Extreme Integration

Published in *AD: Exuberance (ed. by Marjan Coletti)*
March, 2010

In Terry Gilliam's 1985 film Brazil, there is an unforgettable scene where Robert De Niro, a guerrilla air-conditioning repairman, responds to an urgent call for help from a sweating man. He has intercepted a call directed to the totalitarian State parodied in the film, and drops in out of nowhere to assist. De Niro removes a standardized interior panel from a wall, and mechanical systems behind literally pour out onto the floor, in a shower of sparks and feeble pulsations. As he makes illegal repairs to the jumble of tubes and wires and ducts, he reveals his motivation: "I came into this game for the action, the excitement, going anywhere. I travel light, get in, get out, wherever there's trouble."

Brazil depicts a dystopian world in decline characterized by failing infrastructure and decadent culture. In its focus on dysfunctional infrastructure, this scene in particular speaks to architecture: it takes place at the threshold between the extended visible world and the intensive technological systems and forces that underlie it. These worlds are alternately at odds with or effects of one another: one is dysfunctional, the other merely keeps up appearances. De Niro's guerrilla operative is the unlikely agent of change.

Infrastructure and its relation to the superficial has long been a point of productive contention in architecture. This history has been marked by two radically different sensibilities, one concerned exclusively with the visible realm, stuffing structure and building services into the spaces between walls and behind ceilings, and the other a modern rationalist desire to express or represent technology for its own sake. It is a tired dance in which both partners, postmodernism and structural expressionism, have run their course but continue to appear on our skylines. With Architecture of the Well-tempered Environment (1969), Reyner Banham was one of the first to suggest that the history of building infrastructure in architecture is characterized by general neglect simultaneously manifested in the repression of environmental systems and an assumption of the primacy of structure in determining form. While problematic for its humanist underpinnings, his argument that re-tooling the relation of form, structure, and lowly mechanical services can be generative in terms of design is intriguing, and to a great extent, still unexplored territory.

Going one step further, I would like to suggest that assuming separation between the realms of building infrastructure and affect may be similarly unproductive. As interest in single-surface and topological projects wanes in contemporary digital design, there arises the possibility to think about surfaces not as abstract, endless, and of zero-thickness, but as spaces of variable thickness, embedded and laced with structural, HVAC, plumbing, and lighting systems. Once the sanctity of the surface as an independent agent exclusively responsible for affect is challenged, other logics and systems can begin to operate in a space that opens up between performance and sensation, infrastructure and ornament.

This is architecture of extreme integration, of nuanced transgressions of the extensive and intensive, of dipping in and out of poché space, pushing up against architectural surfaces, and reconstituting them in a more complex way. Poché becomes vivid, active space rather than blackened solids of classical architectural representation. The hung ceiling, one of the least examined poché spaces, must also be attended to in terms of its repressive function as well as its thinness. Moreover, a rethinking of the problem of standardized fixtures in ceilings and walls is long overdue, in the sense that the interface between systems and surfaces can be more productive.

Imagine instead the potentials of surface delaminations, embedded hollows, structural pleating, bundled micro-capillary systems, and deep relief, where the iconography of technology and infrastructure dissolves as they are woven into architectural form.

Jungle-style

I am not making an argument for a new techno-functionalism, nor am I endorsing the neobaroque; rather, I am projecting a middle ground where architectural species are robust enough to be both formally and technologically innovative. The lens I often use is biology, a field often incorrectly cited by neofunctionalists as a model for efficient architecture, in particular, so-called „green" architecture. The thing about the biological world that resonates and fascinates is its seemingly limitless ability to generate excess, that is, exotic features and behaviors that are untraceable to any particular function. Biology obfuscates as much as it expresses: although it is possible to make generalizations about particular biological features and their performance, it is impossible to untangle with certainty the complex combinations of morphological features and behaviors of individual creatures or ecosystems. The deeper you look at organisms, the more the messiness of biology is revealed, and the more it becomes clear that it is inadequate to compare biology, which is about imperfect points of departure, adaptation, opportunism, and emergence, with the field of engineering, which is very often lived as a reductive problem-solving routine.

It is doubtful, for example, that a jungle ecology could be „engineered." A jungle is too integrated. Jungles are always evolving based on local synergies between non-optimal conditions, material properties, and adaptive behaviors. Indeed, the mantra of „optimization" has become a mental block for engineers and their profession at large, because it assumes a single optimum condition rather than a multi-optimal ecology. A case in point is the oeuvre of Frei Otto, which has been instrumental in relating material distribution to form, but which is increasingly being used by others to promote "minima" at the expense of messier biological models.

