Architecture in the Penumbra

Our interest here lies in architectural ways to knowledge, and, the forms in which such investigations can be captured and described. The interrelated topics of knowledge and learning are, despite their ubiquity in our lives, perennially difficult to define. For this reason, their descriptions inescapably tend to rely on some basic set of metaphors. Over time, these tropes have lost their original imagery and have become so engrained in our ways of speaking that we tend to overlook how they also shape our understandings: They become "metaphors we live by."[1]

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Whereas the oft-used linguistic phrasing "the construction of knowledge" is basically cast as being a process, it still suggests something more tangible as an outcome. Also, its associated repertoire of constructivist object-based terminology, pertaining to "schemata" or "scaffolding," is no stranger in the architectural world. But if architectural research leans on such understandings too heavily, there is a risk that it will confuse process with product. To provide for a better basis, we instead draw on the work of Carla Hesse in her discussion on the recasting of knowledge forms in *temporal* rather than *spatial* terms.

> In fact, knowledge is no longer conceived and construed in the language of forms at all ("bodies of knowledge," or a "corpus," bounded and stored), but rather as modes of thought, apprehension, and expression, as techniques and practices. […] Knowledge is no longer that which is contained in space, but that which passes through it, like a series of vectors, each having direction and duration yet without precise location or limit.[2]

The *vector* is a candidate primitive to which we can tie our developing understandings of the practices under study. It is further a concept with immediate bearing on the work that is undertaken. And as will be described, recurrently figures in the different investigations.

INVESTIGATING THE PENUMBRA

One of the central topics of our investigations is the relation between the representations and their material manifestations. More specifically the interest lies in the different ways *vagueness* can be construed and considered productive. The subject of vagueness continues to haunt the philosophical discussions with the impending threat that reality—ultimately—may not be definite.[3] If vagueness is a property of

the world itself, and not only of our language and representations, then, for philosophy, this spawns an epistemological quandary as regards the possibilities of attaining truth. For this reason, Bertrand Russell argued that "Vagueness and precision alike are characteristics which can only belong to a representation, of which language is an example. They have to do with the relation between a representation and that which it represents."[4] As a model of language, this so called 'picture theory' was subsequently met with demur.[5] Nevertheless, in his continued reasoning, Russell points to the observation that "all words are attributable without doubt over a certain area, but become questionable within a penumbra, outside which they are again certainly not attributable". This notion of the *penumbra*, or the semi-shadow in between, is what catches our interest. We deem the arising ambiguities residing in this gray area, due to vagueness in representations, to be pertinent to architecture. However, to further zoom in on our target, we will sketchily review a few different ways of configuring the phenomenon.

Clear code—obscure representation: Some objects, although fully conventional in their form or code, may be presented through a somehow skewed or partial representation. The effect is often suggestive, inviting further scrutiny. The condition can trigger 'perceptual completion', a process that consists of bridging the gaps imposed by occlusion. Advertisers vigorously exploit this circumstance. In such a case, the object only remains ambiguous or unclear until the perceptual process has locked in on the gestalt. After this happens, the previous condition becomes unattainable; the "not seeing it" becomes impossible.

Dual codes—multistable perception: Some ambiguous objects operate differently on a perceptual level. The images of the duck-rabbit, the Necker cube, Rubin's vase etc., are all made up of single visual stimuli that lend themselves to multiple interpretations. The specific situation here is that the perceptual system has trouble in maintaining more than a single gestalt at any moment. Ambiguity then, arises in the oscillation between the possible (seen) patterns over time.

Dual codes—simultaneously present but competing: The fur-covered cup, saucer, and spoon in Meret Oppenheim's sculpture "object" simultaneously present two readings. The bare functionality of the tableware and the tactile qualities of the fur are equally present and it is by their juxtaposition that we find the force of the surreal. Ambiguity emerges as an effect of this impasse, in the tension between two co-existing readings that cannot be fully resolved.

Layered codes—the multivalent object: Some objects are configured in such a way that they afford more complex interpretations. A typical example is provided by Jencks' analysis of Gaudi's Casa Battlo, as Jencks is tracking his own struggle to fathom the embedded meanings in the roof dragon.[6] We can regard this kind of design approach as a layering of codes. Uncovering possible readings then becomes an intellectual enterprise in itself; an excavation of denotations trading on the observer's own proficiency with convention, symbolism and particular histories. This operation partly works by obscuring the representation, through deviations from the conventionalized signs and turning the reading into a semiotic game of hide and seek between artist and public. As a bricolage made up of fragments of symbolisms, it is a form of pluralism that honors authorial intent.

