ACSA Creative Achievement Award

2016-2017 Winner Submission Materials

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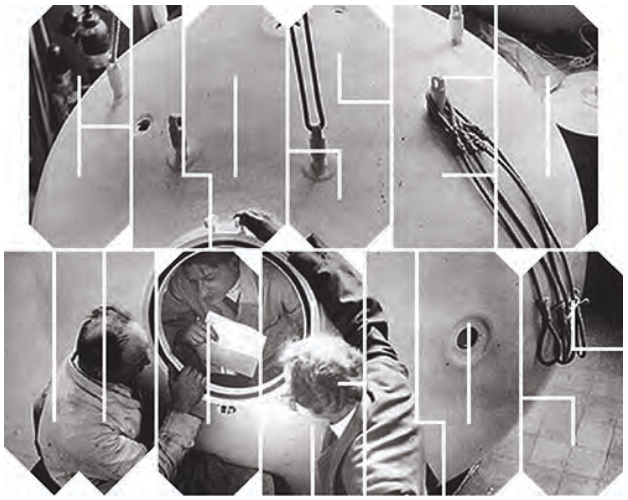
Rensselaer Polytechnic Institute



What do outer space capsules, submarines, and office buildings have in common? Each was conceived as a closed system: a self-sustaining physical environment demarcated from its surroundings by a boundary that does not allow for the transfer of matter or energy.

The history of twentieth century architecture, design, and engineering has been strongly linked to the conceptualization and production of closed systems. As partial reconstructions of the world in time and in space, closed systems identify and secure the cycling of materials necessary for the sustenance of life. Contemporary discussions about global warming, recycling, and sustainability have emerged as direct conceptual constructs related to the study and analysis of closed systems.

From the space program to countercultural architectural groups experimenting with autonomous living, Closed Worlds documents a disciplinary transformation and the rise of a new environmental consensus in the form of a synthetic naturalism, where the laws of nature and metabolism are displaced from the domain of wilderness to the domain of cities and buildings. While these ideas derive from a deeply rooted fantasy of architecture producing nature, Closed Worlds displays their integration into the very fabric of reality in our contemporary cities and buildings.

Closed Worlds, directed by Lydia Kallipoliti, features an archive of 41 historical living prototypes from 1927 to the present that put forth an unexplored genealogy of closed resource regeneration systems. Prototypes are presented through unique discursive narratives with historical images, and each includes new analysis in the form of a feedback drawing that problematizes the language of environmental representation by illustrating loss, derailment, and the production of new substances and atmospheres. Each drawing displays a feedback loop, wherein man's physiology of ingestion and excretion becomes the combustion device of an organizational system envisioned for humans, animals, and other live species. The moments of failure portrayed when closed worlds escape the designed loop cycles raise a series of questions about the ontology of autonomous enclosures. An adjacent display of speculative projects reflects upon a parallel historical narrative of enclosed spaces, figures of man, and legislation related to closed systems. An expanded lexicon on environmental history derived from the study of the 41 prototypes is included in the book and expanded online at www.closedworlds.net

01 EXHIBITION

CLOSED WORLDS | Curated by Lydia Kallipoliti
Storefront for Art & Architecture, New York | February 16- April 9, 2016
http://storefrontnews.org/programming/closed-worlds/

02 BOOK

CLOSED WORLDS, Or, What is the Power of Shit? | by Lydia Kallipoliti
Forthcoming Book by Lars Muller (October 2017)

03 CONFERENCE

CLOSED WORLDS; ENCOUNTERS THAT NEVER HAPPENED
The Cooper Union | New York | February 27, 2016
http://storefrontnews.org/programming/closed-worlds-encounters-that-never-happened/

04 ONLINE LEXICON

An online lexicon of environmental history derivative from the CLOSED WORLDS archive
www.closedworlds.net

05 VIRTUAL REALITY

SOME WORLD GAMES | by Farzin Farzin
An immersive environment reinterpreting the CLOSED WORLDS archival material

06 PUBLICATIONS + COURSES

Publications by Lydia Kallipoliti in Volume + Architectural Theory Review
Courses Taught by Lydia Kallipoliti at Syracuse University+Rensselaer Polytechnic Institute


1974
CAN NEW MATERIALS THE ENERGY PROFILE SUBURBAN HOMES?
DOES ENERGY
IFFICIENCY PA
IETAL STRUCT
SUSTAIN
EATING
TAIL?
SPACE?
OWN TO EARTH?
17 GOBAR BIO-GAS
19 MAN + EXOSKELETAL SYSTEM
20 ECOLOGICAL HOUSE
21 PRJECT OUROBOROS SOUTH
22 EARTH WORKSHOP
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CAN COW DUNG FUEL YOUR HOME?
DOES ENERGY SUFFICIENCY PROMISE SOCIETAL STRUCTURES?
A HOUSE SUSTAIN ITSELF BY EATING ITS OWN TAIL?
25 SUN-DWELLI

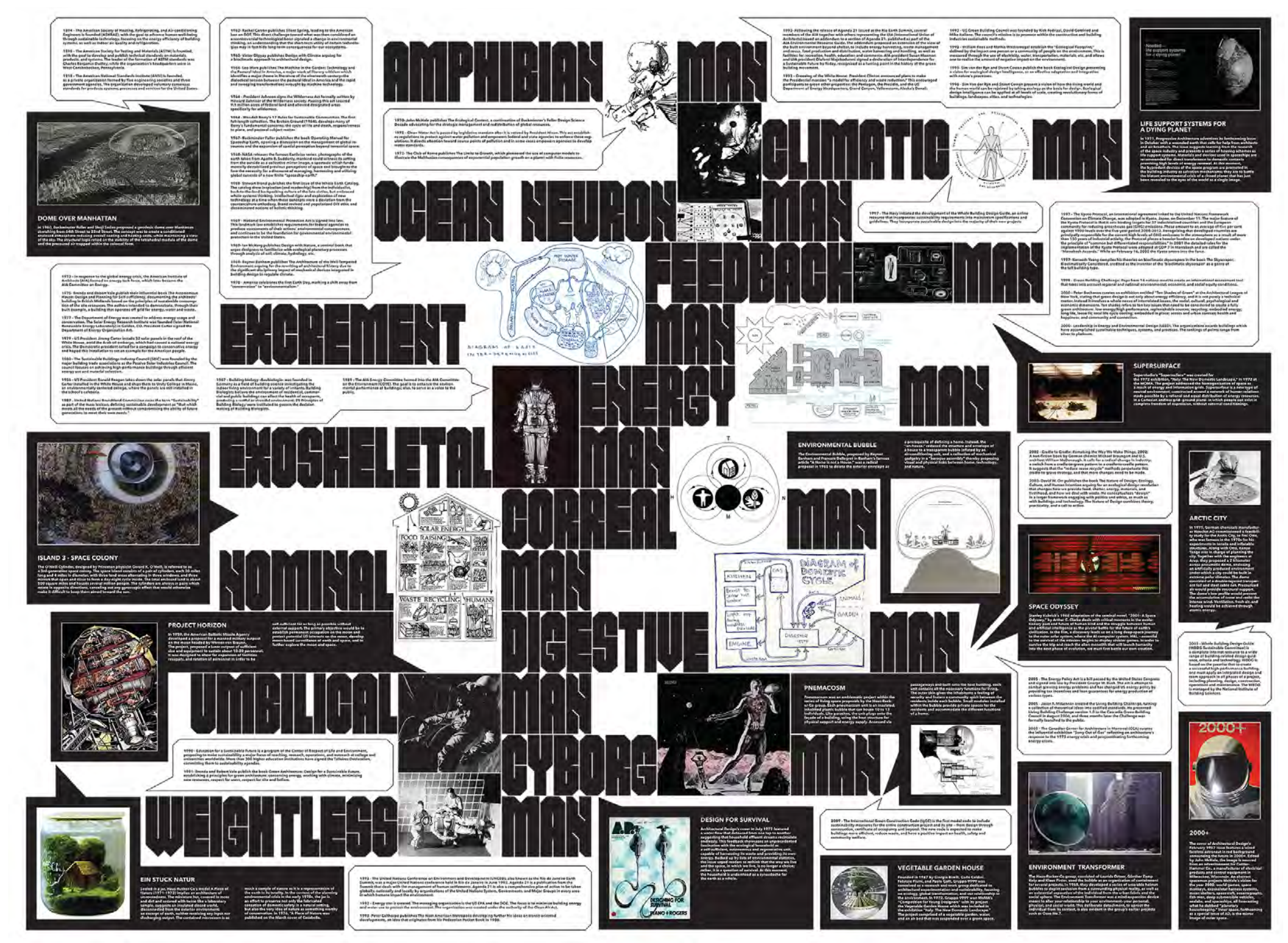

CAN MAN BECOME AMPHIBIAN?
IS A SPACESHIP HOUSE ON EARTH THE FUTURE?

