Animal Interfaces for a Post-Human Territory

Ariane Lourie Harrison
Yale University

Architecture today recognizes that its once-familiar disciplinary terrain now bristles with new hybrids. Smart materials, sentient systems, and responsive envelopes are but a few of the networks assembling humans and non-humans, animals and technology in what has been described in varied but intersecting disciplines: by geographer Sarah Whatmore as "hybrid geographies," by urban ecologist Mathew Gandy as "cyborg urbanization," by cultural anthropologist Bruno Latour as a "parliament of things," and by feminist theorist Donna Haraway as "species-companionship."[1]

The working through of such hybridizations, in disciplines ranging from cultural studies to bio-digital sciences to animal geography, has spawned many different theoretical positions that largely reflect a *post-human* understanding of the relations between organisms and the environment. "In the post-human," writes the former chemist/literary theorist N. Katherine Hayles, "there are no essential differences or absolute demarcations between bodily existence and computer simulation, cybernetic mechanisms and biological organism, robot teleology and human goals."[2] The animal folds into a networked environment and is already connected to humans by technology, as Haraway points out, as lab, food, and military animals. Network theory, into which I would argue that the post-human lodges, offers terms and criteria by which to describe for architecture new collectives in which animals become actors, have agency, and even possess subjectivity. This essay suggests that such terms are needed to counter dominant architectural representations of the non-human as biomorphic, animate, or organic formal inspirations, or even as non-entities—if one considers the widespread usage of material and lighting strategies in buildings that are damaging to non-human species. More importantly, networked logics suggest that the question "For how many species do you design?" should no longer shock but rather inspire design.

Building on the positions established by Hayles and Latour, this essay charts some of the promising territory for human-animal relations that the

post-human discourse offers for contemporary architecture, from its integration of actor–network theory to its articulation of new forms of trans-species urbanism. Such thinking has been materialized in architecture, as I suggest here, and in other publications, in the melded performative, programmatic, and formal assemblages by The Living, Studio Gang, and SCAPE.[3] We find in their works evidence for an ecological approach forged from working among many disciplines: architects are absorbing methods from new schools of human and animal geography, political ecology, and science and technology studies, among other new fields of study. If the current geological period, the Anthropocene, marks humans (*anthropos*) as the most powerful environmental force on the planet—chiefly through technology—then we should understand how architecture can extend a technological network of care across the environment, and in this sense, how architecture can function as a companion species to the many hybrid structures jostling for recognition.

ANIMAL NETWORKS

> Once we understand that "the human" and "the animal" are relics of a philosophical humanism that flattens the actual complexity and multidimensionality of what are, in fact, many different ways of being in the world that are shared in myriad particular ways across species lines, then the question of the animal—and of the animality of the human—cannot help but open onto fundamental issues that are best thought not as problems of distinct and discreet ontological substances, but rather in terms of processes, dynamics and relations—what Donna Haraway (When Species Meet, 2007) winningly calls "contact zones" between human and non-human life forms and the environments, technologies, prostheses, and practices in which they are embedded as beings both acting and acted upon.[4]

Cultural theorist Cary Wolfe locates the problematics of human–animal relationships within the framework of post-humanist thought, describing its networked approach "in terms of processes, dynamics and relations." Potential "contact zones" between human and non-human—whether articulated in philosophical terms as the deconstruction of humanist hierarchies (Derrida) or the reconciliation of companion species (Haraway)—may be more accessible to architects when considered in the frameworks of network theory.

