Planetary Interior

Daniel A. Barber

Figure 1: 1958 solar house

Thermal Interior

The thermal interior is an abstract but remarkably potent site for considering the cultural friction of new futures—for the speculation on different socio-climatic conditions at a planetary scale. Air conditioning (Heating, Ventilating and Air Conditioning systems – HVAC) took over the thermal interior at the end of the 1950s, setting up supply chains and path dependencies that have proven difficult

to disrupt. Though as an analytic, as a socio-spatial framework, 'thermal interior' suggests any number of possible means of adjusting the humidity and temperature of interior space, the fossil-fueled aspect of contemporary interiors iis difficult to avoid, in both embodied carbon and maintenance energy. We live in thermal interiors and adjust them to specific, changing needs. Thermal interior and thermal practice help consider a different set of planetary priorities for thinking about architecture. The planetary effect is the accumulation of discrete units, spatial and thermal conditioning of interiors, connected through infrastructures and ways of life.

There is an initial and remarkable coincidence, historically, between the interest in interiors as the planetary scale of architectural resonance and the emergence of *research* and academic knowledge production in architecture. In the 1950s, one of the ways design sought to legitimate itself was through a diagrammatic, quasi-scientific, well intentioned and somewhat over-wrought method to design a building according to its climatic surround. Research in engineering schools, and in new specialized departments or streams in schools of architecture were focused on what would eventually be called *architectural science* – but which, when it preoccupied practitioners, academics, and students, was just thought of as architecture, one of many ways of playing out the intersection of resources, infrastructure, cultural possibility and occupant aspiration.

Research into architecture and climate had a number of active mid-50s nodes, all caught up in forms of retooling colonial and extractive knowledge into a formal and functional language of lifestyle improvements. Climate was in this sense a powerful idea, a conceptual object to manage, if not exactly control, account for as part of architectural expertise. The premise was clear: architectural form, materials, and attention to site could produce a felicitous relationship between the building and its environment. The benefits were economic, reflective of regional cultures, and often framed as moral: the appropriate use of the plentiful sun's energy, for example, or the experience of the sun coming up in one room and going down in another as a connection to nature. One prominent solar house competition describes the future inhabitant as "adventuresome enough" to work all the shades and curtains and nobs and levers, to maintain and care for the mechanisms solar and climatic adaptive systems.[1] Buildings, especially houses in the mid-50s, came to be seen as devices for climatic adaptability, as research into technology and lifestyle focused on climate.

Climate research developed in schools and professional circles around the world. Henry J. Cowan occupied the first chair in Architectural Science at the University of Sydney, Australia from the early 1950s. He taught and wrote on the topic for decades.[2] Cowan's focus was exemplary, but far from unique. Henry

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[1] John Yellott, *Living With the Sun: Competition for a Solar House*. Stanford, CA: Stanford Research Institute, 1958.

[2] Henry J. Cowan, *An Historical Outline of Architectural Science* (New York: Elsevier, 1966) and Cowan, *The Master Builders: A History of Structural and Environmental Design from ancient Egypt to the Nineteenth Century* (New York: Wiley, 1977). Daniel Ryan, "Architects in White Coats" in Andrew Leach and Lee

Wright's "Form and Climate" group at Columbia University; Oluwole Olumuyiwa's built experiments in Lagos, just a few examples of researchers, students, and practitioners around the world who took on questions of climate and adaptation, considering the focused details of site for its planetary context. It is not so much that 'climate research' as a category of architectural knowledge, was in itself ubiquitous in the 1950s, rather that such consideration were simply a part of any architectural approach, before air conditioning.

`These centers of activity indicate a sophisticated discourse that developed in this more everyday context and continued to be elaborated - the research and writings of the Israeli-American architect Baruch Givoni later in the 1960s developed elaborate and more precise means to analyze, evaluate, and produce thermal conditions. Givoni could perhaps best be seen as a second-generation architectural-climate methodologist, no longer caught up in the travails of how to get the discussion started but, rather, expanding its technical acuity in the context of focused research streams. Simultaneous to his methodological research ongoing interest in the use of computation for rendering architecture's climatic performance more precise depended on the ongoing refinement of atmospheric knowledge and other operable meteorological knowledge. These are, again, exemplary but representative examples; climate was part of the architectural

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Stickells, eds, *The Sydney School: Formative Moments in Architecture, Design, and Planning at Sydney University* (Sydney: Uro Publications, 2018).

development across the post-war period. The period of the sealed-curtain wall tower has been quite brief.

