

The Envirobubble: Clean Air Pods Redux

OUTSIDE AIR

The underground architecture collective Antfarm staged in 1970 the performance “Breathing—That’s your Bag,” inviting visitors to enter an enclosed pneumatic bubble, in order to breathe safely sealed off from the air pollution outside. The bubble, called the “Clean Air Pod,” would screen out noxious atmospheric contaminants and shield the people sheltered in the envelope. With an idiosyncratic sense of humor,

Antfarm—Chip Lord, Hudson Marquez, Doug Michels and Curtis Schreier—wore gas masks, protective gear, and white laboratory suits to survive outdoor air pollution; they urged passing visitors to sign death consent forms if choosing not to come into the Clean Air Pod. The Oakland Tribune reported Antfarm’s recital as if it were to happen in the future; per Antfarm’s request, the event was published as a forecast for April 22, 1972.

A year later, the anarchist British architectural group “Street Farmers” released a manifesto on the first page of their self-published homonymous magazine, prognosticating that fresh air would soon constitute a new prominent type of real estate for purchase. Both instances proactively reflected a fear of asphyxiation in urban environments, which became an issue of intense public concern in the 1960s and 1970s. Outdoor air quality was a primary press headline in environmental campaigns, while our memory of urbanity in the immediate postwar period is the dark city of smog, like New York City’s “Thanksgiving killer smog” in 1966, famously illustrated in the TV series “Mad Men.” As headlines reported, “a band of warm air, capping cool air settled above New York City and trapped all of the choking, gagging fumes that would otherwise have risen up and out of the city.”¹ A large number of people died that very day, and many were hospitalized due to inhalation disorders. Certainly, there can be no substantiated claims of a direct ‘cause and effect’, yet the throttling *fumifugium*² regenerated the paranoid fears of the atomic age as fears of breathlessness.

The pervasive sense of airborne contamination in urban areas fueled a sociopolitical battle against pollution for all parties that composed the political scenery at the time. On the one hand, Lyndon B. Johnson’s

Lydia Kallipoliti

The Cooper Union



01

administration was markedly active on the issue, having signed several “clean air acts” with the scope of protecting the environment. On the other hand, countercultural activist groups shared similar concerns, as witnessed in numerous proactive performances and riots with respiratory devices. Parallel to Antfarm and Street Farmer, Vettor Pisani’s *Stampo Virile* (published in *Casabella* in January 1971) featured a woman unable to breathe without a respirator. With the title, translated as the “imprint of man,” Pisani reflected on John McHale’s vision of bodily prosthetic devices as an imminent prerequisite of human survival and raised a severe critique of large scale infrastructure and social reality. The kinship between governmental goals and countercultural groups was a paradoxical convergence from antithetical social streams that led to entirely different sets of actions; yet the concerns stemmed from a common point of departure that marked the dawn of the age of ecology as a gallant political and religious position.

INSIDE AIR

As levels of outdoor air pollution mounted in the 1960s and 1970s, Reyner Banham ardently advocated for the conditioning of indoor air quality and moreover, for the numerical calculations and flows of air as a novel creative type of design practice. Necessary to the mechanical servicing of a building is the numerically controlled environment, described by Banham as “software.” As he explains in his celebrated book *The Architecture of the Well-Tempered Environment*, “software” signifies the intangible reality of the milieu, as described not theoretically but digitally. According to Banham, the word “atmosphere” was to be read literally;³ he claims that historically, atmosphere, has not only been calculated, but has also governed design decisions,⁴ decisions undertaken with the aid of medical practitioners.

Medical practitioners have been especially influential throughout the nineteenth century in determining the evolution of building systems, as they were directly transferring their medical knowledge in the environmental management of airflows.⁵ The fear of disease, then thought to be caused by the miscalculated distribution of air, was a determining factor in the involvement of doctors designing new versions of building circulations. Many alluded to environmental management as a kind of pathology that needed to be cured. For instance, Dr. John Hayward’s Octagon house in Grove Street was presented to the Liverpool Architectural and Archeological Society as a precise reification in plan, section, and construction⁶ of a rightful breathing organism, where everything was determined according to the appropriate function of the gas-lighting and ventilation system. Banham referred to this kind of pathology and suggested the tempered interior, furnished adequately with mechanical apparatuses, as a “remedial treatment.”