Associated with sociologists of science Bruno Latour and Michel Callon, among other cultural theorists including N. Katherine Hayles, John Law and Manuel De Landa, Actor–Network Theory (ANT) attributes to humans and non-humans equally an agency as actors. Actor and network are at each level mutually constitutive: an actor cannot act without a network, and a network consists of both human and non-human actors. Any entity (human, non-human, scientific, architectural) can be conceptualized as both an actor and a network. ANT in this way questions the circumscribed attribution of specific capacities to specific things, proposing that such capacities may in fact be distributed widely among networks of humans and non-humans. As Latour demonstrates in *Assembling the Social: An Introduction to Actor–Network Theory* (2005), the relation among actors in a network determines

a provisional form, which is nevertheless contained in a larger matrix of relations and distributed agency:

> It is the thing itself that has been allowed to be deployed as multiple and thus allowed to be grasped through different viewpoints, before being possibly unified in some later stage depending on the abilities of the collective to unify them.[5]

By this approach, it becomes more difficult to refer to an entity as a discrete object and more productive to find precise ways to describe the relations between entities. It is also important to note that ANT relationality challenges the (somewhat architectural) notion of hierarchically ordered or nested scales, linking the body to the cosmos in a chain of being. Instead, the scale of interaction is produced by the actor. ANT in this sense invokes the foundations of ecological thought—ecosystems as flexible networks that foster the adaptive organization of resources—to such a totalizing degree that ANT critic Timothy Morton suggests that to "see that everything is interconnected … *is* the ecological thought."[6] The problem for Newton, among other object-oriented philosophers, is to avoid the holistic view of "Nature" and instead propose a mode of thought that addresses the particularity of relationships forged between specific objects: symbioses among many living entities that speak to, in Haraway's terms, a species companionship. The unique quality of objects, and their particular symbiotic relationships, in the consideration of Graham Harman and Morton, risks dissipating in the indifferent sprawl of the network; instead they propose a "mesh" of relations that preserves the intimacy between unique objects.

This ecological vision of networks has occupied the margins of architecture since the early twentieth century from Patrick Geddes's *Cities in Evolution* (1915) or Ian McHarg's *Design with Nature* (1970); today it returns in the current coupling of the ecological motif with computation. Environmental and behavioral parameters frame a rigid concept of organicist form, championed most ardently perhaps by Patrick Schumacher.[7] An environmental parameter in Schumacher's *Parameticist Manifesto* scripts a formal manifestation: this direct causality recalls what Harman describes as "strong connectivity." He suggests that less deterministic connectivities characterize ecological thought as "a process of becoming fully aware of how human beings are connected with other beings—animal, vegetable, or mineral."[8] Weaker or loose connectivities figure in what architectural critic Helene Furjan proposes as "a concept of performativity [is] rigorously tied to material dynamics, environmental parameters, urban and social organizations (as infrastructural parameters rather than socio-political representations) and ambient conditions."[9]

These varied approaches to the network become especially productive for architectural critique in challenging the tendency to interpret architecture as a by-product of disciplinary objectives or social forces. In her recent book, *Mapping Controversies in Architecture*, architectural theorist Albena Yaneva unveils the tangled networks that animate the project for the London Olympics 2012 Stadium, the Sydney Opera House and the Cardiff Opera House; she notes:

> our accounts 'deploy' architectural objects as networks instead of either merely describing them ethnographically or unveiling the hidden meanings behind them. Action is not merely related to a particular agent or explained by enduring historical structures and urban systems. To 'deploy' means to meticulously account for the performances of the entire collectives of humans and non-humans.[10]

In her analysis, these works of architecture emerge as simultaneously powerful and constrained actors entangled in environmental, social, and political skirmishes. Yet an understanding of the controversy (defined as "the best way to describe the many issues with which administrators, architects, urban researchers and citizens have to deal with on an everyday basis" rather than a problem to be solved or suppressed)[11] unfolds the manner in which architecture creates space for new collectives, which presumably accommodate multiple species-interests. Architecture may seem embedded in networks of common instruments, vocabularies, and representations; yet mapping these shifting scales (often as computer simulations) reveals a geographically and socio-culturally constructed space—what David Gissen suggests has taken the negotiated quality of "territory."[12] The relations between actors constantly construct the territory, an idea set forth in French philosopher Jean Baudrilllard's "The Animals: Territory and Metamorphoses"; he insists on territory's relational quality: "The territory is the site of a completed cycle of parentage and exchanges—without a subject, but without exception: animal and vegetal cycle, cycle of goods and wealth, cycle of parentage and the species, cycle of women and ritual—there is no subject and everything is exchanged."[13]