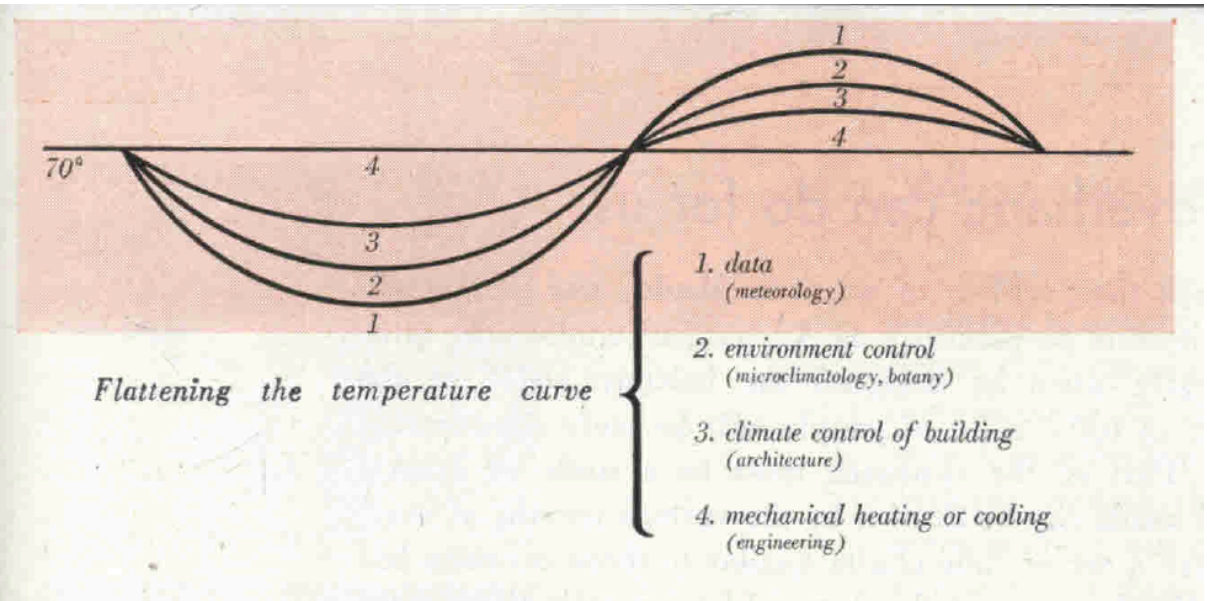

Figure 2: Flattening the Temperature Curve

Planetary Agency

At risk of repeating a platitude, the brise soleil, or shading device, is a useful technique to trace the history of climatic knowledge in architecture, of the rise and fall of climatic modernism. The brise-soleil is a general term used for any range of shading devices, fixed or variable, generally hung at some small distance from a largely glazed façade. The purpose of the brise-soleil is to selectively shade the façade so as to modulate the incidence of solar radiation on the interior. In addition to radiation, as heat, light is also controlled by the coordinated relationship of the façade system to the daily and seasonal passage of the sun.

On planetary terms, the historical significance of climate modernism is less in the details of the building's produced with dynamic shading screens, or even

the role of such shaded interventions as agents, intensifiers of corporate and neo-colonial interventions as part of resources and labor extractive schemes in the 1960s – a complex topic that I have covered elsewhere What operates at the planetary scale is less the buildings themselves, as they accumulate, and more a story of the diagrams, drawing, charts and other technical images that were disseminated as a means to transform architecture purpose and process.

Through these complex diagrams of inter-relationship, which I show here only illustratively, we can also pivot briefly to the marked contrast they indicate: contrast to another sort of diagram or historical schematic, that of the sealed, hung curtain wall, unshaded, unmodulated, receptive of radiation and daylight and dependent, instead of the careful elaboration of design, materialism and site, reliant on a fossil-fueled air conditioner to make them habitable (quite literally). Bereft not only of design moralities and adventuresome occupants, these diagrams indicate - again as their all-too-familiar inverse in the sealed thermally conditioned space – a contrasting relationship to planetary systems, to tropes of resilience or sustainability or adaptability; to a different sort of framework for *design* for excellence in expression and elaboration of broader cultural elaborations. How can we be different people, have different desires, live in different buildings?

Here is the emergence of a certain planetary discourse – all architecture, everywhere, should adapt itself to its environment. According to the specificity of

site and planetary knowledge - of climate patters, as well as supply chains, and resources systems, and many other things. The design of buildings becomes a planetary agent, in the derogatory Anthropocenic sense, through its capacity as an energetic system, a social device for the throughput of fuel, a marker of 'the human enterprise' and its relationship to the lived world and the possibility of a collective future.

