

Cloud Formations: Operations of Ambiguity

JOHAN VOORDOUW

Azrieli School of Architecture & Urbanism, Carleton University

This paper explores how physical and digital cloud formations implicate architectural ideas on structure, operation and materiality. The architectural cloud is constructed through aggregation, and defined through the representational lens of softness, and thing-ness.

The work argues that clouds are not simply ambiguous form, but constructed indeterminate structure, pliable operations and ambiguous materialization, that offers a compelling extension of architecture's recent theoretical discourse and practice.

Using a history of both the physical and digital manifestation of clouds from media studies, it explores how cloud formations differ from the networks and pliant surfaces of architecture's recent past?

It concludes that as a filled volume, clouds require a new reading of transparency, space, and material and environmental boundary.

INTRODUCTION

The cloud is both a physical and digital structure, and to define its relevance to architecture a number of general concepts should be established.

As a physical condition a cloud is complex form, its materialization is emergent, and arises from the environmental conditions that surround it. As a digital body, the cloud comes from a long lineage of communication technologies, and comes from the deep logic of cable television, radio, telephone, and even infrastructures such as railways that preceded it. In describing the cloud as technological infrastructure it gains a real structural, organizational, and material condition, even if this condition is typically hidden from view.

In relation to the formation of physical clouds is a compelling quote by Johann Wolfgang von Goethe from his book *Towards a Theory of Weather*:

“... nothing exists or comes into being, lasts or passes can be thought of as entirely isolated, entirely unadulterated. One thing is always permeated, accompanied,

covered, or enveloped by another; it produces effects and endures them. And when so many things work through one another, where are we to find what governs and what serves, what leads the way and what follows?”¹

—Johann Wolfgang von Goethe, *Towards a Theory of Weather*

This quote is equally fitting for the digital cloud.

Physical clouds are material, but not durable, digital clouds are durable but not material, but these preconceived notions are more passively assumed than actually conceived. Physical clouds are durable, but they continuously move over our horizon, breaking apart and collecting somewhere else. Digital clouds are material but hidden behind the digital interface racing under the surface of the ground, or beaming up to the satellites that shine like the stars in space.

The cloud is nebulous. It mirrors many of concepts already established in architecture: questions of emergence, and non-linearity but shifts these concepts from a biological, to a meteorological condition, from a body, to a body within the wider environment. If we move away from literal, and idealized virtualities of the cloud, both in its physical and informational condition, architecture might partake in materializing the cloud, and find opportunities for its occupation and experience.

So how might the cloud implicate architecture? This paper is at pains not to argue for a neo-avant-gardism, or for the cloud to become a semantic theoretical trope that has defined much of architectural speculation in its recent past, and yet it will struggle to give existentialist reason for the precipitation of clouds as a necessary architectural solution. But within the cloud is a number of compelling architectural ideas that counter contemporary formal, spatial and programmatic thinking.

The cloud might, on the face-of-it, be anti-architecture par excellence. I aim however to convey how it might be structured, operationalized, and materialized in real terms, and how these concepts are part of a longer lineage of architectural ideas that find their roots in post-war discourse leading to the present day.



Figure 1: Blur Building, Diller Scofidio, Swiss EXPO 2002, Yverdon-les-Bains, Switzerland, Norbert Aepli, Switzerland .

In constructing an architectural cloud I will lean on the term *aggregate* to strategize how architecture might realize a cloud. An aggregate as termed here is the materializing of discrete elements that coalesce together - emerging, merging and dissipating with the surrounding environment. An aggregate has a number of precedents in art such as collage and montage, and in philosophy, assemblage theory conveys how elements (units of an aggregate) may retain some autonomy within the larger matrix.² The aggregate is not a single thing, its parthood is difficult to discern. As a collection its individual elements work simultaneously at the scale of a unit, a small aggregate, an aggregate of aggregates, and as a totality.

These aggregates may have what Sanford Kwinter describes as *softness* to affect and be affected by its internal and external surroundings.³

To frame my argument on architectural clouds I would like to introduce two additional ideas: one by Ashley Schafer where she describes the difference between *representation*,

and *representational*, and the second idea as described by Elizabeth Grosz where she describes *thing-ness*.

