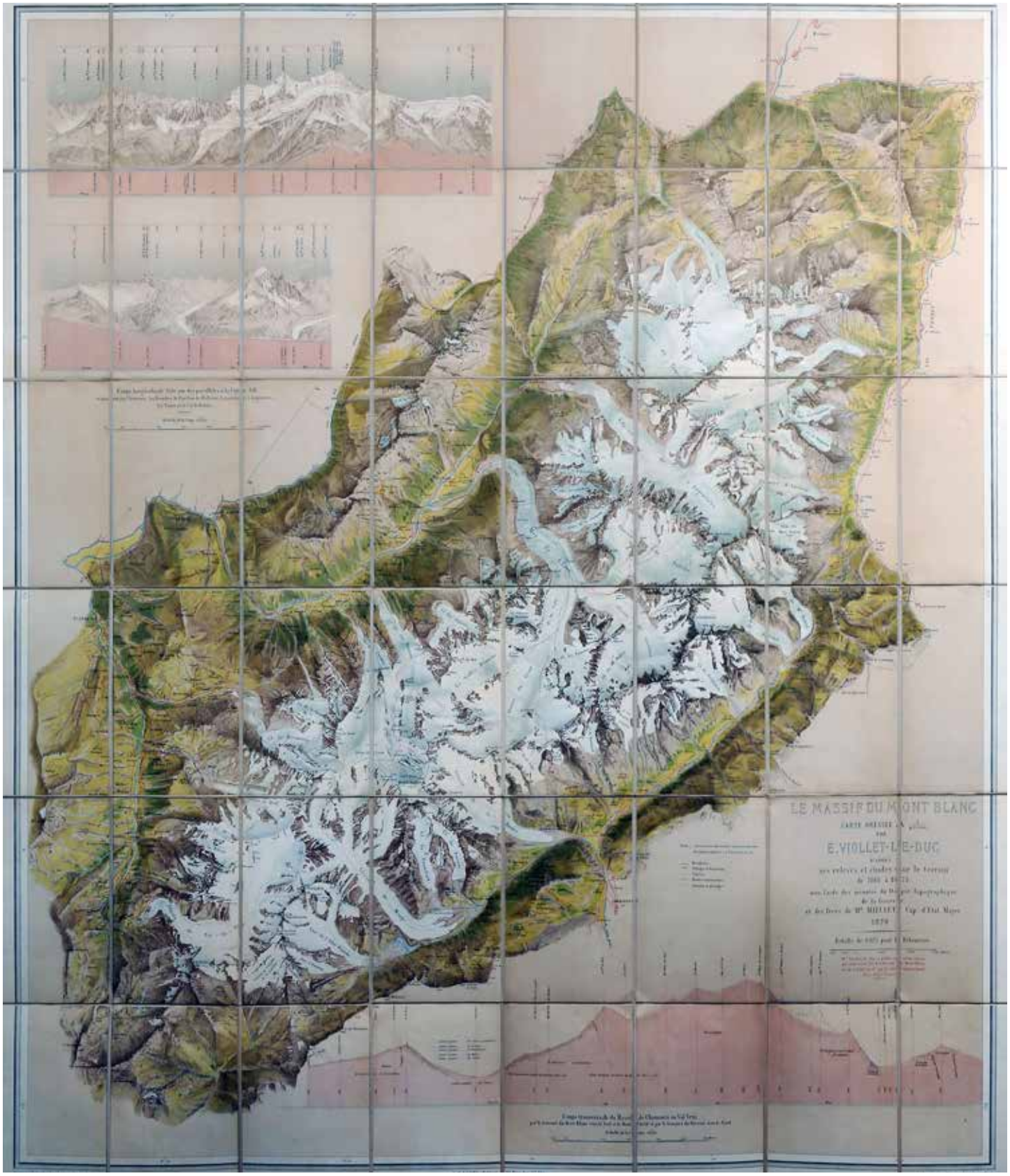
The Farnsworth House does not subtly mediate between architecture and nature in the manner of the Court Gardener's House and Barcelona Pavilion; but neither does it keep them apart. The environmental conditions outside so temper and intrude on those inside that the relationship between architecture and nature is by no means visual alone. Within its vulnerable interior the full effects of weather and weathering are amplified and experienced, from the pleasant beauty of sunlight to the painful beauty of cold and condensation, from the majesty of thunder and lightning to the fearful flood when immediate danger overcomes the sublime. The Farnsworth House departed from romantic classicism, exemplifying instead the more fully romantic immersion in nature that is less familiar to German romanticism. Its vulnerability to anthropogenic climate change recalls the hybridised weather of nature and industry that Turner consciously engaged a century before. We do not know if such an immersion was Mies's intention. One response to this dilemma is to recognise the architect's debt to romantic classicism and speculate that his experience of the American landscape led him to a more extreme interaction between architecture and nature. Another is to focus less on the architect's intentions and more on the building's fate, recognising the weather's role in affirming the northern romantic tradition. Ambiguous because of the weather as much as the architect, the Farnsworth House is a hinge between the early modernist control of nature and the later modernist accommodation of nature, countering the technological bombast of the time.

FROZEN WATER: ICE

Ice upon ice, the well-adjusted parts

Were soon conjoined, nor other cement asked

Than water interfused to make them one



Eugene Viollet-le-Duc, LE MASSIF DU MONT BLANC I 1:40’000, Alps, 1876
108

Viollet-le-Duc was explicit about the analogy between architecture and geology in the introduction to his Le massif du Mont Blanc:

"To analyse carefully a group of mountains, the manner in which they were formed, and the causes of their ruin; to discover the order in which the phenomena of upheaval occurred, the conditions in virtue of which they have resisted or endured the action of atmospheric agents, to note the chronology of their history, is to devote oneself to a work of methodical analysis which is, on a grander scale, analogous to that to which the practical architect and the archaeologist applies when drawing conclusions from the study of buildings."

LABORATORY OF HYDRAULICS, HYDROLOGY AND GLACIOLOGY (VAW),

ETH, Zürich

Glacier lake outburst floods (GLOFs) are a natural hazard characteristic of high alpine environments. This project sets out to take advantage of a unique situation emerging at Glacier de la Plaine Morte, Switzerland: With the aim of mitigating an annually-occurring GLOF, the local authorities have decided to construct an englacial channel through which the lake will be drained artificially. The project will perform dedicated measurements during the time that water flows through the artificial channel. Exploiting the unique fact that the initial channel location and geometry are known, the measurements will allow for testing both long-standing theories of englacial water flow and more recently proposed monitoring strategies based on seismics. This project is in support to WSL initiative Climate Change Impacts on Alpine Mass Movements (CCAMM).
vaw.ethz.ch

Kei Kaihoh Architects, MELTING LANDSCAPES, Venice Biennale, 2021
112

Melting Landscape is an installation of a modern version of Yukimuro, a traditional snow storage method, used to preserve food on the mountains of Japan. In its original setting, the use of snow is connected to a delicate system. Heavily affected by climate change, land consumption, financial crisis, urbanisation, pollution, and unsustainable uses of limited natural resources, the small village of Yasuzuka bases its entire economy on a Yukimuro. The collected snow is used for a number of activities, such as the air-conditioning of public buildings, agriculture, food production, and the textile industry. The installation represents research on new ways of using snow, and on new technologies to apply to it. This study wants to set the basis for the design of the future of these ephemeral landscapes. The use of storage methods, from valleys in small villages to empty plots and gardens of dense cities, can generate clean energy and bring attention to this disappearing resource. A new typology of architecture can branch, one that works together with natural phenomena. Materials: snow, insulation, wooden structure, LED screens, deck of cards, weather station.
labiennale.org/en/architecture/2021/one-planet/kei-kaihoh-architects

White cloth covering to slow glacier melt, RHONE GLACIER, Valais,

Switzerland, 2019

WATER OBSERVED: INTERACTIONS & INTERVENTIONS

The way we represent our buildings,

Shapes the way we build

Its supposed opposition to weather, which represents a physical and psychological threat, has often been used to define the limits of architecture. As David Sibley remarks: 'Nature has a long historical association with the other.'[35] In an early fifteenth-century demonstration of linear perspective, Brunelleschi depicted the square around the Baptistery in Florence. But rather than draw the sky he silvered part of a wooden panel so that it was seen in reflection, and a different sky was always present. Brunelleschi's demonstration seems to confirm the opinion that weather is outside architecture and outside architectural representation. But an alternative interpretation indicates the continuing importance of weather to architecture. First, because the dialogue between architecture and weather is a means to reconsider nature–culture relations. Second, because the weather locates architecture in a specific place, combating globalisation. Third, because attention to the changing climates and seasons encourages buildings that coexist with their immediate and wider environments. Fourth, because architecture is not just a mirror to the weather but can also be like the weather in all its subtle variation, both in the ways it is perceived and in its formal, spatial and material conditions. Fifth, because the weather makes architecture more ambiguous, unpredictable and open to varied interpretation, questioning established uses. Sixth, because the effects of weather on architecture are means to recognise, represent and reconsider time. Seventh, because a building is therefore understood not as a perfect, finite object but as provisional and open to change during its conception, construction, use and decay. Eighth, because the weather is a significant authorial voice over which architects have little control, tempering their claims to sole authorship.

