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Environmentalisation and Environmental Re-Conceiving the History of 20thc Architecture

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As historians confront the geographic and epistemic changes of climate change and other environmental catastrophes, the historical forces seen to condition the developments of modern architecture will be reconceived. Much of the early historiography of the modern movement was already concerned with climate, resource and comfort issues that are not far from contemporary tropes of sustainable design. However, a more momentous historiographic transition is taking place, one that shifts emphasis away from an emergence of ‘modernity’ out of the potentials and pitfalls of industrialisation, and traces instead a history of the ‘environmentalisation’ of the architectural discourse as it confronts new pressures in the 20th century. Such a history takes into account implicit and explicit interactions between an architectural modernism and a proto-environmentalism that converge through concerns with cultural, technological, and bureaucratic developments.

In this sense, environmentalisation follows on a seemingly progressive historical narrative from industrialisation and

modernisation. Hilde Heynen, interpreting the work of Marshall Berman for an architectural context in her *Architecture and Modernity, a Critique* (2000), helpfully clarifies the distinctions between modernisation, modernity, and modernism. In brief, modernisation comprises transformations in the objective processes of industrialisation and its manifest material effects on the world; modernity is the subjective experience of these transformations; and modernism encompasses the “cultural tendencies and artistic movements” that serve as a mediating device, expressing the subjective experience of these objective conditions.¹ From this perspective, one could trace the environmentalisation of the conditions of production and consumption in the 20th century; its ‘cultural tendencies’ of environmentalism, and an environmentality that begins to re-conceive the subjective experience of a world slowly degrading into uninhabitability.

The concept ‘environmentality’ has also developed out of the late work of Michel Foucault and the concept of ‘governmentality’ that he proposed in lectures in the late 1970s.² While the published work of Foucault had a profound impact on the historical and theoretical discourse of architecture in the early 1970s, following both the general interest in continental theory that swept the American academy and the specific relevance of Foucault’s writings on space in social and political analysis, his analyses have now largely fallen out of fashion. The posthumous publication and translation of the lectures presents an analytic framework with new opportunities for connections between policy and culture that is especially relevant to the historical problematics of architecture and environmentalism. So, before detailing some historical phenomena relevant to an environmentalised architectural history, I will briefly describe this theoretical framework of ‘environmentality’.

To interpret the literature on governmentality in this context we can emphasise four of the issues developed Foucault’s lectures. First, a general description of the concept of governmentality: it is outlined on the terms of the emergence, from the 16th century onwards, of non-sovereign forms of state power, which Foucault describes as:

the ensemble formed by the institutions, procedures, analyses, and reflections, the calculations and tactics that allow the exercise of [a] very specific albeit complex form of power, which has as its target population, as its principal form of knowledge political economy, and as its essential technical means apparatuses of security.³

New forms of ‘governmental rationality’ and the ‘art of government’ – cultural and bureaucratic, aesthetic and analytic – are no longer reliant on the transcendental power of the sovereign, and are rather concerned with how methods of social control infuse the daily

practices and cultural activities of the population.⁴ This is to some extent a transformation of the investigation of disciplinary society in *Discipline and Punish* (1975) into one of security and the “Society of Control;”⁵ It is also developed in close connection with ‘biopolitics’ as it was elaborated in *The History of Sexuality* (1976 and 1984) and throughout the same late ‘70s lectures. Though important distinctions emerge, as will be discussed below, biopolitics is proposed in Foucault’s lectures as creating as its analytic object:

a set of elements that, on the one hand, form part of the general system of living beings... and on the other hand, may provide a hold for concerted interventions (through laws, but also through changes in attitude, ways of doing things, and ways of living that may be brought about by “campaigns”).⁶

The central point is that the governmentalised state is no longer one of direct control over the freedom of individuals, but is concerned, rather, with “a sort of complex of men and things... men in their relations, their links to wealth, resources, climate, customs, famine, epidemics, and so on;”⁷ it is concerned with population as an abstract field of individuals, with their health and disposition as a statistical body that can be optimised according to perceived needs. Campaigns, as Foucault indicates, become a primary element of state power, encouraging the population to act in accordance with health provisions, environmental issues, urban crises.

