

The Environmental Enclosure, from Greenhouses to Phytotrons to Installation Art

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To the layperson's ear, 'phytotron' sounds like a made-up word, like a device that Flash Gordon would shoot on the planet Mongo. Indeed it was — made up, that is — though made up not for science fiction, but for actual science. 'Phyton' is the Greek word for 'plant', for any green thing that grows, while 'tron' denotes, also in Greek, any kind of tool or instrument. A phytotron, then, is a tool used in the plant sciences. In fact, it was arguably the most groundbreaking technological apparatus devised in the twentieth century for studying plant life. It was a kind of *summum* of greenhouse technology. If a greenhouse encloses plants in glass to control sunlight and heat in otherwise adverse climates, a phytotron encloses plant life in hermetic chambers in which every aspect of the environment is manipulable for experimental purposes. Grow-lights provide the phototrophic energy, nutrients are fed into the system, and the air is conditioned down to tiny fractions of degrees of heat, cold, and humidity. If push came to shove, a phytotron could even make it snow indoors.¹ A phytotron is, as per the title of Melissa Laing's installation, a controlled environment laboratory — a set of room-sized crucibles in which plants are put to the test to see what makes them grow best. Laing's father, William Laing, was one of a number of scientists who conducted experiments, from the 1970s to the 2000s, in New Zealand's first ever phytotron. This was opened in 1970 in Palmerston North, the brainchild of William Laing's eventual boss Ken Mitchell. The world's first phytotron was in California, at Caltech, built at the end of the 1940s by the Dutch biologist Frits Warmolt Went — and it was there that two of Went's associates coined, almost as a joke, the term "phytotron."²

Phytotrons may be said to be a historical phenomenon, to be 'history', in more ways than one. The Palmerston North phytotron is, indeed, unfortunately, 'history' — it was shut down in 2013. But in its time it generated an enormous amount of data that was put to use in the horticultural and agricultural industries. Phytotrons were a player in world history: they were one small part of a larger concerted effort in the middle of the twentieth century to revamp agricultural knowledge and practice. This led to what we now call the Green Revolution³, that contra-Malthusian push, from the 1950s onwards, to apply new science to methods of worldwide food production, resulting in the successful churning out of so much edible matter that generations of people are alive today that otherwise might have died of starvation or might never have been born. The fact that a head of broccoli can be purchased with mere spare change, at least in the chain supermarkets of the industrialised West, is an economic effect of the Green Revolution.

¹ K.J. Mitchell, "Controlled Climate. The potentialities of a major line of research considered in advance," undated (circa 1957). Proposed Controlled Climate Laboratory Building, Palmerston North [Archives Reference: AAQB 889 W3950 360/ 24/2520/3 1] Archives New Zealand, The Department of Internal Affairs Te Tari Taiwhenua. Reproduced in Melissa Laing, *A Report on Progress: The Rise and Fall of the National Climate Laboratory 1956–2013* (Auckland: Laing Publishing, 2018), unpaginated.

² David P. D. Munns, *Engineering the Environment: Phytotrons and the Quest for Climate Control in the Cold War* (Pittsburgh: University of Pittsburgh Press, 2017), 52.

³ Munns, *Engineering the Environment*, 15.

In the phytotron we can also discern something of the larger history of scientific method and scientific instrumentation. This is the history of increasingly complex scientific apparatuses. But it's also the shift in method from field observation to *in vitro* experimentation. The latter began in the nineteenth century, according to historians of science Lorraine Daston and Elizabeth Lunbeck, when "prominent scientific writers began to oppose observation to experiment and to vaunt the prestige of the latter over the former."⁴ Mere observations in the field began to be perceived as inferior for being prone to bias, whereas *in vitro* experimentation was promoted as opening up the possibility of total scientific objectivity. In earlier days, scientists would have often needed "an army of amateur observers to enlist as foot soldiers," as field workers⁵ — amateurs who might bungle the data, if only because of natural human biases and idiosyncrasies, or because of the multiple complexities of 'real world' situations. These biases would, it was hoped, be obviated by means of controlled laboratory conditions. Likewise, prior to the emergence of the phytotron, plant scientists would have felt like foot soldiers in the field, like mere "passive, registering observers"⁶, imprecisely conducting what amounted to gardeners' or farmers' observations — a predicament obviated by the invention of the phytotron.⁷ So the history of the phytotron also constitutes a capsule history of a scientific paradigm — the paradigm of apparently totally objective knowledge issuing forth from *in vitro* methods.⁸

