ON AIR: THE DARK MATTER OF ARCHITECTURE

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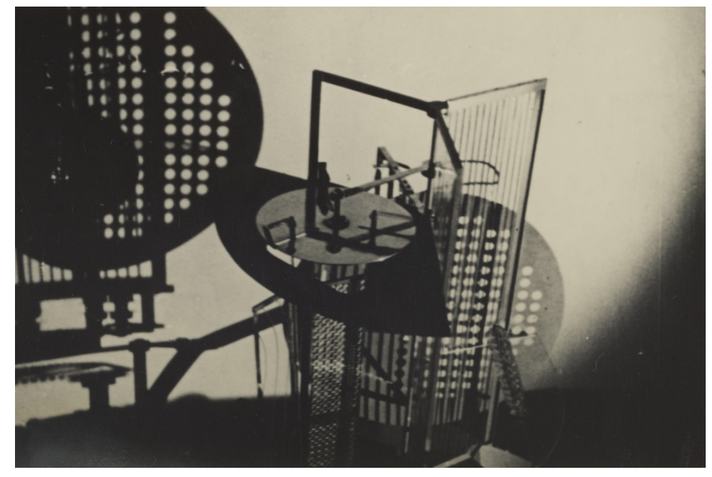
Consider the air. Imagine the atmospheric soup in which you sit—the many millions of particles of oxygen and nitrogen (and whatever other trace elements and pollutants may be present) drawn into the lungs, accumulating, swirling, vibrating, wafting around one another. Quickly drawing one's hand through the air registers the invisible matter as a pressure differential on the palm—a draft—and it is easy to imagine images of smoke swirling or aerodynamic tests. The registration of breath on the cold air in early winter is the first sign that the seasonal atmosphere is shifting, and depending on where you live, it signals a companion shift in your mood toward the impending chill in the air. Ease into whatever meditative state necessary to feel the air filling your lungs, then exiting; for some this is called *awareness*—a concentrated attention toward the existence of one's body in its implicit environment.

Just before reaching the bottom of that catatonic oneness with the invisible matter around you—just before you begin to feel the carpet fibers contracting and expanding with your every breath—remember also that through that same air is coursing nearly innumerable electrical signals. That airspace is packed with radio- and microwaves that run the gamut of the broadband spectrum—a ceaseless barrage of proliferating waves in all directions, literally coursing through the bodies, spaces, and architectures around them. The air is swimming with a veritable broadband zoo of frequencies and signals—broadcast television across the surface of the earth, 4G cellular data transmissions between towers and devices, GPS satellite signals bathing the earth with constant updates, wireless routers emanating a bubble of access, FM radio playing the latest pop hit ad infinitum, aeronautical radio navigation, extremely low frequency (ELF) maritime beacons, astronomical and meteorological research satellite traffic—packets of information coursing over and through one another in the air in real-time, all the time.[1] They operate in various languages: SQL protocols moving across IP addresses, HTTP links connecting to DNS servers, IMAP email clients competing with POP and SMTP counterparts—a linguistic collection that floats imperceptibly by and through us all the time—but it is all translated in the mother-tongue, the lingua franca of binary bits, ones and zeros, on and off, open and closed, transmitted through the air as modulations in a wave field through gaseous particles of air.

It becomes even more interesting—or when considering the current socio-political climate, nervous, if you prefer—to consider the content of all that electromagnetism: errant "reply-all" emails sharing space with top-secret documents, first expressions of "I love you" via text message mixed briefly in the air with online hate speech, algorithmic stock trades bullying their way past not-for-profit donations, server requests bumping into each other by the thousands under a Distributed Denial of Service attack, TLS-encrypted secure bank transactions in the midst of pirate emails from benevolent Nigerian princes, meteorological data indicating an inescapable shift in global temperature moving perilously close to deregulatory legislation on air-pollutants… credit card transactions, online search queries, video from baby monitors and home security cameras, requests to Alexa, subtweets emanating from the Oval Office—all bouncing around among us in real space and time, quietly and unbeknownst, until they encounter the antenna they were looking for and become translated once again into phenomenological experiences to those who have "tuned-in".

In 1927, László Moholy-Nagy famously wrote: "This century belongs to light."[2] And as the 20th Century unfolded, his self-reflexive generalization was proved mostly right. Moholy-Nagy's art—including his photograms, montages, paintings, and sculptures—were aesthetic practices allied with emergent cultural practices of the time, including the way the technology of modernity was ingratiating itself with modern subjects. His tools were cameras and his medium was light. One of his important sculptural works is the *Light-Space Modulator* (Figure 1), a series of flat geometric steel and glass objects (some reflective) onto which are cast multiple light sources. The *Modulator* slowly revolved on a mechanical turntable, spilling shadows and reflections at varying speeds around the room in which it was stationed. The pieces of the sculpture itself are not in themselves the most important aspect of the work; instead, it is the *relationship* cast between the tangible medium of the steel and the intangible medium of the light coursing through and around it. Moholy-Nagy, as he and his spouse Lucia did with much of their work, sculpts light as much as anything.



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The *Light-Space Modulator* was a material, technical device—an *architecture*, if you will—set in a performative context with an immaterial medium, and in so doing, it produced *effects* within and upon the implicit conditions in which it existed. Through its own performance, it made light (an aesthetically inert actor when left to its own devices) itself a performer. It made the medium of light explicit, and as such, we can consider Moholy-Nagy's experiment an act of *explication*, of rendering knowable and actionable a ubiquitous, implicit condition of life. The whole body of Moholy-Nagy's work is a construction of operational terms through which to explicate light as a medium in which we exist and that, for him, constituted a language through which humans make sense of the world and each other—"the new culture of light", as he put it.[3]

Figure 1. László Moholy-Nagy, Light-Space Modulator (1930).

[1]To see the full range of the National Telecommunications and Information Administration's allocations of the radio spectrum in the United States, see: "United States Frequency Allocations Radio Spectrum." October 2003. Accessed August 1, 2018. https://www.ntia.doc.gov/files/ntia/publications/2003-allochrt.pdf.