Getting to the space of multi-optimums, indeed of massive parallelism, however, is not as simple as adding more optimized systems on top of one another; it requires difference of kind rather than degree. The key, as with biological species and ecologies, is the active feedback loop that produces mutations and local inefficiencies that only later are revealed for their advantages. If a beam becomes a luminous pleat that can also move air, it may not result in most efficient beam or duct or lighting system, but it will do work, and more importantly, it has the potential to produce nuanced jungle-style architectural effects. This is, to be clear, not an issue of engineering, but rather, of design.

Consider the Agamid lizard from Australia, whose skin exhibits several interwoven features – deep relief, micro-patterning, and color variegation. Not all of these features are legible in terms of their performative value. It turns out that the deep grooves in the skin conduct water from the lizard's back all the way into its mouth, so it never has to drink. However, this function is obfuscated by other salient features of less obvious purpose and their combined visual effect. Excesses and messy overlaps of form and function allow multiple types of work to be done, from structural to environmental to ornamental.

Airflow, Fluid Flow, and Glow

It's time to replace outmoded terms like „building services' and „mechanical systems" once and for all. Something servile will always be repressed, and repression will always impede experimentation in the realm of extreme integration. The notion of the „mechanical" brings us back to the industrial paradigm, rooted in a pre-networked world. And lighting design has become little more than a fixture-shopping experience. For now, maybe we can refer to these marginalized techno-systems in a more refreshing way as airflow, fluid flow, and glow.

Beyond the prosaics of plumbing, fluids are on the cusp of having a huge impact on building design for two reasons: first, water carries thermal energy much better than air; second, fluid system applications are blooming into illumination, bio-fuel generation, architectural hydroponics, grey water distillation, and so on. To frame this new sensibility, it is useful to think of fluids in terms of vascular systems, integrated networks characterized by bundling and weaving, micro-capillary systems, and also secondary emergent effects such as structural performance and heliotropism in plant stalks.

Aerodynamics, as well a fluid mechanics, is also open territory. Once you table the idea that air must be ducted into hermetically sealed spaces from a central source, you are free to consider the true complexity and possibilities of modulating laminar and turbulent flows, capitalizing on natural aerodynamic behaviors triggered by thermal differentials, creating micro-climates and buffer zones, and generally reconsidering environmental thresholds as design opportunities rather than problems to be solved.

And glow, used as a verb, removes illumination from association with standardized fixtures. Glow denotes emanation from within, from behind, from unseen and unexpected sources, and therefore can be associated with thresholds between surfaces and systems in nuanced, ambient ways. All of this is most interesting in terms of crossovers and becomings, the point at which beams become ducts, where airflow and fluid flow are laced together into vascular arrays, or when color features begin to co-evolve with structural features.

Surface-to-strand Geometries

Our office is currently exploring geometries that allow us to move beyond both duality of frame-and-skin characterized by discreet systems and the 1990s topological project characterized by homogeneous smoothness and lack of articulation of systems. What we refer to as „surface-to-strand geometry" allows for both surface and strand behavior as well as everything in between. One in-between geometry is a pleat, which is a becoming-strand of a surface. Surface-to-strand geometry is inherently useful in negotiating the realm of surface affect and infrastructural pathways. Its syntax enables radical shifts from beam to membrane, from bending to shell behavior, from capillary to bundled structure. Some of the specific types currently in play are surface-to-pleat, surface-to-armature, relief-to-aperture, bundle-to-bramble, vector-to-shell, beam-to-membrane ("beam-branes"), and double delaminations.To this end, we established a geometry dump that we call The Menagerie containing hundreds of surface-to-strand species. It is a well for projects. As some species are discarded, others take their place. Often, features of one species are combined with those of another and a third species with novel characteristics emerges. So the language evolves.

The design process in the office often begins with the design of a prototype, what we call a „chunk,“ rather than thinking about the whole. Chunks consist of a set of features with a particular range of behavior and a specific aesthetic sensibility. They are evaluated simultaneously for their quantitative and qualitative features; neither takes precedence all the time. These prototypes have no fixed scale and their agency is deliberately left vague to allow for flexibility and chance in their incorporation into a building project. Importantly, these prototypes are not „cells“ or agents that aggregate into scripted swarms, nor are they processed though a parametric gradient routine, or „blend-shaped“ into a visual whole. They are not parts to be repeated or varied in an array – a characteristic of false emergence; rather, they are fragments of a whole that does not yet exist and cannot be predicted.