Schafer describes *representation* as an analog or digital drawing or model of a project or object. *Representational* is a drawing, model or building that acts in place of an idea.⁴ This paper argues for representational conception of clouds. These conceptions might actually resemble or be representations of clouds as well, but it is not necessary. To describe a representational understanding of the cloud, and to illustrate a possible limit, I start by showcasing the *Prada Epicenter* New York, by OMA (2000-2001) as a project never intended as a cloud, but one that exhibits characteristics of cloud formations. The *Prada Epicenter* constructs an ambiguous relationship of program to space; its floating masses subvert conventional understandings of weight and materiality.⁵ The store is a filled volume that redefines matter and transparency, and blurs type. Where the *Prada Epicenter* is less successful as a cloud formation is in the linear sequence of a single undulating plane. The project is not an aggregate, as

much as a programmed carpet, but the Epicenter illustrates well a non-literal cloud; the cloud as an indeterminate idea, made physical as built space.

My second frame relates to Elizabeth Grosz's writing on *thingness*. Her writing starts by describing the *thing* as typically inert, and counter to the subject, but she enriches this argument with an alternative reading when she "conceives of the thing, not as other, but as provocation or incitement for the subject: the thing is that which prompts us to act, to invent, to practice, to extend ourselves beyond ourselves."⁶

The cloud here is situated as an architectural provocation, a 'thing' that is typically floating in the sky, as becoming architecturally spatialized and materialized. It is the weightlessness, emergence, and indeterminacy that is a provocation to architecture. It forces us to spatially, programmatically and materially invent and expand our practice. Clouds are filled volumes that are non-spatial, non-material, and yet we can be inside them, see them, feel them, and when it storms we can hear them through their thunder. We have moments where we enter a cloud, like during takeoff or landing in a plane, or when we stand on the peaks of mountains or dip into cool valleys. And we interact with the digital cloud daily, its pervasion now at almost physical levels. We live digital lives concurrent to our physical lives,⁷ and even when we are off-line, the structure of the digital world implicates our real one, the weather from our physical clouds and the climate in our digital clouds defining our worldview, its content and our relations.

LONGUE DURÉE

If we expand, for a moment, our view from clouds to encompass the sky it is a critical repository of our collective history. It is in the sky that we read the stars for navigation, and the winds for trade. It is from the sky that we build our heavens, and weather our storms. It is past the sky that we have exceeded our own human reach. First in flight across the surface of the earth and then in space thrusting satellites past the edge of our own solar system, and filling them as a technological ring around our earth's waist; a band of technology that makes present part of our growing digital world.

It is our sky that gave our forbearers their first data sets, observations of the seasons and stars forming the calendar and clock of our world, defining abstract concepts into discrete units to make sense and order of our chaotic surroundings. As John Durham Peter's writes, the sky makes possible our most precise science in astronomy, and its most predictive in meteorology. Astronomy is a study that can look back into the past and forward into the future, meteorology is an observation of the immediate present. Together they make our daily condition as a moving point on a continued arc in time.⁸

In the arts, representations of clouds are relatively new. Symbols of clouds have been used for approx. 2000 years, but the realistic depiction of clouds in western art is more recent – only since the Renaissance have we attempted to realistically render the sky.

In early photography clouds are remarkably absent, like people they moved too fast to capture. Today we track clouds, seeing real time simulation of their future movements, and yet they remain elusive to capture or tame.⁹

In architecture clouds are both a buildings material counterpoint and its perennial enemy – the weather something to keep out and weathering at bay. In representation, however, comes a compelling anecdote from the very inception of our profession; that the clouds in Brunelleschi's early perspectival drawing, were mirrors to reflect the sky.¹⁰ A flattened plane giving way to a moving temporal dimension of an otherwise structured and fixed pictorial construction. It was in the first instance of architecture that is saw clouds as a mirror, a removed, ambiguous 'other' reflected off the stasis of both the idea of building, and of buildings themselves.

Architecture has built some clouds. The Blur Building by Diller Scofidio is the foremost, example. The Blur Building was developed from a network of hoses and nozzles to maintain its presence on Lac Neuchatel, even when the driving wind was ushering it to go.

Physical and digital clouds are technological and cultural/media infrastructures,¹¹ and as such parallel many of the concerns of architecture.

The digital cloud is not a virtuality, but something that is made, it was programmed, constructed, maintained and innovated. Therefore, it is not something that is fixed and finished, but something that is still evolving, and as such, architecture has an opportunity to further conceptualize the cloud spatially and materially.