[2]Phillips, Christopher. *Photography in the Modern Era: European Documents and Critical Writings*, 1913-1940. New York: Metropolitan Museum of Art, 1989.

[3]Ibid.

Though, it is difficult to imagine when he designed his *Light-Space Modulator* in 1930 that Moholy-Nagy fully anticipated the extent to which the light-space modulators that would follow it—like television, virtual reality, and fiber optic data transmission—would shape the culture of the late 20th and early 21st Centuries. The speed of light came to govern every mediated political interaction—the speed of communication and transmission being the new, almost impossible to exceed, limiting factor. But if Moholy-Nagy's 20th Century belonged to light, a reassessment of that claim is necessary while this new century is still somewhat young. At the risk of mistakenly disenfranchising light, which has and will undoubtedly continue to play a powerful role in the techno-cultural development of our species on this planet—in the same way that Modernity will continue to sink its teeth into us for as long as we live—I recommend an amendment to Moholy-Nagy's polemic for our own cultural epoch. This century—the digitized, microwave-laden, ethereal 21st Century—belongs to *air*.

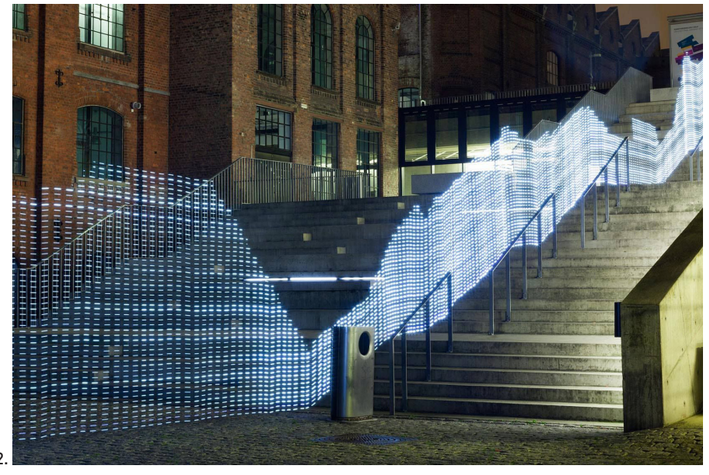

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Figure 2. Sensors that detect wifi signals in space illuminate LED lights, and are captured by long-exposure photography in Immaterials: Light painting Wifi. Here, air enrolls light as a partner in explication. Timo Arnall, Jørn Knutsen, and Einar Sneve Martinussen (2011).

Air is our medium. It is the dark matter of architecture—the negative, the inverse, the underlying force. It is the soup in which we exist and through which we communicate and transmit. We are what we breathe. Chemical and cultural air is exchanged around the globe as "clouds" of both bits and atoms. Air is more volatile than light; it is sneakier and more promiscuous, and it is decidedly more difficult to render out (the very nature of light as that which constitutes our vision makes it more easily rendered). The energy that makes up the radio- and micro-wave section of the electromagnetic spectrum (which also includes visible light) behaves much more like air, at least phenomenologically speaking. Because they are so evasive to our senses, the frequencies that make up our electronic world are the black sheep of the spectrum family—they belong more to the world of air than to light (Figure 2). We cannot perceive the air (nor the radio that makes up our communicative environments) with any reliable consistency, and in this sense it is the perfect medium through which to understand the sensibilities of a hyper-digitized, information-obsessed 21st Century.

A transition from light to air is also one from the project of Modernity to the complicated contours of an emergent Late-Postmodernity. Light (and also Modernity) produces singular, hermetic objects; it delimits and produces clarity; it renders visible what is otherwise hidden and unverifiable. Air, on the other hand, enjoys vagueness and unverifiability; it revels in all the complicated relational fields, fraught identities, and mutant geopolitical economies that have spilled out of Postmodernity across the digital networks, social medias, and global urban cultures of the 21st Century. The fluidity of air and the cultural rebreathing of mediated exchange produce the *pneuma* of global culture.

My attempt in this essay will be to sketch out a theory of airspace for architecture—one that is responsible to the chemical, electrical, and cultural contents of the atmosphere as much as it is to phenomenal registrations to which the discipline of architecture has long been committed. We will trace the contours of air through the writing of Peter Sloterdijk on our way to a consideration of the recent history of air concerns in the discipline of architecture—including projects that deal explicitly with the status of the air and those (like OMA's *CCTV Headquarters*) that, whether they know it or not, are agents of the atmosphere. We will then call architecture to action more specifically through the lens of its most prominent air-control feature: the envelope. Benjamin Bratton's writing on the status of architecture (among other things) within the logic of planetary-scaled computation—particularly the envelope as an interface for the city within digital culture—will be informative for how to frame a possible approach for architecture in the air. A study of the potentials of the envelope within complicated air space will again trace a too-short history through recent architecture (and allied atmospherics), from modern glass-box houses to DS+R's *Blur Building*. Finally, through the notion of "haptics", we will study ways to reconcile phenomenological atmospheres (to which architecture has a clear and valuable commitment) with the types of atmosphere outlined in this essay that are much more difficult to register.

THE EXPLICATION OF AIR

One important progenitor of *air-theory*—of how, when framed as such, the air becomes a critical lens through which to understand almost everything—is the preeminent German philosopher and cultural-theorist Peter Sloterdijk.

In his book *Terror From The Air*, Sloterdijk describes what he claims is the first moment of the 20th Century–in 1915, with the invention and first deployment of gas warfare (Figure 3). This is, for him, also the first instance of terrorism, whose basic premise is to target an enemy's environment rather than his or her body: "If an enemy's body can no longer be liquidated with direct hits, then the attacker is forced to make his continued existence impossible by his direct immersion in an unlivable milieu for a sufficiently long period of time."[4] For Sloterdijk, this is an act of *explication*, of making the air an explicit, knowable milieu—a substance, an actionable object. As such, it also precipitated both technologies and cultural practices in response to a new level of awareness of the atmosphere. The gas mask is the first such spatial device (Figure 4)—a hermetically-sealed, face-sized envelope that separates a pocket of filtered, clean air; an "atmotechnic" response to the introduction of noxious chemicals into the air. Sloterdijk extrapolates the *concept* of the gas mask into implications for the way we inhabit space at-large, and in this

[4] Peter Sloterdijk, *Terror from the Air*, trans. Amy Patton and Steve Corcoran (Los Angeles: Semiotext(e), 2009): 16.