As a contrast, we will end up in a different approach altogether, something more in line with *The ambivalent object*. In Jason Payne's explorations on the "Variations on the Disco Ball,"[7] the goal was to make an object lacking entrenched signifiers. By exploring the class of celestial bodies termed planetesimals and their relation to the more familiar shapes of planets, Payne touches on

yet another form of vagueness. When the concrete form strays from its Platonic double, it still lingers within the penumbra of the ideal. The project thus shows how it is possible to disrupt the familiar without falling into outright rejection. Most importantly, we take this identified relation, between the planetesimal and the sphere, to be considered as a *generative idea* open to further explorations.

THE PRECISELY INEXACT

The word hippo, an abbreviation of hippopotamus, in Greek (Íppos) translates as horse. In his early essay *Le Cheval Académique*[8] Georges Bataille provides a thought provoking contrast between the two creatures. The horse is portrayed as the noble animal of Greek antiquity and used as an expression of the pure *idea*, an emblem of the 'eidos' of Platonic philosophy or the architecture of the Acropolis. The hippopotamus, on the other hand, is related to the barbarian culture of the French Gauls. As hideous monsters whose absurdities are at odds with scientific arrogance, they are the nightmares that contradict the pure geometric lines.

Geometry and the methods of descriptive geometry have long been the prevailing languages of architecture—they are architecture's *academic horse*. Within a discipline where the exact translation of virtual instructions in the form of drawings or codes to their material actualization has historically played a decisive role, the current ubiquity of algorithmic design tools and fabrication technologies would seem to eliminate the possibility for exactitude to submit to some external deviating influence. Paradoxically, the seduction of algorithmic precision has become exhausted in the fulfilled promise of its own fidelity. This produces a renewed interest in the analogue, or in capturing qualities that lie outside the realm of computational control—qualities that appear to be incongruous to the processes and tools used to generate them. Here we find relevant, the odd coupling of precision and inexactitude. This construction possibly advances our understanding of the role of the analogue in regard to contemporary aesthetics, if we consider the distinction between *inexact forms* (things that appear as if they are non-reproducible) and *inexact processes* (processes that are in fact non-reproducible).

The shift from one medium to another, inherent to the practice of architecture, from the drawing to the model, or from drawing to building, involves varying degrees of specificity. The exclusion of certain kinds of information and the inclusion of other kinds of information within a given medium is driven by the conventions of architectural notation, where a degree of generalization is often required in the interest of enhancing legibility. As an alternate move, an incongruous state of *precise inexactitude* may be engendered through contamination, whereby a process of delineation reveals discrepancies germane to the act of drawing itself, or where the particularities of geometry become compromised in the translation from the digital to the analogue.

Mario Carpo has described the recent shift away from the logic of spline-based delineation and the smooth geometry invariably spawned by it, as a byproduct of technological change. The digital technologies we currently use to interface with our environment are increasingly based less on extrapolation and more on sampling. Carpo remarks that whereas, "Yesterday's spline-dominated environment was elegant and modern; today's data-driven design environment is messily postmodern: disconnected, broken, fragmentary, rickety, patchy, and aggregatory."[9] It is relevant to ask whether the contemporary interest in eluding the instant legibility of formal logics is primarily a technological or a cultural phenomenon.