Without any doubt, his proposals—including the “transportable standard of living package,” the “anatomy of a dwelling,” and the “environment bubble”—were radical. Banham went as far as to suggest the total eradication of the exterior envelope replaced by a calibrated tempered immaterial environment with a tower of machinery in its core. Moreover, he defended his subversive schemes with great fervor and satire, calling his dwelling a “baroque ensemble of domestic gadgetry”⁷ and his transportable package “the ultimate

Figure 1: “Clean Air Pod” by Antfarm.
Performance at the University of California
at Berkeley in 1970.

goody”⁸ and provocatively posed naked in the design of his theoretical speculations, his own “mechanically baroque non-house.” Expectedly, his ideas were largely overlooked, misinterpreted, or even ridiculed by critics.⁹

What remains a paradox is the fact that Banham’s well-tempered environment has surfaced as a sustainable design practice promoting buildings as regenerative and closed ecological systems, capable of harnessing waste and providing their own energy. With blockage from the mechanics of the seasons and the flows of the natural world, buildings saved significant amounts of energy and thus, because of their numerical performance, were esteemed as environmentally favorable. In light of this perhaps absurd conservationist ethic, Antfarm’s Clean Air Pod, which was originally conceived as a protective uterine-like environment, has been reiteratively translated as a conserved ecological milieu blocked from the effluence of the exterior world.

Forty years after, we may consider the viability of closed ecological systems and the process of translating planetary ideals to environmental policies and consequently to a set of physical rules and artifacts in the building industry. Enclosed spaces were tested in the massive Biosphere 2 project in Arizona, which was completed and sealed in 1991; after a period of time, fresh air had to be pumped and food introduced into the sphere to ensure the health of the sealed subjects. But beyond the Biosphere 2, the enclosed space of the Biosphere’s “envirobubble” lives within thousands of sick buildings of corporate America. Sealed, heavily air-conditioned buildings usually generate problematic airborne conditions, resulting from a building’s lack of exchange with its surrounding environment. In most sick buildings, there cannot be an identifiable cause for illness, as a causal effect of a specific deficiency. A 1984 World Health Organization Committee report suggested that up to 30 percent of new and remodeled buildings worldwide may be the subject of excessive complaints related to indoor air quality and suffer from what is known as the «sick building syndrome,» a term used to describe situations in which building occupants experience acute health and comfort effects that appear to be linked to time spent in a building.

Public concerns of indoor air quality mount rapidly as large percentages of building occupants in heavily air-conditioned buildings repeatedly experience symptoms of breathlessness, exhaustion, headache, nausea, and unconsciousness. Air conditioning systems are in several cases the main carriers of diseases, as they can quickly transfer and distribute pathogenic airborne bacteria like in the case of legionellosis. Still, windows remain closed. In parallel, the outdoor atmosphere has cleared if compared to the 1960s. The condition is reversed.

THE ENVIROBUBBLE

2011, *Design Hub (D-Hub) Barcelona, Spain*: Inspired by Antfarm’s project for the theatrical purification of air in urban environments, five architecture professors from three different universities led a collaborative design and fabrication workshop with the intention of revisiting the issues raised in the 1960s, still eminent today. More than a dozen students worked laboriously on inventing architectural prototypes for air chambers as



02

Figure 2: Left: Thanksgiving Day November 1966 in New York City, known as the “killer smog,” as portrayed in the TV series “Mad Men” (Season 5, Episode 509) | Right: Vettor Pisani’s *Stampo Virile*, published in *Casabella* (January 1971).



03

Figure 3: "The Envirobubble" installation at the Design Hub in Barcelona (March, 2011). Design credits: Professors Kostis Oungrinis, Lydia Kallipoliti, Anna Pla Catalá, Marianthi Liapi, and Michael Young with the student assistance of Georgios Andresakis, Yiannis Apostolopoulos, Tzeny Gorantonaki, Eirini Kalogeropoulou, Michalis Kantarzis, Despina Linaraki, Ioannis Liofagos, Dimitris Mairopoulos, Evangelos Alexandros Maistralis, Anna Neratzouli, Iasonas Paterakis, Eleni Roupa, Aggeliki Terezaki, Alma Tralo, Vassilis Tsismetzis, Dimitris Vaimakis, Anna-Maria Moschouti-Vermer, Georgia Voradaki.



purifying machines. During the workshop, we revisited Reyner Banham's celebrated "well-tempered environment" in HVAC building systems and examined a diverse body of building technology techniques translated as design and spatial tools for the development of air purifying strategies in enclosed spaces.