'*In vitro*' is metaphorical, of course — phytotrons aren't glass houses and don't necessarily or primarily feature vitreous materials. The experiments in phytotrons are figuratively *in vitro*, in the sense of taking place in an enclosed environment. Indeed 'enclosure' and 'environment' may be the key words here that allow us a further understanding of the historical heyday of the phytotron. In the 1950s, '60s, and '70s, it seems, things everywhere were being enclosed in controlled environments. A greenhouse-like structure comes to mind when we think of the optimistic techno-utopianism of the postwar decades: Buckminster Fuller's geodesic dome. In the 1972 film *Silent Running* (the science fiction reference I should have used at the beginning of this essay instead of Flash Gordon), a geodesic-dome greenhouse is put inside a spaceship — how else would people of the dystopian future grow plants? — and sent out into deep space under the care of an astronaut played by Bruce Dern. This was also the heyday of the space age — actual astronauts were being sealed inside actual space vessels. Meanwhile, back on planet Earth, air-conditioned homes and indoor climate control became a widespread possibility from the 1950s onwards — prosperous families in newly built

⁴ Lorraine Daston and Elizabeth Lunbeck, "Introduction: Observation Observed," in *Histories of Scientific Observation*, ed. Lorraine Daston and Elizabeth Lunbeck (Chicago: University of Chicago Press, 2011), 3.

⁵ Daston and Lunbeck, "Introduction," 4.

⁶ Daston and Lunbeck, "Introduction," 4.

⁷ A passage from a document by Ken Mitchell in Archives New Zealand reads: "There is the view, particularly in some agricultural circles, that field conditions in general and climate in particular — with its seasonal uncertainties and day to day vagaries of weather conditions — have about them some special qualities, which render them incapable of study except in the field and on the farm. Irrespective of whether such views are expressed by people with scientific qualifications or not, they are really expressions of the opinion that the techniques of analytical thought and measurement are incapable of resolving complex situations and drawing out the essential simplicities. Eight centuries ago, people of similar views burnt the writings of Roger Bacon when he first suggested the potentialities of the methods of reasoning and experimentation we now call scientific method. Such views stem from conservatism and mental laziness in refusing to have thinking go a stage deeper than the level at which it has been used to working in the past." This is in Mitchell, "Controlled Climate," op. cit.

⁸ Also see Lorraine Daston and Peter Galison, *Objectivity* (New York: Zone Books, 2007).

suburbs could now shut the windows and sit back and relax in the artificially cooled bubble of their own living rooms.⁹ (One could now go from that living room to one's equally air-conditioned car and drive to one's climate-controlled office building.)

We even find *in vitro* enclosures in the artwork of the period. This was the moment of Hans Haacke's now talismanic sculpture *Condensation Cube*, first exhibited in 1965, which is a simple one-foot-square plexiglass cube enclosing a sealed-off quantity of water (like a glass jar that one forgets to completely dry out before putting on the lid). The water of course is subject to the laws of evaporation and condensation — and different ambient temperatures in different art galleries affect the rate of evaporation and condensation — thus the plexiglass is always marred by water droplets trickling down the inside surface. The unconventionality of this piece lies in the fact that, as Haacke wrote in a short accompanying text, what you get here is less a classical sculpture than an object that “slowly chang[es] appearance... never repeats itself...[and] cannot be precisely predicted.” In fact, perhaps it was something more like “a living organism which reacts in a flexible manner to its surroundings.”¹⁰ *Condensation Cube* essentially presents, in the form of an artwork, a natural phenomenon: a simple feedback loop, a hydrologic cycle, inside an artificially generated closed-system environment.