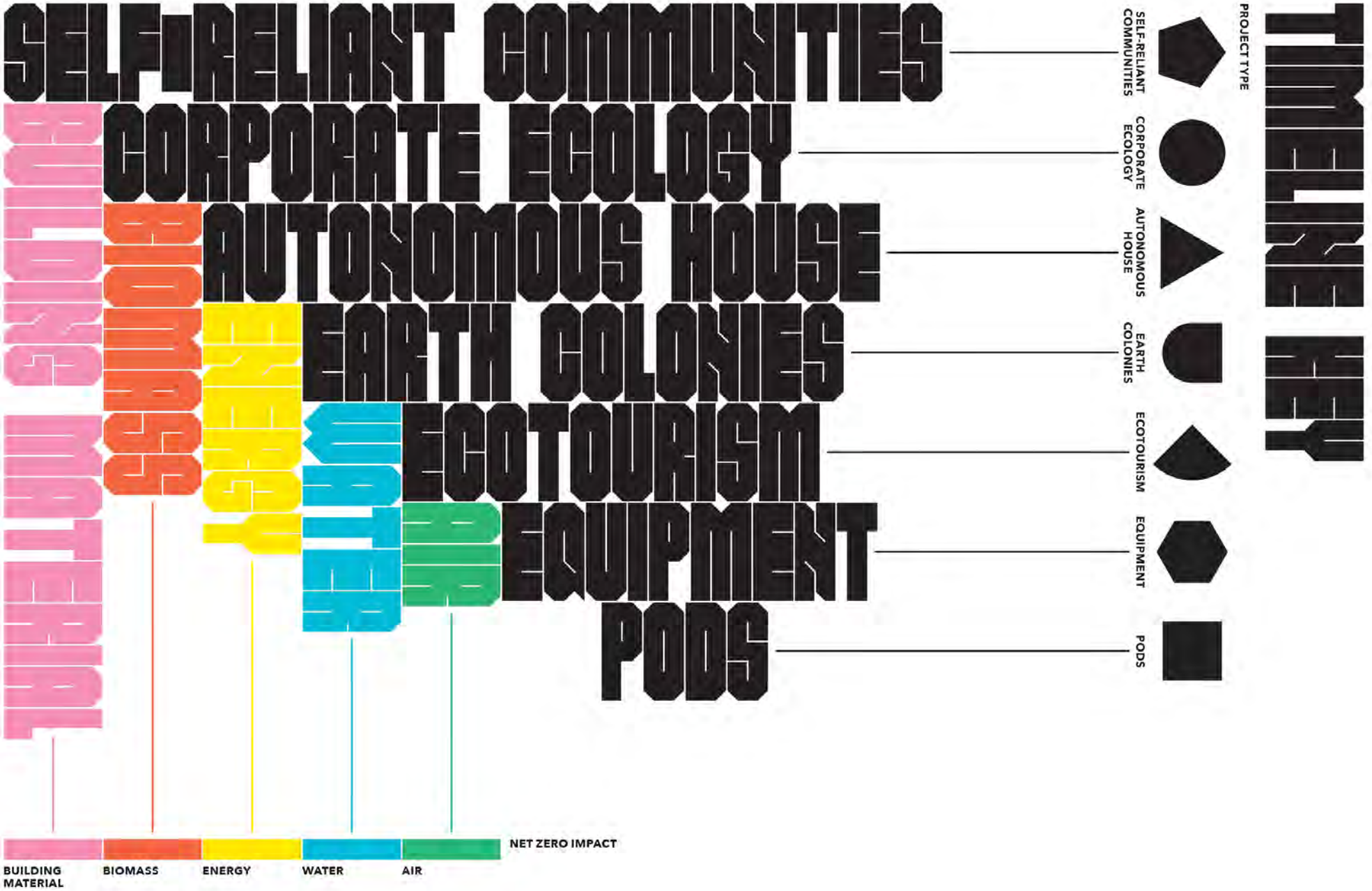

CAN A
BY ROBO
GERBILS SIMULATE


WHAT IS THE POWER OF SHIT?
STORE FRONT FOR ART & ARCHITECTURE

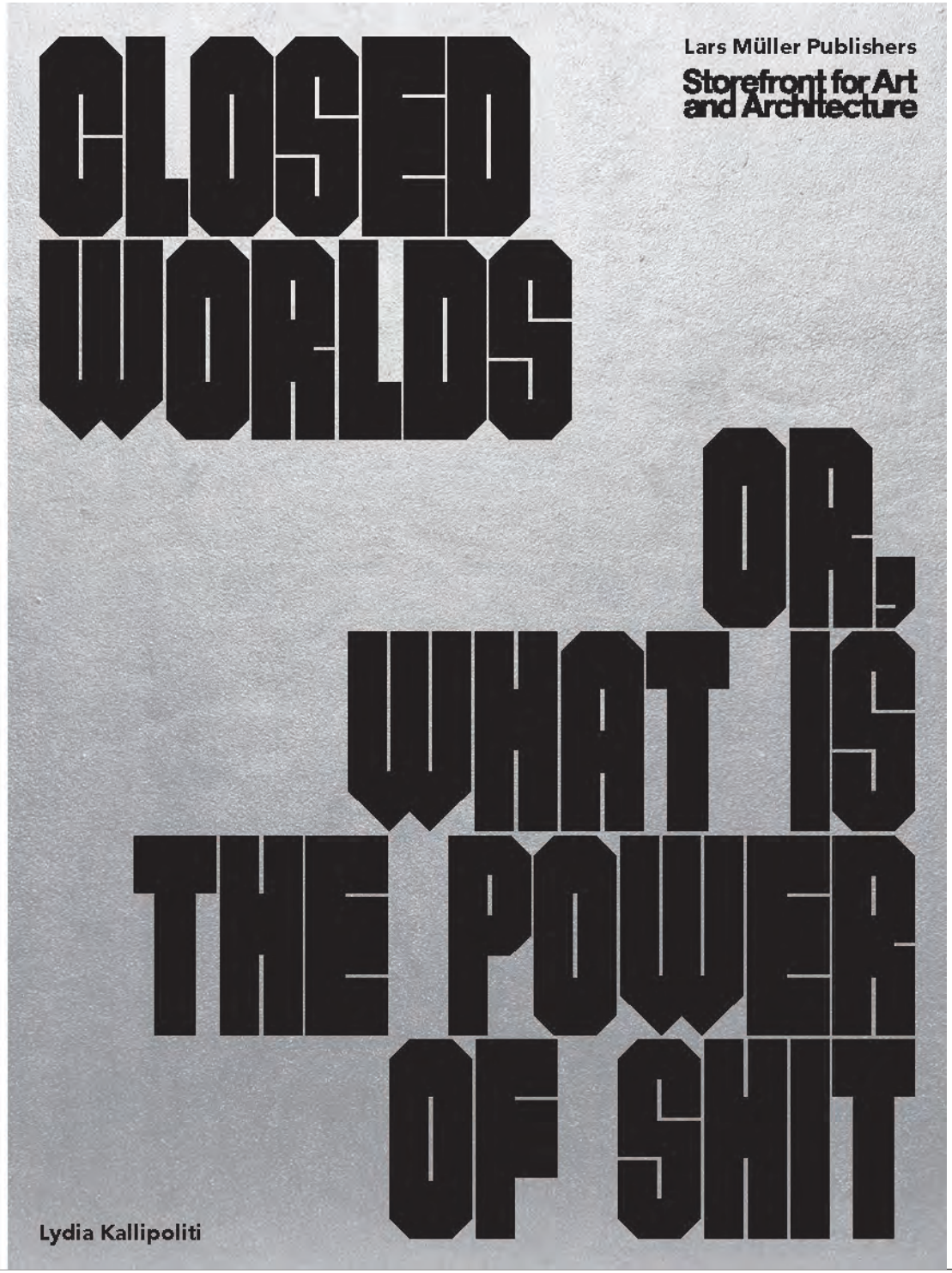
Storefront for Art and Architecture
97 KENMARE STREET NEW YORK NY 10012 TEL 212 431 5795 www.storefrontnews.org