As an immersive media, architecture and clouds might either define a schism, or an opportunity to spatialize new ideas in very real ways. This spatialization makes present contemporary questions of public access, security, ownership, and agency. Architecture could form a persuasive argument that materializes the cloud from a networked lineage of capitalist and militaristic origin, to enact alternative modes of social formations and engagement.

STRUCTURE

So what might be the structure of such a 'thing'? Clouds exhibit similar characteristics to both networks and topologies without the corresponding dependence on lines and surfaces. While clouds take a similar position to relative distance and deformation, the lines of networks and surfaces of

topologies evaporate into a volume of points. These points aggregate through attraction and repulsion as oppose to emplacement along a line or in a surface.

This requires a very different realization of structure, one that might correspond to the work of Mette Ramsgaard Thomsen and her project *Thicket*. Thomsen also uses the term ‘soft’, but to describe a tectonic inquiry that is adaptable, crafted and motile where the structure is inherently weak and the forces move through a field of friction based interconnectivity.¹² It is here that Thomsen’s soft, gives structural space for Kwinter’s softness, the soft movement of the motile structure affecting its spatial surroundings.

An alternative to Thomsen’s *Thicket* is the recent installation of the *2018 ICD Aggregate Pavilion*,¹³ where a porous structure of loose granular forms is poured, and stacked. Where stasis is not assured and structural resilience is managed through friction.

A non-static structure is a provocation to the hegemony of stasis to play a more nuanced role in space making. Friction and aggregated structures are dependent on their neighboring elements, rubbing and resting on a surrounding collection of elements. This structure is very different from architecture’s tripartite past. It is not the representation of a structure, but representational of an indeterminate system that is continually evolving - structure is not fixed and finished. In friction structures depth and thickness offers the necessary medium for force to find a tentative equilibrium. Structure does not gridded Cartesian space, but offers a loose weave in which to carve ancillary space. It is not a singular object or system, but a collection of elements, many things forming the idea of one thing; a provocation of what structure might be. The structures of *Thicket* and the *Aggregate Pavilion* do not articulate a defined surface, but an ambiguous boundary filled with slippages and re-adjustment. This is the structure of a spatial body in continual *correspondence* and *sympathy*¹⁴ of its internal and external forces; of force not as a dynamics to be contained and controlled, but one to be slowly danced with, swirling, tumbling, and uplifting the structures that define our spatial and operative condition.

OPERATION

Operation is two-fold condition, firstly it is the practice that develops the work, and secondly it is its subsequent use after realization.

In architectural practice, cloud operations are intimately connected with digital and computational procedures that automate a sequence of defined scripts and commands. As such, this mode of work generates both representations and representational modes of an idea. A cursory example of cloud formations is the Software No.14, DRIFT2 project by MOS Architects,¹⁵ which layers, and voids simple square,

triangle, circle, cross and oval shapes to form an aggregate of simple figures forming complex formal and spatial relations.

These images are two-fold, in that they form representations of an aggregate of simple elements that form possible cloud formations, and can act as representational images of the idea of cloud formations. In both ways they operate within the established conventions of architectural practice to convey an idea through image making which can be enacted in the future through construction.

If we shift to the second operational condition, that of use, architectural clouds continue to decouple programmatic boundaries from form. In terms of operations, clouds fray edge conditions, and exhibit continuity through evolving emergence and indeterminacy.

Operations within the cloud do not occur in an empty void, but in a filled volume of consequential effects. Cloud volumes subvert space; space morphs from the inside out, as oppose to forming from the outside in.

Operations are not to mimic or construct a realistic cloud. Operations are the negotiation and facilitation of social formations. Formations that set up real conditions to subvert, augment, and reconfigure spatial and programmatic relations, and that undermine architecture as a static, autonomous object and emplace it as a subject within human relations.

Anton Picon makes a critical distinction in the difference between the *real* and *reality*. In line with Kant, *reality* is the world as perceived; *real* is “the world envisaged independently from us, or as the original source of what appears to us.”¹⁶ What is important to this distinction is Picon’s following argument that to prevent idealization is to understand the real, not as a precursor to the utopian, but as a fundamental condition of how architecture relates to the social imaginary – a common frame to express issues that are important to a group of people.