If the status of the animal within an evolving concept of networks has found some representation in the aforementioned network theories, then it is also important to track how the rapidly changing disciplines of human and animal geography, animal sociology, and trans-species urbanism offer tools for describing this territorial assemblage in which animals figure. Despite the checkered fortunes of animal representation in geography—from the bloom of interest in the 1910s to its virtual extinction in the 1970s—the animal has returned as a surprising focal point within *human* geography:

> This new turn has been inspired by the encounter between human geography and a range of new conceptual notions derived from political economy, social theory, cultural studies, feminism, post-colonial critique, psychoanalysis, and anthropology … This "new" cultural animal geography reflects upon situations where people and animals coexist in particular sites and territories, and ponders the social interactions between the people and certain non-human groupings in the vicinity. [14]

Urban geographers Jennifer Wolch and Chris Wilbert describe a field permeated by theories and methodologies from cultural criticism, a field in which the relations between human and non-human reflect overlapping (if not conflicting) political interests. The active (and activist) discourse emerging from this field questions the conventional geometry of humans inside the city, non-humans on the margins. Instead we find that human

geography's mapping of nests, flocks, and migrations points to a far more dynamic usage of urban space.

According to human geographers Steve Hinchcliffe and Sarah Whatmore, controversy should be expected: "It follows that there can be debates and struggles over which realities to enact and that these struggles will involve assemblages of human and nonhumans. Politics, in this sense, becomes a more-than-human affair."[15] The recognition of animal agency requests from architects an interdisciplinary openness to mapping and constructing zones in which humans and animals share space. Perhaps even more pressing than new diagrams of interaction is the design and implementation of new interfaces through which these collectives can be delineated.

Architecture participates in this nuanced view of urban actors: emerging firms have designed experiments that register fish presence, water quality and pigeon patterns, contributing to the shift in the politics of urban knowledge. Once the province of experts, environmental data can be produced and interpreted by diverse participants, from experts to amateur naturalists, "citizen scientists," or as the work of the Living, Natalie Jeremijenko and Lateral Office demonstrate, architects and designers.

ARCHITECTURAL HYBRIDS

Three recent works establish dialogues with multiple species, and in doing so, these propose new collectives in urban sites that range from industrial to postindustrial and cultural. The following discussion of works by The Living, Studio Gang, and SCAPE offers a spectrum of interfaces between humans and non-humans, using sensor-based technologies, sensitive materials, and novel programmatic intersections.

UNDERWATER INTERFACE

Amphibious Architecture is, as its name suggests, a water-based installation that rallies participation in a critical understanding of urban ecology at a larger scale than a building. Developed by Natalie Jeremijenko (xDesign Environmental Health Clinic) and David Benjamin and Soo-in Yang (The Living) for the Architectural League's 2009 exhibition, "Toward the Sentient City," the installation introduced floating networks of chemical and motion sensors, each connected to an SMS interface, into New York's East River. The Living assembled sensors, hacked solar cells, and reconfigured consumer electronics to create a monitor for aquatic conditions. The partially-submerged tubular assemblages relayed information in real-time to colored LED lights registering different layers of water data. The SMS interface engaged participants in an information network about the river and encouraged one to "text-message the fish,"[16] a step toward "establishing a two-way interface between environments of land and water."[17]

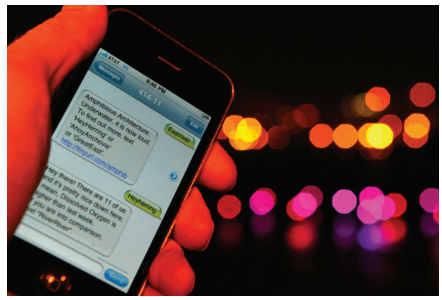
Jeremijenko expands the concept of the public for Amphibious Architecture: "Fundamentally the interaction was intended for a local audience human, piscine, avian and one or two beavers and turtles": human and nonhumans comprise its "local" publics.[18] The installation's website offered a tutorial on procedures for SMSing the fish. While such communication is entirely

mediated by human technology and produced by the installation designers, the idea of SMSing fish is a performative act aligned the project's challenge to anthropocentrism.