FEBRUARY, 17— APRIL 9, 2016


AMPHIBIAN MAN
CLIMATIC MAN
OCEAN NEURON MAN
FEEDBACK MAN
ENCREMENT MAN
ENERGY MAN
ENDOSKELETAL MAN
CORREAL MAN
NOMINAL MAN
DIGESTIVE MAN
UMBILICAL MAN
CYBORG MAN
WEIGHTLESS MAN
1894 - The American Society of Heating, Refrigerating, and Air-conditioning Engineers is founded (ASHRAE), with the goal to advance human well-being through sustainable technology, focusing on the energy efficiency of building systems, as well as indoor air quality and refrigeration.
1898 - The American Society for Testing and Materials (ASTM) is founded, with the goal to develop and publish technical standards on materials, products, and systems. The leader of the formation of ASTM standards was Charles Benjamin Dudley, while the organization's headquarters were in West Conshohocken, Pennsylvania.
1918 - The American National Standards Institute (ANSI) is founded, as a private organization formed by five engineering societies and three government agencies. The organization developed voluntary consensus standards for products, systems, processes and services for the United States.
1962- Rachel Carson publishes Silent Spring, leading to the American ban on DDT. This direct challenge toward what was then considered an economic-critical technological force signaled a change in environmental thinking, an understanding that the short-term utility of certain technologies may in fact be long-term consequences for our ecosystems.
1965- Victor Olgyay publishes Design with Climate arguing for a bioclimatic approach to architectural design.
1966- Lee Marx publishes The Machine in the Garden: technology and the Pastoral Ideal in America, a major work of literary criticism which identifies a major theme in literature of the nineteenth century—the dialectical tension between the pastoral ideal in America and the rapid and sweeping transformations wrought by machine technology.
1964 - President Johnson signs the Wilderness Act formally written by Howard Zahniser of the Wilderness society. Passing this act secured 9.1 million acres of federal land and allowed designated areas specifically for wilderness.
1964 - Wendell Berry's 17 Rules for Sustainable Communities. The first full-length collection, The Broken Ground (1964), develops many of Berry's fundamental concerns: the cycle of life and death, responsiveness to place, and pastoral subject matter.
1967- Buckminster Fuller publishes the book Operating Manual for Spaceship Earth, opening a discussion on the management of global resources and the expansion of spatial perception beyond terrestrial space.
1968- NASA releases the famous Earthrise series photographs of the earth taken from Apollo 8. Suddenly, mankind could witness its setting from the outside as a collective mirror image, a spectacle which fundamentally destabilized previous perceptions of space and brought to the fore the necessity for a discourse of managing, harnessing and utilizing global controls of a new finite "spaceship earth."
1968- Stewart Brand publishes the first issue of the Whole Earth Catalog. The catalog drew inspiration (and readership) from the individualistic back-to-the-land backpacking culture of the late sixties, but embraced whole systems thinking, intellectual rigor, and exploration of new technology at a time when these concepts were a deviation from the counterculture orthodoxy. Brand evolved and popularized DIY ethic and disseminated notions of holistic thinking.
1969 - National Environmental Protection Acts signed into law. This landmark law establishes requirements for federal agencies to produce assessments of their actions' environmental consequences, and continues to be the foundation for governmental environmental protection in the United States.
1969- Ian Mckarg publishes Design with Nature, a seminal book that urges designers to familiarize with ecological-planetary processes through analysis of soil, climate, hydrology, etc.
1960- Eugene Eenhaus publishes The Architecture of the Well-Tempered Environment arguing for the rewriting of architectural history due to the significant disciplinary impact of mechanical devices integrated in building design to regulate climate.
1970 - Among celebrates the first Earth Day, marking a shift away from "conservation" to "environmentalism."
1970- John McHale publishes The Ecological Context, a continuation of Buckminster's Fuller Design Science Decade advocating for the strategic management and redistribution of global resources.
1972 - Clean Water Act is passed by legislative mandate after it is vetoed by President Nixon. This act establishes regulations to protect against water pollution and empowers federal and state agencies to enforce these regulations. It directs attention toward course points of pollution and in some cases empowers agencies to develop water standards.
1972- The Club of Rome publishes The Limits to Growth, which pioneered the use of computer models to illustrate the Malthusian consequences of exponential population growth on a planet with finite resources.
1992- Following the release of Agenda 21 issued at the Rio Earth Summit, several members of the AIA together with others representing the UIA (International Union of Architects) initiated an addendum to a section of Agenda 21, published as part of the AIA Environmental Resource Guide, the addendum proposed an extension of the view of the built environment beyond shelter, to include energy harvesting, waste management and reuse, food production and distribution, water harvesting and handling, as well as the social, cultural and economic dimensions of architecture and urban design. Both AIA and UIA president Chris Abel, architecture and energy consultant Ken Yeang, and director of Interdisciplinary Center for a Sustainable Future by Today, recognized as a turning point in the history of the green building movement.
1993 - Greening of the White House: President Clinton announced plans to make the Presidential mansion "a model for efficiency and waste reduction." This encouraged participants to green other properties: the Pentagon, the Presidio, and the US Department of Energy Headquarters, Grand Canyon, Yellowstone, Alaska's Denali.
1992 - US Green Building Council was founded by Rick Fedrizzi, David Gottfried and Mike Italiano. The council's mission is to promote within the construction and building industries sustainable methods.
1992 - William Rees and Mathis Wackernagel exhibit the "Ecological Footprint," defined by the impact one person or a community of people on the environment. This is measured through the use of electricity, water, transportation, materials, etc, and allows one to realize the amount of negative impact on the environments.
1995- Sim Van der Ryn and Stuart Cowan publish the book Ecological Design presenting a claim for ecological design intelligence, or an effective adaptation and integration with nature's processes.
1998 - Jim Van der Ryn and Stuart Cowan present a vision of how the living world and the human world can be retained by taking ecology as the basis for design. Ecological design intelligence can be applied at all levels of scale, creating revolutionary forms of buildings, landscapes, cities, and technologies.
1997 - The Navy initiated the development of the Whole Building Design Guide, an online resource that incorporates sustainability requirements into mainstream specifications and guidelines. They incorporate sustainable design into the majority of their new projects.
1997 - The Kyoto Protocol, an international agreement linked to the United Nations Framework Convention on Climate Change, was adopted in Kyoto, Japan, on December 11. The major feature of the Kyoto Protocol is that it sets binding targets for 37 industrialized countries and the European community for reducing greenhouse gas (GHG) emissions. These amount to an average of five per cent against 1990 levels over the five-year period 2008-2012. Recognizing that developed countries are principally responsible for the current high levels of GHG emissions in the atmosphere as a result of more than 150 years of industrial activity, the Protocol places a heavier burden on developed nations under the principle of "common but differentiated responsibilities." In 2001 the detailed rules for the implementation of the Kyoto Protocol were adopted at COP 7 in Marrakesh and are called the "Marrakesh Accords." While on February 16, 2005 the Kyoto Protocol entered into force.
1997- Kenneth Yeang compiles his theories on bioclimatic skyscrapers in the book The Skyscraper, Bioclimatically Considered, credited as the inventor of the 'bioclimatic skyscraper' as a genre of the tall building type.
1998 - Green Building Challenge: More than 14 nations meet to create an international assessment tool that takes into account regional and national environmental, economic, and social equity conditions.
2000 - Peter Buchanan curates an exhibition entitled "Ten Shades of Green" at the Architectural League of New York, stating that green design is not only about energy efficiency, and is not a question of taste. Instead it involves a whole nexus of interrelated issues, the social, cultural, psychological and economic dimensions. Ten shades refer to ten key issues that need to be considered to create a fully green architecture: low energy/high performance, replenishable sources; recycling; embodied energy; long life, loose fit; total life cycle costing; embodied in place; access and urban amenity; health and happiness; and community and connection.
2000 - Leadership in Energy and Environmental Design (LEED), the organizations awards buildings which have accomplished sustainable techniques, systems, and practices. The rankings of points range from silver to platinum.
1972 - In response to the global energy crisis, the American Institute of Architects (AIA) formed an energy task force, which later became the AIA Committee on Energy.
1976- Brenda and Robert Vale publish their influential book The Autonomous House: Design and Planning for Self-sufficiency, documenting the architects' building in British Midlands based on the principles of sustainable consumption of the site resources. The author intended to demonstrate, through their built example, a building that operates off grid for energy, water and waste.
1977 - The Department of Energy was created to address energy usage and conservation. The Solar Energy Research Institute was founded (later National Renewable Energy Laboratory) in Golden, CO. President Carter signed the Department of Energy Organization Act.
1979 - US President Jimmy Carter installs 32 solar panels in the roof of the White House, amid the Arab oil embargo, which had caused a national energy crisis. The Democratic president called for a campaign to conservative energy and hoped this installation to set an example for the American people.
1980 - The Sustainable Buildings Industry Council (SBIC) was founded by the major building trade associations as the Passive Solar Industries Council. The council focuses on achieving high performance buildings through efficient energy use and material extraction.
1986 - US President Ronald Reagan takes down the solar panels that Jimmy Carter installed to the White House and ships them to Unity College in Maine, an environmentally centered college, where the panels are still installed in the school's cafeteria.
1987 - United Nations Brundtland Commission coins the term "Sustainability" as part of the mass lexicon, defining sustainable development as "that which meets all the needs of the present without compromising the ability of future generations to meet their own needs."
1987 - Building Biology -Baubiologie- was founded in Germany as a field of building science investigating the indoor living environment for a variety of irritants. Building Biologists believe the environment of residential, commercial and public buildings can affect the health of occupants, conducting a number of detailed environmental. 25 Principles of Building Biology were instituted to govern the decision making of Building Biologists.
1989 - The AIA Energy Committee formed into the AIA Committee on the Environment (COTE). The goal is to enhance the environmental performance of buildings also, to serve as a voice to the public.
1990 - Education for a Sustainable Future is a program of the Center of Respect of Life and Environment, proposing to make sustainability a major focus of teaching, research, operations, and outreach at college and universities worldwide. Over 300 higher education institutions have signed the Talloires Declaration, committing them to sustainability agendas.
1991- Brenda and Robert Vale publish the book Green Architecture: Design for a Sustainable Future, establishing 4 principles for green architecture: conserving energy, working with climate, minimizing new resources, respect for users, respect for site and holism.
1992 - The United Nations Conference on Environment and Development (UNCED), also known as the Rio de Janeiro Earth Summit, was a major United Nations conference held in Rio de Janeiro in June 1992. Agenda 21 is a publication from the Summit that deals with the management of human settlements. Agenda 21 is also a comprehensive plan of action to be taken globally, nationally and locally by organizations of the United Nations System, Governments, and Major Groups in every area in which humans impact the environment.
1992 - Energy star is created. The managing organization is the US EPA and the DOE. The focus is to minimize building energy and water use to protect the environment. The organization was created under the authority of the Clean Air Act.
1992- Peter Calthorpe publishes The Next American Metropolis developing further his ideas on transit-oriented developments, an idea that originates from his Pedestrian Pocket Book in 1989.
2009 - The International Green Construction Code (IgCC) is the first model code to include sustainability measures for the entire construction project and its site - from design through construction, certificate of occupancy and beyond. The new code is expected to make buildings more efficient, reduce waste, and have a positive impact on health, safety and community welfare.
DOME OVER MANHATTAN
In 1960, Buckminster Fuller and Shoji Sadao proposed a geodesic dome over Manhtiman stretching from 14th Street to 33rd Street. The concept was to create a conditioned enclosure atmosphere reducing snowfall costing and heating costs, while maximizing a view of the city. The structural logic relied on the stability of the tetrahedral modules of the dome and the pressured air trapped within the interior form.
ISLAND 3 - SPACE COLONY
The O'Neill Cylinder, designed by Princeton physicist Gerard K. O'Neill, is referred to as a 3rd generation space colony. The space island consists of a pair of cylinders, each 20 miles long and 4 miles in diameter, with three land areas alternating in three windows, and three mirrors that open and close to form a day-night cycle inside. The total enclosed land is about 500 square miles and houses several million people. The cylinders are always in pairs which serves in opposite directions, cancelling out any gyroscopic effect that would otherwise make it difficult to keep them aimed toward the sun.
PROJECT HORIZON
In 1959, the American Ballistic Missile Agency developed a proposal for a manned military outpost on the moon headed by Wernher von Braun. The project proposed a town center of sufficient size and equipment to sustain about 10-20 personnel. It was designed to allow for expansion of facilities, resupply, and rotation of personnel in order to be self-sufficient for as long as possible without external support. The primary objective would be to establish permanent occupation on the moon and construct potential US interests on the moon, thereby monitored surveillance of earth and space, and to further explore the moon and space.
EIN STUCK NATUR
Created in a jar, Hans Ruthen Co's model A Piece of Nature (1971-1972) implies an architecture of unencumbrance. The miniature hut, covered in moss and dirt and encased with twine like a laboratory sample, suggests an insulated closed world, disconnected from the exterior environment, an excerpt of earth, neither receiving any input nor discharging output. The contained microcosm is as much a sample of nature as it is a representation of the earth in its totality. In the context of the alarming environmental crisis in the early 1970s, the jar is an effort to preserve not only the fabricated cessation of domestic safety in a natural setting, but also the very idea of nature as something worthy of conservation. In 1976, 'A Piece of Nature was published on the Month cover of Casabella.
DESIGN FOR SURVIVAL
Architectural Design's cover in July 1977 featured a cover flow that detached from one top to another suggesting that household effluent streams recirculate endlessly. This feedback showcases an unprecedented fascination with the ecological household as a self-sufficient, autonomous and regenerative unit, capable of harnessing its waste and providing its own energy. Backed up by lists of environmental statistics, the cover's caged creature and recycling array are less about the creature within, as the living organism within, it is a symbol of survival. At this point in time the household is understood as a synecdoche for the earth as a whole.
ENVIRONMENTAL BUBBLE
The Environmental Bubble, proposed by Reyner Banham and Francois Dallegret in Banham's famous article "A Home is not a House," was a radical proposal in 1965 to divide the exterior envelope as a prerequisite of defining a home. Instead, the "un-house" released the structure and envelope of a house to a transparent bubble inflated by an airconditioning unit, and a collection of mechanical gadgetry in a "kenyon assembly" thereby proposing visual and physical links between home, technology, and nature.
PNEMACOSM
Pnemacosm was an emblematic project within the series of living space proposals by the Haus-Rucker-Co group. Each pneumacosm unit is an inflated inhabited plastic bubble that can house 10 to 12 individuals. Life provides, through plugs into the facade of a building, using the heat structure for physical support and energy supply. Accessed via passageways and built into the host building, each unit contains all the necessary functions for living. The outer skin gives the inhabitants a feeling of security and fosters a community spirit between the residents inside each bubble. Small modules installed within the bubble provide private spaces for the residents and accommodate the different functions of a home.
VEGETABLE GARDEN HOUSE
Founded in 1967 by Giorgio Birelli, Carlo Caldini, Fabrizio Fiumi, and Paolo Galli, Gruppo 9999 was conceived as a research and work group dedicated to architectural experimentation and nationalizability, focusing on ecology, global transformation, and our relationship to the environment. In 1972, Gruppo 9999 won MoMA's "Competition for Young Designers" with its project the Vegetable Garden House which was included in the exhibition "Italy: The New Domestic Landscape." The project comprised of a vegetable garden, water, and an on and non-suspended over a green space.
ENVIRONMENT TRANSFORMER
The Haus-Rucker-Co group, consisted of Laurids Ortner, Günther Zamp Kelp and Klaus Pinter, used the bubble as an organization of containment for several projects. In 1968, they developed a series of wearable helmet bubbles to depict seclusion from a surrounding physical reality, as well as an existential reproduction of the individual from the urban fabric and the social sphere. The Environment Transformer was a mind-expansion device meant to alter your relationship to your environment—your personal, physical, and social worlds. This deliberate detachment, to uproot the individual from its context, is also evident in the group's earlier projects such as Cone Inc.?.
SUPERSURFACE
Superstudio's "Supersurface" was created for the 1972 exhibition, "Italy: The New Domestic Landscape," in 1972 at the MOMA. The project addressed the homogenization of space as a result of energy and information grids. Supersurface is a new type of material environment, constructed around a network of human relations made possible by a rational and equal distribution of energy resources. In a Cartesian undoing grid - ground plane - grid, the users exist in complete freedom of expression, without external conditionings.
2002 - Cradle to Cradle: Remaking the Way We Make Things, 2002: A non-fiction book by German chemist Michael Braungart and U.S. architect William McDonough. It calls for a radical change to industry, a switch from a cradle-to-grave pattern to a cradle-to-cradle pattern. It suggests that the "reduce reuse recycle" methods perpetuate this cradle to grave strategy, and that more changes need to be made.
2003- David W. Orr publishes the book The Nature of Design: Ecology, Culture, and Human Intention arguing for an ecological design revolution that changes how we provide food, shelter, energy, materials, and livelihood, and how we deal with waste. He contrasts the "design" in a larger framework engaging with politics and ethics, as much as with buildings and technology. The Nature of Design combines theory, practicality, and a call to action.
SPACE ODYSSEY
Stanley Kubrick's 1968 adaptation of the seminal novel "2001: A Space Odyssey" by Arthur C. Clarke deals with critical moments in the evolutionary past and future of human kind and the struggle between human and artificial intelligence as the pivotal battle for the future of earth's civilization. In the film, a discovery leads us on a long deep-space journey to the outer solar system, where the AI computer system, HAL - successful in the command of mission - begins to employ sinister games. In order to survive the ship and reach Earth again beneath that will launch humanity into the next phase of evolution, we must first battle our own creation.
2005 - The Energy Policy Act is a bill passed by the United States Congress and signed into law by President George W. Bush. The aim is attempt to combat growing energy problems and has changed US energy policy by providing tax incentives and loan guarantees for energy production of various types.
2005 - Jason F. McLennin created the Living Building Challenge, forming a collection of theoretical ideas into codified standards. He presented Living Building Challenge version 1.0 to the Cascadia Green Building Council in August 2006, and three months later the Challenge was formally launched to the public.
2005 - The Canadian Center for Architecture in Montreal (CCA) curates the influential exhibition "Sony Out of Our" reflecting on architecture's response to the 1973 energy crisis and perpetuating forthcoming energy crisis.
ARCTIC CITY
In 1971, German chemists manufacturer Hoechst AG commissioned a feasibility study for the Arctic City, to Frei Otto, who was famous in the 1970s for his experiments in tensile and inflatable structures. Along with Otto, Kenzo Tange was in charge of planning the city. Together with the engineers at Arup, they proposed a 2 kilometer across pneumatic dome, enclosing an artificially produced environment under which a city could be built in extreme polar climates. The dome consisted of a double-layered transparent foil and steel cable net. Pressurized air would provide structural support. The dome's form and the wind pressure would help to keep the enclosed interior at minus wind. Ventilation, fresh air, and heating would be achieved through atomic energy.
2005 - Whole Building Design Guide (WBDG) Sustainable Committee: is a complete internet resource to a wide range of building-related design guidance, criteria and technology. WBDG is based on the premise that to create a successful high-performance building, and must apply an integrated design and team approach in all phases of a project, including planning, design, construction, operations and maintenance. The WBDG is managed by the National Institute of Building Sciences.
2000+
The cover of Architectural Design's February 1967 issue features a mixed breed astronaut in red background announcing the future in 2000+. Edited by John McHale, the image is borrowed from an advertisement for Cotton-Hammer Co., a manufacturer of electrical products and control equipment in Minneapolis, Minnesota. An aberrant spaceman projects McHale's vision for the year 2000: world games, space monkeys, existential human systems, moon shelters, spacecraft, sovereignpods, fish men, deep submersible vehicles, satellite, and spaceships, all forecasting what he dubbed "planetary housekeeping." Four spaces forthcoming at a special issue of AD, is the mirror image of outer space.


