Noise Control: Designing with Entropic Processes

> In antiquity there was only silence. In the nineteenth century, with the invention of the machine, Noise was born. Today, Noise triumphs and reigns supreme over the sensibility of men.
>
> —Luigi Russolo

Daniel Norell
KTH Royal Institute of Technology

PRODUCTIVE NOISE

The thorny relation between entropy, information, and noise has remained a debated issue in complexity science and information theory.[1] Within the discipline and practice of architecture, on the other hand, these issues seem relatively straightforward at a quick glance. *Entropy*, for starters, has become important to architects simply because its effects are inevitable: Buildings are without exception subject to processes of decay. Moving on, one may understand *information* as the different forms of representations that architects use to convey design intent to a fabricator or contractor. *Noise*, finally, might in this context designate anything that *distorts* that initial intent, ranging from poor material specifications to the afterlife and eventual ruination of the building. If noise produced by entropic processes has conventionally been associated with failure and destruction, I will in this essay instead outline an approach where noise is embraced as a *productive* force. Can *noise*, to a certain extent, be *controlled* and used as an ally in design?

This prospect becomes especially alluring when approached in relation to current conversations around the role of matter in architecture.[2] Because of its keen relationship to digital design and fabrication, matter has often been associated with discourses on optimization. The calibrated pairing of the precision attainable in digital fabrication with the noise produced by entropic processes points in a different direction. Take texture and patina, for example. Minute variations in color and grain typically caused by a combination of natural variation, tool marks, and years of wear-and-tear have so far tended to elude digital design because they are not easily drawn or reduced to exact geometries. Further, entropic processes have a tendency to occur "on site" rather than "in the lab," making them ill-suited to conventional modes of research. Finally, the act of design happens in a time span that is much more limited than accumulation of dirt or the eroding of a material.

It is precisely the apparent mismatch between the level of *control* achievable in the digital domain and the *noise* produced by entropic processes that makes the effort of combining them worthwhile. In digital design and fabrication, software, machines, and materials are typically combined with the aim of eliminating modulation and maximizing the transparency between digital geometry and machined material. Noise, on the other hand, is commonly understood to be something unwanted or even random—just think of the "static" heard in a weak radio transmission or the "snow" on a television image.

But noise also goes beyond process. If used intentionally, its effects may generate new sensibilities by distorting our perception. A distorted voice, for instance, may just be a result of bad cell phone reception. But in a different context, the experience of the very same distorted voice might be eerie and give rise to much stranger associations. An architectural ruin works similarly in that its state of decay tends to make it very atmospheric. In his treatise on baroque architecture, art historian Heinrich Wölfflin famously remarked that architecture in general does not lend itself to being painted—it is not painterly (1992, 29–31). The monotonous façade of a classical temple, he argued, could only become picturesque if it is in ruins or, alternatively, if it can be retreated into the background of the painting by means of light, atmospheric effects, and landscape setting. In other words, by intentionally emulating the effects of background noise, baroque architecture could expand its register of experiences.

DIGITAL DETRITUS

Painterliness in baroque architecture, according to Wölfflin, was largely based on the experience of overlapping, plastic building masses that create a visual illusion of movement. The concept of noise in contemporary architecture is however not limited to the visual realm. On the contrary, noise, like texture, is decidedly visceral in its nature and has the capacity to entice all the senses. In fact, even when noise is indeed limited to variations in color on a flat plane, its textural effects tend to lend depth and materiality in a way that can be felt rather than merely seen. Noise, when produced or experienced, tends to transgress the limits of a certain media or sense. Most modeling software, for example, includes options for randomly adding noise to a surface geometry when rendering it. Known as displacement mapping, this feature essentially uses data in a two-dimensional image to distort three-dimensional geometry, to produce a textured surface.

Noise, as an ally in design and creative endeavor, is about producing new sensibilities by amplifying and partially controlling by-products that may arise in the interaction between materials, machines, environments, and human agents. Nowhere has this been more evident than in music. Jeffrey Kipnis has pointed out that the guitar solos of Jimmy Hendrix rely on the combination of virtuosity with improvisation and heavy feedback for artistic expression. Ambient music composer Kim Cascone, in an influential paper titled "The Aesthetics of Failure," outlines how the use of similar by-products of largely computer-generated music "allow artists to work beneath the previously impenetrable veil of digital media" (2002, 12). Variously referred to as *glitch* or *microscopic music*, this genre often uses what Cascone refers to as the *detritus* of digital technology as an active part of their repertoire of sounds (2002, 13). Distortion, aliasing, bugs, and

hardware noise are incorporated in ways that lend the tracks of acts like Pan Sonic an almost palpable texture.