The story of the 20th century is the story of oil, of carbon dioxide emissions. Architecture, and indeed precisely its global-ization, has been an essential medium for the spread of petroleum and its effects: buildings, their disposition, are the cultural and material system through which petroleum has been processed by societies; on a planetary scale. Architects, in this context, give form to our carbon-dependence. It is, in no small part, through global architecture that we have collectively built a planet inexorably (it seems) reliant on the ongoing burning of fossil fuels. It's a bit hard to imagine that architecture will be a way out.

How, then, can we (historians of architecture and urbanism attentive to the global scale) leverage 'planetary' to reframe and restructure architecture. To read it as a cultural relation to carbon, at least in part. Building on the legacy and promise of the GAHTC in its ambition to claim history as social practice; in this case to construct architecture and its forms of knowledge production as a sort of energetic force, an array of activities and knowledge concerned with the cultural processing of carbon - less about objects or architects and more about systems

and arrangements, resources and materials, habits and ways of life. And yet to still cultivate an afterlife for architecture, or at least an aftermath, to confront the sense of urgent operationalism in planetary discourse, as we consider what sort of knowledge comes next, and how to produce it. To recognize that climate change, as a concept, is a historical concept, read into and a part of histories of architecture culture and its many threads and tendrils, and to face, however uncomfortably, the spectre of an applied history, a narrative mode and a version of the past that is also a way out, an opening into a different future.

In Jennifer Gabrys' "Becoming Planetary" from 2018, she stages a discussion between Spivak and the Jamaican novelist and theorist Sylvia Wynter, a discussion on the question of praxis and the labor of identity; on the occlusions, I think, of oil and its reach: "The question of the planetary," Gabrys writes, "cannot be addressed without also reworking divisions of the human, and the injustices that result from these limited modes of being." "The 'catastrophe' of climate change," she continues, here drawing on Wynter's phrasing; "is also a 'catastrophe' of the ways in which the 'genre' of the human has been designated as an excluding and accumulating subject."[3] The planetary opens up this new space of consideration, of the assessment of social practices and their political or material valence not only in reference to the perils of climate instability, but to the

[3] Ref, and to Wynter. And Spivak

longer-term catastrophe of colonialism and colonization; our collective foundation on inequity.

So, what sort of life are we after, after carbon? Gabrys on Wynter, again: "The planetary in this sense is not proposed as an abstract figure of earth science, nor is it a unifying globe that would make uniform and universal conditions for all humans. Instead, the planetary is in many ways irresolvable, and yet it is a way to figure, de-figure, and re-figure collective responsibility to the other in postcolonial and decolonial circumstances." Taking this, for this short text, as a prompt, for scholars considering the future of the global, the future of history, perhaps the question is: what is a planetary method of knowledge production? How is it both conceptual and geophysical? Can it be an imperative without being imperial? One of the concerns of architectural history, of narratives of collective energetic flows, their representations and materialities, is to examine if not in fact encourage spatial conditions for these multiple worlds and ways of being members of collectives.