Second, a major innovation of Foucault’s analysis is a clarification of the complex productivity of power. As the Danish philosopher Sven-Olov Wallenstein has indicated in his concise analysis *Biopolitics and the Emergence of Modern Architecture* (2009): “that power is something productive means that it is always both power *over* (application of an external force that molds matter) and power *to* (the work of shaping a provisional self as a response to external forces)” and thus describes “a process of simultaneous subjugation and subjectification.”⁸ The formation of subjects is where power is located – both the power that leads to subservience to state regimens and the power that allows for resistance and the formation of new objective conditions. Wallenstein’s analysis provides some interesting avenues for understanding the spatial critique embedded in these analyses: he locates the emergence of architectural modernity in the mid-19th century work of Durand, when the Vitruvian *dispositio* is transformed into a modern architectural sensibility which “solves a *problem* rather than... expresses *sense*: [the architects] task is to find the optimal equation” in the face of the variables of client, economy, symbolism, value, and other priorities of governmental organisation.⁹ For Wallenstein, in sum, modern architecture emerges at the moment that the field withdrew from the “*representation of order*” to become more and more “a *tool* for the ordering, regimentation, and administering of space in its totality”

and emerges as “*an essential part of the biopolitical machine...* this means that its primary goal is to *produce subjectivity*.”¹⁰ I will briefly return to Wallenstien’s tantalising proposal below, what is important here is to identify architecture as one of many fields of cultural inquiry and practice that comes to embody and enforce the process of governmentalisation.¹¹

A third issue central to the reception of the theory of governmentality, as Foucault alludes to and much of the secondary literature emphasises, is its facility for a precise tracing of the cultural components of the development of the modern liberal and neo-liberal dispositions towards global governance, offering numerous opportunities for the re-conceptualisation of the notions of environment and environmental action.¹² In this context we need to emphasise a micro-discursive distinction between ‘biopolitics’ and ‘governmentality’: on the one hand we could say that ‘biopolitics’ describes this set of analytics from the perspective of political subjectivity, understanding how individuals contribute to and resist the production of power in cultural practices; and ‘governmentality’ as engaging the theory of state power on the terms of transformations towards governing this biopoliticised subject. On the other hand, if these two concepts can be seen to describe the same conditions and techniques from different perspectives, it is also because of their distinct histories of disciplinary engagement. Biopolitics has been important to a number of discourses of cultural analysis – the result of, among a constellation of other relevant texts, Hardt and Negri’s *Empire*, and as a continuation of a cultural studies engagement with other Foucauldian and post-structuralist themes. Following *Empire*, there is often an emphasis on the ambivalence of the location of the site of power: both a population subject to an *apparti* of security and as the potent ‘multitude’ producing ‘power from below’.¹³ By contrast, governmentality has developed through the fields of sociology, government policy, education, and global governance in attempts to analyse the cultural dimensions of bureaucratic practices – and thus how educational systems, regimes of medicine and health, and environmental and urban campaigns and other ‘arts of government’ conceive of a given political and behavioural subjectivity. The emphasis here is on neo-liberal practices of global economic management, insurance and risk, and, more and more, the global managerial principles of mitigating environmental destruction and potential catastrophe. These concepts have been brought into the scientific and social scientific discussions of environmentalism – also by virtue, to some extent, of the interpretation of Foucault’s comments on risk and insurance and their relationship to the writings of Ulrich Beck, already known in environmentalist circles.¹⁴ Thus ‘environmentality’ has emerged as a site of interconnection between the critical and global analyses of policy and in environmental science and the political productivity of cultural practices.¹⁵

Fourth, in describing the elements of population, security, and territory in the lectures on governmentality, Foucault develops the term 'milieu' to describe the 'complex of men and things' that the governmentalised state is acting upon.¹⁶ Some authors writing in English have translated milieu as 'environment'; though tempting, this is a misleading oversimplification. Instead, the concept 'milieu' precisely conflates the terms 'man' and 'environment' that have pervaded and frustrated environmentalist discourse since the 1950s.

Significantly, Foucault identifies the role of architects and urbanists in describing the "notion of milieu... as the target of intervention for power."¹⁷ Indeed, Foucault gives some centrality to the analysis of the city as the model for the transformation endemic to these new forms of population-focused power. The city is the center of hygienic concerns as well as of circulation of goods and money; control over those circulations and interactions comes to define the organisation of the countryside according to the city's needs. The "specific space of security," Foucault writes:

refers to a series of possible events; it refers to the temporal and the uncertain, which have to be inserted within a given space... [which is] roughly what one can call the milieu... What is the milieu? It is what is needed to account for action at a distance of one body on another. It is therefore the medium of an action and the element in which it circulates. It is therefore the problem of circulation and causality that is at stake.¹⁸