"Everything is an experiment; everyone is an experimenter,"[19] Jeremijenko shares The Living's do-it-yourself sensibility, yet her 2006 Glow Fish Interface, a series of buoys in the Hudson River that lit up in response to fish movement, offers some background for Amphibious Architecture's performative biases. Glow Fish incorporated a provocative script that melded the effects of the pharmaceutical industry with environmental concerns. In Glow Fish, the illuminated buoy prompted its audience to sprinkle chelating agents into the river, a symbolic act of detoxification of New York City's waters—the specific toxins cited in the provocative scenario are psychotropic drug residues flushed from city plumbing by millions of anxious or depressed urban dwellers.[20] The scientific veracity of the experiment is less important than Glow Fish's capacity to incite imaginative extrapolations regarding the long-term ecological effects of collective urban habits and behaviors. The performative approach of Glow Fish maps onto terms we find in post-human discourse: situated contexts, embodied information, polysensory engagement with human and nonhuman actors.

> What I see and in many senses try to instantiate in particular examples is the capacity to change the structure of participation: who is producing the data, who is interpreting that data, and who can do something with that data. So in a participatory democracy that means restructuring participation from the production of scientific or authoritative data and knowledge to this structured participation.[21]

"Structured participation," also known as "citizen science," promotes public engagement in the collection of environmental data. Both xDesign and The Living embrace the approach, reiterating that the gathering and interpretation of environmental data in a feedback system can be productively situated in a public sphere. The activist stance of this work updates the sensory feedback systems developed in postwar cybernetic experiments yet includes a significantly more diverse range of actors, both human and nonhuman, within the urban environment.



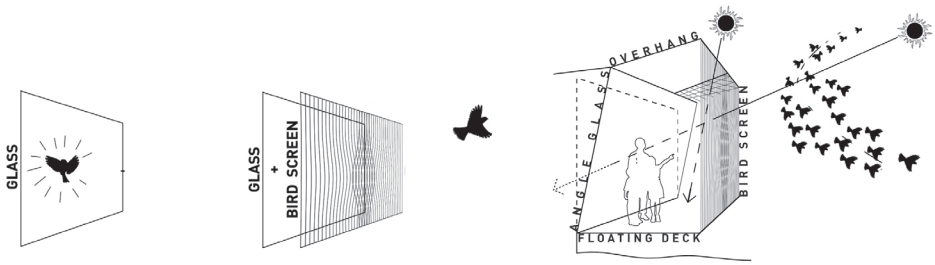
01

Figure 1: Amphibious Architecture, SMS interface © The Living.

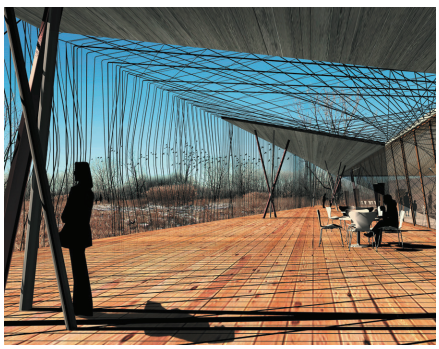
AVIAN MATERIALS

Studio Gang Architects, in their project for the Ford Calumet Environmental Center (FCEC) also engages environmentally oriented programming to posit new human–animal relationships. Yet in the architecture of the FCEC, the articulation of species-companionship relies more heavily on materials rather than on formal geometries.