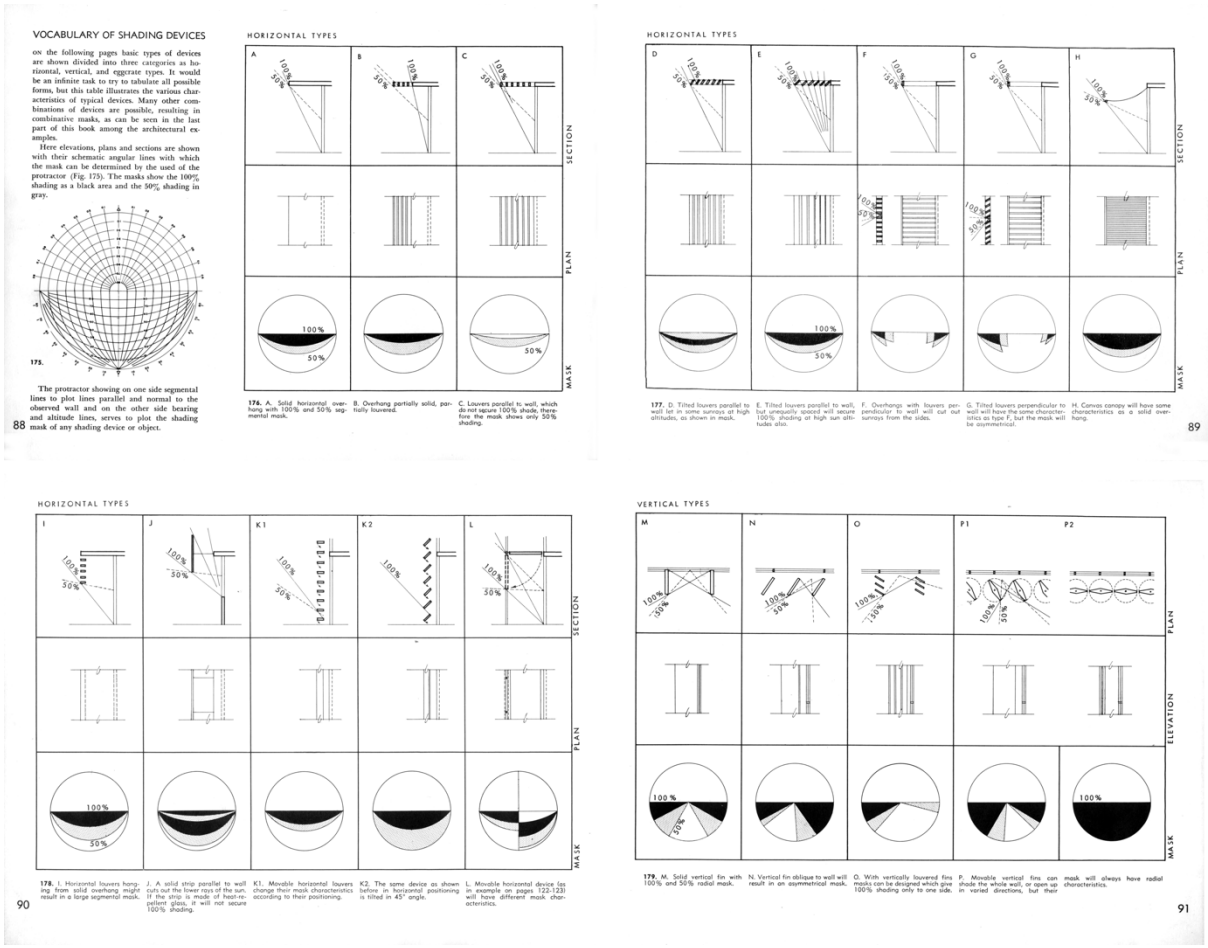

Figure 3: brise-soleil typology

Hydrocarbon Imaginary

It is difficult to summarize, in case studies, the world-wide proliferation of HVAC systems, so is it necessary to point towards the sharp increase in shading devices, and more generally the materials and design methods of non-mechanical thermal conditioning, as an important aspect of the architecture of the 21st century. To count, or list, such buildings is less of import than the recognition that simulation tools, means of assessing environmental performance, and, in general, design methods and materials considerations aimed at engaging the climatic surround (and aimed at reducing fossil-fuel throughput); that such tools, methods, and

materials are increasingly effective and increasingly engaged in the more general discussion of architecture and its frameworks of aesthetic and functional value.

Shading devices are still an essential aspect of the built environment, a part of the design and construction of buildings around the planet. This is, or has been, especially the case in those regions where seasonal heat is of concern, and where infrastructural, economic, and cultural barriers to mechanical conditioning exist. The persistence of the dynamic shading device, and of the façade as cultural technique, begins to seems less like an anachronism, or a design reference to a recent past, and more like an outline of methods for the immediate future—a future in which infrastructural, economic, and cultural ambitions may be more likely to play out in compromised, inconsistent, unevenly shaded spaces.

If the brise-soleil persists, partway through the 21st century, haltingly gaining acceptance and interest as a design tool appropriate to the contemporary formal and social milieu, technical images are everywhere ascendant, determinant, in many ways, relative to the technological present and immediate future, especially in climate discourse.[4] Architects in the 50s were still struggling to develop means of graphic representation, illustration, and visualization that could articulate the promise of a given architectural intervention relative to changes to the cultural and technical conditions of the climatic interior. These images have

[4] See for example Schneider, "Climate Model Simulation Visualization;" John May, "Everything is Already an Image" in *Log* no. 40 (Spring/Summer 2017) and the ongoing series on "Accumulation" co-edited by the author, on the *e-flux architecture* online platform.

moved from the dynamic potential of the façade section to animations, narrative–perspectives, false color diagrams, and a whole range of photographs, charts, spreadsheets and other visual material have contributed to the discussion of architecture and climate, as traditional means of plan, section, and elevation, and biometric charts as well, have been overcome by a wide range of computer assisted drafting programs, visualization methods, and modeling software.