35 Sibley, p. 26.

36 Hill, *Actions of Architecture*, pp. 88–89.

In *Actions of Architecture,* 2003, I categorise users as passive, reactive or creative.[36] With a role as important in the formulation of architecture as that of the architect, the creative user either produces a new space or gives unexpected meanings and uses to an existing space. Architecture is usually experienced habitually, when it may not be the focus of attention. But even the familiar experience of architecture is not necessarily passive. Instead, as empiricism made evident, it can be a questioning intelligence acquired through continuing experience. Rather than necessarily a deviation from habit, creative use can instead establish, affirm or develop a habit that is itself creative. All buildings change, often slowly and subtly. But an architecture that is ever-changing like the weather will require constant re-evaluation, encouraging particularly questioning and creative relations between objects, spaces and users at varied scales and locations.

Informed by the weather signs tradition of Virgil's *Georgics*, architecture's relations with the weather were of interest to Renaissance architects and painters. Leonardo da Vinci wonderfully expressed his fascination for the weather in the title and subject matter of his painting *A Town Over-whelmed by a Deluge*, *c.*1515. He credited Sandro Botticelli for noticing that 'various inventions are to be seen' in a building stain and identified similar potential in weather: 'I have in the past seen in clouds and walls stains which have inspired me to beautiful inventions of many

things.'[37] However, attention to the effects of weather and weathering is an architectural tradition principally developed from the picturesque, sublime and romanticism due to the combined fascination for subjectivity and the natural world in the eighteenth century, which reconfigured the relations between nature and culture and encouraged an expanded conception of architectural authorship that attributed creativity widely and to varied protagonists. Emphasising that a critical understanding of the past can be a catalyst to creativity, this tradition acquired renewed relevance in the mid-twentieth century as a means to reassess and revise modernism, while today it is increasingly relevant due to anthropogenic climate change.

37 Da Vinci, pp. 201, 222.

Today's weather is especially complex and hybridised. As earlier buildings were porous, the weather was always inside as well as outside them. While means to exclude wind and rain have expanded, physical barriers – such as doors and walls – are especially permeable to new weather conditions such as electromagnetic pollution. Increasingly, architecture and weather are two inter-related elements of a complex system. Defining nature–culture relations, the term 'coproduction' applies to architecture as well as the weather. Just as the intermingling of natural and human forces creates the contemporary climate and weather, a building results from the relations between nature and culture that arise during its conception, construction and use. As architecture and the weather are each a product of nature–culture relations, they inform, affect and alter each other in a complex developmental process that is never one way. Critical awareness of the weather, its causes and effects, is a valuable basis for design because, in all stages of building, it recognises architecture's dependence on its immediate and wider environments.

As a metaphor, the weather is a means to understand time. But weathering is not necessarily equivalent to decay. It can be protective, as in the rust coating on Cor-ten steel, and stimulating, drawing attention to the transience of life and the possibility and potential of change.[38] In writing a history of architecture as a history of weather, my first purpose was to emphasise that environmental awareness is central to the architectural imagination while also recognising the weather as an architectural author in creative dialogue with the designer and user. In English, weather and time are two separate words. But in some languages their connection is explicit. For example, in French *temps* is both time and weather; while in Greek *kairos* is the weather and qualitative, momentary time in contrast to *chronos*, which is quantitative, sequential time. As my research progressed from Dormer, to Soane, to Jarman, focusing on subjective experience and the natural world, I increasingly realised that *Weather Architecture* is a story of time.

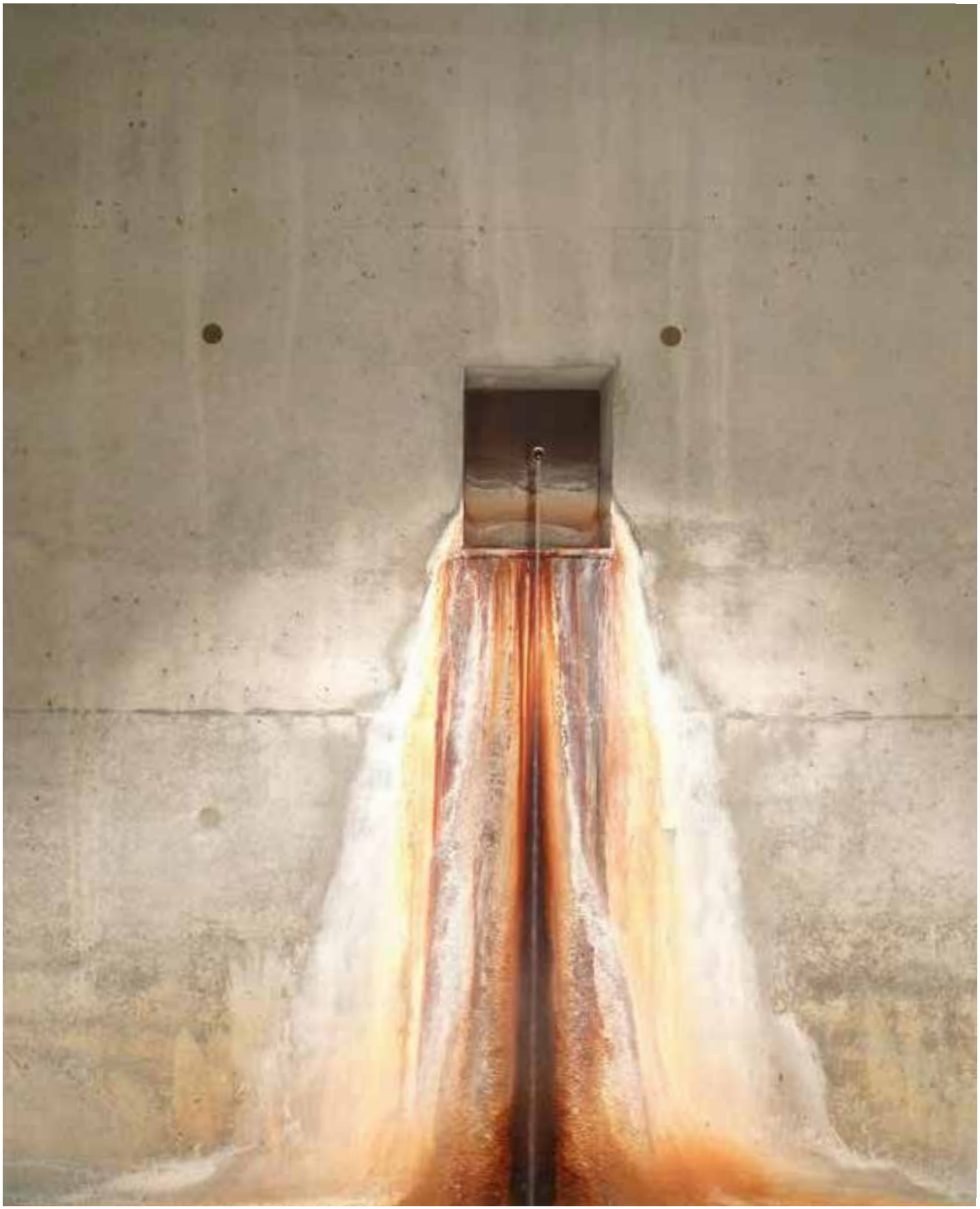
38 Developed in the 1950s by the US Steel Corporation, Cor-ten is also known as 'weathering steel'. Refer to Leatherbarrow and Mostafavi, pp. 5, 104.

> Busie old foole, unruly Sunne,
> Why dost thou thus,
> Through windowes, and through curtaines call on us?[39]

39 As quoted in Jarman, *Derek Jarman's Garden*, p. 117.

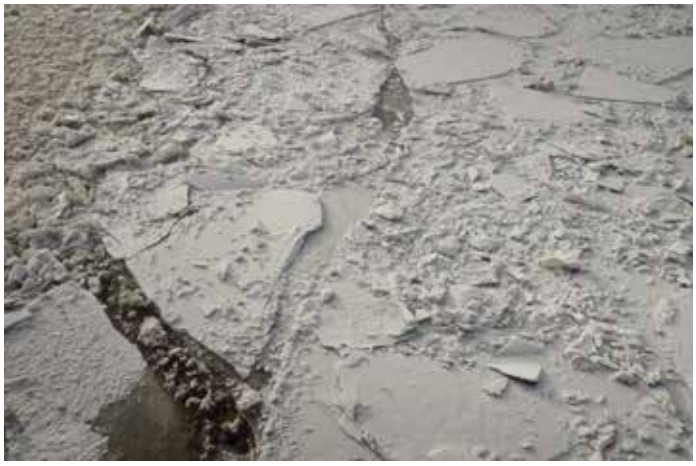
Aurelio Galfetti, RENOVATION OF CASTELGRANDE, Bellinzona,

Switzerland, 1981



Peter Zumthor, 7132 THERMAL BATHS (Water Source), Vals, Switzerland, 1996






Beka & Lemoine, HOMO URBANUS PETROBURGUMUS, Saint Petersburg,

Russia, 41 mins, 2020
124

Beka & Lemoine, HOMO URBANUS VENETIANUS, Venice, Italy, 1 hr, 2020

Window cleaning.