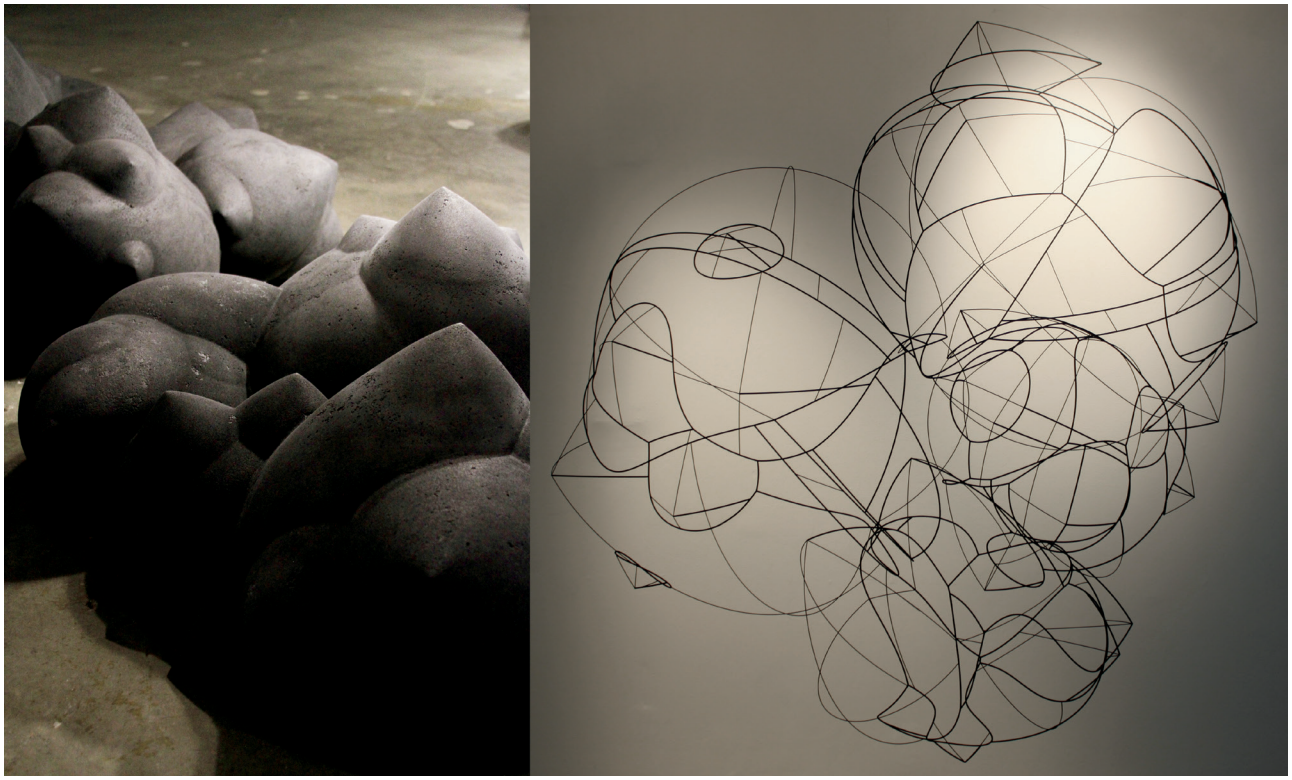

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Figure 1. *Aqueotrope*, left: cast three dimensional tiles; right: drawing of tiles

In what follows, we call upon Bataille's vision of the hippopotamus, as "insulting the correctness of the academic animal," a fat, and sweating beast in danger of melting.[10] As an evaporation of structure, melting or fusion is an entropic physical process and occurs during the phase transition of liquefaction. This potential threat, of falling into indifference, has further informed the projects under consideration as they have engaged with a combination of digital and analog techniques of design and fabrication.

GRAYENING

A reference point for our project *Aqueotrope* was *The Gray Book* by Aris Fioretos. The ambiguous nature of this work is due to its capacity to be understood as either literary criticism or fiction. The difficulty of placing the text within a specific literary genre is referred to in relation to the writing about gray literature and grayening. Gray literature is the term used to categorize informally published forms of text that are often ephemeral or appear in limited distribution. Fioretos elucidates grayening as follows:

> Grayening would be what makes time readable […] a crease first unfolding, then ceasing to be. Although such grayening may provide form for the formless, it seems itself thus to appear only by being attached to something else, like an escaping trail of effervescent dizziness, the elastic, colorless gauze swaddled around an invisible body of air. A vanishing turning point.[11]

The word grayening operates in a linguistic penumbra. It simultaneously encompasses the verb 'to grayen' or 'to become gray' and the participle 'turning gray.' Grayening creates a deferral of clarity. It is deliberately ambiguous. The equivocal status of words like grayening can be understood as a parallel to the ambiguous role of geometry in contemporary architectural work. A gray zone or penumbra

exists between computational and analogue work regarding the essential connection between geometry as a virtual description of something and objects that are derived from it.

The latter part of the concatenated project name "Aqueotrope" alludes to the possibilities of dual significances of expressions—how a word might both own a literal sense as well as invite a figurative understanding. Analogously, a single specified geometry may be instantiated as a series of objects, each being bestowed with different properties, thereby widening the interpretative space. By adding the notion of *equivocation*, we also implicate the act of deception or deliberate misguidance as a further resource, especially in the context of the translation between digital and analogue form.