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sense the air becomes designable (to nefarious ends in the case of gas warfare), and by extension, it becomes both partition-able and conditional. He writes, "The rapid popularization of the gas mask concept manifests the efforts of those subject to attack to try to shake their dependency on their immediate milieu, the breathable air, by concealing themselves behind an air filter. This involved a first step towards the principle of air conditioning, whose basic idea consists in disconnecting a defined volume of space from the surrounding air."[5] As Sloterdijk scales up from the gas mask to the gas chambers of the Holocaust, to the explication of radioactivity after 1945, to the manipulation of the weather on a global scale, the concept gets increasingly freed from treating the air as a singular, local event into a much more pervasive, worldwide condition that is constantly in motion and up for manipulation.

Sloterdijk paves the way to understand the air as a spatial device, as something that is not void, but on the contrary *full* of very particular substances, with vary particular chemical compositions—some of which we prefer to breathe and some of which we do not. But most crucially, he also extends this conception of air, and in particular *breathing*, to other, less-gaseous mediums of aesthetics and culture. Through recounting the story of a Salvador Dalí performance in London, in which Dalí almost suffocated to death (mistakenly) while giving a speech inside a deep sea diving suit (Figure 5) before being returned to the airspace of London, Sloterdijk makes a transition from air as a physical medium into air as a metaphorical and conceptual mechanism for understanding it as a system of culture.[6] He writes:

> "By contrast to Dalí's experiment [since he escaped], the conditions of technical civilization no longer allow the essential to be forgotten: namely that individuals who currently or habitually find themselves in distinctly indoor situations must be hooked up to a life-sustaining "air supply system"… The progressive explication of the atmosphere forces a sustained mindfulness of the air's breathability—above all in the physical sense, and then, more and more, in the metaphoric dimensions of respirations in cultural spaces of motivation and concern… We begin to understand that man is not only what he eats, but what he breathes and that in which he is immersed. Cultures are collective conditions of immersion in air and sign systems."[7]

Here, he refuses to make distinctions between the interior of the diver's helmet, the ideas Dalí was transmitting, the interior of the room, the air of greater London, or even the language of communication itself, trading them equally throughout his

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writing. He treats the air as a *medium* for the exchange of ideas—as *media*— and by extension he implicates all the other types of media at play with it (in this case, the diving suit, architecture, and the city). Building further on this, he invokes an even larger scale of mass communication through the concept of "states of somnolence".

> "States of somnolence are states in which people move as mere trend followers under the trance of normal… large modern societies, integrated from the mass media viewpoint, have entered a phase in which their day-to-day existence has, from the atmospheric viewpoint, come under the domination of mass-psychological mechanisms… These effects serve to immerse entire national populations in strategically generated trend climates, and thus constitute the informational analogue to chemical warfare… [This is] the parallelism between gas warfare—as the attempt to surround the enemy in a poison cloud thick enough to annihilate him physically–and the production of mass insanity."[8]

For Sloterdijk, the air is a substance *and* a cultural conduit, and he exchanges them freely for one another. The atmosphere is an explicit object of manipulation, agency, and desire, both in the sense of the air particles that carry chemicals into the body and in the sense of a delivery device for ideas and systems of culture. When considering the contents of the electro-troposphere that I have laid out above, the exchange between air as chemistry and air as culture becomes even more fluid and immediate.

Figure 3. German Frightfulness from the Air, World War I German gas attack on the eastern front, photographed by a Russian airman, (German Federal Archive, 1916).

Figure 4. British "air raid wardens" wearing gas masks that envelop the entire head during a mock gas attack. (Photograph by A. Hudson/Topical Press Agency/Getty Images, 1941).

Figure 5. Salvador Dalí lecturing from inside a deep sea diving suit. (Scottish National Archives 1936).

[5]Ibid, 20.

[6]Ibid, 72-74.

[7]Ibid, 84.

[8]Ibid, 101-103.

In the more recent history of explication, there is an immediate and palpable analogy to the so-called "influence campaigns" allegedly perpetrated by Russian agents on the American electorate during the 2016 U.S. presidential campaigns. According whistleblower Christopher Wylie, Cambridge Analytica scraped data from social media activity in order to apply fashion trend forecasting algorithms to political opinions. In an interview with The Guardian, Wylie puts into a poetic nutshell Sloterdijk's concepts of cultural rebreathing: "…to change politics you need to change culture. And fashion trends are a useful proxy for that. Trump is like a pair of Uggs, or Crocs, basically. So how do you get from people thinking 'Ugh. Totally ugly' to the moment when everyone is wearing them?"[9] As it turns out, choices about what we like—whether fashion-wear or presidents—are remarkably similar, and furthermore that any individual choice need not be indicative of what the collective agrees upon. In Sloterdijk's terms, we are that in which we are immersed, and witting agents of the air have the ability to concoct that atmosphere when necessary.

SELF-CONTAINED ATMOSPHERIC ENVELOPES

After being atmospherically radicalized by Sloterdijk, perhaps it is easy to consider buildings as simply one particular scale of a larger ontological genre of self-contained atmospheric envelopes in the world. These air pockets are caught within a globe-sized assemblage of other larger and smaller pockets performing around and through them, some more solidly than others. They range in scale and content that they mediate: from body-sized (post-SARS face masks in East Asian cities symbolically securing one's own lungs away from others' respirations; ad hoc gas masks made by protestors encountering police; various bodysuits for space-faring, quarantine, epidemiology, or underwater breathing) (Figure 6), to room- and building-sized (seamlessly-connected, air-conditioned airports, shopping malls, sporting arenas, museums; indoor ski slopes in Dubai; airplane cabins; distribution centers) to infrastructural- or city-sized (networks of subterranean transit tunnels, whether train or Elon Musk-style LA car "Loop"; mountainous natural land barriers that trap and stagnate urban pollution away from a passing jet-stream; domed, indoor vacation resorts).