Explaining how the leaking and degradation of the iron and concrete are due to a section of the roof designed to be open.

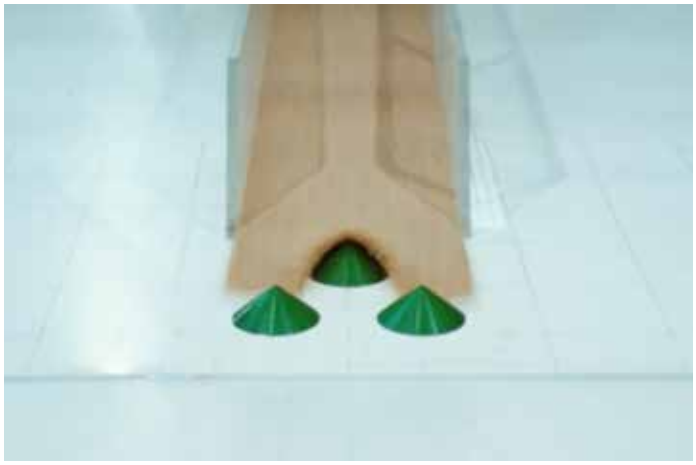
A leak is being tended to by inserting a cut plastic cup that better directs the flow of the water towards the bucket below, to not damage the wall.

Explaining how the metal door reflects the sun, meaning that the grass needs more water to compensate for the extra heat.

Rain water leaks tended to by collecting the water with buckets and towels.

Rain water leaks tended to by collecting the water with buckets and towels.

Beka & Lemoine, KOOLHAAS HOUSELIFE, Bordeaux, France, 1 hr, 2008



University Center for Hydrogeological Risks in Mountain Areas, Trento, Italy

Meteorological Alps model, EPFL, Switzerland

Covering the Pitztaler Glacier, Austria, in this scene workers cover the glacier with a white fleece to protect it from melting.

Transhumance, Similaun Glacier, Austria

Switzerland aims to replace the existing nuclear generation capacity with predominantly renewable resources by the year 2050.
Wind power could play a significant role in this transition, yet the wind resource in the mountainous terrain that makes up most of the country is poorly understood. Therefore the EPFL created an Alps model to assess and simulate wind speeds over the Alps. This same model is then used to calculate the wind turbine capacity that is required to produce significant amounts of wind power.
Transhumance is a type of pastoralism or nomadism, a seasonal movement of livestock between fixed summer and winter pastures. The traditional farmer or shepherd is seen here to have a generational rootedness and knowledge in the landscape, their hands and herding movements work to gently engineer the earth. These ancient practices are now adapting to climate change.

Armin Linke, ALPI, 60 mins, 2011, Editor Giuseppe Lelasi

HEATED WATER: VAPOUR

The form

Of the high mountains cleaves the clouds asunder,

And soars into far realms of fear and wonder,

And howling wildernesses where the storm

Goes darkly with its thunder

Hans Haacke, CONDENSATION CUBE, Los Angeles, USA, 1963–1965
136

Hans Haacke's Condensation Cube (1963-65) is a hermetically sealed, clear acrylic plexiglass box, thirty centimeters on the side that holds about one centimeter or so of water.[2] Condensation collects against the inner surface of the plexiglass forming vertical streaks on the inside. How the condensation is created can be explained in the following way: Air can hold only a limited amount of water vapor and when that limit or dew point—a law of nature, which applies to all bodies of air all over the world—is reached, condensation occurs. In almost all art museums, the temperature is set at a cool 65 degrees Fahrenheit, which means that at a relative humidity of about 45 percent (the standard in most museums), the dew point is at 42 degrees. Because plexiglass is a bad thermal insulator, the air temperature inside the Cube is the same as the temperature on the outside, namely 65 degrees. But since the humidity is close to 100 percent, the dew point is much higher, and is, in fact, about 65 degrees, precisely the temperature of the plexiglass.

I will argue that the Cube sets in play a rather complex game of illusions between the museum and the architecture that defines its space. This revolves not only around the word "cube," but also around the status of condensation as a cultural construct.

The story begins in the mid-nineteenth century when, with the advent of mechanized, ducted heating systems in multi-floor apartment buildings, it was discovered that condensation appeared neither on the outside nor on the inside surfaces of the building, but within the wall itself. There it would lurk, creating mold and rot. Condensation endangered the life span of these new buildings and thus, of course, the capital investment that they represented. Though the problem was first noticed and studied by the French who were building thousands of apartments in Hausmann's Paris, it was in the northern climate of Berlin where condensation proved to be particularly vexing. It was thus natural that among the first scientists to address the problem was Adolf Wilhelm Keim (1851-1913), whose family name, by the way, means 'germ.'[3] He argued that though dampness is brought into architecture because of the capillary nature of stone and brick, that in itself is not the problem. Stones and bricks had survived relatively well even in damp climates. What happens is that the dry heat on the inside sucks the moisture deeper into the building where it no longer dries out in the summer. In the lingering encounter with lime and cement, moisture creates corrosive chemical discharges that lead to what Keim called Mauerfrass, literally a "wall-eating" disease that was, in Keim's mind's eye, similar to cancer eating at the tissue of a living body.

To protect against Mauerfrass, Keim argued that the wall needed to be ventilated from within; in other words a flow of air, the positive, would offset the flow of water, the negative. The wall, therefore, needed to be separated into two component layers, a structural wall and a type of skin or internal surface, composed of thin brick tiles separated from the structural wall by about an inch, in which space air could flow. To keep moisture in that air corridor from entering through the bricks, Keim added that it was "beneficial to give the inner surface of the tiles a coat of asphalt."[4] This would leave the surface facing the room permanently dry so that it could be coated with plaster, which can then be painted or papered. Wall paper, which had become common in bourgeois houses, and which had also become quite costly, was now safe from the damp. Needless to say, Keim's solution has been used in architecture ever since, except that by the early twentieth century, tar paper was preferred and by the mid twentieth century special types of plastic sheathing like Tyvek, known to every home-builder in the United States, became the norm.

In Keim's world, architecture, in facing the crisis of industrialization, needed to be rethought from the inside out without having to give up its unity. His metaphor was thus appropriately biological. Structure had to be separated from skin by a type of two-dimensional lung. The structure could then do the heavy lifting, the interior wall could work as backdrop for the decorative embellishments in the room, and the lungs of the newly devised body could guarantee the whole a long and healthy life. And yet, if there was a moment where we see the first true separation of interior design from architecture, and architecture from environmental engineering, it was

Jarzombek, Mark. HAACKE'S CONDENSATION CUBE: THE MACHINE IN THE BOX AND THE TRAVAILS OF ARCHITECTURE. Thresholds, vol. 30, 2005, pp. 98–105., doi:10.1162/thld_a_00292

when architecture had to guarantee a way to keep the interior surfaces dry.

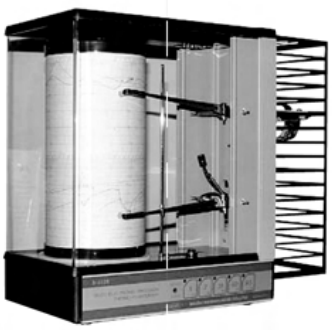
The history of condensation took another step, and one that brings us even closer to meaning of the Cube, when we move from the heating to the cooling of air. If heating dried the air out, air conditioning returned moisture back into the architectural ecosystem. However, since air conditioning, with Willis Carrier's patent given out in 1906, was mainly used to cool machinery in milling and paper factories, condensation was an industrial not a civilian problem. The trend maintained itself through largely WWII when the military created sophisticated insulated and de-humidified environments for the transportation of munitions. The first de-humidifier was built for the United States military in 1947. They were more complex than humidifiers since if not maintained properly, mold and bacteria could grow inside them, thus requiring the introduction of an array of chemicals to keep them clean. After WWII, both humidifiers and de-humidifiers became significantly cheaper, which meant that mechanized air now became more properly "architectural." Soon one could find air conditioners in any American home. Condensation was now encountered by the home builders on a scale never before seen. Already in 1949 the Housing and Home Finance Agency published Condensation Control, a pivotal document in understanding the science of building moisture.