The field of architecture has become one of the primary sites for the production of future imaginaries relative to climate change. Designers are increasingly prolific in the use of images to present, frame, apply or criticize data.[5] Some of these images are seen to be operational – providing tools to better understand the thermal conditions of the interior. New analytic tools allow for an increasingly precise understanding of climatic patterns in their relationship to materials, technologies, and interior spaces, allowing designers to approach a project with a capacious range of methods and materials for rendering the building as energy-efficient as possible.[6] The challenge to architects today, as to society at large, is less about the clarity of the technical image and more about how to overcome cultural barriers to the transformations necessary to radically reduce carbon–how to produce a convincing model of the future as means to

[5] See, for example, Barry Bergdoll, editor, *Rising Currents: Projects for New York's Waterfront* (New York: Museum of Modern Art, 2011); Rania Ghosn and El Hadi Jazairy, *Geostories: Another Architecture for the Environment* (Barcelona: Actar, 2018); Lola Sheppard and Mason White, *Many Norths: Spacial Practice in a Polar Territory* (Barcelona: Actar, 2017) among many others.
[6] Ladybug Tools is one of the more creative: www.ladybug.tools.

encourage a different kind of attention to the structural conditions that continue to destabilize the climate.[7]

While numerous innovations in energy efficiency have informed the architecture of the 21st century, and indeed the potential transformation of the global industrial base more generally, fossil fuel emissions are still on the rise. All of the bureaucratic and technocratic efforts towards managing that rise have fallen short. Governments are struggling to develop effective means to reduce carbon dependence without exacerbating societal tensions.[8] Even in centers of the proposed energy transition, such as Germany, where hi-tech energy focused buildings are the norm, the ongoing *energiewende* faces significant political and economic challenges.[9] Amidst revised IPCC reports, Green New Deals and the New European Bauhaus, the system, such as it is—political, infrastructural, social, architectural—is not actually producing a reduced carbon future, but only imagining how to.

Architecture in the 21st century engages across a neoliberal spectrum of climate agency. Technological innovation is seen as one of its strengths: both as a means of providing more comfort at less carbon cost (more efficient) and also as a

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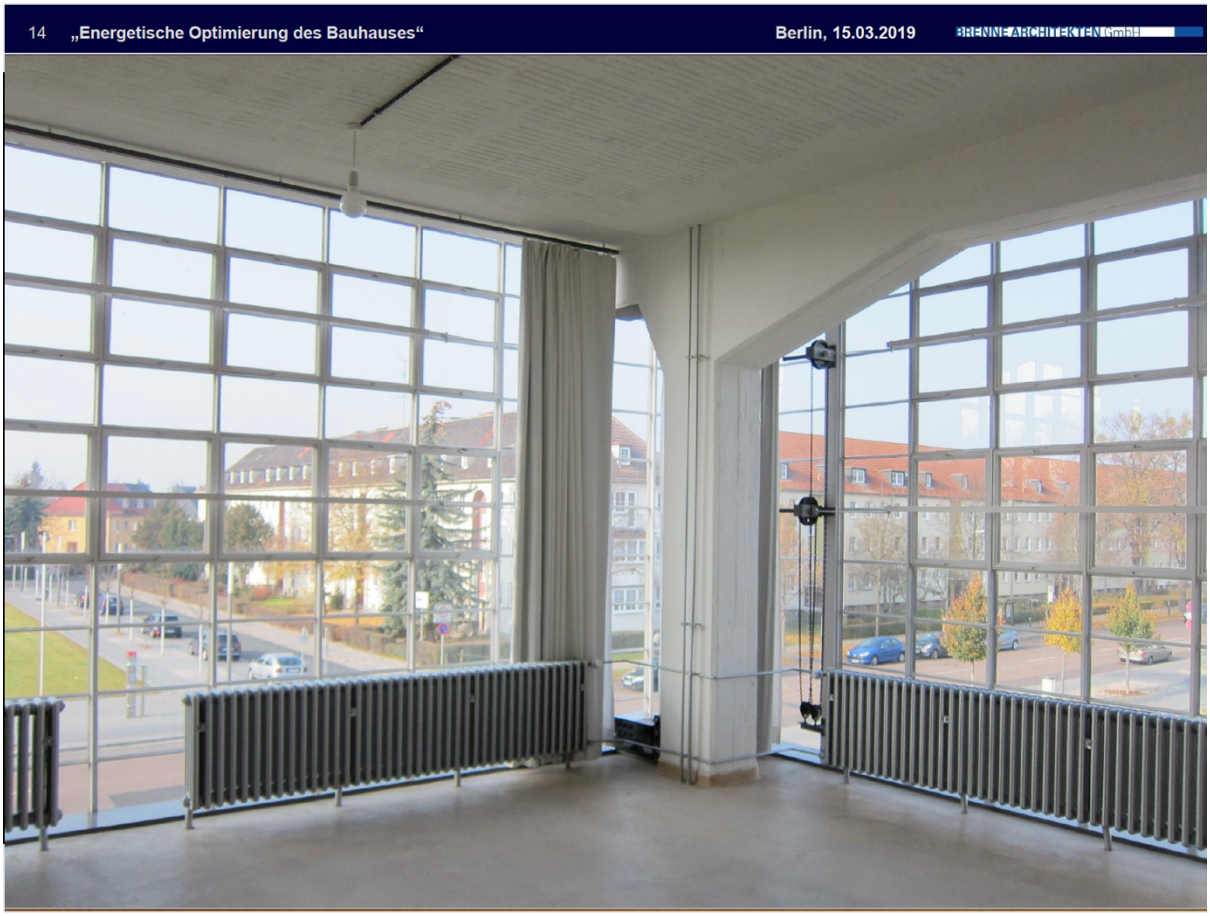
[7] Orit Halpern, "Hopeful Resistance," part of the Accumulation series on *e-flux architecture* (2017) http://www.e-flux.com/architecture/accumulation/96421/hopeful-resilience/ accessed Dec 18, 2018.
[8] Daniel A. Barber, "How Can Architecture Respond to the 1.5 degree Imperative?" on *Archinect* (November 2, 2018); https://archinect.com/features/article/150093748/how-can-architecture-respond-to-the-1-5-c-imperative accessed Dec 18, 2018.
[9] See Christina Newinger, Christina Geyer, and Sarah Kellberg, eds., *Energiewenden: Energy Transitions as a Chance and Challenge for our Time* (Munich: Deutsches Museum, 2017); for shortcoming, see. for example Tobias Haas and Hendrik Sander, "Shortcoming and Perspectives of the German Energiewende" in *Socialism and Democracy* vol. 30, no. 2 (2016): 121-143.