He goes on to describe that the *milieu* has not been the explicit object of the architects or town planners, but rather that

the technical schema of this notion of milieu, the kind of pragmatic structure which marks it out in advance is present in the way in which the town planners try to reflect and modify urban space. The apparatuses of security work, fabricate, organize and plan a milieu... as set of natural givens – rivers, marshes, hills – and a set of artificial givens – an agglomeration of individuals, of houses, etc. The milieu is a certain number of combined, overall effects bearing on a population, a multiplicity of individuals who fundamentally and essentially only exist biologically bound to the materiality within which they live.¹⁹

To indicate that the milieu precedes the operations of architects is not so much to say that it is not available for design practices but rather that such practices tend to focus on the effects of government rather than its causes. The issue here is that the project of re-conceiving the history of architecture can be informed by an

analysis of the ‘pragmatic structure’ that provides opportunities for architectural intervention.

With this in mind I will close this brief discussion of the potency of the ‘governmentality’ analytic by indicating three summary points: first, that architectural-historical analysis can attempt to understand the relationship of professional and pedagogical interventions in architecture within a broad conception of the milieu as: a) resource, infrastructure, and material conditions of the ‘environment’ as they are conflated with social processes;²⁰ b) the bureaucratic forms of management and scientific forms of knowledge that inform these material conditions and also inform concepts of innovation in architectural practices, especially insofar as modern architecture emerges as a global phenomenon more or less contemporaneous with the strategies of neo-liberal governance; and c) the extent to which cultural or formal developments in architecture reflect and inform – both cause and affect – these tactics of population management and the broader strategies of campaigns, codes, guidelines and other tactics that produce the disposition of both local and global governance. Second, rather than implicate architecture as complicit with these new forms of power, we can follow Wallenstien in identifying modern architecture as part of the ‘biopolitical machine’ and also identify the design practices as emphasising the possibility of “counter-production that is always intertwined with the production of subjects.”²¹ Historians can interrogate and problematise the role of architecture, then, in the formation of environmentalised subjects – or the extent to which the process of subjectification is a product of the milieu and also central to its formation.

Finally, we can follow Jean-Luc Nancy, in his brief essay ‘Note on the term: *Biopolitics*’ in which he generalises the concept of milieu in reference to both nature and technology:

it is clear that so-called “natural life,” from its production to its conservation, its needs, its representations, whether human, animal, vegetal, or viral, is henceforth inseparable from a set of conditions that are referred to as “technological,” and which constitute what must rather be named *ecotechnology* where any kind of “nature” develops for us (and by us).²²

And further: “what *forms a world* today is exactly the conjunction of an unlimited process of eco-technological enframing *and* of a vanishing of the possibilities of forms of life and/or common ground.”²³ In this sense, the pervasiveness of the technological in the history of architecture needs to be, again, brought to the fore, but this time with an emphasis on its imbrication with processes of environmental management and the development of environmental-scientific knowledge. ‘Environmentality’ as a historical analytic for architecture would thus be informed by these

biopolitical and ecotechnological enframings, while focusing on architecture in its relationship to the ‘arts of government,’ and its formal, material, and conceptual connections to the formal and managerial proposals that also developed in the discourse of environmentalism.²⁴

New issues come to the fore, then, when describing the historical progress of the 20th century as one of the environmentalisation of architecture: the texture and consistency of the historical landscape is altered; different signposts become available to monitor and manage these forms of historical knowledge. A timeline of this environmentalised history connects an alternate constellation of important dates and events. In what follows I will briefly follow a historical thread of climate and architecture at mid-century, as an example of how new stakes and consequences can be embedded in architectural-historical narratives.

In a narrative of architecture and climate, a few seminal years stand out. 1928, for example, has long been seen as a significant date in 20th century surveys: Le Corbusier’s *Ville Savoye*, Mies’ Tugendhat House, Neutra’s Lovell Health House, Gropius’ light and air diagram – all profoundly engaged with developing a climatic and technological conception of architecture. 1928 was also the year of the *brise-soleil*,²⁵ developed most famously by Le Corbusier at Algiers and Carthage, after the abject failure of his mechanical air-conditioning system in Paris and Moscow.²⁶ The *brise-soleil* was simultaneously conceived by the Greek architect Stamo Papadaki then resident in Brazil, and became a prominent characteristic of the emerging modernism in that country. It was central to the plastic and functional exuberance of Costa and Niemeyer, and also the technological innovations in shading design by MMM Roberto, Luiz Nuñez, Paulo Antunes Ribeiro into the late 40s and early 50s. Their contemporary historian Henrique E. Mindlin outlines three main factors for this proliferation: technological research in Sao Paulo engineering schools developing “a scientific basis for the orientation and sun-lighting of buildings” in architecture schools by the mid-20s; the widespread use of reinforced concrete, especially in urban contexts; and, most importantly for Mindlin, the *brise-soleil* allowed for an expressive connection between vernacular traditions of sun-breaking devices throughout the tropics, and thus its use as a culturally meditative device, understanding the new force of technology, production, and social organisation of a modernising world.²⁷ More recent historians have added a fourth factor: the bureaucratic disposition of a government promoting modernism in social and economic terms; in other words, the relationship of modern architecture to development practices.

