Environmental Infrastructures: From Bubbles to Territories

In the past decade or so, architecture has renewed its fascination with the notion of environment as a physical, dynamic and atmospherically tangible space of design. Several trajectories within the field have driven this reprise. On one hand, the expanding discourse on sustainability has brought forth debates over technology-driven versus passive means of building control as

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alternate mechanisms for producing interior environments. On the other hand, the field of responsive design embraces architecture as a cybernetic environment of information and atmospheric feedback; a technologically driven instrument for sensing and responding to its human occupants. Responsive design has also reached for biological and ecological metaphors, embracing the idea of architecture as an organism that can physically respond to changing interior and exterior environmental conditions.

In the 1960s, Reyner Banham, Francois Dallegret, Cedric Price, Buckminster Fuller, among others, challenged architects to rely less on the traditional tropes of architectural form and envelope. Instead, they urged architects to adopt technology and cybernetics as tools to produce responsive environments. Renewed interest in the writings and work of this constellation of thinkers has also contributed to a series of contemporary architecture practices whose work is motivated by the design of environment.

In images produced at the time—Fuller and Sadao's dome over Manhattan, Banham's Environmental Bubble, or David Greene's Living Pod—there was a sense that inside is distinctly different from outside, regardless of the ephemerality of the envelope. Much of this work evolved in parallel to the environmental movement and the development of the Cold War. Many of the projects implicitly suggested a "defensible strategy" against an exterior environment potentially threatening or toxic, or at the very least "other". In representations, environment is always abstracted. Material realities of environment like rain, snow, smog, or dust were never represented.

More recently however, designers and critics such as Philippe Rahm, Francois Roche, and David Gissen have provocatively expanded the discussion on environment as design agent. They see environment as a much more tactile, tangible thing, and challenge the understanding of comfort as the necessary end goal of environmental control. Their work suggests that environments, embodied by insects, weeds, mold, or humidity, offer untapped design possibilities. This in turn produces perhaps new versions of the sublime, in which aesthetics, tactility and unease merge into an intellectual and sensorial experience. Here, species, ecologies and environments are not metaphors but literally integrated into buildings—such that a building becomes armature both for natural processes and for human inhabitation. The results are synthetic environments that embrace the natural and the technological, the stable and the dynamic.

DEFINING ENVIRONMENT

Given the range of interpretations of the admittedly broad term "environment," it proves fruitful to examine its multiple definitions. The Oxford English Dictionary contains some of the following:

> The action of circumnavigating, encompassing, or surrounding something; the state of being encompassed or surrounded.

> The physical surroundings or conditions in which a person or other organism lives, develops, etc., or in which a thing exists; the external conditions in general affecting the life, existence, or properties of an organism or object.

> The social, political, or cultural circumstances in which a person lives, esp. with respect to their effect on behaviour, attitudes, etc.;

> The overall physical, systematic, or logical structure within which (a part of) a computer or program can operate; the particular combination of operating system, software tools, interface, etc., through which a user operates or programs a system.

Embedded in each of these definitions is an idea that environment is a territory under the influence of a given force—be it political, technological or ecological. What, however, are the natures of these boundaries? Most architectural discussions on environment seem to imply architecture at the scale of the bubble—as envelope, however ephemeral, intended to separate the interior conditions from exterior surroundings.

Anticipating a full eradication of the architectural envelope in "The Environment-Bubble," Banham advocates that "to the man who has everything else, a standard-of-living package such as this could offer the ultimate goody: the power to impose his will on any environment to which the package could be delivered; to enjoy the spatial freedom of the nomadic campfire without the smell, smoke, ashes and mess." Environment here is a decidedly anthropocentric one. It is an area conceived for human comfort, controlled by technology, and neutralized to remove (as Banham suggests) the tangible and messy realities required to maintain a conditioned environment.

Banham's metaphor of the campfire, however, opens up the potential for environment to be demarcated as zones of attraction: magnets of comfort (or discomfort), whose boundaries fade or overlap with other micro-environments. Indeed, the true potential of producing synthetic environments may materialize when architects shift discussion from environments to ecologies, and as conditions of instability, unpredictability, and variability. Once one abandons the requirement for control and a predetermined level of comfort, human environments may well overlap with those of other species—whether plant or animal—for mutualistic purposes.