generator of economic *growth*. Architecture embodies various eco-modernisms and green capitalisms in its very operational premise: keep buildings, but do so according to a new set of environmental concerns that require a new kind of architectural expertise. That is, even if the fossil-fuel mechanical system can be rendered efficient, the socio-technical production of new sustainable buildings is itself founded on a discourse of technological innovation and growth, with, in all but the best cases, only marginal effects on the throughput of fossil fuels (especially when the embodied energy costs are taken into account).[10] Green buildings still produce carbon emissions; the built environment contents to help structure our lives around carbon hungry patterns and practices. Even "green capitalism" assumes economic expansion, leading back to an apparent axiom of industrial modernity: that trajectories of economic growth are coupled with trajectories of environmental damage. If one goes up, so does the other.[11] So even today climate-engaged efforts in architecture aim to minimize carbon emissions, not eliminate or absorb them.[12] Business as usual.

[10] David Benjamin, editor, *Embodied Energy and Design: Making Architecture Between Metrics and Narratives* (New York: Lars Müller and Columbia Books on Architecture and the City, 2017).
[11] See the dossier of responses to the "ecomodernist manifesto," by Bruno Latour, Eileen Crist, Bronislaw Szerszynski and others in *Environmental Humanities* vol. 7, no. 1 (2016).
[12] Philip Oldfield, Dario Trabucco, and Antony Wood, "Five Energy Generations of Tall Buildings: An Historical Analysis of Energy Consumption in High-Rise Buildings," in *The Journal of Architecture*, vol. 14, no. 5 (September 2009): 591-613.



F*igure 4: Bauhaus interior*

Planetary Interior

All buildings are environmental: manipulating systems of resources and pollution, capital and comfort; adjusting, decreasing, or intensifying specific flows of knowledge and products and ways of life; and articulating a capacious mediating presence as object, screen image, as a means to amplify the climatic effects of these new (again) ways of thinking about building. All buildings are environmental in that they help *produce* the environment, especially in the Anthropocene; indeed, they are a primary aspect of this material and immaterial production. The "environment" is not one of a set of issues to take up, to identify this or that project

as “environmental” or “green” or “sustainable” or “resilient” but rather a perspective on the built environment in its relationship to the social world and to planetary systems. So, all architecture is environmental, just with different dispositions—some projects, some architects, are self-conscious about these flows and aim to manipulate them towards a certain trajectory; others, less so.