In the Aqueotrope project, an archipelago of gray cement tiles situated on the gallery floor is illuminated by a series of orbicular, glass light fixtures. A drawing comprised of black lines delineating the geometry used in the project is inscribed on the adjacent wall. A cable sargassum confounds the simple diagram of a closed electrical circuit with the entropic tendencies of accumulation, excess and disorder, and in doing so, creates a third spatial layer—a drawing manifested in space, a canopy which is suspended above an unnatural gray landscape. Here form can be understood as the delineation of the geometry in the drawing or the cables as well as the form of the three-dimensional tiles and lamps.

The project Aqueotrope thus examines the role of geometry through the coexistence of several artifacts where the contours of objects were treated differently. The first instantiation of the geometry occurred in the space of a drawing, where line work was used to delineate only the extremities of the objects in question. The second instantiation of the geometry was through the formal features present in several objects made of concrete and glass.

This work questions the status of the eidetic image in relation to an object. It expatiates on the idea that geometry, here in the form of a drawing, is *underspecified* in relation to its material manifestations. Any act of transmutation—of moving from geometry to object—may thus be corrupted or eschewed. As the Gnostic tradition has it, this fall from the upper non-material realm and into the lower world of material things is marred with imperfections and flaws. This way, the work is intended to situate the uncertain status of the geometry (invisible and exact) in relation to a set of objects that are descending from it. All the objects are composed of the same geometry and are derived from the same set of drawings, but each one has a different physical instantiation. Furthermore, the drawing disowns the conventions of an architectural elevation, contour drawing or sectional cut, and thereby calls its own status in to question. The legibility of its essential characteristics (form, outline, volume) becomes either accentuated or subsumed in the offspring (lamps and tiles). Sometimes the gray occludes the legibility of this geometry, as does the glass when it exceeds the confines of the mold.

The exchange between the mathematical realm and the material realm is instantiated as a series of phase transitions between a specified geometric constellation and a selected set of materials. Rather than assuming this exchange to be inert in nature, Aqueotrope explores the influx of non-inert forms of matter into material assemblies. The constituents of Aqueotrope are designed to exploit the transformation between states of fluidity and solidity germane to casting. This fluxional behavior is accentuated by considering the space where this material transaction occurs, namely the mold, as a non-inert entity,

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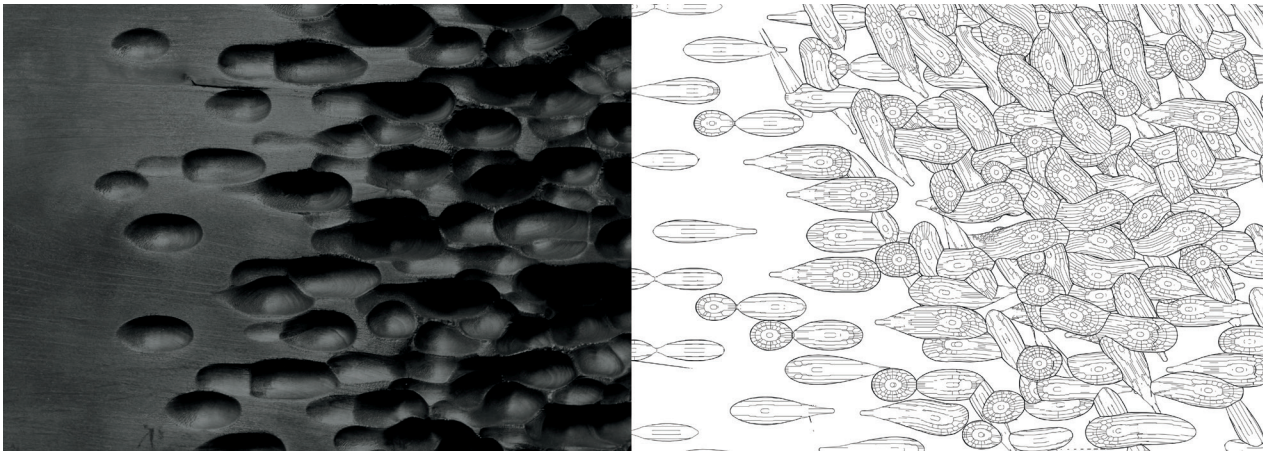

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enabling it to produce a multitude of differential outcomes through iterative reuse. A conscious calibration of the mold geometry enables it to collaborate with fluid transitions, rather than privileging the mold as entirely deterministic of the formal outcome. Culling out and selectively amplifying the inherent physical properties of the casting material in response to the qualities of the negative mold produces forms that deviate in a controlled manner from the original model. The project focuses on capturing qualities that would appear to be incongruous to the processes and tools used to generate them, pursuing the apparent vagaries of matter in flux albeit through the use of highly controlled algorithmic and machinic processes.