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Figure 6. Popularized after the SARS outbreak in 2002, breathing masks are now prevalent in Asian cities like Beijing not only because of risk of disease, but also because of air quality. (Photograph by Kevin Frayer, 2014).

[9]For the full interview with Christopher Wylie, see: Cadwalladr, Carole. "'I Made Steve Bannon's Psychological Warfare Tool': Meet the Data War Whistleblower." *The Guardian*. March 18, 2018. Accessed August 01, 2018. https://www.theguardian.com/news/2018/mar/17/data-war-whistleblower-christopher-wylie-faceook-nix-bannon-trump.

When airspace is considered as a set of electromagnetic signals *and* as an exchange of cultures and ideas, the architectures that capture and orient those airs are further implicated in their ability or inability to participate with or traffic those flows. Buildings, whether they know it or not, are increasingly extensions of larger urban, mega-regional, and global networks of actors—both objects and subjects, human and non-human actors blurred together. They are also increasingly extensions of smaller body, chemical, electrical, and molecular flows between various substances routed through them. Think of logistical flows, communication networks, cellular signals, and air-quality. Buildings are increasingly the site of the formation of digital publics in real-time and are continually acting as nodes within digital urban networks. The smartphone and the built environment share a virtual space, built equally out of concrete and microwaves, hardwares and softwares. As Amazon can attest, the technology of 21st Century market exchange does not sit wholeheartedly within architecture, but instead out-scales it and flows through it. Architecture acts as one-among-many inputs and outputs in their network (Figure 7). Their distribution centers couple with transportation networks, logistical chains, and digital platforms to facilitate one of the largest private economies on the earth. Built space is a partner with algorithms, machine intelligences, FedEx trucks, cardboard suppliers, QR codes, part-time laborers, just-in-time logistics, cloud storage, traffic patterns, data centers, fiber optic lines, boards of directors, and in the cases that it causes shipping delay, extreme weather events.

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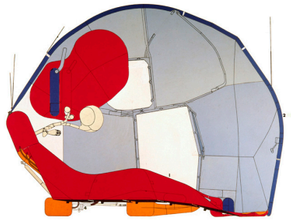
Figure 7. Interior of Amazon distribution center, Phoenix, AZ. The vast, singular interior is at once one of the largest chemical atmospheres in architecture and one of the most vibrant constellations of mediated electromagnetic and cultural airspace. (Photograph by Ariel Zambelich, 2014)

The built environment seems to have no trouble engaging with the atmosphere, even if this engagement is violent and fraught with conflict on both sides—air-conditioned interiors battling to keep themselves air-locked, crisscrossing frequencies struggling through concrete walls, carbon metabolisms fluctuating against the backdrop of a catastrophic four-degree Celsius shift in global temperature (one of the chief concerns of architecture is the *keeping out* of the weather, while one of the largest contributors to environmental disaster is the energy usage and atmospheric effects of producing materials for construction and conditioning the interiors of buildings).[10] Our constant and inescapable exchange with the atmosphere—as a function of our very lifeworld chemically, digitally, and culturally—demands (and begets) physical,

[10]Buildings, both their construction and conditioning, account for nearly half of all carbon emissions. For a closer inspection of the impact the building industry has on climate change, see: "Why the Building Sector?" Architecture 2030. 2013. Accessed August 01, 2018. http://architecture2030.org/buildings_problem_why/.

material responses. While most of it is as hidden-away and remains nearly as undisclosed as the air itself, the movement, conditioning, partitioning, capturing, and controlling of air is one of the chief concerns of architectural practice and its equipment.



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Likewise, the larger discipline of architecture is no stranger to the topic of the air. We have our own historical catalog of obsessions with the atmosphere, especially of the chemical variety, with cultural overtones always built in to the projects. It is no coincidence that late 1960's and early 1970's architecture culture produced a flourish of interest in air at the same time it was at the height of its political charge. As Sloterdijk has laid out, the one carries and harbors the other. Not long after Buckminster Fuller's provocation of *Dome Over Manhattan* in 1960 (Figure 8), the rogue architectural pirate troupes Archigram, Superstudio, Ant Farm, Haus Rucker Co., and Coop Himmelb(l)au wasted no time making spatio-political incisions into the *pneuma* around them: huge inflatable plastic bubbles, body suits that transformed into small living spaces (Figure 9), living pods that mimicked space-faring vessels, funny insect-like headwear (Figure 10), spherical volumes in which people rolled through the city inside their own air space, globe-sized structures that dwarf the city in universalizing atmospheric sameness, spaces made of voluminous soap foams, and clean air zones in which people and plant matter could exist unadulterated by the presumably toxic air outside them (in which any audience for these works, not incidentally, also existed) (Figure 11).[11]

More recent adventures in the airspace of architecture have mapped more complicated contours of the atmosphere within and around the projects, concentrating less on the thin membrane that separates inside from outside, in favor of a thickened relationship between what constitutes the airspace of the architecture, sometimes disposing of that boundary altogether. François Roche and R&Sie(n) produced *Dustyrelief* (also called *B-mu*), a museum proposal for Bangkok in which the exterior shell of the building is an electro-statically charged wire mesh that gathers "particles [of] a pure grey ectoplasm under the lightning grey sky of Bangkok" (literally the dust in the atmosphere) into a furry, continually-growing, thickened

Figure 8. Buckminster Fuller, Dome Over Manhattan (1960).
Figure 9. Michael Webb, Cushicle/Suitaloon (1966).
Figure 10. Haus Rucker Co., Yellow Heart (1968).
Figure 11. Ant Farm, 50'x50' Pillow (1970)