One effect of architectural-climatic knowledge is a potential re-framing of the history of architecture writ large according to an understanding of how issues we now identify as environmental have played a role in the production of buildings, and in the production of the subjects, collectives, and societies that inhabit them. The effects of this climatic discourse are historiographic, in other words, in the sense described at the beginning of this book, following Isabelle Stengers concept of the “event” leading to a new understanding of the past so as to imagine a different possible future—new narratives tying together different stories, identifying novel understandings of cause and effect. One could, for example, examine the role of coal availability to the open, uninsulated workshop spaces of the Bauhaus Dessau (designed by Gropius in 1925); or how concerns around population growth informed the Archigram drawings for a “Walking City.”

Such an effort also involves re-framing the diagrams, drawings, buildings, and speculations that we gather under the term “architecture” as a medium for reflecting a cultural approach to environment, as it changes over time, as it is distinct in different regions; and also a medium for producing that approach, for

the making physical of a kind of disposition towards the complex and contingent relationship between social practices and planetary systems. Again, architecture becomes a screen on which to watch socio-environmental transformation, as well as a material system from which to produce it.

All buildings are environmental because they impact the climate, and always have; for the last six or seven decades, this impact has intensified dramatically. Before HVAC, the thermal interior became a space of creativity for designers; since HVAC, and increasingly in the face of rising emissions, the interior becomes a space of contestation, a space of disruption, a space for assessing and measuring cultural capacity for responsiveness and resilience.

The interior is defined by its isolation. It is discreet, distinct, cut off to varying degrees from the vagaries of the increasingly unpredictable exterior climate. However, these millions of interior spaces, all around the planet, aggregate towards a collective impact on geophysical systems. The thermal conditions of the interior become a crucial site for collective engagement.

The thermal interior became a planetary space—everywhere, but not universal, and with consequences that further complicate local, regional, and global effects. If "planetary," as argued above, accounts for both the world system of capital and the geophysical dynamics of earth systems, in all of its unevenness, then the planetary interior can be conceptualized and analyzed with attention to multiple and varying scales, and according to new understanding of the causal

relationship between the conditions of that discrete interior and changes to the atmosphere of the planet. The thermal interior has both a circuitous and direct role in determining the future of human life on earth; the media practices of architects and others are increasingly focused on understanding and making tangible these multi-scalar and abstract connections.

