

EC(h)O: New Media Meets the Environment

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If the old science of instrumental operationalism is behind the domination of Nature and humanity in the abstract machines of industrial environments, then perhaps a new art-scientific practice, linked not to a metaphysics of domination but rather to a metaphysics of liberation, might well offer a new sensibility not yet reached.

Timothy Luke, *Ecocritique* [1]

1.0 INTRODUCTION

1.1 Environmental Concerns

The environment is a thorny subject when it comes to technology. From trash eating genetically engineered organisms to plastic bags that biodegrade, advances in technology are curbing threats against our environment while simultaneously making us wary of their impact.

Within the art world, environmental concerns have long been prevalent topics for creative expression. As technological art practices gain acceptance, contemporary artists are questioning how our physical and digital lives interact. The natural world has become the perfect antidote for false expectations of technological utopia.

1.2 Unearthing Questions

From some of the earliest [modern] environmental art in the 1960's such as Robert Smithson's "Spiral Jetty" or Christo's wrapped islands, there has been a desire and challenge to both display the natural beauty of our environment while simultaneously critiquing its use. [2]

Fusing technology with ecological art unearths questions relating to how technology can illuminate environmental issues that too often go unnoticed. What is technology's role in conserving nature? How does questioning reality - either virtual or real - help us improve our relationship with the natural world? In what constructive ways can technology reveal and support nature? How can technology enable communication about ecological conservation between people over distance?

2.0 SCIENCE ART

2.1 Artists Interest in Ecology

Many science-based artists are attracted to the interdisciplinary nature of ecology. They see opportunities to elevate environmental consciousness and critique through making art. They strive to shape a new aesthetic. Their new sensibility combines a visual sense of place, a willingness to physically map living matter, an active engagement in public life, and an eagerness to invent new syntheses of science, action and art. [3]

2.2 Sound Mapping

Iain Mott is a sound artist who makes computer-based, interactive urban installations. His work examines the physical relationships of participants with sound, sometimes placing them in performance roles or drawing their attention to their own physicality within an acoustic urban space. In *Sound Mapping: An Assertion of Place*, Iain Mott makes use of GPS technology to customize the sound that participants hear based on their changing physical position in outdoor locations [See Fig. 1]. Pedestrians interact with a composition that is anchored in a geographi-

cal space. Sound-generating suitcases equipped with motion detectors and GPS capability are moved through a pre-determined tonal space. Sensors in the suitcases register the speed and quality of the movement as well as their positions in space. By means of these parameters, the users control the music while they stroll with their suitcases through the urban landscape.

Fig. 1. Sound Mapping

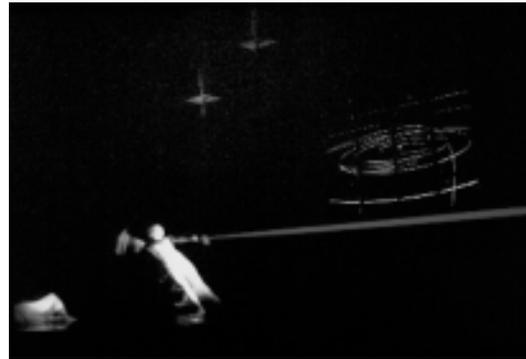


2.3 Translated Terrains

Starting in 1979, Michael Heivly worked on a series of sculptures that translated terrain into sound events and microwave transmission. These transmissions were beamed at particular constellations and would retain their form for millennia. Similar to Sound Mapping, later works included the audience as participants. Heivly notes that technology has helped alienate people from their physical surroundings and he works to reestablish that relationship. [4]

Heivly has spent the past two decades developing the concept of micro-waves as sculptural volumes in deep space. Through numerous collaborations, individual exhibitions and performances, he has succeeded in blending computer technology, electronic music, performance and sculpture into a new and innovative artistic form. In *Deep Space Site Transmission*, Heivly produced a series of sculptures that translated terrain into sound events and microwave transmission [See Fig 2].

Fig. 2 *Deep Space Site Transmission*



2.4 DED [Digital Equals Dirty]

As most of us become more digitally active and agile, there is a tendency to think that digital equals clean. With computers we eliminate the need for paper, cataloging systems, and our offices and homes become more streamlined. Subverting this notion are artists who change our relationship to the digital objects we consume and interact with everyday.

