After Seam Stress: Patterns of Performance

MATT BURGERMASTER
New Jersey Institute of Technology

Figure 1: Partial elevation detail and view of 'Pipe-cycle'

"Details have apparently vanished into a black hole." [1]
- Ben van Berkel + Caroline Bos (UN Studio), in "The Purpose of Details"

"…it appears to me that the age of tools has now given way to the age of systems..." [2]
- Ivan Illich, as quoted in *Rethinking Technology*

SEAM STRESS

Disciplines are shaped by their particular preoccupations, as well as by their anxieties. Operating amongst shifting conventions, practices, and technologies, such unease has, at times, been a productive catalyst for articulating what is at stake for disciplines, while at others, has obscured and constrained their potential agency in such matters as they emerge and evolve. The discipline of architecture claims detailing as an expertise uniquely its own, locating it at the center - a disciplinary 'inside' - of an otherwise broad field of affiliations and systems. No doubt a stressful endeavor. Despite such unequivocal propriety, architecture sustains a false, or at least outdated, anxiety concerning this preoccupation with the articulation (and authorship) of its own joints.

Symptomatic of this 'seam stress' is the unease provoked by re-occurring desires for a correct mode of expression for the architectural detail (in the work itself). The terms of such 'correctness' were canonized within the top-down, object-based

thinking of Modernist orthodoxy as integral to its (supposed) 'truths' of technologically-determined production and performance. The residual traces of this heroic legacy have lingered in various ways amidst the Post-modern construction/de-construction of cultural meaning, in tectonics' expressive revealing of material and construction logics, and in the smoothness of digitally-driven topological surfaces. Despite the latent significance of the detail within these historically influential modes of production, architecture's recent and not-so-recent past has seen only rare instances where detailing's agency in design practice has been directly taken up as the subject of reflective thought and critical assessment.

While the functional resolution of a building's constituent parts may have preferred technical solutions in professional practice, the disciplinary issues at stake in the detailing of these joints regularly extends beyond the necessary facts of construction and, consequently, it is common that there is not an a priori, one-to-one correlation between a detail's authoring, formal articulation, technical resolution, and performance within larger technological, environmental, and human systems. Despite (or perhaps because of) such non-causal relations, contemporary thinking on details is usually enacted and exchanged through professional "shoptalk"[3] and reference manuals that document detailing standards (for typologies, materials and methods, etc.) without much consideration of the interpretive frameworks and operative strategies for construction's performative effects. What is at stake in architecture's details for the discipline, however, is much more elusive and contested, and perhaps of greater consequence than just getting the job done well. As such, it might be said that architectural detailing is a practice without a discourse.

This predicament, however, has not always been the case. The detail was once considered essential – as the elegantly conceived and executed "*minimal unit in the process of signification in the architectural production of meanings*".[4] When Marco Frascari wrote these words in 1984, the architectural detail was being positioned at the center of disciplinary discourse. In this model, there could be no architecture without the detail. Sixteen years later, however, Rem Koolhaas suggested that while buildings may still need details, architecture perhaps does not. In the essay "Junkspace", he claims that

the detail is *"no longer a problem"* - in fact irrelevant - given the ubiquity of the ad-hoc construction techniques in which *"transitional moments are defined by stapling and taping"* to such a degree that *"details are no longer the orchestrated encounter of difference, but a stalemate, the abrupt end of a system"*.[5]   At stake in the space between the rhetorical polarities of these two positions is the detail's agency - or lack thereof - in constructing the difference and/or indifference within systems of material organization and representation, and by extension, in architecture itself.

This disciplinary predicament has left the practice of detailing wide open. Such a theoretical *"black hole"*[6] opened up between these opposing models - one emerging from the discipline's outside, the other from its inside - may been seen, in part, as an effect of the paradigm-shifting changes to the various technological, environmental, and human systems within which architecture was produced and encountered over the past 20 years. The shift from 20th century industrialized modes of material production to the production of information, the organization of its networks, and the distribution of its flows has characterized the trajectory of this recent past and has radically reconfigured what is at stake for contemporary architecture. A particular consequence of these trajectories for the contemporary detail is the provocation that the recent digital and ecological 'turns'[7] have, each in their own ways, re-assigned architecture's primacy away from the static tectonics of building construction to the dynamic flows of virtual information and ecological flux that pass through it.