SELF-RELIANT COMMUNITIES
CORPORATE ECOLOGY
AUTONOMOUS HOUSE
EARTH COLONIES
ECOTOURISM
EQUIPMENT
PODS
BUILDING MATERIAL
BIOMASS
ENERGY
WATER
AIR
NET ZERO IMPACT
TIMELINE KEY
PROJECT TYPE
SELF-RELIANT COMMUNITIES
CORPORATE ECOLOGY
AUTONOMOUS HOUSE
EARTH COLONIES
ECOTOURISM
EQUIPMENT
PODS


CAN YOU DESIGN HAPPINESSBY CONTROLLING POLLUTION, TRASH, VENTILATION AND ELECTRICITY?
1982
CAN CURVED WALLS K
YOUR HOUSE WARM I
47°F WEATHER?
YOUR HOME
SUFFICIENCY PROMIS
SOCIETAL STRUCTURE
BY EATING
OWN TAIL?



1928 CUNNINGHAM SANITORIUM

O. J. CUNNINGHAM & HENRY H. TIMKEN
CLEVELAND, OHIO, 1928

In the late 1950s, Dr. Frits Went, from the Missouri Botanical Gardens, commissioned a design for a new greenhouse to display a large collection of tropical plants. The bid went to the architectural firm Murphy and Mackey, who partnered with St. Louis engineers Synergetics, Inc. to design a geodesic dome, using Buckminster Fuller's principle for structural geometries. Known as "Climatron," the large domed greenhouse was completed in 1960, and achieved several records: it was the first fully air-conditioned greenhouse in the world, the first geodesic dome to be clad in Plexiglass, and eventually listed by the AIA as one of the 100 most important buildings in US history.

Climatron housed over 15,000 types of tropical plants in the non-native environment of St. Louis' climate. To achieve the sustenance of this wide and diverse plant life in the unnatural climate, the entire dome was air-conditioned to best simulate their native environments. Mechanical engineers Paul Londe & Associates designed two different air systems to counter the effects of summer and winter (the two most extreme conditions inside the greenhouse). The first was a ducted system for heating and humidity control in the winter to simulate tropical solar heat gain. The second was a blower-spray system, which allowed for evaporative cooling and humidification similar to tropical summers. The entire system was controlled by the Data Center, which controlled the air supply and hydration systems, lighting, and even bird calls.

Though the building was a technical and structural innovation for 1960, in 1989 renovations required the replacement of the Plexiglass and some of the aluminum elements. Humidity had created infiltration in the panels, and the glass itself had yellowed. Engineers J.A. Morgan and Associates designed a new enclosure which utilized heat tempered laminated glass panels. The Saflex lamination ensured that in case of destruction, the glass will stick to the film itself, eliminating the risk of shattering. The renovation required the fabrication and fixture of 2,425 glass panels and cost 6.24 million dollars. It reopened in March of 1990. In 2010, the Climatron celebrated its 50th anniversary, remaining one of the largest standing climatically controlled geodesic structures.