Brazil in the 1940s, relatively isolated from the world at war, saw what was possibly the largest sustained production of concrete buildings to date and was, on the one hand, arguably the site of the material emergence of modern architecture. The careful

consideration of climate in Brazil then saw a broad influence on the modern architecture of the global South – both in hot-humid and hot-dry environments, due to Brazil's own climatic diversity – and on the development of the urban office building more generally.²⁸ On the other hand, the brise-soleil can be seen as one of the earliest and clearest demonstrations of the environmentalist factors endemic to the modern architectural project – or, as I am proposing here, to the modernisation of architecture as its environmentalisation. Climatic efficacy is a central component in the history of buildings as technological and resource-laden objects – agents in the environment, mediators of energy and climate, and as cultural objects – agents in the production of a culture of environmentalism.

A second signpost develops these themes further: in 1957, the architecture of climate reaches an apex in this year with two significant developments: the Association for Applied Solar Energy's 'Living with the Sun' solar house design competition and the publication of Hungarian émigré architects Victor and Aladar Olgyay's *Solar Control and Shading Devices* (1957). The Olgyay's complex sun-shading methodology became a reliable manual for a generation of architects used widely until the 1980s; their basic principles still inform professional architectural examinations in areas of ventilation, orientation, and solar radiation. The Olgyay method involved a careful investigation of weather patterns, thermal capacity of materials, and site to establish both volumetric standards and a vocabulary of shading devices to minimise mechanical conditioning loads in both summer and winter.²⁹ Their work participated in a dramatic re-conception of the internal environment of a building: as part of their dizzying mappings, calculations, and diagrams, they identified the conditions that would produce an optimum zone for human activity. All of their methodological experimentation was aimed at keeping the inhabitant in this 'comfort zone'.

The Association for Applied Solar Energy, founded jointly by the Stanford Research Institute and the Arizona public power agency, represents another creative proliferation of these concerns. The AFASE was a multi-faceted organisation: it lobbied US and foreign governments and the UN; it promoted solar products to industry and corporate leaders; and appealed to diverse parties for increase in solar technology funding. During the 1950s, most of the organisation's time and money was spent on solar desalination technology for use in developing countries. The design of the solar house was a close second: the house competition, called 'Living with the Sun', solicited over 1600 entries from 36 countries.³⁰ The entries combined volumetric exploration of the modern-climatic tradition with the technology of heat collection through solar panels.³¹ A precise area of panel coverage was specified, including an optimal sun-incidence tilt-angle, as well as a cubic diagram demonstrating basic natural ventilation principles. Energy

from collectors was to have provided for year-round water-heating as well as winter space-heating and pool-heating. The winning entry, by Peter Lee of Bliss and Campbell in Minneapolis, was a straightforward rectangular shell surrounding a concrete and glass box, with outer walls of brick screens and patios covered by mechanically-tiltable solar-collection louvers.

The techno-cultural formation of the AFASE reflects other events in this banner year of our environmental history, namely a significant 'extra-architectural' development especially relevant to climate concerns: The International Geophysical Year (IGY) and the scientific and organisational collaborations that emerged from it. IGY was a catalyst for a proliferation of meteorological observation stations and data gathering systems around the world.³² Many other technological developments supported this climatic observation imperative: rockets – including Sputnik – balloons, sonar and ice-coring devices. New *apparati* were developed to monitor sunspots, air glow, and the intensity of the aurora; indeed when the mathematician John von Neumann was looking to test the new IBM 701 computer he turned to the mass of under-analysed data gathered during IGY.³³

New forms of organisation also proliferated, the scientific community developing a number of non-governmental organisational strategies. The recognition of the climate crisis as well as the bureaucratic and scientific model of environmental management that would be applied to it, were both first seen in 1957. As scholars, analysts, and scientists begin to address the geo-political and geo-physical drama that climate change promises to bring we will perhaps look back to this year as a hinge, the beginning of a new era in our environmentalised history.