There's a web of connections between the phytotron and all these other artificially managed enclosed environments, connections that can be summed up by simply saying that they emerged from the same intellectual and cultural moment. *Condensation Cube* is partly explained by the fact that Haacke and other artists in this period were explicitly influenced by contemporaneous trends in the sciences. Although there's no evidence of which I'm aware that Haacke gave much thought to the phytotron, there was widespread interest in the art world, in the 1960s and '70s, in cybernetics, systems science, systems theory, and the kind of closed-system research exemplified by the phytotron. This was a real moment of crossover between the “two cultures.”¹¹ (The artists refracted all this material towards their own ends, of course. Quite apart from that suggestive image of the water inside the cube as being like a living organism, *Condensation Cube* is no phytotron. Rather, the so-called “systems art” of the time was concerned with another kind of hermeticism, with how concepts of open and closed systems might disrupt modernist notions of the hermetic autonomy of the artwork.¹²) Likewise, while human thermal comfort in air-conditioned buildings seems to be, in a literal sense, a world away from growing plants

⁹ Air-conditioning was invented in 1902 by Willis Carrier and was shortly thereafter used in commercial buildings, but it was in the 1950s that residential air-conditioners became widely available, became a domestic consumer good alongside vacuum cleaners, televisions, and washing machines. See Andrea Vesentini, “It's Cool Inside: Advertising Air Conditioning to Postwar Suburbia,” *American Studies* 56, no. 1 (2017): 91–117.

¹⁰ Hans Haacke, *Working Conditions: The Writings of Hans Haacke*, ed. Alexander Alberro (Cambridge, MA: MIT Press, 2016), 6.

¹¹ C.P. Snow famously said that scientists and “literary intellectuals” are very different kinds of people who make up two very different cultures. *The Two Cultures* (Cambridge: Cambridge University Press, 2012), originally delivered as a lecture in 1959.

¹² Recent re-evaluations of Hans Haacke and systems art of the 1960s and '70s can be found in arthistorical scholarship by, amongst others, Francis Halsall, Luke Skrebowski, and Caroline Jones: Francis Halsall, *Systems of Art* (Bern: Peter Lang, 2008); Luke Skrebowski, “All Systems Go: Recovering Hans Haacke's Systems Art,” *Grey Room* 30 (2008): 54–83; Caroline A. Jones, “Hans Haacke 1967,” in *Hans Haacke 1967* (Cambridge, MA: MIT List Visual Arts Center, 2011), 6–27. Arthistorical interest in systems art — which, by the 1990s, had fallen into a certain degree of invisibility or had come to be perceived as irrelevant to the dominant currents of twentieth century art — was given a shot in the arm by a major exhibition in 2005 at Tate Modern in London, curated by Donna De Salvo, *Open Systems: Rethinking Art c. 1970* (see the essays in the accompanying exhibition catalogue of the same title.)

13 David Gissen, "The Architectural Production of Nature, Dendur/New York," *Grey Room* 34 (2009): 68.

14 Mark Jarzombek sees a connection between Haacke's *Condensation Cube* and the history of building insulation technology and moisture prevention: see his article, "Haacke's *Condensation Cube*: The Machine in the Box and the Travails of Architecture," *Thresholds* 30 (2005): 98–103.

15 The phrase 'Spaceship Earth' had been floating around for a while, but was popularised in the 1960s by Kenneth Goulding and Buckminster Fuller, amongst others. See Sabine Höhler, "'Spaceship Earth': Envisioning Human Habitats in the Environmental Age," *GHI Bulletin* 42 (2008): 65–85.

16 "The true engineers of 'Spaceship Earth,'...used the term...to describe an innovative technological model of a natural environment yet to come." Höhler, "Spaceship Earth," 66.

in phytotrons, the architectural historian David Gissen has identified a direct point of contact. In the 1970s, when architects and building designers were pioneering the possibility of climate control within huge indoor spaces, they — or rather one person in particular, the landscape architect Dan Kiley — brought to bear research from Frits Went, from phytotrons. It seems the architects mainly wanted to figure out optimum conditions for indoor landscaping in, for example, museum atria. **13** (When you next feel too hot or too cold at work in your air-conditioned office space, give a thought to the fact that the building designers, in the first instance, may really have been thinking about the comfort of houseplants and museum artefacts.) Gissen also points out that some of the most heavily climate-controlled *public* spaces in modern cities are in museums. We can thus add museums and galleries to our list of enclosed spaces that benefited from mid-century advances in the technologies of environmental management. **14**

How do we account for this intellectual and cultural moment of artificially enclosed environments? The sunny technoutopianism of the time tells us a lot. In the 'tomorrowland' images of spaceships and of colonies on Mars surviving self-sufficiently under geodesic domes (or just in the idealized advertising images of the perfectly air-conditioned home of the 1950s), we can discern a faith in the larger idea of the technoscientific optimization of the environmental conditions of life. Here was human progress: things will get better for us all if we learn to better manage environmental conditions. Science is the handmaiden of this progress — but we would need to create closed-system simulations to find out more.