Echoing the systems thinking of the 1960's and 70's that shifted Modernism's emphasis from technological tools to systems, and correspondingly, architectural objects to environments, contemporary possibilities associated with the digital and ecological are dissolving conventional (tectonic) correspondences between the bifurcated terms of up/down, inside/out, material/immaterial, and seam/seamless such that our understandings of each may not be as self-evident nor well-defined as they once were.

Of this shift, critic and historian Antoine Picon has suggested that: *"The advent of the digital represents an even greater challenge for design than what the early stages of mechanization had meant*

for modern architecture…For the first time perhaps, architecture has to confront itself with a deeply non tectonic reality."[8] This 'confrontation' was perhaps most radically articulated in the late 1990's by William Mitchell in his pivotal essay "Antitectonics" in which he emphatically and influentially argued that emerging digital technologies offered more than just a new 'toolbox', but that they should be the basis of a new architecture of immateriality, weightlessness, and seamlessness.   His indifference to the discipline's traditional referents of material, gravity, environment, and habitation was a direct assault on the recently published Studies in Tectonic Culture by Kenneth Frampton which, vis a vis a revisionist history of Modernism, asserted that architecture can, and should, be more than a technologically-determined spatial abstraction. Mitchell's essay re-located Frampton's project – and the detail as it had come to be known - on the 'losing' side of history as an anachronism. Still a disciplinary preoccupation today, choices continue to have to be made between their mutually exclusive claims - an architecture that reveals its material, constructive logics ("poetics of construction") versus one that disregards, or at least conceals, them ("poetics of virtuality"). [9]

Some contemporary models of design practice aim to synthesize such unsustainable dichotomies into more robust, performative practices. They sublimate the 'revealing' and 'concealing' capacities of detail articulation – and the technological engines that they are complicit with - within the same system. Reconfiguring questions of a correct correspondence between architecture's literal material substrate (as object) and its 'materiality' (as effect), such novel ecologies of construction loosen linear causality between a detail's effects, the means of its production, and the mandates of its representation.   By eschewing the indexical conundrums of both technological (functionalist) and representational (semiotic) thinking, this strategy posits that the amplification or extension and suppression or limitation of a detail's responsiveness within a given system is a matter of choice, not monolithic ideology. This phase-changing capacity of the detail is instead contingent, tactical, and responsive, operating along an expanded and inclusive gradient of multiplicities.   As disciplinary discourse continues to evolve from the 'reflective' figure of critical theory to a 'projective' model of performative practice, (the practice of) detailing -

and the seam stress that it is complicit with - might be re-scripted within this contemporary project as one of its 'responsive extensions'. (fig.1)

 "Quick, the first flakes are coming; the couriers of the coming snow storm. Open the skylight, and directly under it place the carefully prepared blackboard, on whose ebony surface the most minute form of frozen beauty may be welcome from cloudland. The mysteries of the upper air are about to reveal themselves, if our hands are deft and our eyes quick enough." [10]
- Wilson A. Bentley, "*The Story of the Snow Crystals*"

ICE CYCLE HOUSE: From Detail to System

The Ice Cycle House is a single-family residential prototype designed for a typical suburban lot in Buffalo, New York. The building's 1,200 S.F. footprint consists of two 12 x 50 prefabricated building modules that are 'ganged' and offset to increase its exterior surface area and capacity to act as an interface between interior and exterior environments. The project's building envelope demonstrates an alternative strategy for harvesting natural resources that re-distributes their latent phase-change properties (of snow-to-ice-to-water) as a catalyst of novel material behaviors and performative effects. These variable arrays operate as a 'thermotectonic' field that couples the architectural detail's traditional status as a localized, revealing of a material object's construction with its capacity to produce more expansive, immaterial effects.