Looking at environmental pollutants in home computers and distributed networks, Australian research scientist and techno-artist Natalie Jerimijenko's work challenges our assumptions about the cleanliness of "digital lifestyles". Her project, STUMP infiltrates your computer's printer queue keeping track of how many pages you've printed. As time goes by, the software agent prints out a tree ring representing how much of a tree you've consumed. In her work, "Bang Bang", Jerimijenko set up webcams at specific environmental sites where data collected from the site triggers the camera to take video clips. For example, a camera resting at New York's Fresh Kills landfill is activated by a radioactivity threshold meter. Similarly, she attached a crude Co2 meter to the serial port so that virtual trees on the desktop grow in proportion to Co2 readings in the room.

2.5 N/A [Natural vs. Artificial]

As technology gains ubiquity in our everyday lives, the natural and artificial blur. Cross-disciplinary artists are looking at how we can create hybrid spaces where digital and analog worlds exist in tandem within a sustainable architecture.

For example, located in the hills of Scotland, MacroLAB functions as a fully autonomous research, communications, housing and creative unit. Its premise is built on the idea that sustainable architecture can fuse with digital practice to provide a haven for collaboration within a self-contained shell. Since our connected lives require more infrastructure everyday, the MacroLAB project proves that our digital lives can exist in a resource-free world where reliance on oneself is the only option.

Moving from building a sustainable ecosystem on land to within the computer, The Bank of Time installation is a screensaver that uses idle time to grow virtual plants on the desktop [See Fig. 3]. Akin of STUMP, this simple project gives nature a dependency on virtual activities where only when we take a break from using computers will growth occur. Despite the fact that the plants are “virtual”, the project illuminates the struggle for balance between interacting with both natural and artificial worlds.

Fig. 3 *The Bank of Time*



2.6 Reactions to Ecological Disasters

Technological art practices tend to be more accessible to a mass audience since they often have a networked component. As ecological disasters hit, artists respond by creating environmentally conscious works that highlight, frame, and report these events as global phenomena.

For example, reacting to a Russian tanker's major oil spill of the coast of Japan, digital artist, Maki Ueda created Spilt Oil Project [See Fig. 4]. Taking photos of the effected areas, Ueda then printed

them on large pieces of fabric and placed them in pattern formations on beaches along the southern coast of Japan. Ueda features a map of Japan with flags representing the beaches where the fabric was displayed along with the effected areas from the spill.

Fig. 4 *Spilt Oil Project, Maki Ueda*



Similarly, reacting to the disposal of hazardous waste, Ocean Landmark by NYC- based artist Betty Beaumont is an interactive 3D rendering of an ecological art project. As a diver, she appreciated the wildlife of the ocean and sought appropriate ways to preserve that habitat. In 1980, Beaumont dumped 500 tons of processed coal-waste into the sea, 40 miles from the New York Harbor to create a new underwater ecosystem that would create a “fish haven”. In collaboration with biologists, chemists, oceanographers, and engineers, she also developed a special hydrophone technology to monitor the ecosystem. The technological realization of this project exists as a VRML world that recreates the experience of the blocks falling onto the sea floor.

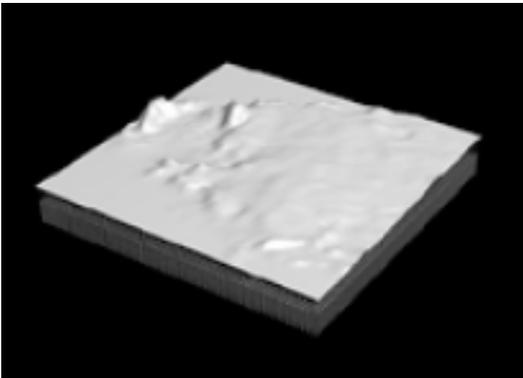
2.7 Digital Representations of Nature

As technological art practices shift from screen-based to physical installations the potential for ecological art becomes more varied. By using natural landscapes from a particular environment, art can flourish by being not-only site-specific but also ecologically sensitive.

In 1968, Jack Burnham promoted the idea that exploring systems was one of the most significant trends in art [5]. In Terrain Machine John Klima systematically scores ecological phenomena. This art project is an analog mechanical device inter-

faced to a computer that creates a physical recreation of the Earth's surface [See Fig. 5]. A continuation of his "Earth" simulation, an interactive geo-spatial visualization system that takes real-time satellite data from the Internet and maps it onto a 3D model of the Earth's surface, "Terrain Machine" looks at how one can represent ecological data in physical form. It is an aesthetic investigation of the world as it currently exists, relying on scientific data in addressing the representation and construction of reality in its various forms.