One has to remember that the shift from a biological metaphor of architectural illness (Mauerfrass as cancer that could be cured by a delamination of the skin from the architectural body) to a mechanical metaphor of respirated atmosphere parallels the design of hermetically-sealed space capsules by NASA. Architects in the mid 1960s were, of course, enamored of the promises of environmental management and soon began to design hermetically-sealed buildings. Museums were a major advocate of applied atmospheric control, with numerous studies being undertaken to show that artifacts practically of all types were vulnerable if not protected from heat and humidity. Museum chatter on the topic reached a pitch by the late 1950s, with the International Council of Museums (ICOM) dedicating its entire 1960 issue of Museum to the question of atmospheric standards and norms.[6] Machines specifically designed for museums were now available, machines that combined both humidification and dehumidification, the fundamental premise being in most museums to keep the temperature as low as possible and the humidity as constant as possible.[7] This soon became the rule governing the preservation of most art works. As one expert noted, "fluctuations in temperature and humidity caused by external factors, i.e. heating, sudden weather changes, an influx of visitors, etc., are a major problem for museums." This means that:

> Museums need to control the environment around exhibits 24 hours a day, seven days a week as temperature and relative humidity can fluctuate frequently and dramatically on a daily basis. This requires constant operation of the humidification system, which therefore needs to be reliable.[8]

The Condensation Cube, first made in 1963, was produced at the very time when museum curating and moisture engineering were becoming synonymous. The piece sets the natural cycles of water and condensation in relation to the invisible and tightly sealed plastic sheathing hidden from view in the museum's walls. The Cube is, however, more than an ironic counterstatement to the museological environment, for one has to remember, that it is not just the mechanization of atmosphere that is important in museums, but the need to preserve temperature and humidity at a constant level. In other words, it is the museum's constantly monitored machines – a humidifier and a de-humidifier working together with a thermohygrometer (also known as hygrothermograph) – that produce the constant rain of droplets in Haacke's Cube. The condensation in the Cube is thus a type of perpetuum mobile induced into motion by remote control. One artifice is posited against another, a Box against a Cube, a man-made constant against a natural law – the white noise of the machines against the quiet of the water.

The Cube also creates a feed-back loop with the machines that set its condensation in motion, for if the machines were to malfunction, condensation would not appear. The Condensation Cube would become just a cube and no longer a "work of art." Stated differently, by observing the Condensation Cube one is registering the efficiency of the machines, with the Cube a type of monitor in its own right. The irony is that, as the quote above indicates, visitors to the museum endanger that relationship. Humans bring heat and humidity into the room, which is why the more precious the objects, the greater the restrictions on how many people are allowed into the museum space. A museum visitor is a potential danger to the law of environmental constancy. If too many people were to stand close to the Cube, the micro-climate around it would change the Condensation Cube into just a plexi-



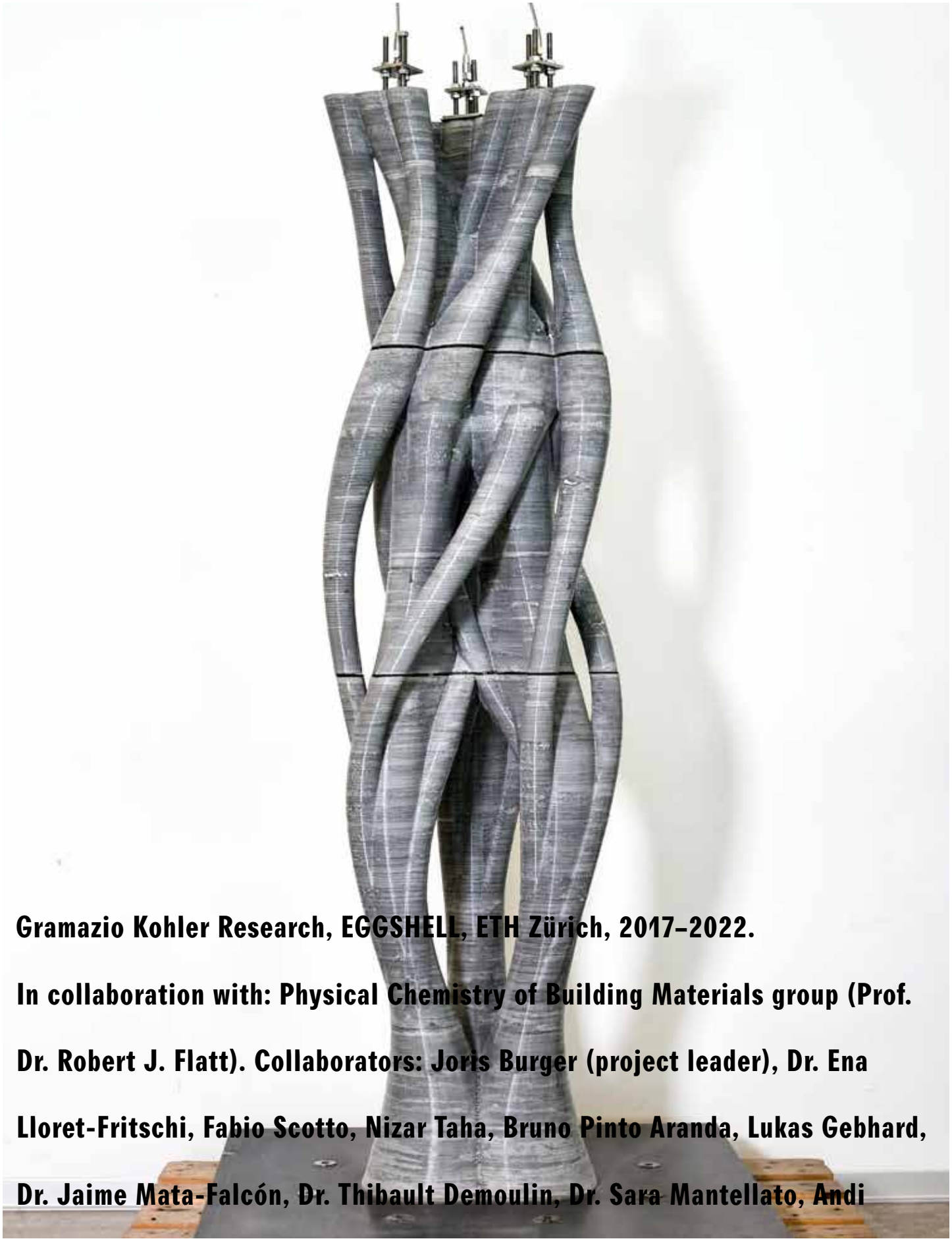
glass box, setting off environmental as well as curatorial alarms. The problem becomes even more complex when one takes into consideration that the environmental constant that is created to preserve art works actually endangers the building. As one researcher noted, "water vapor, thermal diffusion and interstitial condensation have become a serious problem for many museums."[9] Normally one wants condensation to form on the outside of the building, or in the specially designed air cavities, as Keim had hoped, but what happens is that in summer, internal air is cooler than outside air and that, therefore, the vapor barrier is on the wrong side of the inner air corridor; instead of blocking moisture from coming in, it blocks moister from going out. And in winter, when there is less moisture outside than inside and when the humid indoor air meets building elements that are cooled by contact with the outdoor climate, water condenses on the inner surfaces, leading, as it has been observed, "to rotting of wooden elements, mold growth on interior finishes, corrosion of metal elements, and spalling of masonry – damage which can quite rapidly reduce building elements to the point where renovation must be performed."[10] In other words, the attempt to control condensation creates situations where condensation is even more of a problem. The result is a conundrum.[11] The building's respirators keep the art alive, but spell architecture's doom. In other words, the architectural body has to be sacrificed in the name of art. The Cube, its transparent walls mimicking the vapor barrier in the museum's walls, lets us see the processes that are corroding the building from inside out.[1]

The modernist museum, one must remember, was based on the promise of the freedom that artists supposedly had within its space, thus its purported retreat from representation – the empty loft preferred over the colonnaded hallways of old. But in becoming more and more a refrigerated Box, it also became a machine-to-exhibit-in that, in turn, became increasingly regulatory and simultaneously architecturally self-defeating. It is the representation of that paradox that is at stake with The Cube. Architecture in the nineteenth century, in the service of modern comfort, had to split its surface, but once split it could not be put together again. The Condensation Cube – a condensation-producing machine in its own right – is thus the mirror into architecture's philosophical impossibility, for if, as Adorno argues, an art work is such only because it is "hermetically sealed off and blind" and yet able "to represent the outside world," then that is what architecture is in no position to accomplish, since in being "sealed" it encounters its status as something that is undone, unlike Haacke's Cube.

The difference between the Box and the Cube is the difference between modernism and postmodernism. The modernist attitude to condensation started from the premise that diseases could be dealt with by effective treatments. This was the approach of Keim, and is still the approach of the curatorialized museum. The postmodernist position accepts the failure of science – and even the complicity of science in that failure – while struggling to make sense of a more complex bio-cultural world. Architecture, however, had no real choice in the matter, yet for better or worse, it has become a bio-cultural structure where pieces start to get replaced, perhaps a hand rail here; a light fixture there, and then eventually a wall needs to be rebuilt, and then finally, it is cheaper to tear it down altogether, where its pieces wind up in a dump to mold, rot and rust at a more natural pace.