Figure 2: Typical eave, gutter, and drain details

The envelope consists of two ubiquitous accessory building components - a domestic roof drain and roof vent (fig. 2) - which are constructed of off-the-shelf materials and processed via CNC-fabrication.
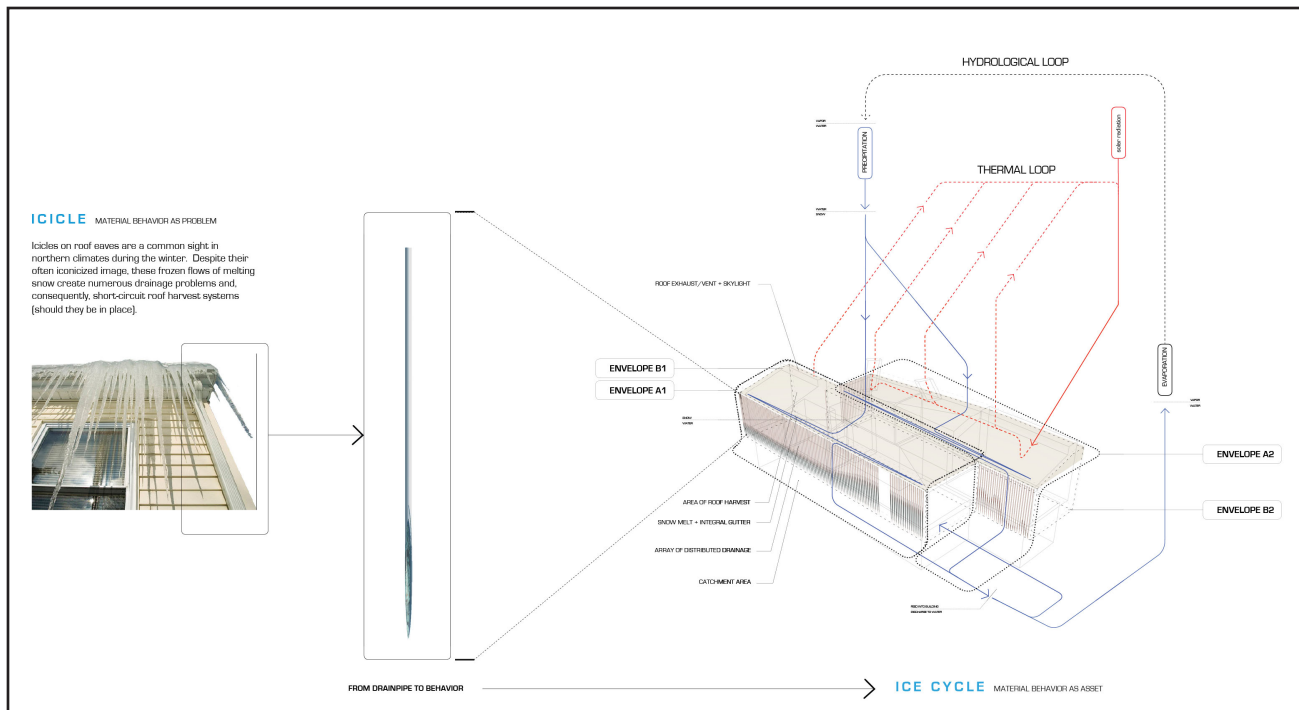
Figure 3: Diagram of Ice Cycle House's harvest, distribution, and phase-change systems

These ordinary details are re-imagined by distributing their functions within the hybrid components of its interdependent, adaptive envelope system. No longer treated as mono-functioning technical accessories, the performative capacity of drainage and ventilation are instead re-invented and designed to address a broad range of concerns associated with their operation in northern climates with high amounts of snowfall and Buffalo as a particular site of such engagement. Here, water and air flows are not only more efficiently managed, but their re-distribution vis a vis the extension of detail into system enables a more effective responsiveness of the whole building to larger material, energy, and human resources. (fig. 3)

> "*Previous theories of the building envelope have not been capable of directly relating the technical and physical properties of envelopes to their political, social and psychological effects…a more intricate design of the limit between private and public increases the contact surface between both realms, like a radiator adopting an intricate form to increase the surface of heat exchange with the air…*" [11]
> - Alejandro Zaera-Polo, "The Politics of the Envelope: A Political Critique of Materialism"

PATTERNS OF PERFORMANCE

The recent call for an expanded capacity of architecture's envelope made by Alejandro Zaera-Polo and others is one that aims to expand our definition of performance-based design beyond instrumentalizing models of technical efficiency. Such practices favor the distributed effectiveness of architecture's interconnected whole over the singular efficiencies of its discreet parts, which can be enabled by alternative detailing techniques that strategically amplify and direct their intended effects. The Ice Cycle House mobilizes its building envelope - and constituent details - as a key site of such co-determined responsiveness. As an 'intricate' space of exchange, its attenuated and thickened perimeter enables not only the increased technical performance now commonly expected of sustainable design, but alternative 'patterns' of architectural performance catalyzed by the environmental phase-change dynamics hosted within the envelope's surface.