Fig. 5 *Terrain Machine, John Klima*

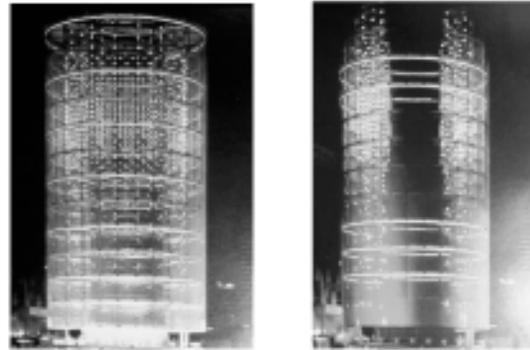


3.0 SCIENCE ARCHITECTURE

3.1 *New Media and the Environment*

These science-based ecological art projects make useful references as we try to understand a growing body of architectural work that lies at the intersection of new media and ecology. To cite a familiar example, The Tower of Winds project by Toyo Ito is one of three media spaces developed over a five-year period [See Fig. 6]. This project is not a building per se but rather an uninhabitable camouflage, the renovation of a 21-meter existing tower in front of the Yokohama train station used to ventilate an underground shopping area. Acrylic mirror plates cover the existing tower, while an oval cylinder of 9 meters by 6 meters formed of perforated aluminum encloses a regular system of 12 neon rings, 30 floodlights, and 1280 mini-lamps.

Fig. 6 *Tower of Winds, Toyo Ito*



In daylight, the tower is a silvery totem; its aluminum skin reflects light and accentuates the cylindrical structure, while the raking light renders the tower opaque. At night the light is modulated, as the patterns of light are subject to variations in the immediate surroundings, through the direction and velocity of the wind. In this way, changes in the environment effect changes in the object itself, as it is transformed from transparency to opacity depending on the effects of lighting. Within this project, Ito is able to explore the possibility of informal fluctuation as a means to deform physicality. The tower is figuratively demolished by the intrusion of media. The informational significance occurs not at any particular junction or condition of the tower – not in the capacity to "read" the relative temperature or wind velocity at any particular moment, but in the changes in conditions from one state to another.

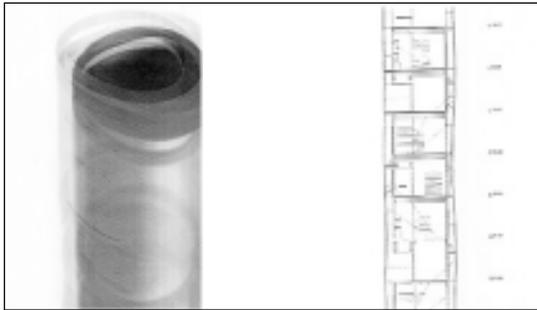
The intention, according to architect Toyo Ito, "was to extract the flow of air and noise from the general flow of things in the environment and to transform them into light signals - that is to convert the environment into visual information, and thus heightening one's awareness of the environment around them."

3.2 *Registrations, Reverberations*

The idea of deformation through registration of various phenomena is the subject of an urban park southeast of Madrid. Following the dictum, "form follows energy," the young Spanish firm Cero9 proposes small temporary work-spaces, encouraging contact with nature and observation of the physical environment [See Fig. 9]. These slender constructions rise up like thin columns of smoke, seeking close relations between them and offering

a territorial readability of the environment. [6] The maximum slenderness of the buildings – about 250 square feet per floor - helps to minimize both the use of the land and the impact on the environment and the water table, while the random configurations of the towers vary in accordance with the site, exposure to the sun and the prevailing winds.

Fig. 9 Phenomenal Porous Skin, Cero9



A thick and porous skin forms the envelope of the towers, and there is an intermediary space which thermally regulates and ventilates the interiors in summer while it captures and accumulates heat in winter. Through its hollow spaces air circulates as a result of different pressures with minimum energy consumption: the towers work like chimneys and give form to the wind. In this in-between area there is also a spiral stairway, electrical and plumbing services, which becomes gradually wider as it passes and differentiates the floors.