The promise of closed-system simulations — which obviously underpinned the development of environmental simulators like the phytotron — was indeed an important aspect of all of this. In fact, in this period, the planet itself was frequently envisaged as a self-contained closed system: this was the proto-environmentalist image of 'Spaceship Earth', the idea that we live inside a fragile, planet-sized closed system — a lifeboat — zooming through space. **15** With this image in mind, the forward movement of human progress and human development bifurcated into both a home project and an 'away' project. On the one hand, the abiding project of how to optimize this particular 'spaceship', this closed system called 'Spaceship Earth', since it is the basis upon which all life subsists. On the other hand, the prospective project of engineering other artificial closed-system environments for future human habitation — space stations, say, or that future colony on Mars. **16**

Some remarks now on the politics of all these enclosed environments. But what politics could they possibly have? At one level, the creation and optimization of enclosed environments for living entities is a very ordinary thing. It's air conditioning, it's the turning on of a heater or humidifier, it's the growing of seedlings under cloches or in greenhouses. But at another level, the ability to manage and control bio-environmental conditions is something more profoundly elemental, something fundamental — it's the mastery of nature and of life within nature. And there are two sides to this sort of technoscientific mastery, one side utopian, the other oppressive (these two sides essentially describe the dialectic of enlightenment). On the one hand, the project of studying and thus optimising bio-environmental conditions is part of a utopian vision of progress, a vision of a better future for human society borne out of the harnessing of extant non-human forces. This is the utopia of the Green Revolution, of lives saved, of higher living standards for everyone (on Earth, if not yet on Mars). On the other hand, there's an oppressive underside to it — to optimize and manage the conditions of life is, by definition, a project of biopolitical control. The science historian Sabine Höhler makes this point when she notes that the engineering of controlled artificial environments for life eventually forces decisions about the “classification and selection of life and nature in order to establish a rational scientific basis for determining what would be useful and what was redundant, what was to be conserved and what discarded.”¹⁷ In other words, at its core, the engineering of bio-environmental conditions leads to the politics of who (or what) gets to live and who (or what) has to die — who gets to board the lifeboat, or just who gets to take advantage of the cheap broccoli. This point becomes starker as the controlled environments become ever more complex, become the esoteric domain of the scientific-industrial complex. Science becomes — if it ever wasn't — tantamount to politics.

The German philosopher Peter Sloterdijk makes a similar argument when he says, more epigrammatically, that “biopolitics begins with enclosure-building”¹⁸ — though here the point is refined by a reversal. It's not that, first, Western civilization began devising enclosures for bio-environmental control and then, whoops, discovered the biopolitical implications of such enclosures, i.e. that they could inadvertently be put to the service of, say, concentration camps and bioweapons as well as privatized luxury gated housing (opposite ends of the spectrum of bio-environmental control). It's actually the reverse. Forms of biopolitical governance emerged, or were already extant, and one manifestation of this was the building of bio-environmental

¹⁷ Höhler, “Spaceship Earth,” 76. Höhler, in another passage, cites the influential analyses of the concept of the state of exception in the work of Giorgio Agamben, one of the key thinkers of biopolitics (79).

¹⁸ Peter Sloterdijk, *In the World Interior of Capital: For a Philosophical Theory of Globalization*, trans. Wieland Hoban (Cambridge: Polity Press, 2013), 170.

enclosures. This is because the fundamental biopolitical act of determination and definition — defining who is deserving and who illegal, the governance of who (or what) gets optimum fresh air and water and who doesn't — is a spatial act: it's the act of defining an inside and an outside. In this picture, the proliferation of bio-environmental enclosures in the twentieth century is an effect — not the cause — of a move towards biopolitical governance. The relevant technologies proliferate because the premises of biopolitical governance are 'in the air' — the Janus-headed premise that life is something to be managed and optimised — and compel physical execution under one guise or another.