The FCEC occupies a defunct industrial site south of Chicago's Loop: the Hegewisch Marsh is flanked by existing manufacturing companies, as well as decaying steel mills, rusting cooling equipment, parking lots, and mounds of black slag. The marsh bears many of the attributes of what the landscape architect Gilles Clément identifies in his *Manifeste du Tiers Paysage* (*Manifesto on the Third Landscape*) as a type of *third landscape*, an abandoned space—often post-industrial—whose neglected status provides



02



03

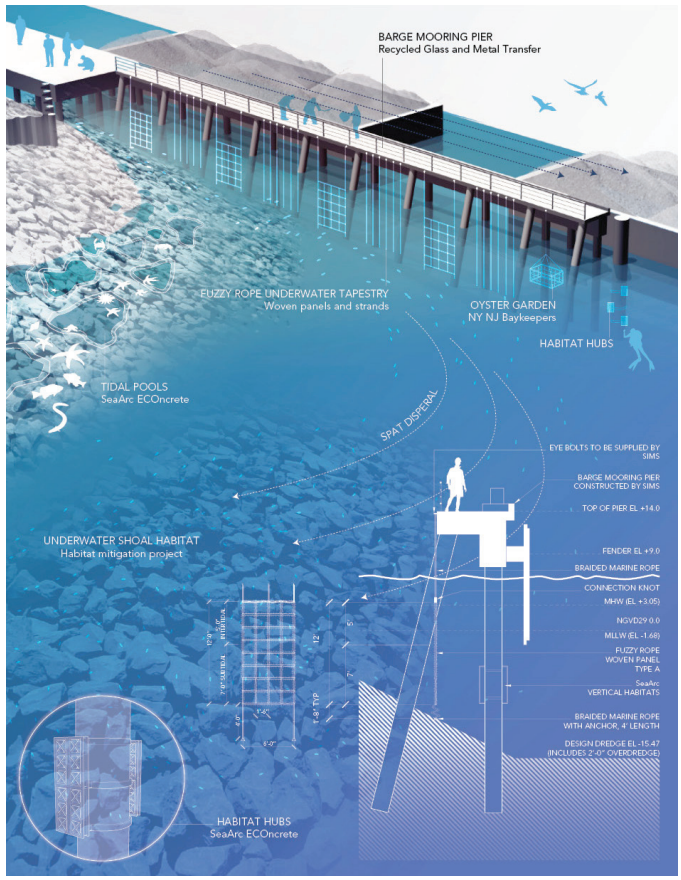
important harbors for wildlife.[22] The site also occupies a strategic position along the Mississippi Flyway, a migratory bird route; its marshland patches and mix of defunct and working factories nevertheless provide the habitat for twenty-six rare and endangered bird species.

Studio Gang uses the bird's nest to interweave several themes. As an image, the bird's nest memorializes the large numbers of bird deaths resulting from birds colliding with glass buildings.[23] As a process, the bird's nest is an exemplar of how to fashion a seasonally durable shelter from materials scavenged from the nearby area. Studio Gang emphasizes the didactic value of "making architecture from nearby scrap, [which] seems both elementary and urgent in a world that is overflowing with waste,"[24] an approach to material that seeks to make visible the intertwined histories of this post-industrial site and migratory bird preserve. Doing so requires that the architect understand how birds sense their environments: more sensitive to UV light, birds are easily confused by transparency and reflection, often mistaking a glazed surface for an open space beyond. Signaling to birds the presence of an obstruction to flight, the FCEC is wrapped in a finely woven "bird-visible" screen that does not impair visitors' ability to observe the wildlife. The FCEC is among the projects that encourage the profession and its regulatory organizations to evolve. The bird-screen factors into a new LEED pilot credit for bird collision deterrence, as LEED followed the bird-safe building regulations passed in Chicago in 2009 and in San Francisco in 2011. Yet in addition to bird sensitivity, the mesh of salvaged local steel hews to principles of sustainability while displaying the individuated welding marks of its industrial origins in the Calumet region.