It should be mentioned that, in my own experience as a listener, the noise in Glitch music tends to intensify sensations rather than making them more ambient. Instead of merely blending in with their surrounding environment, these sound textures often heighten the experience by pointing the listener's attention to the microstructure of the music. In addition, there is another, much less direct set of experiences at work in this type of music as well. The blending of abstract sounds with grittier noises like humming, throbbing, scraping, buzzing, and countless other barely identifiable ones evokes a slower set of associations to soundscapes that we may encounter in our daily lives.

The attention to microstructure in Glitch music seems to resonate well with the finicky level of detail attainable in typical digital fabrication. What the proponents of Glitch music have realized, however, is that this level of resolution can be produced by carefully *amplifying* noise rather than by eliminating it. Moreover, Glitch music refocuses the concept of noise from something detrimental that happens after the fact of design, to something that is a vital part of the act of design.

STRANGE ASSOCIATIONS

Glitch music is neither a very recent phenomenon, nor a genre that is known to make use of the latest advancements in technology. But it is relevant here as an example of how noise, when guided, can produce new sensibilities. Its focus on microstructure and textural effects resonates with a certain strain of contemporary architecture. Projects like Dustyrelief/B_mu, a museum in Bangkok, Thailand designed by Francois Roche/R&Sie(n) or Jason Payne's/Hirsuta's school house renovation project Raspberry Fields rely on the play between architectural mass and overtly fuzzy textures. Their envelopes produce an agitated materiality that is a result of a carefully designed encounter between architectural order and the noise produced by climate conditions in their immediate surroundings. In both projects, this meeting is facilitated by a combination of digital technology, weathering, and material interventions at micro scale.

Mohsen Mostafavi and David Leatherbarrow, in their seminal book *On Weathering*, asked: "Dirt and staining: Can they be anticipated? Certainly they are inevitable, but can they be projected, or envisaged as a likely future occurrence; still further, can they be incorporated into a design project?" (1993, 72). Considering the two examples at hand here, the answer clearly seems to be yes. While neither of them makes use of weathering in a traditional sense, they both clearly rely on the noise-inducing effect of unwieldy materials and climatic conditions as vitalizing rather than destructive forces. But perhaps more importantly, noise is in both of these projects understood as something that *defamiliarizes* and *makes strange*. In the case of the architectural ruin, an increasingly overgrown building is slowly *familiarized* with its context by retreating into its background. The result of that entropic process might however distort our perception of the building, turning it into a strange, eerie place in-between architectural order and unwieldy plant life. Payne and Roche both cunningly play this out in their designs and make use of noise as familiarizing process as well as defamiliarizing experience.

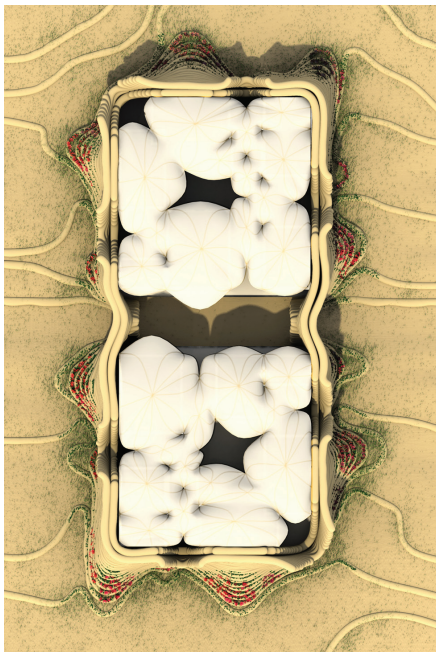

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Figure 1: Norell and Hökby, *Humus House,* 2010 Roof plan