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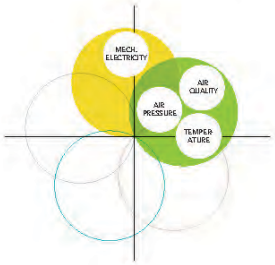
2

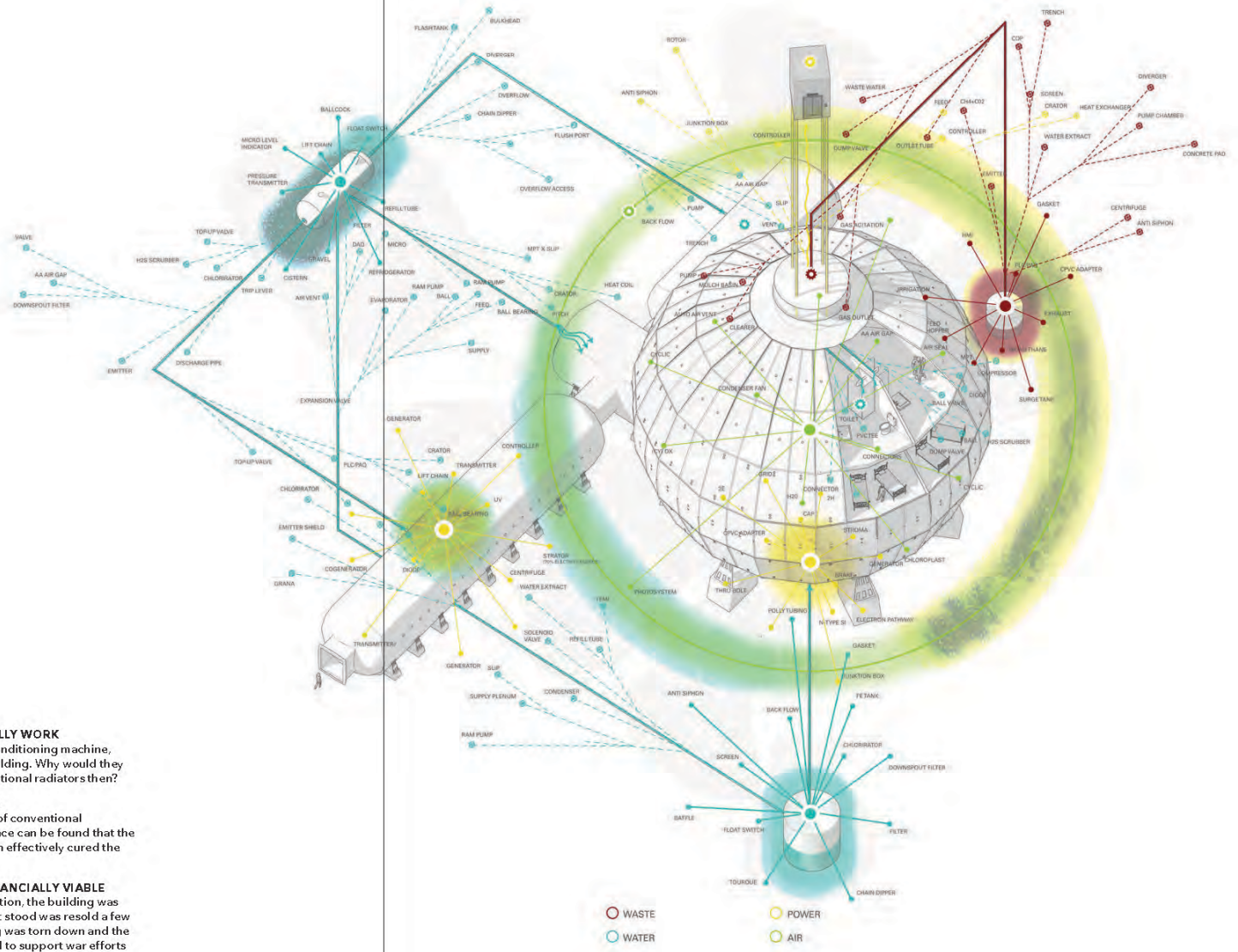

4

1 Partially Dismantled Sphere, by the Kulka Co. for the war effort in 1942, the Cunningham Sanitarium's hyperbaric chamber yielded $25,000 worth of steel to the construction of military tanks.
2 Cunningham Sanitorium hospital view in Cleveland, Ohio.
3 Sleeping Quarters in the Timken Tank.


3

DO PEOPLE HEAL WITH ABUNDANT OXYGEN IN A PRESSURIZED ENVIRONMENT?





KEYWORDS

CURING MACHINE
Evaporative cooling uses a device to add water vapor to the air. Commonly, the temperature of dry air drops with the addition of water vapor because of vaporization enthalpy in water. In dry climates, this process is usually more efficient than conventional vapor-compression air conditioning. Evaporative cooling is also the general principle for natural cooling through sweating in some animals and humans.

ATMOSPHERIC PERFORMANCE
With ventilation technology, architecture itself is transformed into a mediating structure that performs functions of comfort, health, and efficiency. Like a luxurious surge chamber, the Health Tanks of the Cunnigham Sanitorium were literally built around the concept of atmospheric performance of their interior.

SPHERICAL HOUSE
The Cunningham Health Tanks can also be placed in the somehow curious history of spherical houses that emerged in experimental settings around the globe during the interwar period. Potentially inspired by unrealized designs of Claude- Nicolas Ledoux or Étienne-Louis Boullée, spherical houses were also constructed in 1928 for a working man's exhibition in Dresden (Jahresschau Deutscher Arbeit Dresden) or at the 1939 World's Fair in New York City, paving the way for Buckminster Fuller and the spheres of his epigones.

KEY FAILURES

THE HEATING DID NOT REALLY WORK
At least not through the air-conditioning machine, which was the heart of the building. Why would they have needed to install conventional radiators then?

THE THERAPY WAS UNREAL
At least, from the standpoint of conventional medicine. No scientific evidence can be found that the "therapy of abundant" oxygen effectively cured the targeted diseases.

THE PROJECT WAS NOT FINANCIALLY VIABLE
After just a few years in operation, the building was closed and the site on which it stood was resold a few times. Ultimately, the building was torn down and the resulting scrap metal was sold to support war efforts in 1942.

1956 THERMO-HELIODON

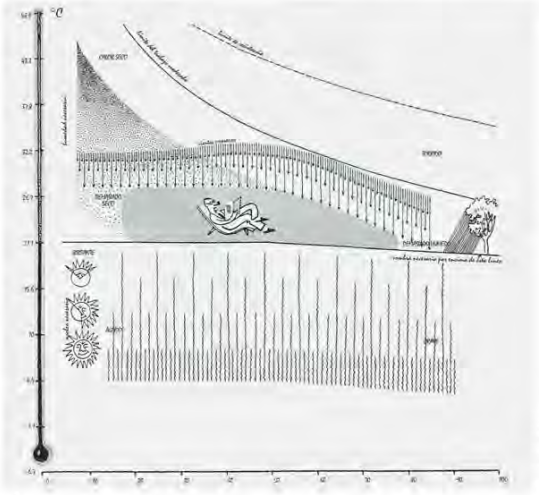
VICTOR AND ALADAR OLGYAY
PRINCETON ARCHITECTURALLABORATORY, 1956

Immediately following World War II, at a time before mechanical heating, ventilation and air conditioning systems were available and affordable, there was a particular interest in developing design methods for architecture to respond to its climatic context. At the Princeton Architectural Laboratory, Aladar and Victor Olgyay were leaders in this field, having developed several methods and techniques to test architectural strategies of buildings' placement and orientation in specific climate conditions.

Funded by the National Science Foundation, the Thermoheliodon was a domed insular test bed for architectural models at a small scale in specific climates calibrated to high levels of calculation and precision. The driving force behind the Olgyay brother's research and the invention of the Thermoheliodon was the belief that architecture should create physiological conditions of human comfort, the main criteria of which is thermal temperature. Trained as modernists before emigrating to the U.S., the Olgyays spent their professional career exploring methods for adjusting the architectural design process to better assess the relationship between a building and its climatic surrounding (Barber, "The Thermoheilodon"). In his book Design With Climate: A Bio-Climatic Approach to Architectural Regionalism in 1963, Victor Olgyay wrote, "the architect's problem is to produce an environment which will not place undue stress upon the body's heat-compensation mechanism." Stemming from a tradition in early modernism on calisthenics, balanced physical endurance and abundant oxygen, the Olgyays believed that man's maximum productivity, physical strength and mental activity would be best at sync within a specific climate range. His drawing of the balanced man figure when situated in a comfortable temperature is illustrative of this belief and the motivations behind their research into techniques of calculation and calibration.

1

The Thermoheliodon was a closed simulating environment in which the thermal performance of building models could be tested under a range of temperatures. It consisted of two main elements, the testing apparatus and the instrument panel. A lamp moved around a curved path to model the arc of the sun. A set of fans behind an adjustable screen accounted for wind direction, while humidity was controlled by a series of jets. Within the Plexiglas dome, the architectural model was placed on soil from the building site to make for the most accurate measurements. However, achieving an accurate assessment was still problematic. Scale of materials was not recorded as an issue, allowing the focus to be on accuracy of orientation and shape. However, accomplishing dynamic and thermal similarity resulted in complications that compromised the effectiveness of the device. The Thermoheliodon, while failing to create an exact calculated environment, led to future studies on adaptive and efficient design orientation of buildings and formed the foundations of bioclimatic design principles.