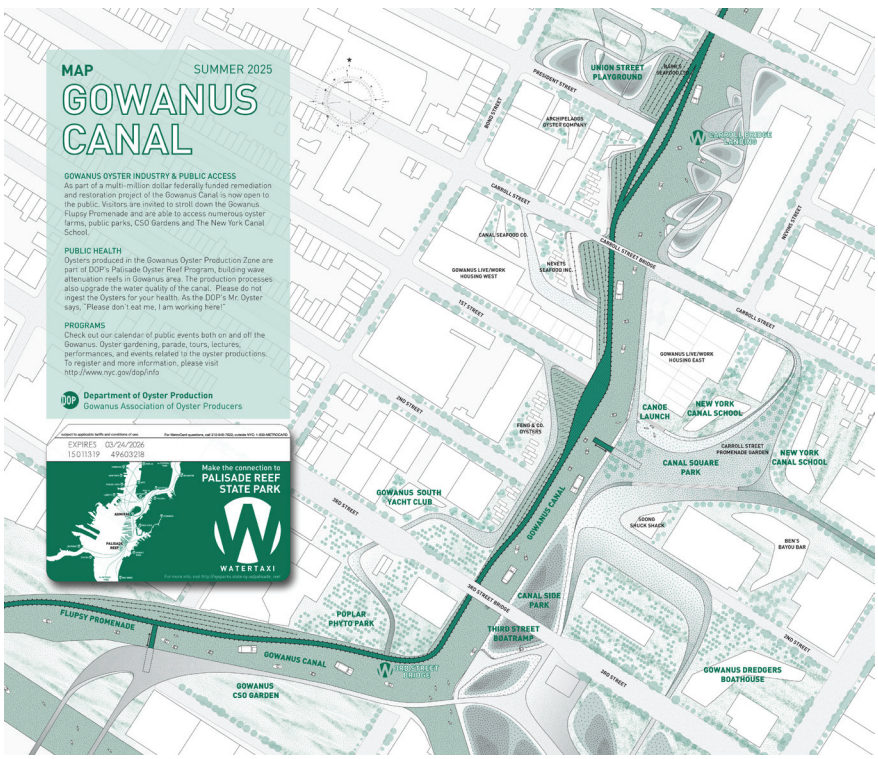
The screening thus materializes the metaphor of human responsibility for the post-industrial environment: to humans, it is a preserve of the historical industrial culture of the site as well as a frame for viewing the marsh wildlife; to birds, it is a deterrent for collision. The performative dimension of the salvaged steel may well register in its ability to communicate the intertwined usages of the post-industrial wetland/wildlife preserve. Yet despite its ecological elegance, the FCEC is no stranger to urban politics—from a competition won in 2004 to its preparation for groundbreaking in 2011, the FCEC garnered much attention but was subsequently delayed by city budget discussions. Today the FCEC is currently being positioned as a future anchor of the Millennium Reserve Initiative, a new 140,000-acre open space reserve system that will connect green spaces throughout northeast Illinois, with the Calumet region at its core.[25]

Figure 2: Diagram of collision deterrent screen © Studio Gang.

Figure 3: Rendering of south porch with screen © Studio Gang.



04



05

Figure 4: SIMS pilot project, 2012
© SCAPE/ Landscape Architecture.

Figure 5: Map of the Gowanus Canal.

MOLLUSK CULTURE

A third and final project, SCAPE's Oyster-tecture and its evolution into a pilot project for SIMS Municipal Recycling, designs a human–animal network in an active industrial site at the Brooklyn Marine Terminal. Developed as part of MoMA's 2010 *Rising Currents* exhibition, Oyster-tecture proposed an oyster hatchery and ecological park at the Gowanus interior that over time would generate a wave-attenuating reef out in the Gowanus Bay. Describing the project as a process for generating new cultural and environmental narratives, SCAPE's founder, Kate Orff makes the somewhat perverse proposition that the extremely polluted waters of the Gowanus Bay have the makings of a productive oyster hatchery (once the ongoing Superfund cleanup of the heavy metals and toxins is complete). Oysters filter excess nutrients, such as nitrogen and phosphorous, which are also present in the canal and harbor waters because of the region's combined sewer outfalls. This is an ongoing infrastructural problem that introduces wastewater into the harbor with every storm water surge. SCAPE integrates water as an overlooked component of urban cultural life: "there is a latent, forgotten connection to the water that could be rebuilt as part of urban culture."[26]