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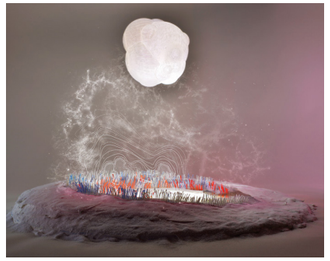

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envelope (Figure 12). This is set in contrast to the "aseptic and deteritorialized [sic] universe" of the white box gallery of the interior, setting up a "climatic opposition between the urban environment's protuberant energy and the indoor subdued [sic] and subject to the museum conditioning procedures (white cube)."[12] Sean Lally and Weathers LLC similarly treat the atmosphere, and energy in particular, as an object of design. His project *New Energy Systems* (Figure 13) proposes thermal, acoustic, electromagnetic, and light energy deployment mechanisms that create zones of heat, light, and pleasure around themselves. Lally foregoes solidity in favor of engagement with the elastic forces of the air.[13]

Still, another case through which to investigate the project of the atmosphere in recent architecture, even if it is perhaps an unexpected entrant into this category, is Office of Metropolitan Architecture's *CCTV Headquarters* (Figure 14). *CCTV* is an example that, while it invokes the full range of Sloterdijk's atmospheres, it is particularly good at explicating the highest order (or the most difficult to elucidate and act on)—that of cultural breathing.

On one hand, it acts as a *single environment* in terms of spatial experience and organizational logic of the television bureau itself. It is conceptualized as a series of spatial "loops", accessible to different subjects in different ways—some for employees, some for public visitors. The loops produce circulation through the building "like a weather system of high and low pressure".[14] But even more critically, *CCTV* is an image of and a participant with political systems of operation within much larger, more pervasive conceptual breathing environments of national and global political exchange. Koolhaas' own description of the building reads as if it is a witting participant in Chinese socialism and statecraft: "A new icon is formed…

Figure 12. François Roche and R&Sie(n), Dustyrelief, Section (2002).

Figure 13. Sean Lally and Weathers LLC, New Energy Landscapes (2014).

[11]For specific works, consider: Archigram: *Living Pod* (1966), *Suitaloon* (1967), *Cushicle* (1966), *Capsule Homes* (1964); Superstudio: *Continuous Monument* (1969), *Super Surface* (1972); Ant Farm: *Clean Air Pod* (1970), *50'x50' Pillow* (1970), *House of the Century* (1972), *Inflatocookbook* (1971); Haus Rucker Co.: *Flyhead Helmet* (1968), *Yellow Heart* (1968), *Mind Expander* (1967), *Oasis No. 7* (1972); Coop Himmelb(l)au: *The Cloud* (1968), *Soft Space* (1970), *Restless Sphere* (1971).

[12]François Roche and R&Sie(n), "Dustyrelief" *New Territories*, http://www.new-territories.com/roche2002bis.htm (accessed 28 July 2018).

[13]Sean Lally, The Air From Other Planets (Zurich: Lars Müller Publishers, 2014), 39.

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Figure 14. CCTV sitting within layers of atmosphere, from the nation-state of China, to the smoggy air of Beijing, to the mediated exchange of television broadcasting.

a canopy that embraces the entire population… an instant icon that proclaims the new phase of Chinese confidence. The consolidation of the TV program in a single building allows each worker to be permeanently aware of the nature of the work of his co-workers; a chain of interdependence promotes solidarity rather than isolation, collaboration instead of opposition. The building itself contributes to the coherence of the organization."[15] The spatial arrangement of the state-sponsored television station itself is considered part-and-parcel to the content they deliver. The process of making television (and the airspace in which it is done) is an agent within the fluid dynamics of systems of social agreement at a moment when the break-neck acceleration of the Internet in China was (and still is) recalibrating that system. *CCTV* is a real space in real-time, organized by the architects (even if they do not consider it this way) as a bundle of airspaces (some local, some broadcast) that are calibrated to perform within specialized political cultures.[16]

The same year that *CCTV* began construction, Rem Koolhaas published his essay *Junkspace*. The essay is a pithy, at times angry stream of consciousness—an unbroken, fifteen-page diatribe of sorts—in which Koolhaas laments the gross resultant piles of spaces and behaviors that have coalesced in the wake of modernization. He writes, "Junkspace is what remains after modernization has run its course, or, more precisely, what coagulates while modernization is in progress, its fallout."[17]

Junkspace was written at the same time as *CCTV* (among other OMA projects) was under design and competition entry (c. 2001). I imagine Koolhaas opening the text document in spare moments of frustration (almost always in airports, it seems) while shuttling back and forth between Beijing, Rotterdam, New York, Porto, Seattle, Los Angeles, Shanghai, Lagos. Every time his ambitions of a globally prominent architecture that reorganized the way humans inhabited their world (the library, the television station, the museum, the store) met resistance in the form of contested client meetings, board reviews, schedule setbacks, project director resignations, or bad press for himself or the design[18], I imagine Koolhaas taking it out on the junkspace around him. *Junkspace* must have been a kind of therapeutic exercise—an airing out, in true furrowed-brow style, of all the ways spatio-cultural enterprises, when left to their own devices, can go wrong and run amok, of all the ways it can gross out. Though in many ways, his design work (especially in interviews and writing about *CCTV)* takes precisely the opposite disposition—of optimism and opportunity—as if he sees the work of OMA as inserting witting spatial agents into larger and smaller systems of spatial, urban, political, economic, and popular culture already in play.