Figure 2. *Aqueotrope*, left: blown glass lamps; right: drawing of mold geometry

Figure 3. *Vector Interference II*, left: cnc milled and blackened wood; right: drawing of cnc toolpath

BLACKENING

In order to shift the discussion from grayening to blackening, we first return to the Gray Book and a quote where Fioretes alludes to the classic distinction between matter and form:

> It keeps us, that is, in the gray. If we wish to tell stories in this mode, we must stick to the contour, because security is found only there. Form precedes fact, as matter cannot be emptied of form, whereas the latter easily may manage without the former.[12]

In one of its earliest versions, this distinction was known as *hylomorphism*. This doctrine was first taught by Aristotle who advanced the view that concrete substance consists of form (morph) and matter (hyle).[13] Aristotle agreed with Plato that forms are closely tied to intelligibility, but denied their separate existence.[14] In the project *Vector Interference II*, this relation was again questioned and subjected to further experiments. Wood—which was the literal translation of hyle before Aristotle adapted the term for his own purposes—functioned as primary testing grounds. These grounds were then intersected by a series of methodological manipulations probing the production of form. Simple vector techniques were used for both the design, in terms of massing and subdivision to provide for architectural specificities, and for the logics of machinic processes for fabrication.

In the work a non-dimensional vector field, produced vector interference when gaining negative thickness through cnc machinic subtractive processes of fabrication. Later, when translating the exact mathematical code of the resulting excavated block of wood and its surface geometry, into an architectural vector drawing, the drawing seemed to consist of a series of interrupted or corrupted lines, gaining textural qualities and sensibilities related to the domain of comics. In this case, the representation stood as a result of fabrication.

The project aimed at embracing these corruptions and entropic instances that had an eroding effect on the figure of architecture. At full scale, the resulting cavities and niches of the vector interference provide a rough surface for a low maintenance biotic roofscape to adhere to. A composite approach to material and environmental architectural systems oscillates between the precisely figured and an erosion of the discrete identity.

The biotic inventory is dominated by drought-resistant mosses that thrive on the roof in the cavities of its surface texture. During construction, mosses are sorted into different color groups for the establishment in the various roof shells/bowls. Over time, due to recurring spontaneous spore spread, the different color groups will blend and give the roof a mottled color fusion of mosses, a living pattern constantly evolving in an uncontrollable manner. Different parts of the roof are given moisture-repellant, hydrophobic, and moisture-absorbing, hydrophilic, properties to produce a varied establishment of dry and wet biotic areas. Additionally, the roof surface is completely exposed in some areas, which provides tectonic qualities involving the interaction between biotic and abiotic expressions.

For the treatment of the abiotic areas, and in order to discuss its textural features, we draw on the notion of *blackening* and its cultural and perceptual connotations. Black appears as a recurrent popular inclination. A journalist recently admitted that as a teenager "The search for the darkest became the goal of my cultural consumption, until I heard the black metal band Darkthrone's 'A Blaze In The Northern Sky' and thought that nothing could be more shadow shrouded."[15]

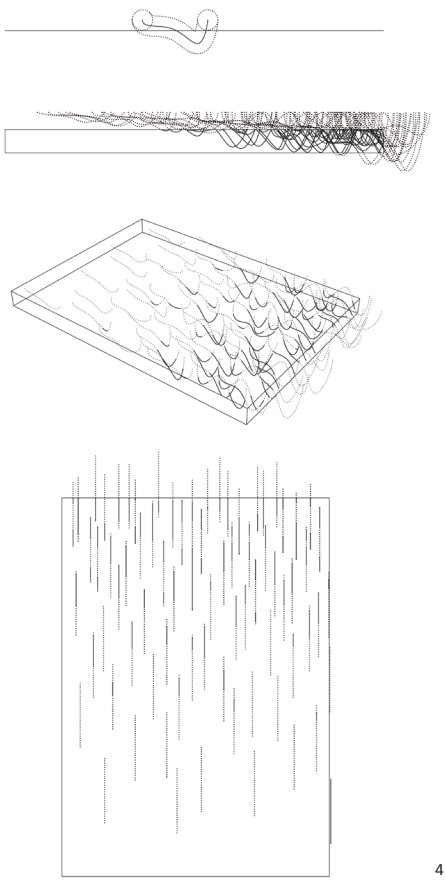

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Figure 4. *Vector Interference II*, diagrams of the vector toolpath

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But recently, when learning about the product vantablack, much to his surprise, he realized that he had never experienced anything truly black. Vantablack is a fabricated coating that has an extremely low index of refraction. The material is made out of carbon nanotubes, grown onto an aluminum substrate. As the diameter of the tubes is smaller than the wavelength of visible light, photons get trapped inside; the electronic energy is absorbed and transferred to the carbon atoms (i.e. as heat). Vantablack absorbs all but 0.035% of the incident light, which makes it near perfectly black.