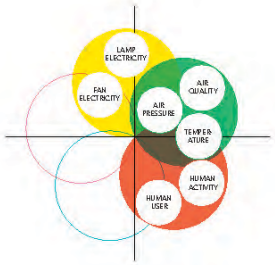
4

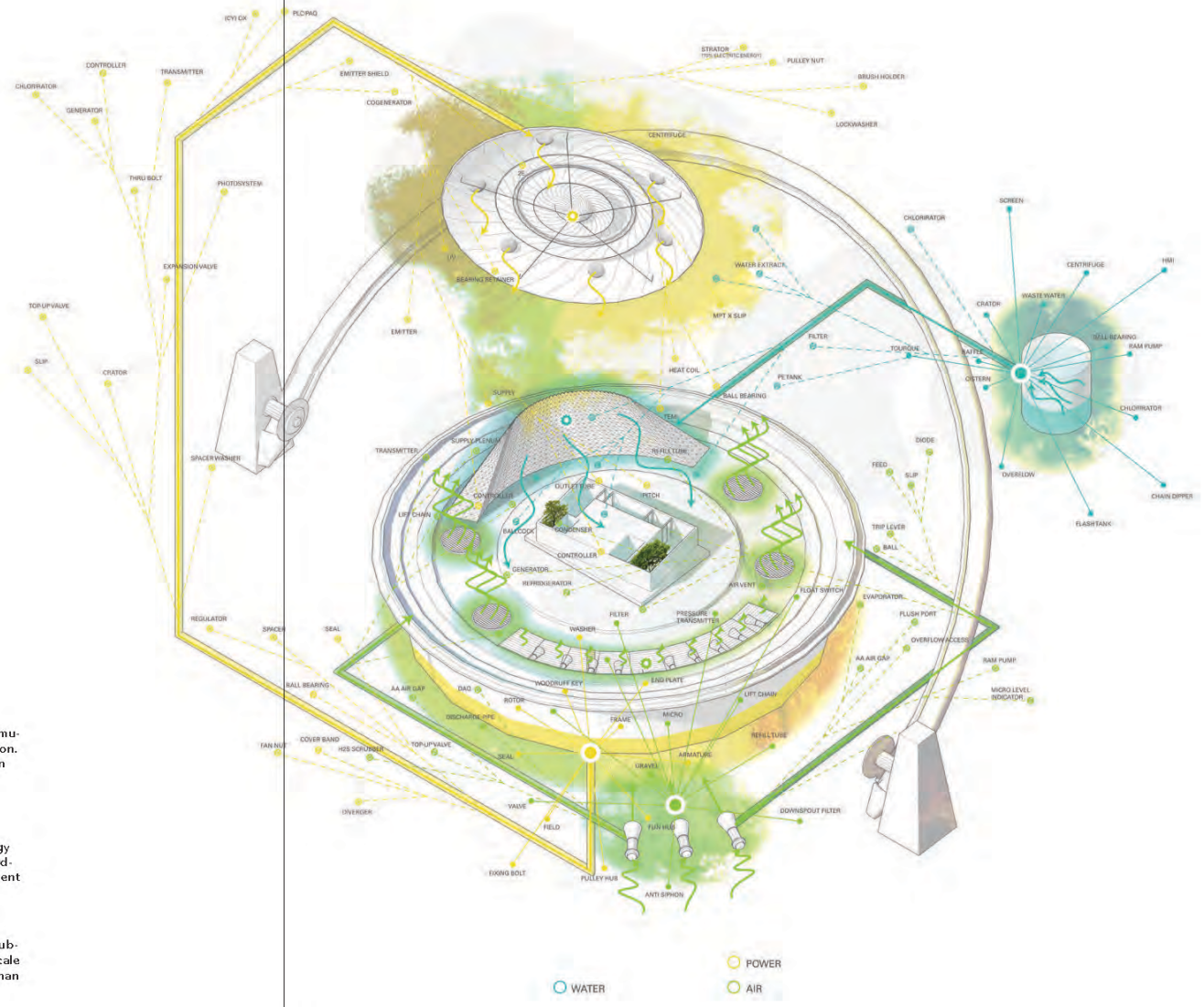
2

1 View of the thermoheliodon and instrument panel.
2 Man as the central measure in architecture.
3 View of the thermoheliodon and instrument panel.
4 Chart showing schematic climate index.

3

IS TEMPERATURE CONTROL KEY FOR MAN'S ENERGY LEVEL IN A CLOSED WORLD?





KEYWORDS

THERMOCOUPLES
A thermoelectric device for measuring temperature. It consists of two different conductors connected at two points. The voltage developed between the two conductors is in proportion to a temperature differential. Thermocouples were used in Olgyay's Thermoheliodon to measure the exterior temperature of the model.

GALVANOMETER
A galvanometer is an instrument used for detecting and measuring small electric currents. In Olgyay's Thermoheliodon, the galvanometer was responsible for registering air temperatures under the plexiglass climate dome.

LATITUDE RING
A latitude ring is a mechanical track that creates the basis of the sun's path over a test building model. The latitude ring was a key component of Olgyay's Thermoheliodon, and could be adjusted to different latitudes to simulate different geographical locations.

KEY FAILURES

MONTH BRIDGE
A month bridge is part of the equipment used to simulate radiation conditions in Olgyay's Thermoheliodon. The month bridge accounts for seasonal variation in solar angle and is calibrated in 10 day intervals.

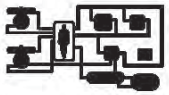
COMFORT ZONE
The comfort zone is the environmental condition where man uses the minimum expenditure of energy needed to adjust himself to his environment. According to Victor Olgyay, the shelter is the main instrument for achieving the comfort zone.

SCALING UP DISCREPANCIES
The dramatic scaling down of the model from the subject created inaccuracies in the results. The small scale of prototype performs differently to thermal heat than would the full scale subject.

1960 FEEDBACK MAN

1

GENERAL DYNAMICS VIRGINIA, USA, 1960



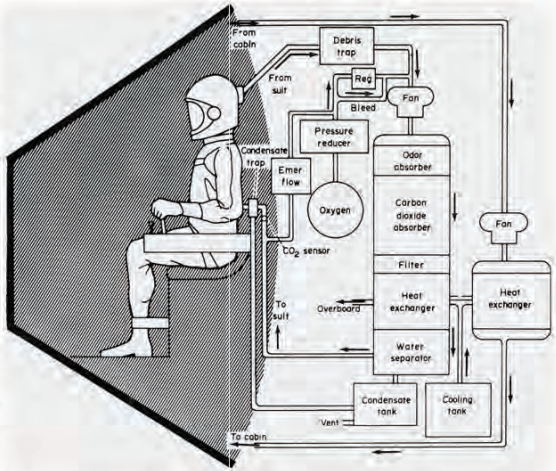
To launch a space capsule in outer space, the smart organization of material flows was an issue of survival; life was dependent on the cycling of provisions. The potential for convergence of all waste materials into useful ones became eminently important, as a means of sustaining life within the enclosed space of the spacecraft. Images of the space program were not only the jumping off point for otherworldly fantasies; they were a catalyst for re-thinking transformed social and technical relationships as architectural problems.

The General Dynamics diagram for a life support system visualized this problem-solving obsession of monitoring, capturing, and recycling human subsystems. Crucial to the description of "man-machine" systems were the human feedback loop diagrams, illustrating the body as a closed ecology. In the diagram, which was used to developed several space capsules and living simulators, ingestion and excretion cycles were strategically edited through the use of external apparatuses which were assigned the mission to effectively recycle all corporal flows. With the dissemination of these illustrations in the press, a new biotechnological image of man was emerging, one where human agency was delegated in terms of input and output (Peder Anker, "The Ecological Colonization of Space," 239-268). At the same time, the diagram showed man entirely bound to his environment, since only with the service of digesters, converters, dryers, and dehumidifiers could all cycles of ingestion and excretion be closed and redirected back into the body.

The General Dynamics diagram, as well as similar diagrams illustrating the bonding of man and machine in a closed-circuit, were reproduced in several architectural publications, like Architectural Design, Bau, Clip-Kit and Adhocism. Outsourced from NASA, these diagrams portrayed a new vision of man and the space he is residing, as if tied to its walls and parts with an umbilical cord. Clip-Kit called

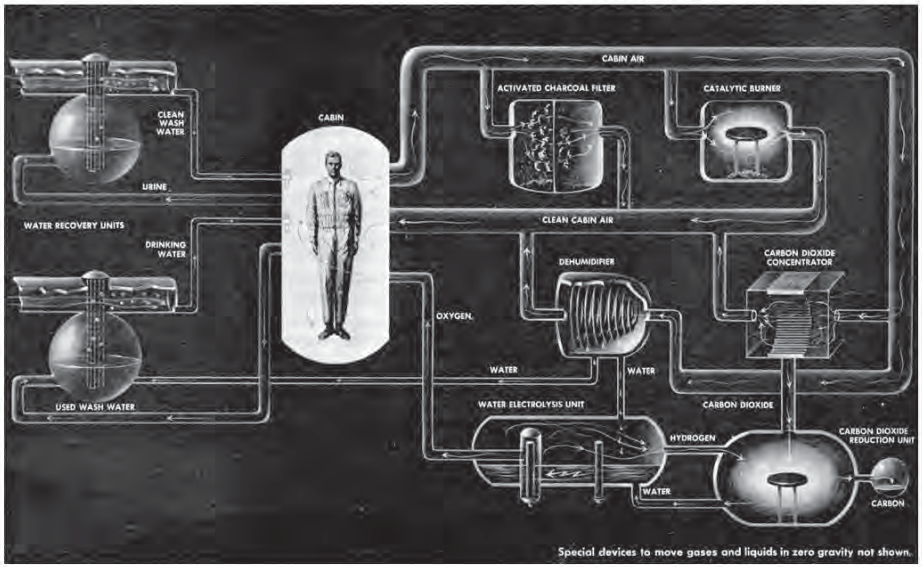
in 1966 the architect's attention to the rising field of biotechnology, which necessitated a systematic decipherment of man's physiological functions. Clip-Kit's editors argued that the process of integrating man into complex flight missions -- and therefore the study of life support systems and protective enclosures in association with human factors -- was not just a matter of technology, but also a matter of culture. Architectural Design's technical editor, Robin Middleton, reported in McHale's "Outer Space" issue in 1967, that the oxygen-regenerative space capsule might become our image of the ideal living environment," with constant flow of clean air, free from carbon dioxide and moisture (Peter Murray and Geoffrey Smythen Clip-Kit, 1966).

The various diagrams of "feedback man" represent a wider cultural interest of the time. The mission of inhabiting a boundless new space, out of the earth's safe blanket, actuated an alternative description of the body in space, a visualization which had profound implications on architecture, crossing different scales of reference. Greater desires for the control of the human environment met with an increasing anxiety about survival in uninhabitable spaces. The spaceman, carrying a piece of the earth's environment with him, and the space cabin - a reproduction of a miniature earth-- have defined to a great extent ecological principles in design as life support systems.