It would not be wrong to suggest that he sees this as a problem of the air, of how space is demarcated, organized, and deployed across a wide range of capacities: "When we think about space, we have only looked at its containers. As if space itself is invisible, all theory for the production of space is based on an obsessive preoccupation with its opposite: substance and objects, i.e., architecture."[19] In his refusal to choose between cultural production and spatial production, Koolhaas invents the concept of junkspace as a way to make sense of globally systemic cultural flows *through* and *because of* arrangements and characteristics of airspace. It is not clear if Koolhaas is secretly admiring junkspace as pervasive and powerful spatio-cultural agent, as a mutant regime of forces that has such a nimbleness and adaptability to sustain a lasting agency over the way subjects and spaces interact with one another—the kind that architecture (especially that of OMA) often aspires to but has trouble achieving if it is too insistent on the primacy of building-ness alone. The manifestations of junkspace that he critiques in the essay are precisely the kind that he spends design energy around in order to produce new conditions around which publics organize (and *breathe*). In some ways, *Junkspace* is not just a lament, it is an argument—a desperation—for architects to care for systems of culture around which design organizes (and vice versa). Put into more Sloterdijkian terms, architects should consider the complicated folds of air they are designing within, the more of which they can explicate, the better.

ENVELOPING AIR

The crucial architectural feature in the conception of air is the envelope. In most cases (though we have already encountered some architecture that does not default to this position), it is the surface that divides inside and outside; it captures a pocket of chemical air and separates it from the less-conditioned air of the greater Earth atmosphere. The primary envelope achievement of the 20th Century was the curtain wall—the increasingly thin steel and glass surface whose structural responsibilities were reduced to near-zero, and therefore it decided to become chief atmosphere divider.

In 2014, Fujiko Nakaya troubled the envelope with her art installation *Veil* (Figure 15), an induced fog (via 800 specialized, patented nozzles) at Philip Johnson's *Glass House*. As the fog billows around the building, it destabilizes the already mostly-transparent box. Nakaya performs what Johnson never fully could: the complete ephemerality of space in and around the house. The house disappears (and reappears) hourly in a "totally white darkness".[20] Nakaya's installation is affective—it produces a sublime aesthetic experience—but it is also rhetorical. The goal of the artificially induced cloud is to produce spatial and phenomenological effects, and it does so quite well. But there is a partner to this event that explodes the network of atmospherics into a global scale. Though, in the relatively short history of upsetting the envelope, Nakaya (like Johnson before her) was beaten to the punch by an older, more systemic force.

[14]In his account of visiting CCTV near its completion, Edzard Mik fascinatingly describes many threads of his cultural encounters while in transit and at the building itself. Edzard Mik, and Jim Gourley, *Koolhaas in Beijing* (Amsterdam: Netherlands Foundation for Visual Arts, Design and Architecture, 2010): 99.

[15]Rem Koolhaas, and Office for Metropolitan Architecture, *Content* (Köln: Taschen, 2004), 489.

[16]Rem Koolhaas and Ole Scheeren, "CCTV by OMA", *A+U* (July 2005): 5-18.

[17]Rem Koolhaas, "Junkspace," *October* 100, (Spring 2002): 175.

[18]For anecdotes about the near-misses and full-out disasters of the CCTV project, among others, see: Rem Koolhaas and Ole Scheeren, "CCTV by OMA", *A+U* (July 2005): 5.

[19]Rem Koolhaas, "Junkspace," *October* 100, (Spring 2002): 176.

[20]Craig Kellog, "Mystery and Transparency: Fujiko Nakaya's Fog Installation at the Glass House" *Interior Design Magazine*, 26 November 2014, http://www.interiordesign.net/projects/10135-mystery-and-transparency-fujiko-nakaya-s-fog-installation-at-the-glass-house/ (accessed 28 July 2018).

15.

Figure 15. Fujiko Nakaya, Veil (2014).

Mies van der Rohe's *Farnsworth House* on the banks of the Fox River, just outside Chicago, Illinois, is the original glass box house (designed and exhibited before Johnson's *Glass House,* 1945-47, but built after it, in 1951). Farnsworth is a miniaturized, single-story skyscraper; it embodies the modernist attempt to reduce the envelope to an infinitely thin plane—still capable of partitioning inside from outside whilst doing absolutely no more (and certainly no less). It was an experiment for Mies in the sense that the envelope need not bother with the demands of size and solar heat gain that his towers did; the glass could be as clear and non-existent as possible. In 2008, *Farnsworth* participated in one of the more notable episodes in explication, when the Fox River overran its banks and invaded the house itself with eighteen inches of water (Figure 16). The house was originally designed and built stilted off the ground—at once a poetic signal that the space floated above and between the structural steel members and a practical move to keep any possible floodwaters out. However, the more recent problematics brought on by climate change have made rainfall in the American Midwest more unpredictable and flooding more frequent and extreme, recalibrating expectations about flood cycles. The sacred envelope of *Farnsworth* was breached by atmospheric violence, punctured by the ramifications of a global climate shift exacerbated by the project of Modernity itself. Photographs of the *Farnsworth House* inundated by floodwater show its interior dripping and swampy with humidity—the once non-registrable envelope driven mad by the sudden thickness of the air inside. *Farnsworth's* envelope was breached that day, and by extension so were the envelopes of all its offspring, by feral atmospheres of all sorts.

ENVELOPE/INTERFACE

If the curtain wall was the envelope project of the 20th Century, the 21st Century envelope begs for more agency. More than any other architectural element, it feels the pulses of the electro-troposphere against it, both inside and out. It has the capacity not just to seal, but to traffic, and it can be as extensive as the networks that want to course through it. Given the complexity of the air it is partitioning and conditioning, architecture and its envelopes want to act less and less like a barrier, membrane, or prophylactic, and more and more like a regulator, a modulator, or an interface.

16.

Figure 16. Farnsworth House flooded on Sept 14, 2008. (Architect Magazine, 2008).