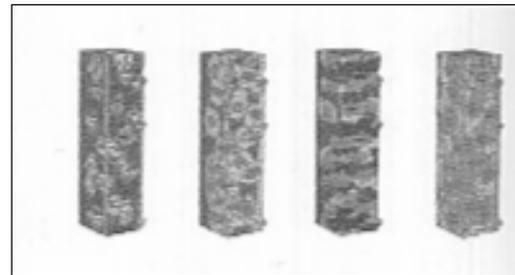
The outer envelope is made of transparent cellular recycled plastic whose color reflects the variable hue of the sky. The overlaying of these skins distorts our perception of the silhouette; it is blurred and sketchy, reflecting the ephemeral and transitory purpose of the project.

3.3 Building Reactor

For Francois Roche, strategies of sensing and morphing gives rise to endless transformations of architecture in which the standard object/subject, object/territory polarities are abolished. The [Un]Plug Building was a commission from the Research and Development division of the French national electricity supplier, EDF, for a block of 352 offices and 22 conference rooms. Each floor needed to have 16 offices per floor and 23 floors totaling 9,839 square meters. The project operates as a

kind of network along the lines of what the German automobile industry is doing with its concept cars that “react” on contact with renewable energies [See Fig. 10]. Hairy with solar sensors and swollen with photovoltaic cells, this curtain wall façade, far from the banal glass skins of the past, is an all energy-producing membrane. Thus the architecture simultaneously consumes and generates energy for injection into the network. Moreover, the building sets out to introduce work-related domestic-style practices. In a world of de-localized work spawned by new technologies, two systems have intersected: one involves working at home and the other is sleeping at the office.”

Fig. 10 [Un]Plug Project, Francois Roche



This off-the-grid and then on-again project is based on the transformation of a standard type of tall office building via contact with renewable energy, using vacuum-tube solar sensors and single-crystal photovoltaic panels. Thus the façade becomes “reactive” to the new energy input. Several processes are involved: 1) incorporation of excrescences with resultant swelling of the buildings skin. Programmatically these contain the conference rooms and include 400 square meters of photovoltaic panels for electricity supply; 2) creation of a hairy wall allowing for implantation of 4,500 linear meters of tubular solar sensors, for heating; 3) integration of plumbing and electricity systems into the structure of the curtain wall allowing for exchanges within the building; 4) disconnecting the building from the ground, utilizing the plug or unplugged mode in relation to the urban electrical network.

3.4 Liquid Architecture

For studio NOX, the dividing lines between the built environment and the realm of media are not only becoming evermore vague but the distinction be-

tween direct physical action and remote control is similarly fading. The multi-disciplinary firm, who works with various media simultaneously, producing videos, essays, books, magazines, websites, and multi-media installations, is fascinated by these developments.

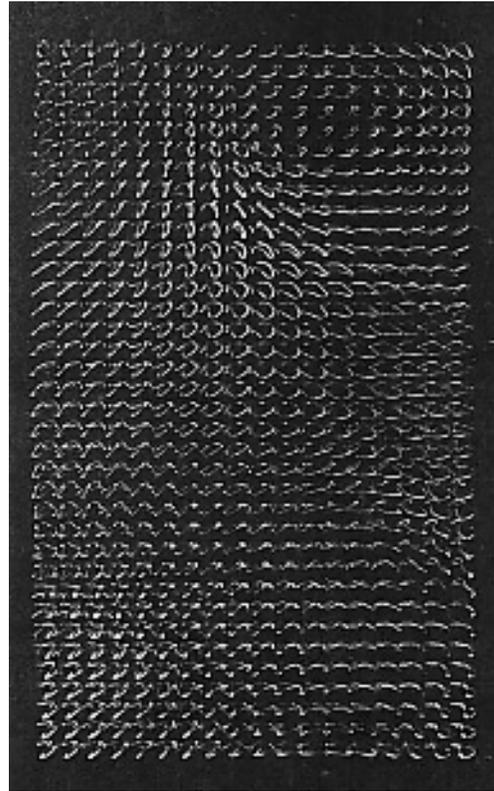
NOX refers to the H2O eXPO pavilion as a “rolled up urban square.” The project is a permanent structure and exhibition facility erected on Neetje Jans, an artificial island made to aid construction of a flood barrier. NOX designed the pavilion dedicated to freshwater. The form was generated on a computer using animation software and as such is a typical example of ‘liquid architecture.’

Unlike such designs though by other architects, it is not simply the form of the building that is fluid. Inside this public space, the visitor is confronted with the liquidity of water in numerous ways: the water flows and boils, there is mist and condensation, and some parts of the walls are so cold that a layer of ice builds up. The interior also contains sound and light effects, including projections of the molecular structure of water and of wave patterns. The public activates these wave patterns by passing light-sensitive cells, touching sensors or operating handles. NOX’s pavilion with its curvaceous silver exterior and media-filled interior is an event space on the ecological theme of wateriness, through which visitors must find their own way.