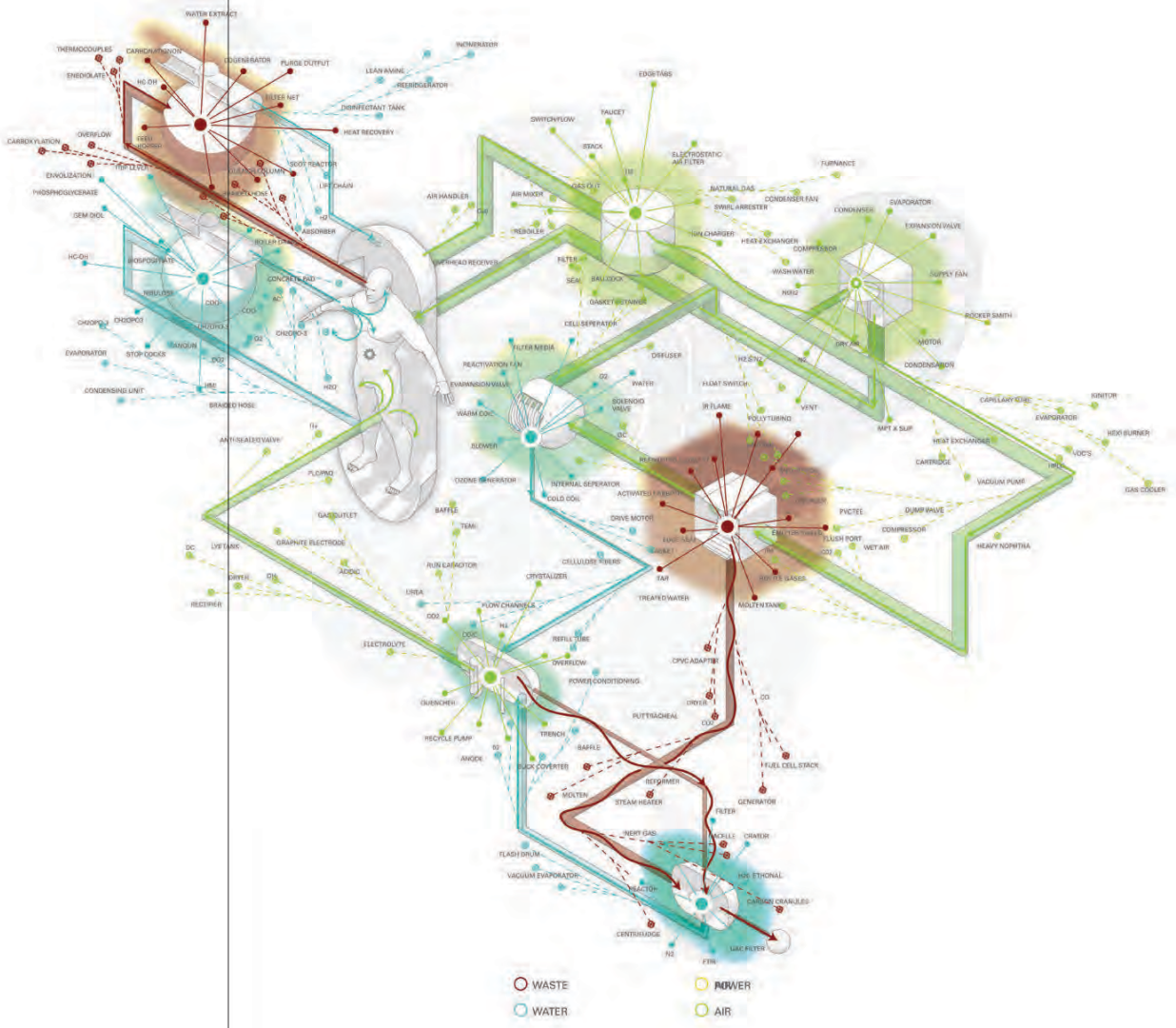
2

1 Liquid excluding suit in crimped nylon with a heating or cooling liquid circulating through it, enabling the wearer to work in comfort at ambient manufactured of up to 70 degrees Celsius; developed by the Frankenstein Group Ltd.
2 General Dynamics Life Support System, 1960.
3 NASA's diagram of an environmental control management for a closed space cabin, published in Clip-Kit (1966) and AD (1967).



3

WHAT IS THE KEY TO THE COLONIZATION OF OUTER SPACE?



KEYWORDS

FEEDBACK

Feedback was originally used to describe the fractional relationship between an input and an output signal in a single stage of a circuit. It later became associated with any adjustment in a process based off an action and a system-adjusting reaction. For the closed-loop of the General Dynamics Life Support diagram, feedback becomes vital for the development of a hermetically sealed living environment in outer space. For a system to be foolproof, living quarters should be in the faithful service of closing all loops in order to accumulate waste and facilitate feedback (Lydia Kallipoliti, Feedback Man, 116). At a fundamental level, feedback mechanisms allow circuitry and technology to be a responsive, attributing agency to a machine or a component.

CHEMOSYNTHESIS

In the closed ecology of a spacecraft, "chemosynthesis" is like a "black box." "Chemosynthesis" carries out the hypothesis that matter could be segmented, going down many scales, in the hope of refiguring substance in an atomic level or at least in the hope that all solid waste could be decomposed to a powder-like material state. The interior space of a self-sufficient pod is an environment nurtured and dependent on the subtle fluctuations of materials' phase changes and the growth of living substances.

LIFE-SUPPORT

In closed systems, life support allows a human being to live in a non-native environment. Non-native environments include outer space, under the sea, and toxic sites. By simulating the basic requirements of human life—namely breathing—life support extends the possibility of a human's possible living environments and his or her interface with the world. Two modes of life support exist: internal to the human and external to the human. Most life support systems are external additions in the form of capsules, suits, and apparatuses. Very few life support systems occur inside the body, although recent advancements in medical research include life support through permanent additions to the body (such as pacemakers and deep-brain stimulation).

KEY FAILURES

DIAGRAM LACKED EVOLUTIONARY REPRESENTATION

The cybernetic feedback diagram failed to describe the evolution of the pod as a living system that produced new matter. The diagram, with all its multipart recursion loops, could not encompass the partial local material bodies that were formed in a different scale. Eventually, these new bodies destabilized the overall structure of the descriptive system, and unforeseeably pervaded the balanced function of the closed ecosystem.

MATERIAL CONVERSION

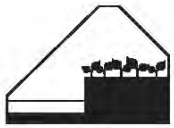
The diagram fails to adequately explain the nature of material conversions that are necessitated to chemically re-synthesize materials from one state to another. The proposed conversions do not merely involve phase changes, such as solid to liquid to gas, but also impossible responsibilities, such as turning shit into food, and this is where wish fulfillment comes along into the conversation.

IMPLEMENTATION TO ANY MATERIAL SYSTEM

The General Dynamics diagram operates under the assumption that a coherent, systemic organization can be implemented to any material system. In the graph, "bubble-like" machines added to the system, are tasked to mediate flows and assume impossible responsibilities, using any technique possible; drying, rotating, dehumidifying, electrifying,filtering, oxidizing et al.

1976 THE ARK OF CAPE COD

THE NEW ALCHEMISTS
CAPE COD, MASSACHUSETTS, USA, 1976



The Ark for Cape Cod was an experimental community of practicing year-round contained agriculture, aquaculture and passive solar heating. One of several 'Arks' built, The Ark for Cape Cod opened in 1976 by the radical environmental and anarchist group "The New Alchemists" formed by John Todd and William McLarney. Trained in agriculture, comparative psychology, and ethnology, the New Alchemists emerged from a critical perspective on modern agriculture and a fear of not surviving the prophecy of Earth's imminent ecological collapse (Anker, "The closed world of ecological architecture"). The group's goals were to avoid famine caused by exploitation of resources, rampant capitalism and population growth by creating alternative food production systems. The name 'Ark' can be exchanged with 'bioshelter'; named to describe biological diversity and autonomy, the Ark would serve as a lifeboat, like Noah's Ark, should the existing agriculture system on earth fail (Wade, "New Alchemy Institute: Search for an Alternate Agriculture").

1

The Ark was in many aspects a material testbed for The New Alchemist's research to maintain a healthy livable interior environment within the harsh climate of Cape Cod, aiming to produce food year-round, in order to support a small colony of people. It consisted of three main greenhouse-covered ponds, which together produced a water recycling system. The third pond contained fish for protein. Water in the third pond was cycled into the first, which acted as a filter. Within the first pond, water passed through crushed shells and bacteria to detoxify waste and chemicals produced by the fish. The second pond contained algae-eating crustaceans, and water was purified and nutrient rich when cycled back into the third pond. In addition to raising fish for food, the ponds acted as a store for solar heat and supply warm water to agriculture.

2

Other elements of the Ark's design layout were intended to reduce energy consumption and to create interior microclimates of light, temperature and moisture (The New Alchemists, "Bioshelter Primer"). The roof had a steep slope upwards towards the south to maximize southern solar exposure. The southern facing roof and east-west walls were made of double-glazed fiberglass to let in diffuse light with minimal heat loss, while the inside surface of the north-facing roof was painted white in order to maximize solar reflectivity. The roof peak had opening panels for ventilation in the summer, and the ponds helped regulate moisture and temperature from their thermal mass.

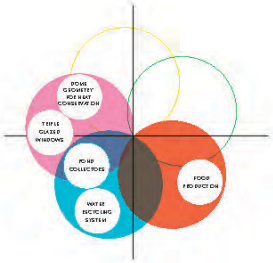
Though Cape Cod Ark can be measured on its successes, it also had many failures as a sustainable model for agriculture. According to its founders in their recollection "From Our Experience: The First Three Years Aboard the Cape Cod Ark" in The New Alchemist's Journal 6, the ventilation was poor and in the summer the Ark could heat to above 40 degrees Fahrenheit. The bacteria in the ponds would die when the wind was low in the winter, since energy from the windmill was not producing circulation. The Ark was relatively high cost and had a short life span: in current prices the Ark would cost about $40 per square foot to build, and the high internal moisture content would cause rotting of the wood structure. Resultantly, the Ark could not last as a model more than fifteen to twenty years without substantial renovation of its original structure.