Benjamin Bratton, in his book *The Stack: On Software and Sovereignty*, prefers to see the envelope as an interface, one that shows up in multiple ways depending on who encounters it and in what capacities. Bratton expertly weaves together the world of "concrete" (i.e. architecture) and "computation" in ways that make sense of the practices and encounters of the 21st Century that span across digital and physical operations. On the one hand, he critiques and expands on Alejandro Zaera-Polo's *The Politics of the Envelope,* as he sketches out some ways of understanding the current status of the physical envelope within the context of the city: "In their different ways, envelopes structure and express links between the building and the world and introduce the segmentation, hierarchy, division, compression, massing, or adjacency that is… the reality of architectural micropolitics," and in particular, "the political effects of the architectural apparatus… [and] how it directly organizes publics (or subjectivizes *Users*…)."[21] Any single envelope is of less immediate importance here, but instead, he offers "neighborhood[s] of envelopes, which combine with others into urban-scale landscapes of competing envelopes and the polities they convene."[22] However, just like the two modernist houses above, that is only half the story. He then speculates on a "matrix of mixed envelopes", involving hardware (i.e. architectural) and software envelopes: "The interfacial problematics of the *City*… include both the micropolities configured by architectural envelopes and the equally complex virtual envelopes that organize mobile *Users* as they meander past the gathering confines of any single building form… For ambulant bodies moving through [an] active world, the handset is part of an active network linking site to speech and data and gesture to affect. Mobile device plus city equals a composite read-write medium, allowing for real-time communication…. This changes not just how people interact with cities but how they see them as well… The *City*, as seen through the medium of [the face of the mobile handset], oozes with living data to be touched and rewritten all over again."[23] The city is a collection of architectural surfaces (envelopes) that collect together into a single, continuous super-surface (or urban interface) through which user-citizens index themselves and their lifeworlds; some of this is through physical encounters with solid matter and some is through digital encounters with ephemeral data, and those are increasingly intertwined with

[21]Benjamin H. Bratton, The Stack: On Software and Sovereignty (Cambridge, MIT Press, 2015), 166.

[22]Ibid., 167.

[23]Ibid., 168-169.

one another. Any singular objects of architecture bleed into one another across a GPS-enabled, price-checked, online-ordered, ride-shared, instantly-instagrammable experience of urban space, both "in real life" and in virtual space at the very same time—the two synthesize a co-dependent encounter with architecture and urbanism.

A contemporary theory of the envelope must include considerations and responses to the multiple valences of the air it traffics—its chemical status, electromagnetic behaviors, and perhaps most importantly, relative to architecture's capacity to foster the formation of subjectivities, the cultural content of the atmosphere. This likely has as much to do with demanding more of architecture within the family of technologies that increasingly facilitate and underwrite our enrollment in vast digital networks (i.e. so-called "electronic devices") as it does with admitting all the ways that architecture is *already complicit* with technologically driven forms of socialization and urbanization in ways that it currently cannot account for. We can imagine ways that architecture can change to play nicer with faster networks: building materials that respond to environmental changes, buildings as images of the information networks they channel, data infrastructure as spatial and tectonic conceit, buildings that contain and separate pockets of microwave-laden air. But even more important for contemporary architects is to come to terms with the ways architecture has changed in the imagination of the subjects that encounter it, in just the same ways as the city has. People implicitly find architecture in places they did not expect to find it, in scales they did not anticipate (both larger and smaller), and strewn out further than they could imagine. They also mix digital and physical experiences with unrelenting frequency, and this requires some flexibility and dexterity in the deployment of hardware and software envelopes relative to one another. The future elasticity of architecture within this framework probably has as much to do with its *connections* as with its shape, as much with its *interfaciality* as with its objecthood, as much with its *atmosphere* as with its solidity.

FUZZY MEMBRANES

Bratton describes the inhabitation of the mixed envelope/interface as "one structured micropolity… pressed against another and linked by the fuzzy membranes that make and unmake publics in different shapes and sizes."[24] The words "fuzzy" and "membrane", within a static, glassy conception of the envelope, seem incompatible. But in the shift from light to air—from delimiting airspace as separate pockets of controllability to interfacing with the air as one among many relational activities—perhaps "fuzzy" is as much of a qualifying adjective for "membranes" as it is a goal for their behavior. Granted, in terms of the envelope's performance as an interface, things that act fuzzy might not *look* fuzzy, and things that look fuzzy might not *be* fuzzy. But when given serious consideration, fuzziness (and its partner *blurriness*) can trigger architecture into all sorts of air traffic.

For instance, Diller Scofidio + Renfro's *Blur Building* (Figure 17)—an exemplary, if audacious, figure within the discourse about architecture *of* and *within* contemporary systems of atmosphere—proves this out. *Blur*—a winning entry for the Swiss Expo in 2001—is, like Fujiko Nakaya's work, an artificially-induced weather event at the scale of a building, only this time it is much larger in size and much wider in terms of the types of air is means to traffic. *Blur* produces one of the most provocative phenomenological experiences in recent architectural history at the same time that it unfurls that experience across networks of ephemeral information and tacit feedback

[24]Ibid., 167.

17.

loops. The building is a steel scaffold built over a Swiss lake, onto which are attached over 30,000 high-pressure water nozzles that expel fog made from the lake water itself. The cloud swallows the steel structure, producing "an optical white-out… Sensory deprivation stimulates a sensory heightening: the density of air inhaled with every breath, the lowered temperature, the delicate and pervasive sound of water spray, and the scent of atomized lake water all engage the senses."[25] Inhabitants are enveloped in the fog, just like the structure. Images from inside the cloud show that there is no longer a distinction between inside and outside, as the obscurity of the thickened atmosphere simply saturates and erases all solid material within a certain visual range. (Figure 18).

18.

While this is the extent of the project that was ultimately built—as exciting as it is—the more atmospherically provocative parts of the project (which sadly succumbed to the institutional pressures of the expo against the ambitions of DS+R) are the ways they implicated media culture as an equal partner alongside the fog. From the very beginning, DS+R planned to integrate digital media in the project, like imagery, film, scrolling text, and sound. "The media event is integrated with the enveloping fog. Our objective is to weave together architecture and electronic technologies, yet exchange the properties of each for the other. Thus, architecture would dematerialize and electronic media, normally ephemeral, would become palpable in space. Both would require sophisticated technologies that would be entirely invisible, leaving only

Figure 18. Visitors to the blur building inhabiting the medium of the fog. Diller Scofidio + Benfro, Blur Building (2001).

Figure 17. Diller Scofidio + Benfro, Blur Building (2002).