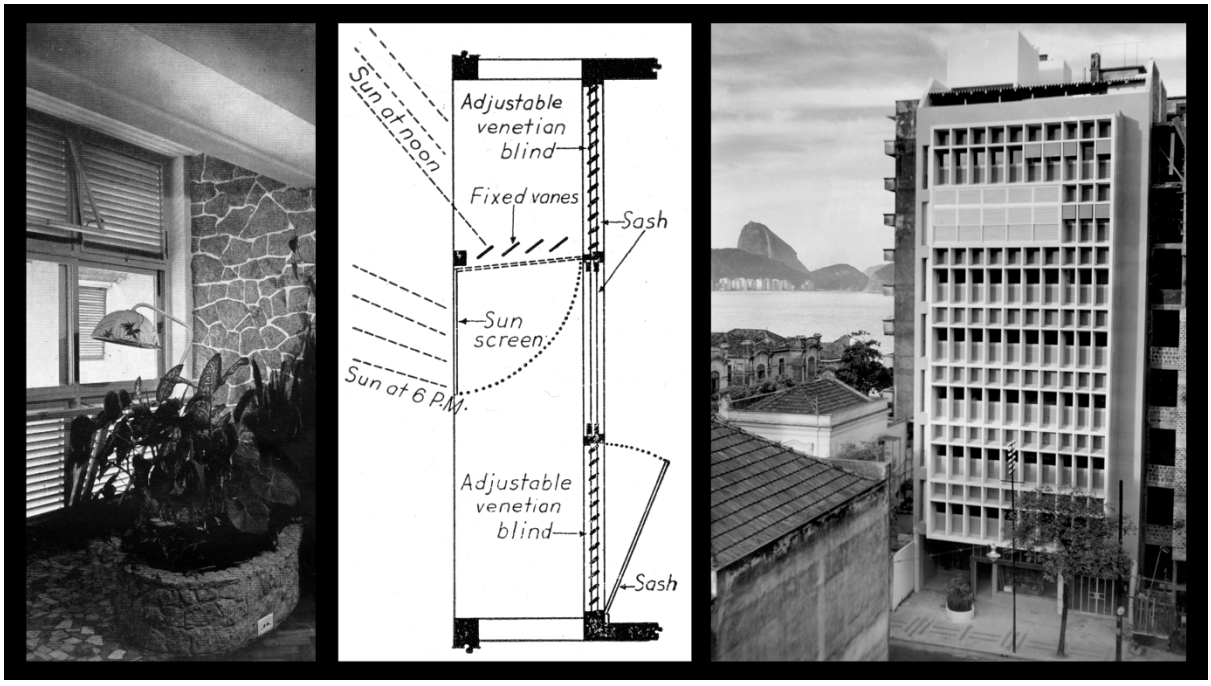


Figure 5: MMM Roberto, Copacabana Apartment building and Seguradoras.

Thermal Practice

'Thermal practice' denotes the habits and practices with which social bodies occupy and operate 'thermal interiors' – according both to the designer's that specify these conditions and the inhabitants, users or occupiers whose daily practices produce this thermal relationship. As anxiety over carbon dioxide emission has increased, design methods for hydrocarbon fuel reduction have become standard. Government- and industry-developed metrics for building performance, attention

to embodied energy in materials, and numerous other tools aim to provide architecture firms with pathways to reduce the emissions of their design proposals. While these approaches have often been effective, in far too many cases the specifics of how the building is used is left out of the equation.

The designer and the user, in this sense, are equally involved in the thermal performance of a building: the design practice provides a framework while the user's daily practices realise (or not) the potential of the project. By involving both structural conditions and the responsibility of the inhabitant, this figure of 'thermal practice' models one of the central challenges of shifting culture toward low-hydrocarbon fuel consumption: that sustainable living is simultaneously a structural problem, to be engaged at the level of government policy and the global economic system, and also an individual responsibility, evident in countless small acts and lifestyle commitments.

Given that one hallmark of architecture since the 1960s is that thermal comfort – the humidity, temperature, and air quality of the interior – is most often provided through HVAC systems., the recent challenge of *performance* is: how can a building provide adequate comfort while reducing carbon emissions? This challenge is essential to achieving carbon-neutrality by 2050. It entails paying attention to fuel sources, to design techniques for fuel-efficiency, and to adjusting the expectations of the inhabitant.

And yet, comfort is a persistent and seemingly intractable social value. Not only is it by definition pleasurable, but the connection of thermal comfort to health and productivity is essential to economic growth, a sense of well-being and a sense of the future. How to live without comfort? Furthermore, comfort is unevenly distributed across regions and around the globe: individuals and societies tend to aspire to more comfort, even luxury, and bristle at it being taken away or reduced. Air-conditioned interiors are often a central aspect of these aspirations. In order to dramatically reduce carbon emissions, collective expectations of consistent comfort have to be renegotiated. How is comfort produced, by designers and users; how can it be more equitably distributed; and ultimately how can it be reduced, in a targeted manner, to elicit a new kind of aesthetic and sense of pleasure tied to a different mode of carbon cycling.

Figure 1. Images of the winning entry to the 1957 "International Competition to Build a Solar House" organized by the Association for Applied Solar Energy. The house was designed by University of Minnesota student Peter Lee. It was built outside Phoenix in 1959 and briefly open as a demonstration house.

Figure 2. Victor and Aladar Olgyay, "Flattening the Temperature Curve" a multi-disciplinary approach to non-mechanical cooling and climate control, summarizing their pedagogic and professional program of focusing design and related disciplines on climate mitigation. 1956.

Figure 3. Victor and Aladar Olgyay, "Vocabulary of Shading Devices" from their 1957 book *Solar Control and Shading Devices*.

Figure 4. the interior of the bauhaus workshop floor, with one of the first thin glass curtain walls, by Gropius and colleagues, Dessau, 1923. The thin wall exhibited poor insulation and required huge amounts of coal. Image is from Brenne Archiitekten's 2011 report on the thermal performance of the building.

Figure 5. MMM Roberto, Apartment House, Rio de Janeiro, 1945. The section shows a variety of methods to adjust the thermal and luminous relationship between the climatic exterior and the thermal interior. With a photograph of the interior and an image of the building in context - one of the first higher-rise buildings along Copacabana's southern stretch.

And MMM Roberto, Edificio Seguradoras, Rio de Janeiro, 1947. (a) Numerous means of facade adjustment - the image is from the Olgyay's 1957 book. (b) The same facade with shading systems removed, replaced by air conditioning units.