The existence of vantablack suggests the possibility of creating objects that thwart our traditional conceptions belonging to the hylomorphic image. Matter does indeed become "emptied of form," at least as far as vision is concerned. Only at the "occluding edge,"[16] where the object covers whatever is to be seen behind, will it give away its contour. The concept of form starts to break apart and reveal something about how it has been concatenated by our different perceptual activities in the first place. Volume, as a property of the object, recedes from the optical world; it is now only open to perception through the exploratory mode of active touch.[17]

While traditional versions of black do not present the phenomenon as acutely, black still fends off geometric legibility. In the text "Doppelgänger," Jason Payne points out that "Unlike form in any other color, black resists even the most ardent attempt at objectification by the subject [...] or at least shrugs it off."[18]

In the project of Vector Interference II, the technique of charring (playing on the ambiguity of black) was used to treat the wood. Charring is essentially the chemical process of incomplete combustion wherein a solid is subjected to high heat. Charring removes oxygen and hydrogen from the solid and leaves a residue called char. This surface deposit, which primarily consists of carbon, is either black as charcoal or, sometimes, silver grey as ashes. The procedure has traditionally been used to protect wood from weathering, from fire, rot and pests, in that it has a preserving effect.

But the process and the blackened surface were found to have additional effects. The technique made façade segments and the roof geometry such as the ridges of intersecting volumes and cusps to become more faint in

Figure 5. *Vector Interference II*, left: wood model of roofscape; right: drawing of roofscape

appearance, or to withdraw. The inexact process of charring would operate differentially across the surface, burning off thinner structures while leaving thicker ones with the residue, thereby pushing some parts of the volume and geometry towards indifferentiation.

To sum up, the coexistence of different modes of making has affected the objects produced, as well as their inherent aesthetic qualities. Technological innovation has afforded the opportunity to intervene in fabrication processes in a way that eludes the monolithicity of a design process. We find that the mixing of analogue and digital design and fabrication processes allows for the production of artifacts that incorporate both anexact and inexact geometries and forms. The works have thus addressed the apparent irreconcilability of precise inexactitude, sharing a predilection to disturb identity and order, presenting a challenge to established borders, attitudes and rules, while operating in a refined manner within the very systems they have attempted to interrogate.

NEW ARCHITECTURAL WAYS TO KNOWLEDGE

To acknowledge that this research has been a joint collaboration, between architecture and a form of social science carried out in the sociological tradition of *ethnomethodology*, we wish to give a brief note on architecture at the boundary of the discipline. One of the founding tenets of the ethnomethodological project is to analyze and describe human activities in terms that preserve, without distortion, members' criteria for descriptive adequacy in relation to those activities.[19] As long as this principle is observed, the risk of short-changing the discipline specific (here architectural) sensibilities for scientism should be minimized. In this case, we have taken the collaboration one step further and created a form of hybrid discipline, where the textual descriptions of the research/design practices aim to "provide specifics of adequate analytic ethnography."[20]

Nevertheless, while we are concerned with the various explorations described in the projects above, we also take an interest in our own methodic practices that make up these very investigations. This involves a form of reflexive turn where the work practice itself becomes scrutinized—lifting the gaze from the immediacy of the material studies to potential generalizations and typifications. We seek to find, in material manifestations, events that point towards classes of generative outcomes. As qualities are identified and collected, they constitute the carriers of new architectural knowledge—veering us in the way of an emerging theory. Such theorizing then is a practical enterprise, albeit significantly operating in the medium of language. By specifying a linguistic register, it projects a conceptual space of possibilities. The continual curating of the register, through the selection and prioritizing of items, re-shapes the conceptual space which then aid in topic selection and future iterations of experiments. This, in our view, is *architecture in the penumbra*: where the gray zone of the semi shadow is simultaneously its *topic* (exploring the ambivalences of forms that defy the ideal and exact) and its *resource* (as the practice becomes staffed by a hybrid group of researchers).

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