[25]Diller + Scofidio, *Blur: The Making of Nothing* (New York: Harry N. Abrams, Inc., 2002): 44.

19.

Figure 19. Diller Scofidio + Benfro, Braincoat (2001).

their effects."[26] For much of the design phase of the project, this was conceived as a glass box (queue *Glass House* and *Farnsworth* from above) in the center of the cloud. "Unlike entering a space with an inside and outside, entering Blur is like stepping into a habitable medium… If immersion in the fog is like ether, the glass box is the perfect context for the experience of another all-pervading, yet infinitely elastic, massless medium—one for the transmission and propagation of information: the Internet. The project goal is to produce a 'technological sublime,' parallel to the 'natural sublime' experienced in the scaleless and unpredictable mass of fog. This notion of sublimity, however, is based on making palpable the ineffable and scaleless space and time of global communications."[27] While DS+R's description of the project perfectly correlates affect and ephemeral data, it is fortunate the glass box never came to fruition. All the power of the cloudy atmosphere in undermining the status quo for the building envelope might have been sapped by the re-inscription of the curtain, which puts its disciplinary roots in a much firmer notion of what it means to inhabit space (physical or digital) in the 21st Century. The more convincing portion of the "media experience" (one that truly was a loss for the eventual built project) is the *Braincoat* (Figure 19), a "prosthetic skin (raincoat) equipped with a 'sixth sense' [which allows] each visitor to navigate the cloud and interact with other visitors without speech."[28] The *Braincoat* had integrated sensors, LED lights, sound emitters, and vibratory actuators that, according to the wearer's responses on a short questionnaire (simple choices between pairs of words), would signal their level of likeness ("affinity") or aversion ("antipathy") to fellow inhabitants in their proximity. It is a simple example, but one with profound implications for the thoroughly strewn-out user-citizens of the city in the 21st Century. Of course, the digital atmosphere of today is decidedly more robust and complicated than it was even 18 years ago when *Blur* was conceived and built (for instance, the first iPhone debuted in 2007, seven years after *Braincoat*). While the degree to which people intertwine their digital and physical experiences is far more sophisticated than it was, *Blur* and *Braincoat* foreshadow the possibilities for architecture to engage with a "mass [digital] public in a haze of fog",[29] both as a project that imports into architecture technological experiences that usually find a home elsewhere *and* troubling the status and role of architecture itself (especially the envelope) within those mixed cultures.

GOOD VIBRATIONS

The ether in which we live and breathe (chemically, electromagnetically, and culturally) partners with a huge variety of much more physical, tangible conduits, filters, transmitters, barriers, modulators, translators, magnifiers, and antennae. Every immaterial, invisible, intangible operation is met with (and offset by) a physical, often designed, set of objects or material assemblies—architectures, if you like. And this is precisely the rub for architects. There is certain dependency between the air and the vessels that mean to capture and orient it. Given this co-constuitive relationship, there are two main axes of response: for architecture, like the mobile phone, to become more technologically aware—to design and prototype systems through which the haptic and interfacial expertise of architecture is leveraged within digital cultural—and second, for architecture itself, as it sits now, to consider and enroll the extensive networks of logistics, information, imagery (and desire), geopolitics, economy, and infrastructure that it organizes (and is likewise organized by), and to destabilize its own assumptions about what constitutes the role and value of spatial production within them. Partly, this means that architects will have to forego the myth of solidity in favor a much more elastic regimes of architecture. Architects may find new value sets that neither sacrifice what they already do well (including phenomenological experience), nor forego their important role in a rapidly developing immediate future condition (currently governed by technology companies and consumer electronics) in which mediated experiences are only partially phenomenological.

Perception is the proto-parent-language of architecture, and as evidenced by the ways in which gadgets and devices have ingratiated themselves to human touch, digital networks are begging to be felt. The bottomless black screens that fill our palms are windows into the most endless trove of information, social interaction, and imagery that has ever existed. They are also increasingly tactile—with designations like "multi-touch", "gestures", and "3D touch"—to the degree that the number of buttons has been reduced to near zero; one simply touches the information itself with increasingly fine dexterity. Technology companies understand the aesthetic value of sensate performance of the objects they create. In this spirit, entire subsystems have been miniaturized and integrated into ever-more-capable gadgets we use to interface with networks: cameras, speakers, and increasingly responsive, sensate, and haptic assemblies. Vibration has been a part of the project of the cellphone nearly since the beginning. The variation in the language of vibration since the cellphone began buzzing is indicative an increasingly complex relationship between our senses and what wants to be felt (or explicated).

On one hand, the technology of architecture looks hapless when compared to the products of tech companies. Appliances and equipment are the techno-gadgetry of architecture, and they only need buildings to keep the rain off. On the other hand, a shinier approach to the packaging of architecture within digital culture does not satisfy all the globe-sized systems coursing around architecture, just hoping to be noticed. Reyner Banham would have loved the smart refrigerator—the most advanced gadget and operator in the most technologically obsessed room of the house—but he would have loved more the extensive networks through which it operates: food logistics, global manufacturing economies, advertising, cellular transmission, celebrity chefs, etc.

Architecture is one of the great producers of atmosphere, and architects have spent a long time learning how to hone and cultivate feelings of space. We are nearly unique in this sense, and it should never be forfeited. Though there is now growing an enormous and complex territory between the largely invisible but highly effectual ether of atmospherics, digital networks, and the concrete domains traditionally ascribed to architecture. It is being tentatively filled by brave frontiers-people in architecture, by so-called user-experience (UX) designers, and so on. Young people learning architecture now have a fluent, native understanding of that ether—they grew up huffing it. We need their imagination in exploring and camping in that between-territory. It will require explication of the air, in all its multiplicity, and commitment to the messy, contingent relational structures that it requires.

[26] Diller + Scofidio, *Blur: The Making of Nothing* (New York: Harry N. Abrams, Inc., 2002): 44.

[27] Ibid., 162.

[28] Ibid., 211.

[29] Ibid., 195.