The production of strange and ambiguous experiences is inextricably linked to noise as a design endeavor. Dustyrelief/B_mu and Raspberry Fields both make use of familiar or even traditional materials—wire mesh and cedar shingles—but alter their material specificity to distort their reading. Art historian and curator Simon Baker, in his recent essay "Watch Out for Life: The Conceptual Close-Up 1920–2006", theorizes how a certain lineage of twentieth century artists have exploited the visual power of close-up photography to produce defamiliarizing effects (2008). Artists whose work is included in the essay range from Man Ray to Mike Kelley. What brings this diverse group of artists together, according to Baker, is the fact that they all use photographic technology to manipulate our perception of, for example, everyday objects, human bodies, or organic matter. By playing with the close-up's ability to distort distance, proximity, and legibility, many of these artists manage to render familiar motifs unrecognizable. In essence, the experiences of these close-ups "depend not on enlargement per se, but on the alien effects of proximity to an alien landscape of dust and detritus" (Baker 2008, 94). The inherently noisy nature of matter is framed and amplified, not as an objective documentation of a natural condition, but as a means to produce distinctly new material sensibilities.

In my view, the strangeness of these close-ups rely on the combination of immediate sensory experiences of color and texture with a slower set of more ambiguous associations stirred by the vaguely familiar nature of objects viewed at short ranges. They recalibrate the relationship between minute detail and whole by oscillating between a strange world of microscopic matter, and cropped but still identifiable objects. This makes them neither purely indexical nor purely representational or picturesque.

These observations shed new light on architecture that successfully balances digital control with noise in general and on Payne's project Raspberry Fields in particular. Here, perception is distorted by the simultaneous presence of the picturesque pitch-roofed massing and indexical effects produced by excessively curled shingles. There is a balance between a stable, identifiable "object"—the iconic vernacular building—and the noise produced by intentionally letting entropic processes work on its surfaces. It is exactly the *combination* of these two aspects that produces the project's strangeness.

The simultaneous presence of matter and object in these two projects sets them apart from most parametrically generated architecture. First, they lack the typical gradient field of ubiquitous, precise joints and instead feature a messier surface that intentionally obscures much of its tectonics. Second, they both embrace rather than resist presentation and figuration..

What is at stake when designing with noise is however not just our perception of objects and synthetic as well as organic matter, but by extension our perception of nature itself. To recap, if the architectural ruin accepts nature as something given and inevitable, the examples I am presenting here instead understand nature as something mutable and unstable. They propose that entropic processes and the noise that they tend to generate can be incorporated as design drivers.

As a closer to this essay, I would like to offer two recent projects that I have co-authored. Though different in scope and kind, both projects draw from the discourse introduced here and point to specific ways of incorporating noise in architectural design.

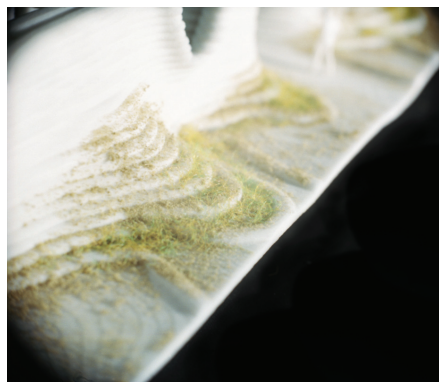

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Figure 2: Norell and Hökby, *Humus House,* 2010 Facade detail

HUMUS HOUSE (2010)

Humus House is a speculative housing prototype developed for two NGO organizations providing housing in St. Marc, Haiti. The project productively exploits two kinds of noise-inducing processes: The progressive accumulation of detritus and organic matter and the settling of a dynamic construction over time. Both processes produce a specific materiality that makes the project simultaneously unfamiliar and connected to its local context.