Operation is not to create the techno-utopias of Constant Nieuwenhuys’s *New Babylon*. It is to reiterate a thesis written by Tung-Hui Hu in his book *Pre-History of the Cloud*. The digital cloud is as much about the new as it is a repository for waste, and the forgotten.¹⁷ If the architectural cloud that I describe is an aggregate, it is an aggregate of new ideas as well as old ones, an aggregate for new freedoms of expression and much as recombinant modes of existing power.

For an architectural cloud to make any significant contribution to our practice, we first have to consider its social purpose. That broader question is one that cannot be answered by architecture alone, but it does offer questions that should concern us all.



Figure 2: Rolex Learning Center, SANAA, Lausanne, Switzerland, Peter Kuley .

MATERIALIZATION

Clouds reconsider notions of surface, enclosure, boundary, depth and transparency, and package these architectural issues in new ways.

Clouds as aggregates undermine the privilege of surface, and as filled volume the dominance of open space. Aggregation frames a range of complexity: a unit might be basic, accrued in equally simple terms, or it may venture in more expressive, complex territory.

With this layering of aggregates is a renewed question of boundary. In the cloud, the material boundary remains obscure, and its effects on the surrounding environment beacons a reciprocal relationship. A cloud is not in the environment. It is the environment. This oscillating relationship expresses the cloud's internal and external forces, the pressures that shape it from outside and within. This parallels discourse on responsive architecture, but not through a porous membrane, but a much deeper material body. It is this material body that establishes an aggregate's depth. This is not surface depth that wraps in enclosure, but a spatial depth that materially embeds a cloud's internal structure and operation and extends it to its obscure boundary. This depth opens questions of transparency not just from inside to outside, but from inside to inside as well. As commented by Cathrine Veikos and Renee Cheng: "transparency does not have to produce full disclosure and opacity does not have to prevent it."¹⁸ Transparency is not viewed solely as building as autonomous object standing in contrast to its surrounding environment. A cloud is the environment. Questions of transparency occur throughout its volume, not just at the edge.

Materialization is a two-fold condition. It is how a cloud is materialized – the practice that makes it, and the material

it is made from. Materialization is very much like the operation as previously described. It is a fluid architectural practice that evolves ideas through iteration towards design and onto construction. The material remains open to debate. It might convey a literal, translucent ethereal glow, but it too could exact the hard edges of steel or the mottled greyness of a deep slab of concrete. What remains important to the material condition of cloud formations is their soft and aggregated structure, and their indeterminate operations. One might consider ideas of atmosphere as a potential material, and the design not only of space, but the airy material in space as an architectural responsibility. Architecture heats the air, and moves the air, but does little to design anything as complex as an internal weather. Whether architecture needs to be this literal to enact a cloud is open to interpretation. Atmosphere as material or as media is an established idea¹⁹ that architecture could work harder to make spatially consequential.

Before the conclusion I relay two questions asked during the panel discussion. They asked specifically about representation and materiality of cloud formations.

Clouds formations can be simulated, but they subvert traditional architectural drawing and modeling. If we consider a section drawing through the *ICD Aggregate Pavilion*, how might we accurately represent a loose aggregate of hundreds, if not thousands of interlocking members, and even more importantly, do we need to? This exhibits why cloud formations exhibit representational questions that might not have architectural representations for answers, and why questions of representation opens a new discourse on the role of information and visualization in architecture.

A second question asked if a cloud formation could indeed be solid. To consider the materiality of cloud formations I used

the example of the *Rolex Learning Center* by SANAA. While by no means a conventional building, the project does use conventional, solid construction materials and finishes which are common to architecture. It is, however, the undulating ground plane, and the oscillating relationship between ambiguous and defined spaces that operates the *Rolex Learning Center* as a possible cloud formation. At the *Rolex Learning Center* the solid materiality of the building dissolves, carving space for an equivocal material and operative experience.

CONCLUSION

Clouds formation might be new as an architectural idea of structure, operation and material, but they are deeply embedded into our collective consciousness. The physical and digital clouds are literally and figuratively all around us, and make a large part of our outer and inner lives.

Actualized through aggregation cloud formations contains the good, the bad and the ugly as an honest reflection of our current milieu. In aggregation, clouds can carve pockets of autonomy, and internal softness to the outside world, and form alternative spatial practices within the larger landscape. Their spaces are not passively interstitial, or junk spaces, but absorbed, and deeply embedded in the very structure of the architectural cloud. Spaces that form part of its many centers, and sequences of space that weaves through its varied volume.