ENVIRONMENT AND SURROUNDING

In the 1930s, German biologist and philosopher Jakob von Uexkull outlined the relationship between individual species and their physical surrounding in his treatise *A Foray into the Worlds of Animals and Humans*. Uexkull articulates the difference between "surrounding" and "environment," or *Umwelt*. Surrounding, he argues, consists of everything that is *physically* present in the territory of a species. Environment, meanwhile, consists only of what is *useful or instrumental* to a particular species— or what Uexkull describes as species' "perceptual-life worlds." He argues that "an animal is not immersed in a given milieu but at best engages with certain features that are of significance to it, that counterpoint in some sense, with its own organs." The environment of the organism is precisely as complex as the organs of that organism. Uexkull suggests that each species has an environmental "bubble," albeit one bounded not by a physical limit but an operational one, defined by the constituent elements required for survival. These bubbles are interconnected and woven into a web.

FROM ENVELOPE TO WEBS

Indeed, once one understands environments as webs of overlapping territories of varying performance and complexity, rather than isolated bubbles, the role of architecture in the production of environment is challenged. In this scenario, architecture must work as a platform—an infrastructure or armature—which should be conceptually (if not literally) porous. It must be able to allow movement of air, water, moisture, gases, heat, materials and species.

Schonewald-Cox and Bayless write that scientists "classify boundaries as having exogenous or endogenous origins, arising, respectively, from processes outside or inside the system" or boundaries or territories being studied. In other words, the species and ecologies within the territory may transform it as well as conditions outside like wind, water currents, or species migration. These forces can maintain, augment or weaken the boundaries over time. In her essay "Shifting Sites," Kristina Hill describes the change in scientists' understanding of ecology as a non-system "in which nature is driven by multi-directional change." Only in the past few decades have scientists understood natural ecologies as deeply intertwined with human presence and forces. Simultaneously, metaphors of ecology are evolving from boundary- and organism-based to a systems-based

understanding, in which organisms and species are described through maps of energy flow or exchanges. There is increasing understanding of the role of temporal transformations, suggesting that ecology is an unstable or changing set of dynamics.

FROM ENVIRONMENT TO ECOLOGIES

So what do these changing understandings of ecology mean for architectures interested in environment? Discourse on the production of environment in architecture in the 1960s focused implicitly on an environmentally stable condition. Dynamic environments were ones charged with information (think Price's Price Fun Palace). As discussions of ecology have entered into architecture, it may be fruitful to embrace environment as a less technologically deterministic understanding of envelope and environment and to shift the discourse from bubble to territory, from environment to ecology, in which architecture becomes the site for dynamic environmental exchanges that accept instability and unpredictability.

Such overlapping, dynamic environments might pose provocative challenges to design. It suggests buildings might need to be conceived in such a way as to evolve, transform, and weather. Landscapes are designed to evolve through processes of succession and evolution. Architecture has no such equivalent. Mostafavi and Leatherbarrow argue, in their book "On Weathering", for a return to buildings that could accommodate changes to envelope. However, the discussion remains at the level of buildings' surface condition, and hence an aesthetic and performance question. What transformations would architecture—as an infrastructure for environment and ecology—be required to undertake if it were to have the capacity to sustain multiple species (human, plant or animal)? Some practices—Weathers, Ecosystemas Urbanas, Francois Roche, Duncan Lewis, or Ants of the Prairie to name a few—have begun testing the potentials of an architecture that is environmentally opportunistic, and mutualistic with other infrastructures and ecologies.

Architecture can no longer define its parameters and responsiveness at the scale of the bubble. Rather, it must operate at the scale of a broader territory, a space expanded and thickened with competing climatic, geological and ecological forces. These new environments will mutate and thus be unpredictable. However it offers the opportunity for architecture to be *agent* rather than *producer* of environment, to shift its focus from interiority to exteriority—and, in so doing, to engage an expanded environmental context. ◆