It is also important to note that the globalisation of the environmental discourse depended heavily on the conceptual formulation of 'the tropics' on the part of western European and American industrialists and bureaucrats. Although tropical rainforest deforestation has accounted for only a small part of total carbon emissions, it has been regarded as a global crisis since the 1950s, when scientists first began to see anthropogenic climate change as a subject worthy of serious study. "The 'rainforest connection'" as the environmental scientists Peter Taylor and Frederick Buttell call it, "has been central in the scientific and popular construction of global-change knowledge."³⁴ As they also point out, one of the major goals of the NGO-based environmental-protest and reform regime that emerged in the 1950s was "to influence, and to employ the influence of, the international development and finance assistance establishment, particularly the World Bank/IMF (International Monetary Fund), because of the important role of these institutions in affecting economic activity in the tropics."³⁵

The argument in *Tropical Architecture in the Dry and Humid Zones*, also 1957, by Maxwell Fry and Jane Drew, is explicitly

tied to development narratives. Following the dissolution of straightforward political control, Fry and Drew advocated design principles that recognise the humanity in economic and resource development projects characteristic of this post-colonial condition.³⁶ Management of the climate – along with its attendant benefits and ills – through passive design methods in areas far removed from infrastructure improves the essential living conditions of the worker, allows for comfortable accommodations for agents of industry and government, and generally provides conditions for economic growth. Thus can tropical architecture's central project be seen as an attempt to use architecture to mediate between political, social and climatic problematics.³⁷

If space allowed, this counter-survey could continue to the present. One last instance that must be noted is the purported end of modern architecture in 1972 – significant less for its historiographic effects than for its symptomatic indication of a shift that was also occurring in thinking about the environment. Indeed, according to our environmentalised narrative, many of our current conundrums – environmental, architectural – were in place by the late 1950s. Elaborate developments in oil networks, nuclear power, electricity grids, appliances and HVAC systems led to a growth in energy use that dwarfed the predictions of the 'first oil crisis' doomsayers of the 1940s.³⁸ By the time of the 'second oil crisis' in the early 1970s, energy consumption had nearly doubled, and domestic production (in the USA) had long since been eclipsed by imports.³⁹

The post-modernisation of architecture in the late 60s and 70s is here overtaken by a different sort of post-modernisation, one that begins to conflate ecological and economic systems and quickly begins to theorise 'Limits to Growth' and other symptoms of the global system of production, consumption, and waste.⁴⁰ In *Empire*, Hardt and Negri indicate that the transition from *formal* to *real* subsumption occurred in the early 1970s, as the culmination of the integration of world capitalist economic and resource systems.⁴¹ Bill McKibben, in a very different context, referred to the *End of Nature* in his 1989 book of that title, bemoaning that "we had ended the thing that has, at least in modern times, defined nature for us – its separation from human society" through anthropogenic climate change.⁴² From the analyses started in 1957, it was beginning to become clear by the late 1980s that our impact on the climate system – largely from combustible engines in cars and coal-burning power plants feeding the electrical needs of buildings – is on the scale of a natural disaster. There was a moment in the early 1970s – a sort of clandestine historical event that the history of environmentalisation seeks to reveal – when the elaborate processes of maintaining human life began eroding our civilisation instead of nurturing it. And we haven't stopped.

Even in the face of such a momentous shift, modern architectural historians have proposed that the most important event of the early 1970s was in June of 1972 when, as Charles Jencks wrote in 1973, the destruction of the Pruitt-Igoe housing complex in St. Louis signaled the ‘end of the modern movement’.⁴³ If we follow the notion of the butterfly effect (developed, we should note, through processing IGY data), it was perhaps the dust blown at the destruction of Pruitt-Igoe that led, node by node, to the formation of the United Nations Environment Program (UNEP) and the inauguration of the contemporary NGO-based environmental movement that same year. The occasion was the ‘Conference on the Human Environment’ at Stockholm in August 1972; the *One World* document that emerged from it, much like the ‘blue marble’ photograph of the earth taken by Apollo 13 later that year, was one of the first social analyses to conceive of the globe as a single entity.⁴⁴

The process of re-conceiving historical narratives in this fashion thus rejects the notion of re-reading modernism for traces of green or sustainable practices in a possible history of architectural environmentalism and instead places architectural practices in the midst of a broad re-conception of the 20th century: an environmentalised history of architecture in its multivalent proposals and strategies that both implicates design in the formation of environmental conditions and, perhaps more promising, identifies architecture as an important and productive site for the formation of a new type of environmentalised subject.