There is one last enclosed environment left to mention. Doesn't installation art also belong to the category of 'enclosed environments'? After all, an installation is an artwork made according to the spatial rules of an apparently closed system. In an installation, we intuit the simple fact that some things in the room are part of the "system" of the installation but not others. The fundamental premise in installation art is that the multiple things or images displayed within a room by the authority of the artist — perhaps even across multiple rooms — can make up a single artwork; yet also that the artwork is not reducible to those things (the whole is more than the sum of its parts)¹⁹ — rather it's the entire 'environment' that is the 'thing.' Indeed installation art may have its origins in the same 1960s and '70s moment when the concept of managed 'environments' emerged and there seemed to be the utopian promise of a better world in the act of orchestrating such environments. Julie Reiss notes that amongst installation art's precursors were Allan Kaprow's 'Environments' of the 1960s.²⁰ These were "room-sized multimedia works" that, in expanding into 'environmental' nebulousness as opposed to retaining object specificity, were meant to be consciousness bending in a way that traditional art objects or sculptures weren't.

¹⁹ When discussing the ostensibly installational character of her work *The bowery in two inadequate descriptive systems* (1974-75) — now commonly thought of as a 'photo-installation' — Martha Rosler notes that it "was intended to pose an argument about a form that transcended the idea of a mere series of [photographic] prints — the whole was meant to be different, or at least differentiable, from a sum of its parts." Rosler, "Installed in the Place of the Public," *Oxford Art Journal* 24, no. 2 (2001): 59.

²⁰ Julie H. Reiss, *From Margin to Center: The Spaces of Installation Art* (Cambridge, MA: MIT Press, 1999), xi.

If this is the case, then we can also note that installation art proves to be as internally ambivalent, as dialectical, as all the other enclosed environments or closed-system simulations mentioned so far. The philosopher Boris Groys, for example, has suggested that the popularity of installation as a mode of art practice tells us a lot about our society's privatised, individualised notions of freedom. Installation art is when an artist, in effect, seizes control of an entire room or environment — takes it over as private property. Inside the circumscribed environment, the power of the artist holds sway: "[T]he space of an artistic installation is

the symbolic private property of the artist. By entering this space, the visitor leaves the public territory of democratic legitimacy and enters the space of sovereign, authoritarian control... Here the artist acts as legislator, as a sovereign of the installation space".²¹ For Groys, this is not necessarily a good or bad thing, but it is illustrative of certain deeply entrenched notions within Western liberalism about how individual freedom and privacy are exercised. The picture here is of installation art as a hothouse — an "enclosed space" — of control.²² In this case, it's 'mere' aesthetic control rather than anything as nefarious as biopolitical control — but again the point is to wonder whether the two kinds of 'control' may not be different manifestations of the same thing.

This ambiguity and dialecticism of the term 'installation' may be why Melissa Laing intuitively resists using the word to describe her work — she prefers to think of *Controlled Environment Laboratory* as "an assemblage of units/components installed in space, not an installation."²³ I think we can allow the word 'installation', however. Ambivalence means we can see the good as well as the bad. The positive spin is given by, amongst others, the artist Martha Rosler, whose remarks, if triangulated with Groys's, effectively suggest to us that installation art's power may lie as much in its openness as in its closure. Among the characteristics she identifies as in the practice of installation art are "malleability", "evasiveness", virtuality.²⁴ These are properties of openness, properties attractive to the practicing artist (even if the theorist may still see ambiguities in them). "I will not soon abandon the making of 'installations'", says Rosler, because of this openness.²⁵ At any rate, it might indeed be more accurate to describe the phenomenon of installation art as emerging from a dialectical tension between opposing ideas of controlled enclosure versus expansive environment, autonomous artwork versus heteronomous relations, open system versus closed system.

Nonetheless the notion that Laing's installation is fundamentally a kind of enclosure gives rise to the semi-serious thought that *Controlled Environment Laboratory* constitutes a Russian-doll-like mise-en-abyme. It's one enclosure inside another. It's a closed-system environment for aesthetic investigation — an installation — that takes as its subject another closed-system device, this one for scientific investigation — a phytotron. The scientist in the phytotron and the artist in the installation are both shapers of hothouse environments. The fruit may not have fallen so far from the tree.

²¹ Boris Groys, "Politics of Installation," in *Going Public* (Berlin: Sternberg Press, 2010), 59.

²² "Enclosed space" is Groys's term in "Politics of Installation," 59.

²³ Private correspondence with Melissa Laing, July 2019.

²⁴ Rosler, "Installed," 59, 73.

²⁵ Rosler, "Installed," 73.