There is a redeeming element in this, in that even though machines in their effectiveness first compensated for and then actually created an ineffectual architecture (or rather an ineffectuality that we continue to call "architecture"), the museum building, unlike an art work, discovers in the process a mortality that is no longer possible for museological art. If an art work, even one that displays nothing more than condensation, is defined as that which must last, as that which must be protected from both human contact and the naturalness of climatic fluctuations, architecture is that which can never achieve such cultural status. Condensation brings to architecture a quality that is forbidden to art, namely a slow and, one could say, almost natural death. 'Mauerfrass' is nature enforcing its presence over the artificial. The Condensation Cube, despite all that it reveals in the context of the modern museum, thus traps the very mechanisms that it wishes to expose. It places them in quarantine.

On the surface, one could ascribe to art works -this one included - the potential importance of their cultural messages, and to architecture its sad and muted collapse into dampness, 'Mauerfrass,' temporality and, ultimately, irrelevance. Architecture is, without remorse, brought to light as an infirm and ultimately discardable body. But the more one sets out such a separation between art and architecture, the more, of course, it collapses. The Condensation Cube works because it explicates nature's departure from itself as something that is simultaneously absolutely natural and absolutely artificial. It respects and violates nature's legality, scanning a passage from nature to society and back again.



Gramazio Kohler Research, EGGSHELL, ETH Zürich, 2017–2022.

In collaboration with: Physical Chemistry of Building Materials group (Prof. Dr. Robert J. Flatt). Collaborators: Joris Burger (project leader), Dr. Ena Lloret-Fritschi, Fabio Scotto, Nizar Taha, Bruno Pinto Aranda, Lukas Gebhard, Dr. Jaime Mata-Falcón, Dr. Thibault Demoulin, Dr. Sara Mantellato, Andi Reusser, Michael Lyrenmann, Philippe Fleischmann

Eggshell is a novel process for the production of non-standardized reinforced concrete structures. The process uses the controlled hydration of concrete, as developed in Smart Dynamic Casting. By carefully controlling the hydration of the concrete, 3D-printed, reusable formwork can be used to cast full-scale concrete components. Concrete casting is traditionally based on two separate processes for producing a concrete element. A formwork is used, then the concrete is poured and the element is made available for demolding. Eggshell aims to combine these processes by 3D printing a thin formwork and at the same time pouring concrete. With this approach, geometrically complex constructions can be produced efficiently, which minimizes the formwork effort. The control and synchronization of the material properties for both printing and casting are essential for the manufacturing process, as the hydrated concrete helps prevent the thin formwork from buckling during printing.
gramaziokohler.arch.ethz.ch

SPIRITUALITY AND CHANGE

A building today is interesting only if it is more than itself; if it charges the space around it with connective possibilities – especially if it does this by a quietness that up to now our sensibilities have not recognized as architecture at all...

Schinkel used the neutralizing skin of columns... Mies got the message

“A lot of people think that the spontaneous or completely natural life, as it is understood by various philosophers, is to act according to whim – a sudden desire or change of mind. There was, for example, a great Zen monk who lived shortly after 1,000 BC, who had a very peculiar way of thinking. He would get very drunk on rice wine, soak his long hair in ink, and flush it all over a piece of paper. He would then do a Rorschach test on it and decide what kind of land- scape it was, and accordingly put in the finishing touches. Suddenly out of this apparent chaos, a great landscape would emerge. However, the true oddity of this practice was the act of putting in the finishing touches. There is more to spontaneity than to place and disorder, and I want to try to explain what that is. Would it not be great if we could live absolutely in the very moment, not making any plans, not worrying if we have made the right deci- sion, if what we do is good or bad, and to not hesitate to do anything?”

HESITATION AND SPONTANEITY by Alan Watts, YouTube, 36:36 min

“...The Japanese have a word ‘yugen’, which has no English equivalent, whatsoever. Yugen is in a way “digging change” it’s described poetically, you have the feeling of yugen when you see out in the distant water some ships hidden behind a far off island, you have the feeling of yugen when you watch wild geese suddenly seen then lost in the clouds, you have the feeling of yugen when you look across Mount Tamapeis and you’ve never been to the other side and you see the sky beyond. You don’t go over there to look and see what’s on the other side, that wouldn’t be yugen, you let the other side be the other side, and it evokes something in your imagination but you don’t attempt to define it, to pin it down, so in the same way, the coming and going of things in the world is marvelous. They go. Where do they go? Don’t answer because that would spoil the mystery, they vanish into the mystery, but if you try to pursue them you destroy yugen. I remember when I was almost a child in the Pyrenees, in the southwest of France, we went way up in this gorgeous silence of the mountains but in the distance we could hear the bells on the cows clanking, and

Partial transcript from a lecture by Alan Watts, WHY WE RESIST CHANGE,

audio recording, Youtube, 10 mins

somehow those tiny sounds brought out the silence, and so in the same way slight performances bring out change, and they give you this very strange sense, life is life you see, because, just because it's always disappearing... The trouble is that we have one-sided minds, and we notice the wave of life when it is at its peak or crest, we don't notice it when it's at the trough, not in an ordinary way. It's the peaks that count. Take a buzz-saw, what seems important to use is the tips of the teeth, they seem to do the cutting, not the valleys between the teeth, but do you see you couldn't have tips of teeth without valleys between them, therefore the saw wouldn't cut, without both tips and V-shaped valleys, but we ignore that. We don't notice the valleys so much as we notice the mountains, valleys point down, mountains point up, and we prefer things that point up because up is good and down is bad, but seriously, we don't praise the peaks for being high and blame the valleys for being low. But it is so you see, that we ignore the valley aspect of things, and so all wisdom begins by emphasising the valley aspect as distinct from the peak aspect. We pay plenty of attention to the peak aspect, that's what captures our attention, but we somehow screen out the valley aspect. It makes us very uncomfortable, it seems that we want and get pleasure from looking at the peaks but actually, this denies our pleasure because secretly we know that every peak is followed by a valley, and we're always afraid because we are not used to looking at valleys, because we are not used to living with them, they represent to use a strange and threatening unknown. Maybe we're afraid the principle of the valley will conquer, and the peaks will be overwhelmed...maybe nothing will overcome something in the end, wouldn't that be awful? So we resist change, ignorant of the fact that change is life and that nothing is invariably the obverse face of something."

What is the Tao
The Tao that can be understood cannot be the primal, or cosmic, Tao, just as an idea that can be expressed in words cannot be the infinite idea. And yet the ineffable Tao was the source of all spirit and matter, and being expressed was the mother of all created things. Therefore not to desire the things of sense is to know the freedom of spirituality; and to desire is to learn the limitation of matter. These two things spirit and matter, so different in nature, have the same origin. This unity of origin is the mystery of mysteries, but it is the gateway to spirituality.

Adaptation to Change
When an administration is unostentatious the people are simple. Whenan administration is inquisitive, the people are needy. Misery, alas, supports happiness. Happiness, alas, conceals misery. Who knows its limits? It never ceases. The normal becomes the abnormal. The good in turn becomes unlucky. The people's confusion is felt daily for a long time. Therefore the wise man is square, yet does not injure, he is angular but does not annoy. He is upright but is not cross. He is bright but not glaring.

Lao Tzu, THE TAO TE CHING COLLECTED: Classical Translations of Laozi's

Daodejing, Teachings originate from the 6th century B.C.

Introduction

The Book of Changes—*I Ching* in Chinese—is unquestionably one of the most important books in the world's literature. Its origin goes back to mythical antiquity, and it has occupied the attention of the most eminent scholars of China down to the present day. Nearly all that is greatest and most significant in the three thousand years of Chinese cultural history has either taken its inspiration from this book, or has exerted an influence on the interpretation of its text. Therefore it may safely be said that the seasoned wisdom of thousands of years has gone into the making of the *I Ching*. Small wonder then that both of the two branches of Chinese philosophy, Confucianism and Taoism, have their common roots here. The book sheds new light on many a secret hidden in the often puzzling modes of thought of that mysterious sage, Lao-tse, and of his pupils, as well as on many ideas that appear in the Confucian tradition as axioms, accepted without further examination.

Indeed, not only the philosophy of China but its science and statecraft as well have never ceased to draw from the spring of wisdom in the *I Ching*, and it is not surprising that this alone, among all the Confucian classics, escaped the great burning of the books under Ch'in Shih Huang Ti.[1] Even the commonplaces of everyday life in China are saturated with its influence. In going through the streets of a Chinese city, one will find, here and there at a street corner, a fortune teller sitting behind a neatly covered table, brush and tablet at hand, ready to draw from the ancient book of wisdom pertinent counsel and information on life's minor perplexities. Not only that, but the very signboards adorning the houses—perpendicular wooden panels done in gold on black lacquer—are covered with in-

1. [213 B.C.]