Notes

1. Hilda Heynen, *Architecture and Modernity, A Critique*, Cambridge, MA: MIT Press, 1999, pp. 9–11. See also Marshall Berman, *All That is Solid Melts Into Air: The Experience of Modernity*, New York: Simon and Schuster, 1982.
2. Foucault delivered bi-weekly lectures at the *Collège de France* from 1970 to 1984, many of which have recently been published. These lectures, developed more as reports on his research than as part of traditional curricula, were often the groundwork for later published studies; others, such as those on governmentality, were not developed explicitly in published work. The lectures have been published as Michel Foucault, *Security, Territory, Population: Lectures at the College de France, 1977–1978*, New York: Pallgrave MacMillan, 2007; those of 1978–79 as Michel Foucault, *The Birth of Biopolitics: Lectures at the College de France, 1978–1979*, New York: Pallgrave MacMillan, 2008.
3. Foucault, *Security, Territory, Population*, p. 105.
4. Foucault traces these forms of power from the shepherding of the flock and the father’s economic management of the family, as described in the lecture of February 1 (later published as the

- lecture on governmentality, see note 12 below), see Foucault, *Security, Territory, Population*, pp. 87–114.
5. See Gilles Deleuze, 'Postscript on the Society of Control' (1990) *October* 59 (1992), pp. 3–7.
 6. Foucault, *Security, Territory, Population*, p. 366.
 7. Foucault, *Security, Territory, Population*, p. 28.
 8. Sven-Olov Wallenstien, *Biopolitics and the Emergence of Modern Architecture*, New York: Buell Center and Princeton Architectural Press, 2009, p. 5. That Wallenstien is talking about architecture should not lead us to take him as an example of a new conception of its history. See note 11 below.
 9. Wallenstien, *Biopolitics and the Emergence of Modern Architecture*, p. 23.
 10. Wallenstien, *Biopolitics and the Emergence of Modern Architecture*, p. 20–21.
 11. Though Wallenstien's summary of the 'late Foucault' is both clear and concise, his reflections on the hospital as a privileged laboratory for this new form of social space, and thus connecting the specific architecture of medical institutions to the early biopolitical analyses of Foucault and his colleagues in the collective volume *Les Machines à Guérir (aux origines de l'hôpital moderne)* (1977), is less convincing. This is in large part because there is no apparent integration between the text and the "pictorial essay on the development of modern hospital architecture" that accompanies it, and the reader is left with vague platitudes about the role of medical spaces in the processes of subjectification. His analysis is further disappointing in that, while the first part of the essay appears to hold out hope for a reconception of the inputs and adjacencies that might allow us to describe modern architecture in a new way, instead we see a reiteration and expansion of the familiar tropes of the diagram and the society of control – reflections made by Deleuze on the importance of Foucault's work that have already seeped into architectural discourse, albeit often in unrecognisable form.
 12. Until quite recently, the majority of governmentality literature came out of British, Canadian, and Australian departments of sociology, and was to some extent the legacy of the strong Althusserian schools of Marxist critique in those countries. Most of this was based on a translated lecture given the title 'Governmentality' of February 1, 1978, published in Italian and English by 1979 though not in book form until 1991 in Graham Burchell, Colin Gordon, and Peter Miller (eds), *The Foucault Effect: Studies in Governmentality : with two lectures by and an interview with Michael Foucault*, London: Harvester Wheatsheaf, 1991. Though some specialised scholars used the taped lecture archives previously, the full courses for these years were not published in French until 2004, and then in