Orff describes a new "reef culture" centering coastal activities from Gowanus Canal to Governors Island around an aquatic network that functions both as ecological sanctuary and public recreation space. Reef-development becomes community development. SCAPE's re-establishing oysters on the urban waterfront places Oyster-tecture in dialogue with Wolch's model of trans-species urbanization, recognizing "that both people and animals are embedded in social relations and networks with others (both human and non-human) upon which their social welfare depends."[27] This vision led to the project's current iteration for SIMS' industrial waterfront, a site for processing metal, glass, and plastic collected by the New York City Department of Sanitation.[28] Working in tandem with SIMS' expansion of a plastics processing plant, SCAPE is redesigning a 100-foot portion of the pier designated for SIMS's barge mooring and its adjacent bulkhead, retrofitting the existing pier infrastructure with ECOncrete, a concrete matrix hospitable to species recruitment. The object of SCAPE's materials research is to create "habitat hubs" for marine ecosystems without interfering with working industrial piers; in addition to ECOncrete, recycled fuzzy-rope (frayed polyethylene rope) can provide habitats for mussels, barnacles, and sponges, while accommodating SIMS' industrial requirements.[29]

Fuzzy-rope attachments, from wrapped wharf piles to hanging networks will provide habitats for mussels, algae, and barnacles. Humans, too, are added to this mix in SCAPE's vision of a "public fuzzy rope knitting project," among educational programs planned for the site.[10] Another important actor in this network is SIMS itself: the existing usage patterns of an active industrial waterfront site are integrated into the program for this "ecological" project. Treating SIMS as a part of the ecology, SCAPE develops strategies by which SIMS's industrial activity can contribute to the site's remediation, for example using the company's recycled glass as the

NOTES

1. Bruno Latour, "From Realpolitik to Dingpolitik—An Introduction to Making Things Public," *Making Things Public: Atmospheres of Democracy*, curated by Bruno Latour and Peter Weibel (Cambridge: MIT Press, 2005). Donna Haraway, *The Companion Species Manifesto: Dogs, People, and Significant Otherness* (Chicago: Prickly Paradigm Press, 2003) See also Latour's review of Haraway's book, *Simians, Cyborgs, and Women: The Reinvention of Nature*, in *American Anthropologist* 94 (1992): 501-2. Latour further proposes a critical dialogue with Haraway's work in "Critical Distance or Critical Proximity ? A dialogue in Honor of Donna Haraway," (2005) Unpublished paper referenced on his website http://www.bruno-latour.fr/article.
2. N. Katherine Hayles, *How We became Posthuman: Virtual Bodies in Cybernetics, Literature and Informatics* (Chicago: University of Chicago Press, 1999), 3.
3. *Architectural Theories of the Environment: Posthuman Territory*, ed. Ariane Lourie Harrison (New York: Routledge, 2013).
4. Cary Wolfe, "Moving forward, kicking back: The animal turn," *postmedieval: A journal of medieval cultural studies* (2011): 1–12, 2.
5. Bruno Latour, *Assembling the Social: An Introduction to Actor-Network-Theory* (Oxford: Oxford University Press, 2005), 116.
6. Timothy Morton, *The Ecological Thought* (Cambridge, MA: Harvard University Press, 2010).
7. Patrick Schumacher, "Parametricism as Style—Parametricist Manifesto," Presented and discussed at the Dark Side Club1, 11th Architecture Biennale, Venice 2008. http://www.patrikschumacher.com/Texts/Parametricism%20as%20Style.htm, Accessed 9/2/2012.
8. Newton, 7.
9. Helene Furjan, "Eco-logics," *Softspace: from Representation of Form to a Simulation of Space, ed. Sean Lally and Jessica Young* (New York: Routledge, 2007), 124.
10. Albena Yaneva, *Mapping Controversies in Architecture* (Surrey: Ashgate, 2012), 5.
11. Yaneva, 49.