THE I CHING or BOOK OF CHANGES. The Richard Wilhelm Translation rendered into English by Cary F. Baynes. Foreword by C.C. Jung. Preface to the Third Edition by Hellmut Wilhelm. Bollingen series XIX Princeton University Press

scriptions whose flowery language again and again recalls thoughts and quotations from the *I Ching*. Even the policy makers of so modern a state as Japan, distinguished for their astuteness, do not scorn to refer to it for counsel in difficult situations.

In the course of time, owing to the great repute for wisdom attaching to the Book of Changes, a large body of occult doctrines extraneous to it—some of them possibly not even Chinese in origin—have come to be connected with its teachings. The Ch'in and Han dynasties[2] saw the beginning of a formalistic natural philosophy that sought to embrace the entire world of thought in a system of number symbols. Combining a rigorously consistent, dualistic yin-yang doctrine with the doctrine of the "five stages of change" taken from the Book of History,[3] it forced Chinese philosophical thinking more and more into a rigid formalization. Thus increasingly hairsplitting cabalistic speculations came to envelop the Book of Changes in a cloud of mystery, and by forcing everything of the past and of the future into this system of numbers, created for the *I Ching* the reputation of being a book of unfathomable profundity. These speculations are also to blame for the fact that the seeds of a free Chinese natural science, which undoubtedly existed at the time of Mo Ti[4] and his pupils, were killed, and replaced by a sterile tradition of writing and reading books that was wholly removed from experience. This is the reason why China has for so long presented to Western eyes a picture of hopeless stagnation.

Yet we must not overlook the fact that apart from this mechanistic number mysticism, a living stream of deep human wisdom was constantly flowing through the channel of this book into everyday life, giving to China's great civilization that ripeness of wisdom, distilled through the ages, which we wistfully admire in the remnants of this last truly autochthonous culture.

2. [Beginning in the last half of the third century B.C. and ending about A.D. 220.]

3. [*Shu Ching*, the oldest of the Chinese classics. Modern scholarship has placed most of the records contained in the *Shu Ching* near the first millennium B.C., though formerly a much greater age was ascribed to the earliest of them.]

4. [Fifth and fourth centuries B.C.]

What is the Book of Changes actually? In order to arrive at an understanding of the book and its teachings, we must first of all boldly strip away the dense overgrowth of interpretations that have read into it all sorts of extraneous ideas. This is equally necessary whether we are dealing with the superstitions and mysteries of old Chinese sorcerers or the no less superstitious theories of modern European scholars who try to interpret all historical cultures in terms of their experience of primitive savages.[5] We must hold here to the fundamental principle that the Book of Changes is to be explained in the light of its own content and of the era to which it belongs. With this the darkness lightens perceptibly and we realize that this book, though a very profound work, does not offer greater difficulties to our understanding than any other book that has come down through a long history from antiquity to our time.

1. THE USE OF THE BOOK OF CHANGES

The Book of Oracles

At the outset, the Book of Changes was a collection of linear signs to be used as oracles.[6] In antiquity, oracles were everywhere in use; the oldest among them confined themselves to the answers yes and no. This type of oracular pronouncement is likewise the basis of the Book of Changes. "Yes" was indicated by a simple unbroken line (——), and "No" by a broken line (— —). However, the need for greater differentiation seems to have been felt at an early date, and the single lines were combined in pairs:

To each of these combinations a third line was then added. In

5. We might mention here, because of its oddity, the grotesque and amateurish attempt on the part of Rev. Canon McClatchie, M.A., to apply the key of "comparative mythology" to the *I Ching*. His book was published in 1876 under the title, *A Translation of the Confucian Yi King or the Classic of Changes, with Notes and Appendix.*

6. From the discussion here presented, it will become self-evident that the Book of Changes was not a lexicon, as has been assumed in many quarters.

this way the eight trigrams[7] came into being. These eight trigrams were conceived as images of all that happens in heaven and on earth. At the same time, they were held to be in a state of continual transition, one changing into another, just as transition from one phenomenon to another is continually taking place in the physical world. Here we have the fundamental concept of the Book of Changes. The eight trigrams are symbols standing for changing transitional states; they are images that are constantly undergoing change. Attention centers not on things in their state of being—as is chiefly the case in the Occident—but upon their movements in change. The eight trigrams therefore are not representations of things as such but of their tendencies in movement.

These eight images came to have manifold meanings. They represented certain processes in nature corresponding with their inherent character. Further, they represented a family consisting of father, mother, three sons, and three daughters, not in the mythological sense in which the Greek gods peopled Olympus, but in what might be called an abstract sense, that is, they represented not objective entities but functions.

A brief survey of these eight symbols that form the basis of the Book of Changes yields the following classification:

	Name	*Attribute*	*Image*	*Family Relationship*
☰	Ch'ien	the Creative	strong	heaven	father
☷	K'un	the Receptive	devoted, yielding	earth	mother
☳	Chên	the Arousing	inciting movement	thunder	first son
☵	K'an	the Abysmal	dangerous	water	second son
☶	Kên	Keeping Still	resting	mountain	third son

7. [*Zeichen*, meaning sign, is used by Wilhelm to denote the linear figures in the *I Ching*, those of three lines as well as those of six lines. The Chinese word for both types of signs is *kua*. To avoid ambiguity, the precedent established by Legge (*The Sacred Books of the East*, XVI: *The Yi King*) has been adopted throughout: the term "trigram" is used for the sign consisting of three lines, and "hexagram" for the sign consisting of six lines.]

	Name	*Attribute*	*Image*	*Family Relationship*
☴ Sun	the Gentle	penetrating	wind, wood	first daughter
☲ Li	the Clinging	light-giving	fire	second daughter
☱ Tui	the Joyous	joyful	lake	third daughter

The sons represent the principle of movement in its various stages—beginning of movement, danger in movement, rest and completion of movement. The daughters represent devotion in its various stages—gentle penetration, clarity and adaptability, and joyous tranquillity.

In order to achieve a still greater multiplicity, these eight images were combined with one another at a very early date, whereby a total of sixty-four signs was obtained. Each of these sixty-four signs consists of six lines, either positive or negative. Each line is thought of as capable of change, and whenever a line changes, there is a change also of the situation represented by the given hexagram. Let us take for example the hexagram K'un, THE RECEPTIVE, earth:

It represents the nature of the earth, strong in devotion; among the seasons it stands for late autumn, when all the forces of life are at rest. If the lowest line changes, we have the hexagram Fu, RETURN:

The latter represents thunder, the movement that stirs anew within the earth at the time of the solstice; it symbolizes the return of light.

As this example shows, all of the lines of a hexagram do not necessarily change; it depends entirely on the character of a given line. A line whose nature is positive, with an increasing dynamism, turns into its opposite, a negative line, whereas a positive line of lesser strength remains unchanged. The same principle holds for the negative lines.

More definite information about those lines which are to be considered so strongly charged with positive or negative energy that they move, is given in book II in the Great Commentary (pt. I, chap. IX), and in the special section on the use of the oracle at the end of book III. Suffice it to say here that positive lines that move are designated by the number 9, and negative lines that move by the number 6, while non-moving lines, which serve only as structural matter in the hexagram, without intrinsic meaning of their own, are represented by the number 7 (positive) or the number 8 (negative). Thus, when the text reads, "Nine at the beginning means . . ." this is the equivalent of saying: "When the positive line in the first place is represented by the number 9, it has the following meaning. . . ." If, on the other hand, the line is represented by the number 7, it is disregarded in interpreting the oracle. The same principle holds for lines represented by the numbers 6 and 8[8] respectively.

We may obtain the hexagram named in the example above —K'un, THE RECEPTIVE—in the following form:

8 at the top	— —
8 in the fifth place	— —
8 in the fourth place	— —
8 in the third place	— —
8 in the second place	— —
6 at the beginning	— —

Hence the five upper lines are not taken into account; only the 6 at the beginning has an independent meaning, and by its transformation into its opposite, the situation K'un, THE RECEPTIVE,

becomes the situation Fu, RETURN:

8. [For this reason, the numbers 7 and 8 never appear in the portion of the text dealing with the meanings of the individual lines.]

In this way we have a series of situations symbolically expressed by lines, and through the movement of these lines the situations can change one into another. On the other hand, such change does not necessarily occur, for when a hexagram is made up of lines represented by the numbers 7 and 8 only, there is no movement within it, and only its aspect as a whole is taken into consideration.