- English in 2007-08. The lecture of early 1978 summarised many of the more important points of Foucault's proposal; by publishing the February 1 lecture, two related interviews, and a collection of interpretations, *The Foucault Effect* was a self-conscious project to expand Foucault scholarship and Foucauldian analysis into studies of government policy. Soon after, Mitchell Dean and Nikolas Rose, both Australian sociologists, produced book length studies expounding on governmentality as a method of social analysis. The central volume of the Australian school, in addition to Dean's book length study, is Andrew Barry, Thomas Osborne and Nikolas Rose (eds), *Foucault and Political Reason: Liberalism, Neo-Liberalism and Rationalities of Government*, Chicago, IL: University of Chicago Press, 1996. The Anglo-Australian dominance of this discussion, it has been argued, is in large part because of the existence of strong welfare and neo-liberal governments in these countries. As Colin Gordon points out, Foucault's lectures at the end of the 70s anticipate the rise of the Thatcher and Reagan governments in the UK and the US, respectively; thus the discourse on governmentality is developing as the practice of neo-liberal state power is itself being discussed and deployed in policy circles. See Gordon, 'Introduction' in *The Foucault Effect*, p. 6. See also Éric Darier, 'Foucault and the Environment: an Introduction' in *Discourses of the Environment*, edited by Eric Darier, Malden, MA: Blackwell, 1999, compelling for its general outlines but written before the lectures were published and seemingly without knowledge of *The Foucault Effect*.
13. See Michael Hardt and Antonio Negri, *Empire*, Cambridge, MA: Harvard University Press, 2000.
 14. See Ulrich Beck, *Risk Society: Towards a New Modernity*, London: Sage Publications, 1992 and Ulrich Beck, *Ecological Politics in the Age of Risk*, Cambridge: Polity Press, 1995.
 15. One of the more interesting examples of this type of investigation is the analysis of cooperation between state governments, NGOs, and cross-border cultural organisations in the Arctic, organising to develop an argument for resistance to global warming, which has been literally destroying their resources of land, livestock and agriculture. Monica Tennenberg's study of this movement articulates the formation of 'counter-management' regimes intended to produce a resistant political subjectivity and economic systems that could operate in protest to a globalised management regime in which other populations are optimised at their expense. See Monica Tennenberg. *Arctic Environmental Cooperation: A Study in Governmentality*, Aldershot: Ashgate, 2000.
 16. A proper analysis of the term milieu would trace it back to one of Foucault's teachers, Canguilhem, and its role in the history

and sociology of science in France in the 1950s. Unfortunately there is not space for that here.

17. Foucault, *Security, Territory, Population*, p. 22.
18. Foucault, *Security, Territory, Population*, p. 20–21.
19. Foucault, *Security, Territory, Population*, p. 21.
20. In this regard, Foucault identifies the role of government in the formation of famines as a particularly coherent example of the emergence of the governmentalised state. This appears to prefigure the analysis in Mike Davis, *Late Victorian Holocausts: El Nino Famines and the Making of the Third World*, New York: Verso, 2001, which has been influential on a number of recent global histories of the economic and ecological developments; see for example Robert B. Marks, *The Origins of the Modern World: A Global and Ecological Narrative*, Lanham, MD: Rowman and Littlefield, 2002.
21. Wallenstein, *Biopolitics and the Emergence of Modern Architecture*, p. 42.
22. Jean-Luc Nancy, 'Note on the term: Biopolitics' in *The Creation of the World, or, Globalisation*, Albany: State University of New York Press, 2007, p. 95. Nancy is, of course, also referring to Giorgio Agamben's developments of biopower under the rubric of 'bare life', see Giorgio Agamben, *Homo Sacer: Sovereign Power and Bare Life*, Stanford, CA: Stanford University Press, 1998.
23. Nancy, 'Note on the term: Biopolitics' p. 93.
24. More recent analyses of the 'late Foucault' have elaborated on a number of the themes described here, from a kind of vulgar version in Eric Paras, *Foucault 2.0: Beyond Power and Knowledge*, New York: Other Press, 2006 to more precise studies of insurance, health, and war in, for example, Alain Beaulieu and David Gabbard (eds), *Michel Foucault and Power Today: International Multidisciplinary Studies in the History of the Present*, New York: Lexington Books, 2006; Michael Dillon and Andrew M. Neal, (eds), *Foucault on Politics, Security, and War*, New York: Pallgrave Macmillan, 2008; and Jonathan Xavier Inda (ed.), *Anthropologies of Modernity: Foucault, Governmentality, and Life Politics*, Malden, MA: Blackwell Books, 2006.
25. Later referred to by Reyner Banham as Le Corbusier's "most masterly invention" and as one of "the last *structural* innovations in the field of environmental management that we have seen," Reyner Banham, *Architecture of the Well-Tempered Environment*, Chicago: University of Chicago Press, 1969, p. 158.
26. For discussions of the climatic problematic in Le Corbusier's work of the late 20's, see Banham's *Well-Tempered Environment* and also Kenneth Frampton, *Modern Architecture: A Critical History*, New York: Thames and Hudson, 1986; Kenneth