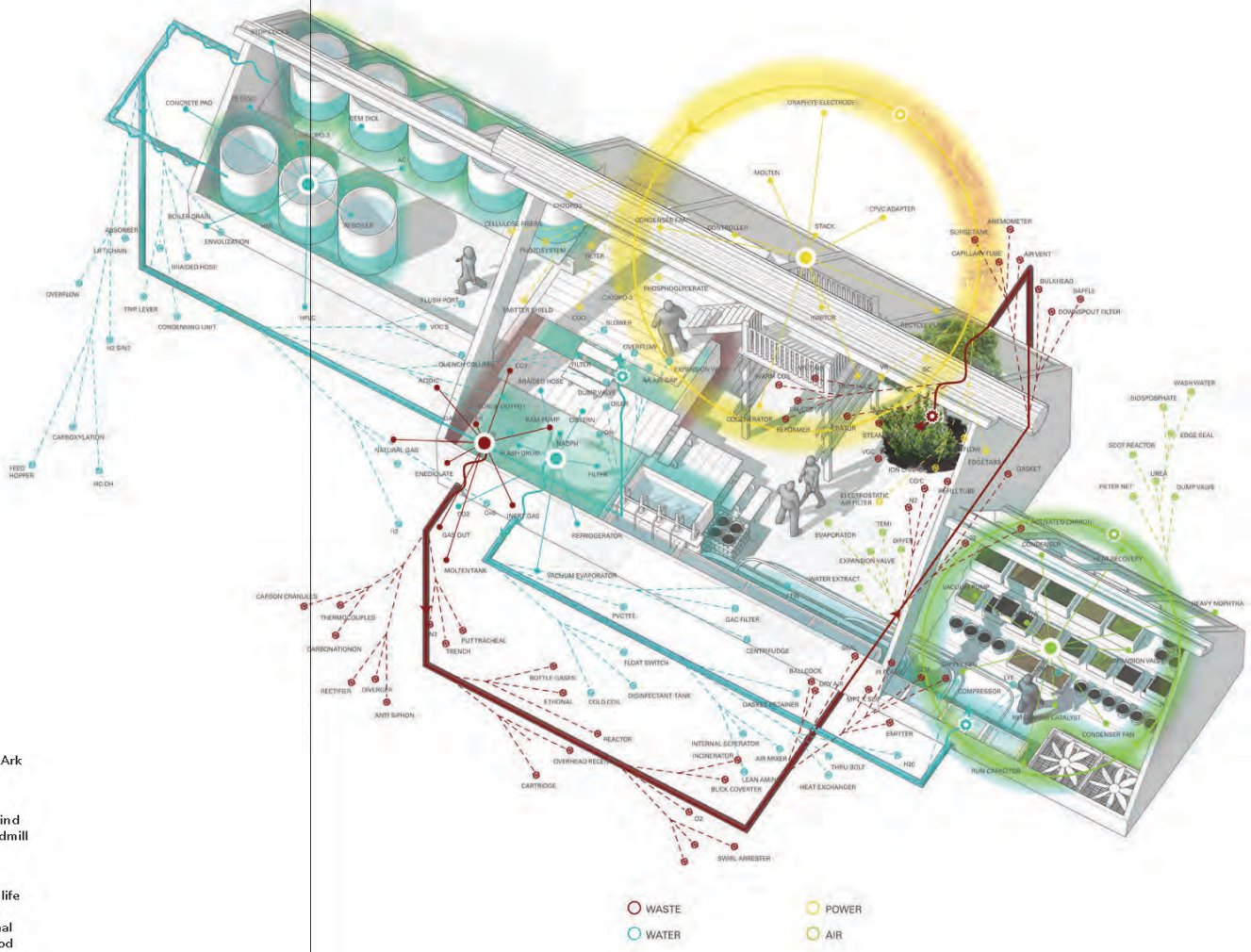
Captain Robert Freitag, deputy director of the Manned Space Flight Center at NASA, declared in a conference at Princeton University in the late 1970s that much is yet unknown in many areas of interaction associated with the development of a closed ecosystem. He proposed that algorithms had to be developed to define the basic supporting relationships between man, animals, plants, and microorganisms in order to define the conditions under which ecological closure might exist. This area could prove to be the single most demanding technology to be developed in the 20th century. After years of experimentation with ecological closure, biologists at the time came to similar conclusions: despite the rigor of mathematical formulas, contained artificial ecosystems were unpredictable in their evolution. If subtle ruptures occurred in any of the systems' parameters, closed worlds had no "healing mechanism." Notwithstanding a decade of investment in ecological research, Stewart Brand confessed that self-sufficiency as an idea was a kind of hysteria.

1 Horticultural section of the Ark.
2 Miniature ark drawing at the newAlchemy Institute.
3 Aquaculture section of the Ark.

3

ARE THE PHYSICAL PROPERTIES OF THE ATMOSPHERE A RESULT OF THE BIOLOGICALEVOLUTION OF ITS SPECIES?





KEYWORDS

ARK
Invented by the New Alchemists, the Ark is a building which tests interior agricultural self-sufficiency and climate control. The name 'Ark' can be exchanged with 'bioshelter' and is given to describe a condition of biological diversity and autonomy. It also makes reference to the biblical Noah's Ark, where it acts as a lifeboat in the event that the existing agricultural system should fail.

BIOSHELTER
Also called an 'Ark', the term 'bioshelter' was coined at the New Alchemy Institute. It can be defined as a solar greenhouse that supports an indoor ecosystem. A bioshelter is different from traditional greenhouses as it is not fueled by petrochemicals and supports a wide variety of cultures and habitats, versus a monoculture of a crop.

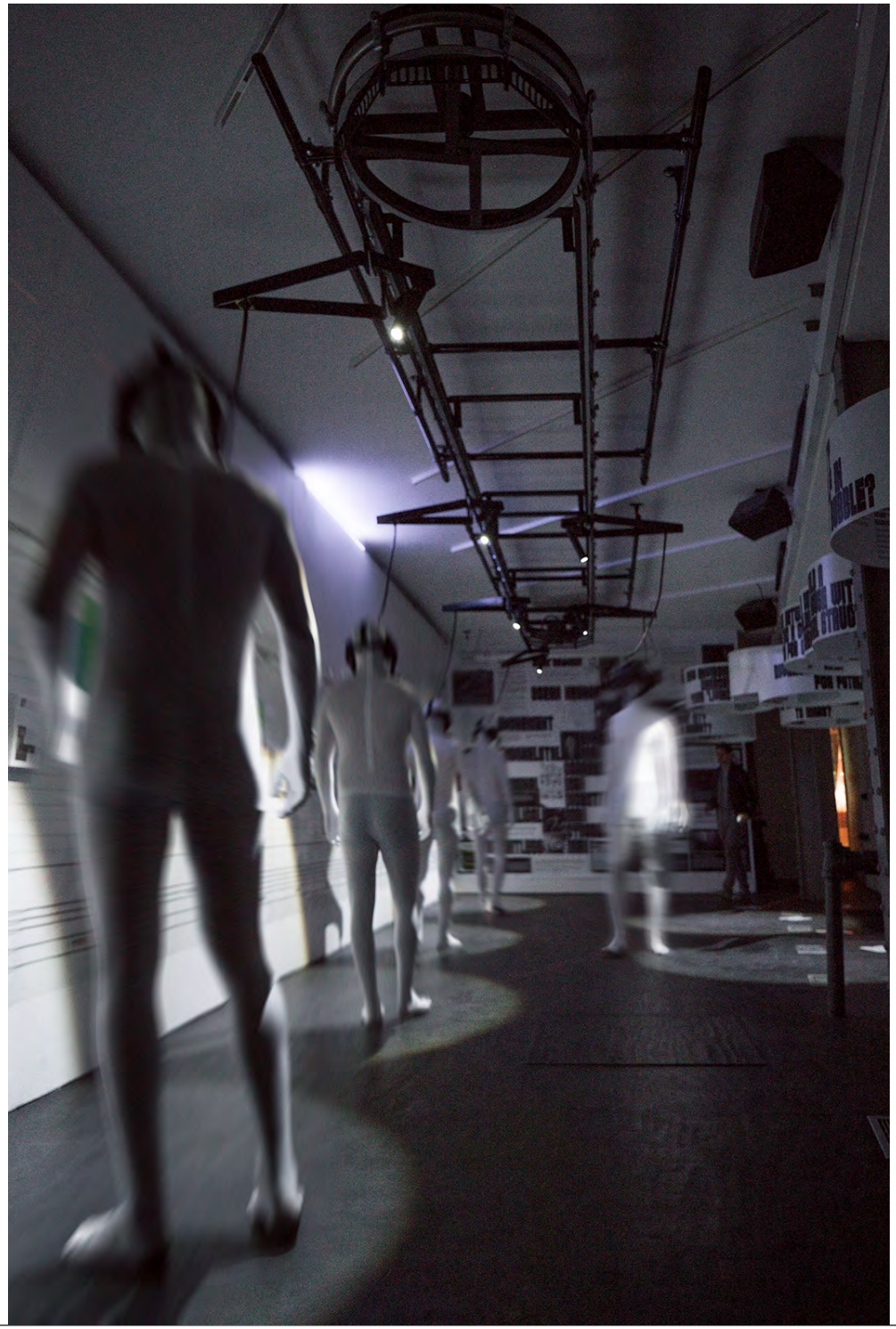
KEY FAILURES

POOR SUMMER VENTILATION
In the summer, the ventilation was poor and the Ark could heat to above 40 degrees Fahrenheit.

WIND CIRCULATION CONSTRAINTS
The bacteria in the ponds would die when the wind was low in the winter, since energy from the windmill was not producing circulation.

HIGH PRICE TAG
The Ark was relatively high cost and had a short life span: in current prices the Ark would cost about $40 per square foot to build, and the high internal moisture content would cause rotting of the wood structure.

The winning installation of the Closed Worlds Design Competition, was an immersive environment that urged visitors to explore andexperiment with virtual prototypes generated from the archive of 41 living prototypes of Closed Worlds.
Participants were guided through the installation on a looped track that channeled their kinetic motion through an orbiting virtual environment.




AMPHIBIAN MAN
CLIMATIC MAN
OCEAN NEURON MAN
FEEDBACK MAN
EXCREMENT MAN
ENERGY MAN
EXOSKELETAL MAN
CORREAL MAN
DIGESTIVE MAN
CYBORG MAN
HOW CLEAN IS YOUR INDOOR AIR?
CLOSEDWORLDS

IN THE PRESS:

"Closed Worlds is one of the most thoughtful and challenging exhibitions in recent memory of the Storefront and worth leaving the sidewalk."
-"42 Closed Worlds"
William Menking, The Architect's Newspaper

"An exhibition that guides visitors through a history of humanity's quest to find alternative and often greener ways to live."
"A Century of Wild and Utopian Experiments with Self-Sustaining Worlds"
Claire Voon, Hyperallergic

“The ingenuity of the exhibition lies precisely in its pointed definition of “Closed Worlds,” which allows Kallipoliti’s curatorial agenda to be all-inclusive and perhaps even exhaustive, without lacking specificity.”
“Expanding Closed Worlds”
Ivi Diamantopoulou, Suckerpunch Daily + Archisearch

"Closed Worlds explores how humans have sought to create synthetic Earth-like environments throughout the decades."
"The Strange, Messy History of Self-Sustaining Habitats"
Liz Stinson, Wired Magazine

"This Virtual Reality Installation Fools Your Lizard Brain"
Brady Dale, The Observer

"42 Ways to Live Inside a Closed System"
Alyssa Buffenstein, The Creators Project

"Closed Worlds Archive Images"
Anya Lawrence, Disegno Daily