In addition to the law of change and to the images of the states of change as given in the sixty-four hexagrams, another factor to be considered is the course of action. Each situation demands the action proper to it. In every situation, there is a right and a wrong course of action. Obviously, the right course brings good fortune and the wrong course brings misfortune. Which, then, is the right course in any given case? This question was the decisive factor. As a result, the *I Ching* was lifted above the level of an ordinary book of soothsaying. If a fortune teller on reading the cards tells her client that she will receive a letter with money from America in a week, there is nothing for the woman to do but wait until the letter comes—or does not come. In this case what is foretold is fate, quite independent of what the individual may do or not do. For this reason fortune telling lacks moral significance. When it happened for the first time in China that someone, on being told the auguries for the future, did not let the matter rest there but asked, "What am I to do?" the book of divination had to become a book of wisdom.

It was reserved for King Wên, who lived about 1150 B.C., and his son, the Duke of Chou, to bring about this change. They endowed the hitherto mute hexagrams and lines, from which the future had to be divined as an individual matter in each case, with definite counsels for correct conduct. Thus the individual came to share in shaping fate. For his actions intervened as determining factors in world events, the more decisively so, the earlier he was able with the aid of the Book of Changes to recognize situations in their germinal phases. The germinal phase is the crux. As long as things are in their beginnings they can be controlled, but once they have grown to their full consequences they acquire a power so overwhelming that man stands impotent before them. Thus the Book of Changes became a book of divination of a very special kind.

The hexagrams and lines in their movements and changes mysteriously reproduced the movements and changes of the macrocosm. By the use of yarrow stalks,[9] one could attain a point of vantage from which it was possible to survey the condition of things. Given this perspective, the words of the oracle would indicate what should be done to meet the need of the time.

The only thing about all this that seems strange to our modern sense is the method of learning the nature of a situation through the manipulation of yarrow stalks. This procedure was regarded as mysterious, however, simply in the sense that the manipulation of the yarrow stalks makes it possible for the unconscious in man to become active. All individuals are not equally fitted to consult the oracle. It requires a clear and tranquil mind, receptive to the cosmic influences hidden in the humble divining stalks. As products of the vegetable kingdom, these were considered to be related to the sources of life. The stalks were derived from sacred plants.

The Book of Wisdom

Of far greater significance than the use of the Book of Changes as an oracle is its other use, namely, as a book of wisdom. Lao-tse[10] knew this book, and some of his profoundest aphorisms were inspired by it. Indeed, his whole thought is permeated with its teachings. Confucius[11] too knew the Book of Changes and devoted himself to reflection upon it. He probably wrote down some of his interpretative comments and imparted others to his pupils in oral teaching. The Book of Changes as edited and annotated by Confucius is the version that has come down to our time.

If we inquire as to the philosophy that pervades the book, we can confine ourselves to a few basically important concepts. The underlying idea of the whole is the idea of change. It is

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9. [The stalks come from the plant known to us as common yarrow, or milfoil (*Achillea millefolium*).]

10. [Second half of fifth century B.C.]

11. [551–479 B.C.]

related in the Analects[12] that Confucius, standing by a river, said: "Everything flows on and on like this river, without pause, day and night." This expresses the idea of change. He who has perceived the meaning of change fixes his attention no longer on transitory individual things but on the immutable, eternal law at work in all change. This law is the tao[13] of Lao-tse, the course of things, the principle of the one in the many. That it may become manifest, a decision, a postulate, is necessary. This fundamental postulate is the "great primal beginning" of all that exists, *t'ai chi*—in its original meaning, the "ridgepole." Later Chinese philosophers devoted much thought to this idea of a primal beginning. A still earlier beginning, *wu chi*, was represented by the symbol of a circle. Under this conception, *t'ai chi* was represented by the circle divided into the light and the dark, yang and yin,  .[14]

This symbol has also played a significant part in India and Europe. However, speculations of a gnostic-dualistic character are foreign to the original thought of the *I Ching*; what it posits is simply the ridgepole, the line. With this line, which in itself represents oneness, duality comes into the world, for the line at the same time posits an above and a below, a right and left, front and back—in a word, the world of the opposites.

These opposites became known under the names yin and yang and created a great stir, especially in the transition period between the Ch'in and Han dynasties, in the centuries just before our era, when there was an entire school of yin-yang doctrine. At that time, the Book of Changes was much in use as a book of magic, and people read into the text all sorts of things not originally there. This doctrine of yin and yang,

12. *Lun Yü*, IX, 16. [This book comprises conversations of Confucius and his disciples.]

13. [Here, as throughout the book, Wilhelm uses the German word *Sinn* ("meaning") in capitals (*SINN*) for the Chinese word *tao* (see p. 297 and n. 1). The reasons that led Wilhelm to choose *SINN* to represent *tao* (see p. XIV of the introduction to his translation of Lao-tse: *Tao Te King: Das Buch des Alten von Sinn und Leben*, 3rd edn., Düsseldorf and Cologne, 1952) have no relation to the English word "meaning." Therefore in the English rendering, "tao" has been used wherever *SINN* occurs.]

14. [Known as *t'ai chi t'u*, "the supreme ultimate." See R. Wilhelm, *A Short History of Chinese Civilization*, tr. by J. Joshua (London, 1929), p. 249.]

of the female and the male as primal principles, has naturally also attracted much attention among foreign students of Chinese thought. Following the usual bent, some of these have predicated in it a primitive phallic symbolism, with all the accompanying connotations.

To the disappointment of such discoverers it must be said that there is nothing to indicate this in the original meaning of the words yin and yang. In its primary meaning yin is "the cloudy," "the overcast," and yang means actually "banners waving in the sun,"[15] that is, something "shone upon," or bright. By transference the two concepts were applied to the light and dark sides of a mountain or of a river. In the case of a mountain the southern is the bright side and the northern the dark side, while in the case of a river seen from above, it is the northern side that is bright (yang), because it reflects the light, and the southern side that is in shadow (yin). Thence the two expressions were carried over into the Book of Changes and applied to the two alternating primal states of being. It should be pointed out, however, that the terms yin and yang do not occur in this derived sense either in the actual text of the book or in the oldest commentaries. Their first occurrence is in the Great Commentary, which already shows Taoistic influence in some parts. In the Commentary on the Decision the terms used for the opposites are "the firm" and "the yielding," not yang and yin.

However, no matter what names are applied to these forces, it is certain that the world of being arises out of their change and interplay. Thus change is conceived of partly as the continuous transformation of the one force into the other and partly as a cycle of complexes of phenomena, in themselves connected, such as day and night, summer and winter. Change is not meaningless—if it were, there could be no knowledge of it—but subject to the universal law, tao.

The second theme fundamental to the Book of Changes is its theory of ideas. The eight trigrams are images not so much

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15. Cf. the noteworthy discussions of Liang Ch'i-ch'ao in the Chinese journal *The Endeavor*, July 15 and 22, 1923, also the English essay by B. Schindler, "The Development of the Chinese Conceptions of Supreme Beings," *Asia Major*, Hirth Anniversary Volume (London: Probsthain, n.d.), pp. 298–366.

of objects as of states of change. This view is associated with the concept expressed in the teachings of Lao-tse, as also in those of Confucius, that every event in the visible world is the effect of an "image," that is, of an idea in the unseen world. Accordingly, everything that happens on earth is only a reproduction, as it were, of an event in a world beyond our sense perception; as regards its occurrence in time, it is later than the suprasensible event. The holy men and sages, who are in contact with those higher spheres, have access to these ideas through direct intuition and are therefore able to intervene decisively in events in the world. Thus man is linked with heaven, the suprasensible world of ideas, and with earth, the material world of visible things, to form with these a trinity of the primal powers.

This theory of ideas is applied in a twofold sense. The Book of Changes shows the images of events and also the unfolding of conditions *in statu nascendi.* Thus, in discerning with its help the seeds of things to come, we learn to foresee the future as well as to understand the past. In this way the images on which the hexagrams are based serve as patterns for timely action in the situations indicated. Not only is adaptation to the course of nature thus made possible, but in the Great Commentary (pt. II, chap. II), an interesting attempt is made to trace back the origin of all the practices and inventions of civilization to such ideas and archetypal images. Whether or not the hypothesis can be made to apply in all specific instances, the basic concept contains a truth.[16]

The third element fundamental to the Book of Changes are the judgments. The judgments clothe the images in words, as it were; they indicate whether a given action will bring good fortune or misfortune, remorse or humiliation. The judgments make it possible for a man to make a decision to desist from a course of action indicated by the situation of the moment but harmful in the long run. In this way he makes himself independent of the tyranny of events. In its judgments, and in the

16. Cf. the extremely important discussions of Hu Shih in *The Development of the Logical Method in Ancient China* (2nd edn., New York: Paragon, 1963), and the even more detailed discussion in the first volume of his history of philosophy [*Chung-kuo chê-hsüeh-shih ta-kang*; not available in translation].

interpretations attached to it from the time of Confucius on, the Book of Changes opens to the reader the richest treasure of Chinese wisdom; at the same time it affords him a comprehensive view of the varieties of human experience, enabling him thereby to shape his life of his own sovereign will into an organic whole and so to direct it that it comes into accord with the ultimate tao lying at the root of all that exists.