- Frampton, *Le Corbusier*, New York: Thames and Hudson, 2001, chapter 8 (pp. 130–149); and Colin Porteous, *The New Eco Architecture: Alternatives from the Modern Movement*, London, Taylor and Francis, 2002.
27. See Henrique Mindlin, *Modern Architecture in Brazil*, New York: Reinhold, 1956, p. 11ff.
 28. In many cases, especially in the global North, of course, the device was used without attention to its climatic logic, which is to say that it was formal accompaniment to a fully mechanised climate-control system; for an early example see SOM's Pan-Am Insurance building in New Orleans of 1952. The basic parti of the Rio Ministry building was reproduced most famously at the UN Secretariat and in countless public and corporate buildings thereafter.
 29. Aladar Olgyay and Victor Olgyay, *Solar Control & Shading Devices*, Princeton, NJ: Princeton University Press, 1957, p. 23.
 30. See Association for Applied Solar Energy, Proceedings of the World Symposium on Applied Solar Energy, Phoenix, Arizona, November 1–5, 1955, sponsored by the Association for Applied Solar Energy, Stanford Research Institute, University of Arizona (Menlo Park, CA: Stanford Research Institute, 1956); and John Yellott (ed.), *Living with the Sun: Sixty Plans Selected from Entries in the 1957 International Architectural Competition to Design Solar-Heated Residence*, Phoenix, AZ: Association for Applied Solar Energy, 1958.
 31. Though the photovoltaic cell had just been invented, it was to remain too costly until the mid-1970s. The technological specifications proposed a basic collector unit, developed since 1939 in a series of experimental houses in the Chemical Engineering Department at MIT. See the AFASE publications above and relevant sections of Giovanna Borasi and Marko Zardini (eds), *Sorry, Out of Gas: Architecture's Response to the 1973 Oil Crisis*, Montréal: Canadian Centre for Architecture, 2007, for a description of these panels.
 32. Climate science, much more than the other global geophysical endeavours, had a history of standardising and sharing observations. In the mid-19th century, the Smithsonian Institute established a network of 800 meteorological observers – mostly at train stations – across the United States and constantly updated a weather map painted on a large wall in its lobby. See William K. Stevens, *The Change in the Weather: People, Weather, and the Science of Climate*, New York: Delacorte Press, 1999, pp. 87–95.
 33. Experimentation with models of climatic behaviour, aside from having the effect of transforming the culture of scientific investigation, quickly began overturning familiar conceptions of the natural world. Chaos replaced harmony as the model of

nature; the notion of the butterfly effect – that a butterfly can flap its wings off the coast of Australia and cause a rainstorm in New York – was conceived by an MIT climatologist in the early 1960s as both a sophisticated analysis of the global climate system and a simplification of this principle of interdeterminacy; the paradigm shift to chaos, in any event, and a profound recognition of the limits of our scientific knowledge and technological capacity was a transformation of historical proportions.

34. Peter Taylor and Fred Buttel, 'How do we Know we have Environmental Problems? Science and the Globalisation of the Environmental Discourse' *Geoforum* 23:3 (1992), p. 410.
35. Taylor and Buttel, 'How de we Know...' p. 411.
36. Maxwell Fry and Jane Drew, *Tropical Architecture in the Dry and Humid Zones*, Huntington, New York: Kreiger, 1956.
37. A recent dissertation has amplified the post-colonial disposition of Otto Koenigsberger, a German architect working in India who went on to run the Tropical Studies program at the Architectural Association in London and was fundamental to the interdisciplinary emphasis of that program by the late 50s. See Vandana Baweja 'A Pre-History of Green Architecture: Otto Koenigsberger and Tropical Architecture from Princely Mysore to Post-Colonial London' (PhD Dissertation, University of Michigan, 2008); see also Hannah le Roux, 'The Networks of Tropical Architecture' in *The Journal of Architecture*, Vol 8, Autumn 2003, pp. 337–356.
38. Despite its Hollywood-like dramatisation of key players and 'great powers', the best analysis of the growth of energy consumption is Daniel Yergin, *The Prize: Epic Quest for Oil, Money and Power*, New York: Simon and Schuster, 1991.
39. Net-importation of oil began in the fall of 1947. See Sam H. Schurr and Bruce C. Netschert, *Energy in the American Economy, 1850–1975: An Economic Study of its History and Prospects*, New York: Resources for the Future and Baltimore, MD: The Johns Hopkins Press, 1960.
40. See Donella Meadows et al., *Limits to Growth: A Report for the Club of Rome's Project on the Predicament of Mankind*, New York: Universe Books, 1971.
41. Hardt and Negri, *Empire*, p. 254ff.
42. Bill McKibben, *The End of Nature*, New York: Random House, 1989, p. 34.
43. The claim is made in Charles Jencks, *Modern Movements in Architecture*, Garden City, NY: Anchor Press, 1973. Obviously it is contentious; however it represents a general historiographic proposal of the emergence of post-modernism in the early 1970s.
44. See Rene Dubos and Barbara Ward, *Only One Earth: The Care and Maintenance of a Small Planet*, New York: WW Norton and Company, 1972.