The envelope consists of 2 assembly types. (fig. 4) The first is the 'Pipe-cycle' assembly which is an open-joined rain-screen system that arrays in-
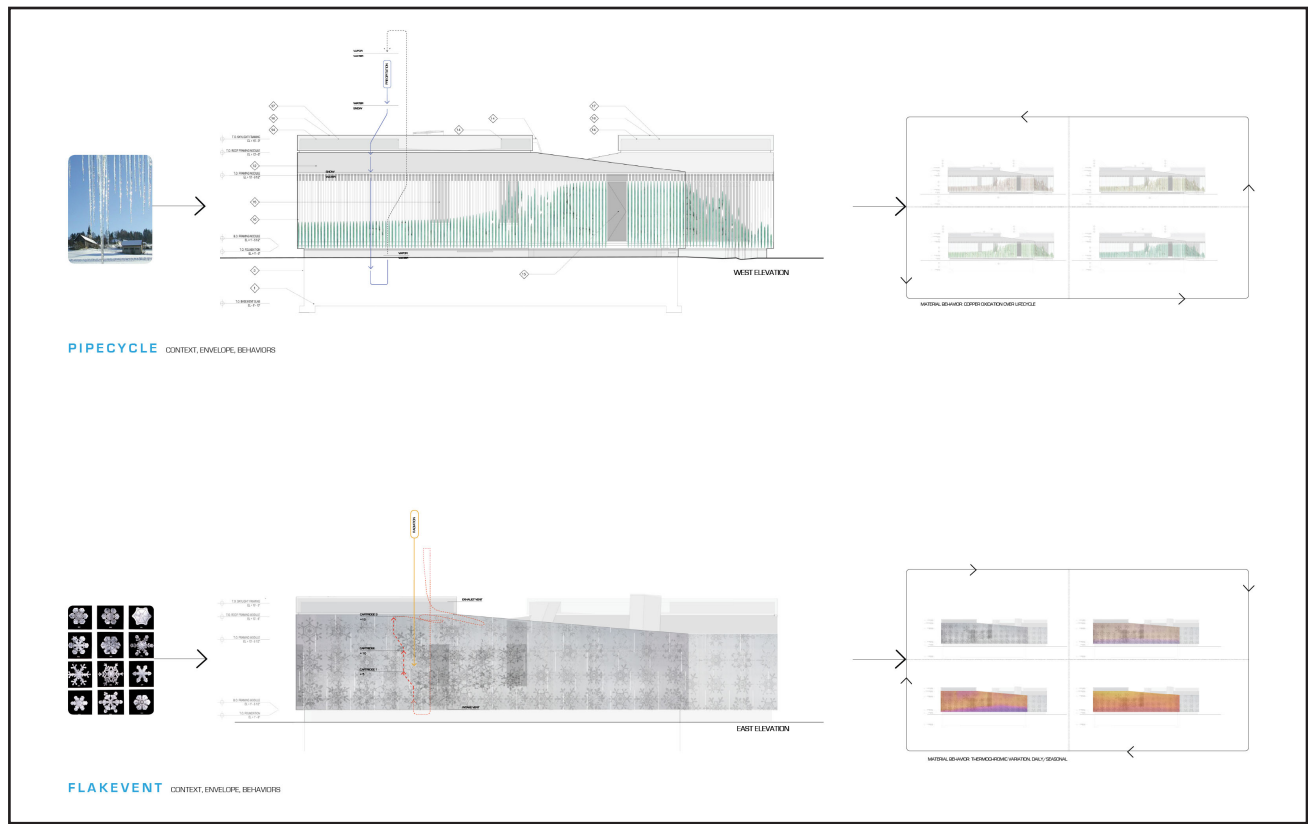
Figure 4: 'Pipe-cycle assembly + 'Flake-vent' assembly elevations: context, envelope, behaviors

dividual drain pipes along the low side of the building's pitched roofs. Instead of relying on traditional single-point drainage via a gutter and drainpipe, roof drainage is here distributed across the entire building envelope to more effectively harvest natural resources and their latent energy potentials. A variant of traditional rain-collection systems, it also retains snow mass as a thermal blanket, prevents icicle formation, and displays water flow - and its effects - 'inside-out' along the envelope's surface. This component-based strategy consists of off-the-shelf copper drain pipes whose shafts are strategically custom-cut to display the internal behavior of oxidizing copper (and to modulate light and views to/from the interior). Pipe distribution (their number, size, frequency) turns this revealing of matter and its energy into a pattern reminiscent of the icicle formations that the 'Pipe-cycle' assembly aims to eliminate.

Across this hydrological field, the architecture is always in a transitional state of phase-change. The detailing of each individual component is in response to localized differences within the whole systems such that, a single drainpipe alternatively acts like a drain *and* wall enclosure *and* window screen, while looking like a drainpipe *and* structural component *and* icicle.