3.5 Registrations, Reverberations

According to Ernst Mayr, ecological analysis marks a revolutionary change in scientific thinking. [7] The analytical processes in mapping and morphing the environment has steered the Aegis Hyposurface and Hystera study by Mark Goulthourpe [See Fig. 7]. These kinetic art projects are comprised of faceted metallic surfaces that reverberates and reconfigures in real-time, registering multiple environmental phenomena - light, wind, and temperature. [8]

Fig. 7 Hystera, Mark Goulthroupe



3.6 SmartWrap

This design research may not be that far from real-world use as new partnerships form between architects, chemists, artists, and scientists, and the building and materials industry.

Designed by the Philadelphia architecture firm of Kieran+Timberlake in consultation with Dupont Industries, SmartWrap is a new micro-thin, advanced composite fabric that incorporates existing and emerging technologies in heating and cooling, visual display and lighting and energy collection [See Fig. 8]. Technology needed for shelter, insulation, lighting and other functions is literally printed onto and adhered directly onto a single composite film. [9]

Still in its R+D stages, SmartWrap is a fabric-based, phase-change material that incorporates ultra-thin solar panels to collect energy and flat chemical batteries to store it. This technology is already used in skiing socks and some forms of drywall to help control temperature.

Fig. 8 SmartWrap, Kieran+Timberlake



A polyester film substrate protects the material from rain and wind. To moderate temperature, SmartWrap contains micro-capsules of phase change materials that are embedded into a polymer resin and then extruded into a film. They provide latent heat storage for thermal moderation by absorbing, storing, or releasing heat as they change state. For lighting and information display, SmartWrap uses Organic Light Emitting Diode (OLED) technology that is based on organic molecules that emit light when an electric current is applied. And for power, it relies on solar energy that is collected in thin film silicon solar cells. This energy is then used to power the OLED technology. According to the architect, the diodes could display any pattern or image desired - the facade of Mount Vernon to an advertisement.

4.0 CONCLUSION

Technology serves not only the dissemination of information and meaning across distance and time, but also allows for insight into the hybridization of the natural and artificial. [10] The collection of the works above is meant to produce a starting point for understanding the increasing importance of how ecological practices and technological innovation in the production of art and architecture can exist as complimentary acts toward a sustainable future.

In an age of digital ubiquity, there is a fear of leaving behind the natural world. Before we attempt to preserve our natural habitat, we must first be aware of how we are affecting it. By creating work that illuminates how our technological existence directly relates to environmental responsibilities, artists and architects are building a new art-scientific practice, one linked "not to a metaphysics of

domination but rather to a metaphysics of liberation." All of the works shown here seek to reduce the friction that stands between artifacts, their inert built environments and their dynamic natural counterpart [11]. At the foot of all of this creative action is new terrain between the arts and sciences - between new media and ecology - in ways that are just beginning.

REFERENCES

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- [2] See Mary Miss, "On a Redefinition of Public Sculpture," *Harvard Architectural Review*, (Cambridge: Harvard Press), 1990, p. 53.
- [3] Wilson, Stephen, *Information Arts: Intersection of Art, Science and Technology*, (Cambridge: The MIT Press, 2002).
- [4] Ibid, p. 130.
- [5] Burnham, Jack, *Beyond Modern Sculpture* (New York: SUNY Press, 1994).
- [6] See Ralph Knowles, *Energy and Form, Adaptive Behavior in Nature*, pp.1-16, and Part Three: *The Shape and Structure of Buildings*, pp. 135-172, MIT Press, 1974.
- [7] Mayr, Ernst, *This is Biology: The Science of the Living World* (Cambridge: Belknap Press, 1997), p. 20.
- [8] Within the discourse of architecture, ecology arouses a historic paradox, since every act of building is inherently anti-ecological to the degree that it induces a "displacement" of natural relationships. Richard Ingersoll, "Second Nature," in *Reconstructing Architecture* (Tom Dutton and Lian Hurst Mann), 1996.
- [9] Klaus, Daniels, *The Technology of Ecological Building* [Berlin: Birkhauser Press, 2001]
- [10] See Marras, Amerigo, *Eco-Tec: Architecture of the Inbetween* (New York: Princeton Architectural Press,