Why do clouds matter?

If architecture is the practice of materializing and spatializing the abstract for human use and occupation, then clouds are a continued cultural lineage from historical modes of organization and existence.

There is no compelling, existential reason to shift to clouds. But clouds offer architects an opportunity to further side step the hegemony of modernism, to distance itself from the fractured oppositions of deconstructivism, and to further nuance architecture to express our current pluralistic lives, and messily aggregate them together. By rendering space as a filled volume we may reconsider a new public. As a filled volume we may realize that every human and non-human body occupies space, and that occupation of one body might displace that of another, and that a new public must therefore leave space for everyone.

In a world where we deem two elements: water and air, to be infinite, the construction of architectural clouds might allow us to understand the finite limitations, and the centrality of these critical resources. To understand that what may seem inexhaustible is actually quite fragile, and to ensure its continued health requires the nurturing attention of design.

ENDNOTES

1. Johan Wolfgang von Goethe, "Towards a Theory of Weather" [Versuch einer Witterungslehre] Goethes Werke, Hamburger Ausgabe, vol. 13, trans. Miller, D. Goethe Scientific Studies (New York: Suhrkamp, 1988)
2. Manuel Delanda, *Assemblage Theory* (Edinburgh: Edinburgh University Press, 2016)
3. Sanford Kwinter, "Emergence: Or the Artificial Life of Space," *Anywhere, Any* (June 1992)
4. Ashley Schafer, "Theory after (After-Theory)," *Perspecta* 38 (2006): 107-124
5. Simone Brott, "Close Encounters, Withdrawn Effects," *Journal of Architectural Education* 61 (May 2008): 6-16
6. Elizabeth Grosz, "Notes on the Thing," *Perspecta* 33 (2002): 78-79
7. Elizabeth Grosz writes extensively about the body in digital/virtual space, and the implication of the virtual and the real in: Elizabeth Grosz, *Architecture from the Outside: Essays on Virtual and Real Space* (Cambridge: MIT Press, 2001): 100-102
8. John Durham Peters, *The Marvelous Clouds: Towards a Philosophy of Elemental Media* (Chicago: University of Chicago Press, 2015): 213-260
9. *ibid*: 252-260
10. Friedrich Kittler, "Perspective and the Book," *Grey Room* 5 (Autumn 2001): 38-53
11. For digital clouds read the Introduction and Chapter 1 of: Tung-Hui Hu, *A Prehistory of the Cloud* (Cambridge: MIT Press, 2016) For physical clouds refer to the Introduction and Chapter 5 of: John Durham Peters, *The Marvelous Clouds: Towards a Philosophy of Elemental Media* (Chicago: University of Chicago Press, 2015)
12. "Thicket" KADK, The Royal Danish Academy of Fine Art, Schools of Architecture, Design and Conversation, accessed October 12 2018, <https://kadk.dk/en/case/thicket>
13. "ICD Aggregate Pavilion 2018" ArchDaily, accessed September 27 2018, <https://www.archdaily.com/902775/icd-aggregate-pavilion-2018-icd-university-of-stuttgart>
14. Tim Ingold uses the terms 'sympathy' and 'correspondence' extensively to describe the relationship of weather to the world and its implications on being, and our built environment in: Tim Ingold, *The Life of Lines* (London: Routledge, 2015)
15. "Software 14, DRIFT2" MOS Architects, accessed November 8 2018, <http://www.mos.nyc/project/drift2>
16. Antoine Picon, "Continuity, Complexity, and Emergence: What is the Real for Digital Designers?," *Perspecta* 42 (2010): 147-157
17. Tung-Hui Hu, *A Prehistory of the Cloud* (Cambridge: MIT Press, 2016): 52-58
18. Cathrine Veikos and Renee Cheng, "The "Sheer Opacity" of Contemporary Enclosure," *Journal of Architectural Education* 57 (Nov. 2003): 11-17
19. See: John Durham Peters, *The Marvelous Clouds: Towards a Philosophy of Elemental Media* (Chicago: University of Chicago Press, 2015), and Tim Ingold, *The Life of Lines* (London: Routledge, 2015)