The 'Flake-vent' assembly, while motivated by similarly performative desires, takes a different approach to the detailing of its constituent parts. Located on the high sides of the pitched roofs, it consists of an array of translucent acrylic wall panels whose overall surface effect is reflective, seamless, and graphic. (fig. 5) These floor-height cartridges harvest solar radiation, retain air as a thermal buffer, and selectively re-distribute it into the roof cavity and interior. Operable vents allow this assembly's internal air chambers alternatively act as a trombe wall and solar chimney. The cartridges' connection details are seamlessly concealed, while the vents are articulated as their surrogate joints. The wall surfaces are digitally etched with archival photomicrographs of the first known images taken of snow crystals[12] and treated with a
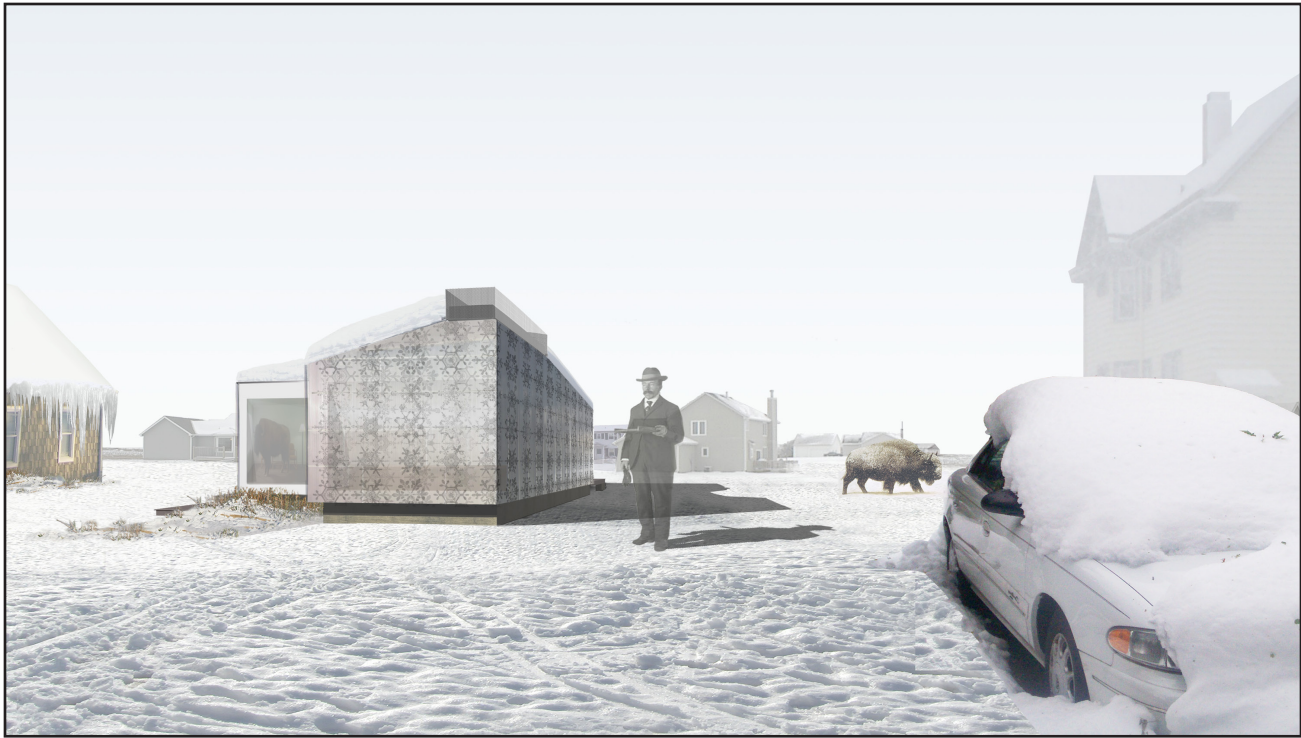
Figure 5: View of Ice Cycle House showing 'Flake-vent' envelope assembly

thermo-chromic plastic adhesive whose sensitivity to temperature variation produces a changing color gradient. Across this thermally-imaged field, the flake-shaped vents are cut and ventilation functions re-distributed.