Deriving its name from *humus*, a highly fertile soil layer composed of organic matter, *Humus House* features housing units of approximately 1,000 sq. ft. Each pair of units is enveloped in a thick topological surface constructed on site from sand-filled earthbags made from geotextile.[3] As each layer of earthbags is laid down, it is kept in place by barbwire and friction alone, making it semi-rigid but not stiff. The wall will thus respond elastically to lateral movement caused by earthquakes, and, unlike bricks held together with mortar, it will not crumble. A by-product of this type of dynamic construction is that it is prone to movement. Sagging of the heavy tubes will inevitably occur both during construction as well as over time. *Humus House* is designed to turn potentially unwanted by-products like this into qualities. Its earthbag walls are intentionally laid down in a manner that creates an irregular relief pattern that will be emphasized further as the walls settle. These small undulations are intensified exponentially in the lowest layers of the walls, creating plentiful outcroppings and cavities that will collect and retain organic matter. Ultimately they will accumulate a layer of soil that can support growth of a variety of plant species. This will turn the exterior of the house into a green and lush oasis in an otherwise arid Haitian landscape exposed to deforestation and erosion.

An important part of the project is about extending and diffusing the material and temporal limit of the design and construction process and the building in relation to its environment. As the façade of the house meets the ground, the earthbags begin to snake out into the surrounding terrain. This creates terraces that will help retain soil and prevent erosion, while simultaneously grounding and articulating the building mass. While this move is certainly calibrated architecturally, the exact degrees of curvature and contour are a result of mediating precise design intent with the background noise of the local topography on a particular site. As the wall gently folds into the ground, its smooth curvatures will for a moment get progressively squigglier and less controlled.

ERRATIC (2012)

Erratic is an installation project that intentionally combines the level of control attainable in digital design and fabrication with unwieldy materials that behave *erratically* when constrained. With this research, we deliberately steered away from noise produced by organic matter. Instead, *Erratic*

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Figure 3: Norell/Rodhe, *Erratic,* 2012, Material study

Figure 4: Norell/Rodhe, *Erratic,* 2012, Material study

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ENDNOTES

1. For a brief summary of these issues and debates, see: Mark C. Taylor, "Noise in Formation," in *The Moment of Complexity: Emerging Network Culture* (Chicago: University of Chicago Press, 2002), 99-123.

2. For an overview of those conversations, see for instance: Gail Peter Borden and Michael Meredith, eds., *Matter: Material Processes in Architectural Production* (Oxon: Routledge, 2011).

3. The late architect Nader Khalili at the California Institute of Earth Art and Architecture first pioneered Earthbags, also known as Superadobe.

focuses solely on synthetic materials and their ability to produce noise. Its spheroid, floating massing and agitated surface echo an *erratic block*, once described by geologist Sir Archibald Geikie as "large masses of rock, often as big as a house, that have been transported by glacier-ice". Because they have been transported, these blocks differ from their surrounding context and are typically eccentric in appearance. Erratic blocks are frequently featured in popular culture as well as mythology all over the northern hemisphere.

The surface of *Erratic* will be constructed from foam rubber and heavy batting, point wise attached to a rigid, inner armature. Forcing a larger sack of this thick and semi-rigid material onto a smaller armature produces a deep relief of meandering, swirling furrows. The excess material gathered by this move makes the surface bend and furl in an unpredictable manner, as if its surface was experiencing sudden bursts of noise.

Measuring approximately ten feet in diameter, the initial design studies of the project were carried out by using material tests as well as fabric simulation in animation software, normally used to make the clothing of digitally animated characters move in realistic ways. In this way, our design could evolve by balancing computational control with frivolous material behavior, regardless of design medium.

Erratic is designed to have direct sensory appeal, but it simultaneously seeks to incorporate a wider set of less immediate experiences. Ranging from its massing to its materiality, it evokes a multitude of ambiguous associations that address our perception of nature. It may look as if it was shaped by natural forces, but is at the same time clearly designed and man-made. Its soft surface alludes to patterns of crevices normally found on rocks, but is also reminiscent of a turbulent fluid medium.

CONCLUSION

In conclusion, *Noise Control* offers a specific approach to design where noise is understood as a productive rather than destructive force. This approach is distinct from others in architecture, where the noise produced by entropic processes is simply accepted as inevitable, or from those that celebrate the purely picturesque nature of matter in a state of decay. *Noise Control* draws from an eclectic collection of sources ranging from contemporary discourses on matter and digital design, to disciplinary history and neighboring disciplines. It argues that the distortion produced by noise can be productively associated with the precision of digital design in order to produce specific material sensibilities. These sensibilities lean towards the strange, because of their peculiar pairing of immediate, sensory experiences of matter with a slower set of associations that rely on manipulation of vaguely familiar objects. ◆