2. THE HISTORY OF THE BOOK OF CHANGES

In Chinese literature four holy men are cited as the authors of the Book of Changes, namely, Fu Hsi, King Wên, the Duke of Chou, and Confucius. Fu Hsi is a legendary figure representing the era of hunting and fishing and of the invention of cooking. The fact that he is designated as the inventor of the linear signs of the Book of Changes means that they have been held to be of such antiquity that they antedate historical memory. Moreover, the eight trigrams have names that do not occur in any other connection in the Chinese language, and because of this they have even been thought to be of foreign origin. At all events, they are not archaic characters, as some have been led to believe by the half accidental, half intentional resemblances to them appearing here and there among ancient characters.[17]

The eight trigrams are found occurring in various combinations at a very early date. Two collections belonging to antiquity are mentioned: first, the Book of Changes of the Hsia dynasty,[18] called *Lien Shan*, which is said to have begun with the hexagram Kên, KEEPING STILL, mountain; second, the Book of Changes dating from the Shang dynasty,[19] entitled *Kuei Ts'ang*, which began with the hexagram K'un, THE RECEPTIVE. The latter circumstance is mentioned in passing by Confucius himself as a historical fact. It is difficult to say whether the names of the sixty-four hexagrams were then in existence, and if so, whether they were the same as those in the present Book of Changes.

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17. Question has centered especially upon the trigram K'an (☵), which resembles the character for water, *shui* (水).

18. [According to tradition, 2205–1766 B.C.]

19. [According to tradition, 1766–1150 B.C.]

According to general tradition, which we have no reason to challenge, the present collection of sixty-four hexagrams originated with King Wên,[20] progenitor of the Chou dynasty. He is said to have added brief judgments to the hexagrams during his imprisonment at the hands of the tyrant Chou Hsin. The text pertaining to the individual lines originated with his son, the Duke of Chou. This form of the book, entitled the Changes of Chou (*Chou I*), was in use as an oracle throughout the Chou period, as can be proven from a number of the ancient historical records.

This was the status of the book at the time Confucius came upon it. In his old age he gave it intensive study, and it is highly probable that the Commentary on the Decision (*T'uan Chuan*) is his work. The Commentary on the Images also goes back to him, though less directly. A third treatise, a very valuable and detailed commentary on the individual lines, compiled by his pupils or by their successors, in the form of questions and answers, survives only in fragments.[21]

Among the followers of Confucius, it would appear, it was principally Pu Shang (Tzŭ Hsia) who spread the knowledge of the Book of Changes. With the development of philosophical speculation, as reflected in the Great Learning (*Ta Hsüeh*) and the Doctrine of the Mean (*Chung Yung*),[22] this type of phi-

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20. [King Wên was the head of a western state that suffered oppression from the house of Shang (Yin). He was given the title of king posthumously by his son Wu, who overthrew Chou Hsin, took possession of the Shang realm, and became the first ruler of the Chou dynasty, which in traditional chronology is dated 1150–249 B.C.]

21. Some are in the section known as the *Wên Yen* [Commentary on the Words of the Text], some in the *Ta Chuan* [Great Commentary]. [Cf. p. *xix*.]

22. [The Great Learning presents the Confucian principles concerning the education of the "superior man," based on the view that innate within man are the qualities that when developed guide him to a personal and a social ethic. The Doctrine of the Mean shows that the "way of the superior man" leads to harmony between heaven, man, and earth. Both of these works belong to the school of thought led by Tzŭ-ssŭ, grandson of Confucius. They originally formed part of the *Li Chi*, the Book of Rites. Under the titles *Ta Hsio* and *Kung Yung* they can be found as bks. 39 and 28 in Legge's translation of the Book of Rites (*The Sacred Books of the East*, XXVII: *The Li Ki*, Oxford, 1885).]

losophy exercised an ever increasing influence upon the interpretation of the Book of Changes. A literature grew up around the book, fragments of which—some dating from an early and some from a later time—are to be found in the so-called Ten Wings. They differ greatly with respect to content and intrinsic value.

The Book of Changes escaped the fate of the other classics at the time of the famous burning of the books under the tyrant Ch'in Shih Huang Ti. Hence, if there is anything in the legend that the burning alone is responsible for the mutilation of the texts of the old books, the *I Ching* at least should be intact; but this is not the case. In reality it is the vicissitudes of the centuries, the collapse of ancient cultures, and the change in the system of writing that are to be blamed for the damage suffered by all ancient works.

After the Book of Changes had become firmly established as a book of divination and magic in the time of Ch'in Shih Huang Ti, the entire school of magicians (*fang shih*) of the Ch'in and Han dynasties made it their prey. And the yin-yang doctrine, which was probably introduced through the work of Tsou Yen,[23] and later promoted by Tung Chung Shu, Liu Hsin, and Liu Hsiang,[24] ran riot in connection with the interpretation of the *I Ching*.

The task of clearing away all this rubbish was reserved for a great and wise scholar, Wang Pi,[25] who wrote about the meaning of the Book of Changes as a book of wisdom, not as a book of divination. He soon found emulation, and the teachings of the yin-yang school of magic were displaced, in relation to the book, by a philosophy of statecraft that was gradually developing. In the Sung[26] period, the *I Ching* was used as a basis for the *t'ai chi t'u* doctrine—which was probably not of Chinese origin—until the appearance of the elder Ch'êng Tzŭ's[27] very good commentary. It had become customary to separate the old commentaries contained in the Ten Wings and to place them with the individual hexagrams to which they refer. Thus

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23. [Fourth century B.C.]
24. [All three are Han scholars.]
25. [A.D. 226–249.]
26. [A.D. 960–1279.]
27. [Ch'êng Hao, A.D. 1032–1085.]

the book became by degrees entirely a textbook relating to statecraft and the philosophy of life. Then Chu Hsi[28] attempted to rehabilitate it as a book of oracles; in addition to a short and precise commentary on the *I Ching*, he published an introduction to his investigations concerning the art of divination.

The critical-historical school of the last dynasty also took the Book of Changes in hand. However, because of their opposition to the Sung scholars and their preference for the Han commentators, who were nearer in point of time to the compilation of the Book of Changes, they were less successful here than in their treatment of the other classics. For the Han commentators were in the last analysis sorcerers, or were influenced by theories of magic. A very good edition was arranged in the K'ang Hsi [29] period, under the title *Chou I Chê Chung*; it presents the text and the wings separately and includes the best commentaries of all periods. This is the edition on which the present translation is based.

3. THE ARRANGEMENT OF THE TRANSLATION

An exposition of the principles that have been followed in the translation of the Book of Changes should be of essential help to the reader.

The translation of the text has been given as brief and concise a form as possible, in order to preserve the archaic impression that prevails in the Chinese. This has made it all the more necessary to present not only the text but also digests of the most important Chinese commentaries. These digests have been made as succinct as possible and afford a survey of the outstanding contributions made by Chinese scholarship toward elucidation of the book. Comparisons with Occidental writings,[30] which frequently suggested themselves, as well as

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28. [A.D. 1130–1200.]

29. [A.D. 1662–1722.]

30. [A number of footnote quotations from German poetry, chiefly passages from Goethe, have been omitted in the English rendering because their poetic suggestiveness disappears in translation.]

views of my own, have been introduced as sparingly as possible and have invariably been expressly identified as such. The reader may therefore regard the text and the commentary as genuine renditions of Chinese thought. Special attention is called to this fact because many of the fundamental truths presented are so closely parallel to Christian tenets that the impression is often really striking.

In order to make it as easy as possible for the layman to understand the *I Ching*, the texts of the sixty-four hexagrams, together with pertinent interpretations, are presented in book I. The reader will do well to begin by reading this part with his attention fixed on its main ideas and without allowing himself to be distracted by the imagery. For example, he should follow through the idea of the Creative in its step-by-step development—as delineated in masterly fashion in the first hexagram—taking the dragons for granted for the moment. In this way he will gain an idea of what Chinese wisdom has to say about the conduct of life.

The second and third books explain why all these things are as they are. Here the material essential to an understanding of the structure of the hexagrams has been brought together, but only so much of it as is absolutely necessary, and as far as possible only the oldest material, as preserved in the Ten Wings, is presented. So far as has been feasible, these commentaries have been broken down and apportioned to the relevant parts of the text, in such a way as to afford a better understanding of them—their essential content having been made available earlier in the commentary summaries in book I. Therefore, for one who would plumb the depths of wisdom in the Book of Changes, the second and third books are indispensable. On the other hand, the Western reader's power of comprehension ought not to be burdened at the outset with too much that is unfamiliar. Consequently it has not been possible to avoid a certain amount of repetition, but such reiteration will be of help in obtaining a thorough understanding of the book. It is my firm conviction that anyone who really assimilates the essence of the Book of Changes will be enriched thereby in experience and in true understanding of life.

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