The research was consolidated in "The Envirobubble" installation fabricated at the Design Hub of Barcelona in March 2011. "The Envirobubble" raises issues on air quality still prominent today, though questioning at the same time if the air we breathe indoors is more hazardous than the air we breathe outdoors. We seek to expand awareness from outdoor to indoor air quality and alert visitors as to the breathable air in heavily sealed air-conditioned buildings, with high degrees of condensation.

"The envirobubble" presents four types of air pods as purifying machines. Each cluster of air pods performs and visualizes a purification process focusing on different types of pollutants: (A) dust, or particulate inorganic matter; (B) moisture (humidity levels); (C) gas (toxic off-gas emissions); and (D) CO₂, or plant respiration. By opening up a perspective on the

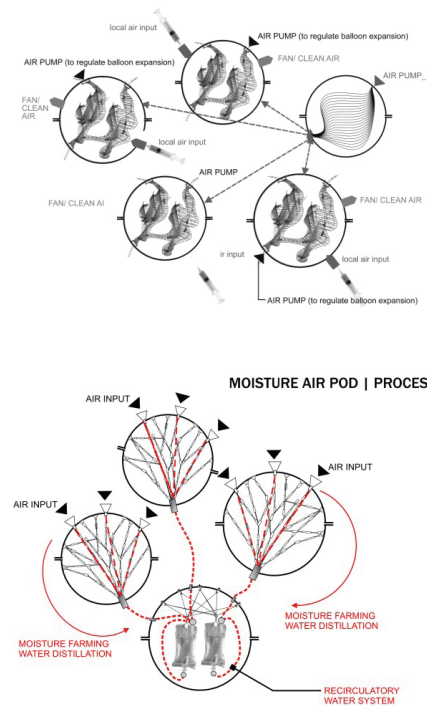
development of indoor air quality as an architectural design problem, rather than an engineering problem, the aim is to initiate a vital reassessment of environmental control in design terminology.

Moisture Pod: The moisture pod harvests water vapor (humidity) from the air and collects it in pneumatic tanks for further alternative use. Matrices of interconnecting tubes “farm” water vapor, via temperature change accommodated in the matrix, and distribute droplets of water in plastic pods. The tubes are located according to the process of vapor distillation. In the lower part of the pod, moisture is reaching two vessels and is then recirculated for other programs. The moisture pod is envisioned as a prototype for a building system that dehumidifies the air, improving indoor air quality, while at the same time collects water to be recycled for irrigating plants or for secondary household water systems.

Dust Pod: Dust is an assemblage of particulate matter ubiquitous in the air and a leading pollutant in indoor air quality. In the domestic scale, it contains small amounts of human and animal hairs and shed skin particles, plant pollen, textile and paper fibers, soil minerals from outdoor soil, and other matter found in the local environment. The Dust Pod is an electrical dust collector, which ionizes dust particles and collects them on a net of strings that in time grow into a surface. Ionization is conducted via copper wire to which high voltage is applied. The Dust Pod is envisioned as a prototype for a building system that purifies the air from particulate matter, while at the same time collects dust to create insulating felt surfaces for other uses.

CO2 Pod: The CO2 Pod uses plant life as a purification system for the atmosphere. Through photosynthesis, and more specifically through respiration, plants absorb CO2, exhaled by humans, and return oxygen. Human respiration and plant respiration work in a complementary way. This continuous cycle links the breathing mechanisms of two species. The CO2 Pod is a moving, breathing “lung” that regulates the respiration percentage of carbon dioxide through the expansion and contraction of plant life surface area. A series of pneumatically controlled pods embedded in the plants modulate the inflation and deflation of plant surface area in response to different times within a day. CO2 is exhaled into the pod and absorbed by the respiring “plant lung.” In return, the air pod exhales back, emitting oxygen to the room.

Gas Pod: Indoors, we daily inhale colorless and odorless toxic gases produced from daily activities. VOCs are a group of volatile organic compounds, carbon based chemicals that evaporate as off-gases from certain solids and liquids at room temperature. They pervade our indoor air with concentrations that can be two to ten times greater in comparison to outdoor air. VOCs have potentially damaging health effects, like eye, nose and throat irritation, respiratory tract irritation, headaches, nausea, allergic skin reactions, fatigue, dizziness, visual disorders, and memory impairment, among other symptoms. There are numerous kinds of VOCs produced and used in manufacturing products. The Gas Pod is a serial filtering system that procedurally cleans air from the first pod onward, until clean air is emitted to the room. The gas pod is envisioned as a prototype for a building system that filters air and prevents the intrusion of biological life indoors, while at