Traditionally binary distinctions between function and decoration, assembly and surface, vent and joint, particular and generic - and the performative roles of each - are immersed within the phase-changing effects of their distributed details. With such dynamic 'distribution' and 'phasing', a detail's construction of varying degrees of difference and indifference within a given system is contingent, subject to material constraints, and as such, more responsive to them. In both the 'Pipe-cycle' and the 'Flake-vent' assemblies, distributed details catalyze the architecture's phase-changing performance a dynamic patterning of material and energy flows.

> *"Such an understanding of architecture requires us to raise the aspirations of high-performance build-ing, to adjust our method of design, and to broaden the criteria used to measure success."* [13]
> - David Leatherbarrow + Richard Wesley, "Frame-works of Performance and Delight"

THE PHASE-CHANGE DETAIL AND ITS DISTRIBUTIVE EFFICACY

A domestic roof drain and vent are rarely thought about by the general public unless they need to be repaired or replaced and are even more rarely taken as objects of design by the design professions. They are two of the many small parts of our poorly performing residential construction market whose 'fix' is usually cheap, disposable, and does not consider the broader, systemic reasons for the part's ineffectiveness in the first place.

Considering both of them as the object and subject of design, the Ice Cycle House proposes technical solutions that - while physically discrete as details - perform an expansive series of novel, distributive effects that engage these larger systems. It takes the failure of these ordinary details not only as an actual problem to be solved, but as symptomatic of contemporary architecture's often limited approach to performance-based design work.

With the phase-change detail, the Ice Cycle House's envelope demonstrates the possible robustness of the ordinary and the functional (and small) within performative design practices. While the legacy of

old notions of efficiency - the 'one-size-fits-all' and 'silver bullet' solutions of 20th century functionalism - continue to discipline certain contemporary models of architectural performance as a sign of their own technological production, this proposal - by linking detail to system - offers a more responsive interface between architecture and the larger technological, environmental, and human systems within which it is situated. As an alternative to such monolithic models of efficiency, this distributive approach aims to loosen - if not detach - the causality and exclusivity typical of such forms of optimization.

Within these novel ecologies of construction, the discipline's 'seam stress' over its details may no longer be belabored as a marginal, repressed problematic, but become integral to a productive (perhaps even enjoyable) disciplinary project that imagines alternative notions of instrumentality in the "age of systems".[14] To do this is to favor the distributed effectiveness of architecture's interconnected whole over the singular efficiencies of its discreet parts. In an effort to catalyze such change, a consideration of the complex, multivalent interactions of responsive architectural systems might begin - but should not end - with a consideration of its smallest nodes, in its details.

ENDNOTES:

1   Ben van Berkel and Caroline Bos (UN Studio), "Discussion," *Detail: The Purpose of Details* 8 (2000): 1437.
2   Van Illich, as quoted in, *Rethinking Technology: A Reader in Architectural Theory*, ed. William W. Braham and Jonathan A. Hale (London and New York: Routledge, 2007): XII.
3   Sylvia Lavin, "Practice Makes Perfect," in *Constructing a New Agenda: Architectural Theory 1993 – 2000*, ed. A. Krista Sykes (New York: Princeton Architectural Press, 2010), 452.
4   Marco Frascari, "The Tell-tale Detail," *Via 7* (1984): 22-37.
5   Rem Koolhaas, "Junkspace," *OMA@work.a+u*, *A+U (*2000): 18-19.
6   Van Berkel and Bos, Ibid.
7   The phrase digital 'turn' is from Mario Carpo in: Mario Carpo, "Revolutions: Some New Technologies in Search of an Author," *Log 15* (Winter 2009): 49.
8   Antoine Picon, "Digital/Minimal?," accessed September 11, 2010, http://architettura. supereva.com/extended/20060225/index.htm.
9   The terms "poetics of construction" and "poetics of virtuality" by Kenneth Frampton and "Antitectonics" by William Mitchell respectively, *Studies in Tectonic Culture* (Cambridge, Mass.: MIT Press, c. 1985).
10   Wilson A. Bentley, "The Story of the Snow Crystals," *Harper's Monthly Magazine* 104, (Dec.: 1901-May:1902).
11   Alejandro Zaera-Polo, "The Politics of the Envelope," *Volume 17: Content Management.* (2000): 79.
12   These images were taken by Wilson Bentley in 1885 and are housed in the Buffalo Museum of Science.
13   David Leatherbarrow and Richard Wesley, "Frameworks of Performance and Delight," *(Sustainability) + Pleasure, vol. 1: Culture and Architecture, Harvard Design Magazine 30* (Spring/Summer 2009): 95.
14   Ivan Illich, Ibid.