04

Figure 4: Diagrams for the CO2 and Moisture Air Pod of “The Envirobubble” installation/Installation Process, Barcelona 2011

ENDNOTES

1. Peter Gwynne, "From Sea to Shining Sea" in *Newsweek* (January 26, 1970), p. 37.
2. *Fumifugium* is a seventeenth century novel by John Evelyn (1620-1706) that speaks of the "inconvenience of the air and smoke of London dissipated" throughout the city, "together with some remedies humbly proposed by J.E., Esq., to His Sacred Majesty and to the Parliament now assembled." It was first printed in 1661 in London by W. Godbid for Gabriel Bedel, and Thomas Collins, and was to be sold at their shop.
3. Reyner Banham, *The Architecture of the Well-Tempered Environment* (Chicago: The University of Chicago Press, 1969).
4. Quoting Banham: "The growing sophistication in the handling of air, carried further by such techniques as drawing it in from the outside only through grilles, containing, or serving, radiators, was rendered necessary by the steady reduction of sources of accidental ventilation, due to their better sealing of windows, for instance, or the disappearance of the chimney in spaces where direct combustion was not the source of heat." Banham, *The Architecture of the Well-Tempered Environment*, 48.
5. An influential figure in this movement was doctor and professor Ernest Jacob, who taught at the Yorkshire College in Leeds. Jacob died shortly before his manual "Ventilating and Warming" was published (SPCK Manuals for Health), London 1894.
6. Banham, *The Architecture of the Well-Tempered Environment*, 34-35.
7. Caption explaining Dallegret's illustration "The Anatomy of a Dwelling." In Reyner Banham, (Illustrations by Francois Dallegret), "A Home Is Not a House," *Art in America*, Vol.53 (April 1965): 70-79.
8. Caption explaining Dallegret's illustration "Transportable Standard Living Package". In Banham, "A Home Is Not a House", *AD*, 47.
9. James Marston Fitch in the "Review for The Architecture of the Well-Tempered Environment" begins his review by attempting to reverse the reputation of the author who has been misinterpreted. Despite the author's previous writings, the book, according to Fitch, deserves a second look. Fitch mentions: "Considering the author's past work and present reputation, this is a surprising book.... It is a most significant piece of work." See Fitch, James Marston, "Review for The Architecture of the Well-Tempered Environment," *The Journal of the Society of Architectural Historians*, Vol.29, No.3 (October 1970), 282-284.
10. United States Environmental Protection Agency (EPA), "Indoor Air Facts No. 4," Research and Development Report (MD-56), Released February 1991. See http://www.epa.gov/iaq/pdfs/sick_building_factsheet.pdf (accessed November 2, 2012).

the same time creates a series of overlapping layers with various degrees of transparency and opacity for the exterior envelope.

INSIDE-OUT

In the early and mid-1900s, building ventilation standards called for approximately 15 cubic feet per minute (cfm) of outside air for each building occupant, primarily to dilute and remove body odors. As a result of the 1973 oil embargo, however, national energy conservation measures called for a reduction in the amount of outdoor air provided for ventilation to 5 cfm per occupant. In many cases these reduced outdoor air ventilation rates were found to be inadequate to maintain the health and comfort of building occupants. Inadequate ventilation, which may also occur if HVAC systems do not effectively distribute air to people in the building, is thought to be an important factor in the Sick Building Syndrome.¹⁰ In the rise of the sick building phenomenon since the 1980s, it is significant to observe that the rigid conservation ethic, which followed the oil crisis of the 1970s, substantially contributed to a series of unpredictable environmental problems detrimental to human health. In many respects, the sick building is a byproduct of policies earnestly instituted against profligate energy building consumption. These actions, nevertheless, resulted in heavily air-conditioned buildings that usually generate problematic airborne conditions due to the lack of exchange between buildings and their surrounding environment.

Since the postwar period, the environmental campaign suggested a new moral and scientific discipline to protect the earth from ruthless exploitation of resources, transferring an ideological framework of religion, politics, and ethics to the management of global resources. It is, nevertheless, critical to question to what degree conservation of resources is still a valid form of sustainable practice. Much is yet unknown in many areas of interaction associated with the development of closed ecosystems. After years of observation, it is evident that artificial ecosystems are extremely complex networks of interaction unpredictable in their evolution. They showcase a certain hubris speaking of the impossibility of a passage that as a species, we still have not yet earned. ♦