substrate for intertidal pools. This small pilot project thus harbors large environmental implications: ecosystem revitalization need not be confined to post-industrial sites, and instead extends biological remediation to an active industrial site, suggesting the pragmatic and productive entanglement of industrial and ecological uses.

ANIMAL INTERFACES

In the works of The Living, Studio Gang, and SCAPE, site becomes more of a territorial assemblage, folding human and animal into its interactive programs. The Living deploys sensors and SMS technologies to both register non-human presences and to broker a form of multi-species communication; Studio Gang wields local materials to reveal avian sensitivities; and SCAPE, in the ongoing pilot at Brooklyn Marine Terminal, integrates mollusks as a living remediative material within an active industrial site. The architectural examples discussed here expand architecture's conception of subject beyond the human by incorporating non-human actors. Each calls upon a performative materiality and each locates built, prototyped, or soon-to-be built works within a multi-scale territory responsive to the site's environmental politics. The full measure of the species-companionship that architecture can offer remains to be seen, but these built or soon-to-be-built examples may be an indicator that the construction of a post-human territory is underway. ◆

12. David Gissen, "Introduction," *AD Territory: Beyond Environment* (June 2010): 8-13.
13. Jean Baudrillard, "The Animals: Territory and Metamorphoses," in *Simulcra and Simulation*, trans. Sheila F. Glaser (Ann Arbor: University of Michigan Press, 1994), 139.
14. Jennifer Wolch and Chris Wilbert, "Through the Geographical Looking Glass: Space, Place, and Society-Animal Relations," *Society and Animals*, vol. 6 no 2 (1998): 107.
15. Steve Hinchliffe and Sarah Whatmore, "Living Cities: Towards a Politics of Conviviality," *Science as Culture*, Vol. 15, No. 2, (June 2006): 124.
16. The network contained a grid of twenty-five tubular components with a submerged "sensory" assemblage (sonar for presence of fish; chemical sensors for dissolved oxygen, nitrates, and pH; accelerometer for hydrodynamic forces) and a buoyant signaling device (photovoltaic/battery pack; stack of lighting disks) to convert sensory data into information (lighting pattern on the buoys; text messages). See Nathalie Jeremijenko and David Benjamin and Soo-in Yang, "Case Study: Amphibious Architecture," *The Sentient City* (Cambridge, MA: MIT Press, 2010) and Jordan Gieger, "The Living: surface tensions," *AD Territory* (2010): 60-65.
17. The Living, www.thelivingnewyork.com/amphibiousarchitecture.htm and www.amphibiousarchitecture.net (Accessed 3/1/2012).
18. Natalie Jeremijenko and Benjamin Bratton, "Suspicious Images, Latent Interfaces," *Situated Technologies Pamphlets* 3 (New York: The Architectural League of New York, 2008): 21.
19. Natalie Jeremijenko, www.nyu.edu/projects/xdesign/ooz/ (Accessed 3/12/2012).
20. Kevin Berger, "The Artist as Mad Scientist," *The Best Technology Writing*, ed. Steven Levy, (Ann Arbor, MI: University of Michigan Press, 2007),
21. Jeremijenko, "Suspicious Images, Latent Interfaces," 20.
22. Gilles Clément, *Manifeste du Tiers Paysage* (Paris: Editions Sujet/Objet, 2004).
23. Bird collisions with glass cause the death of between .5 and 5 percent of the bird population per year in the United States. Daniel Klem, "Sheet Glass: invisible and lethal hazard for birds: making our homes and workplaces safe for birds," in Jeanne Gang, *Reveal: Studio Gang Architects* (New York: Princeton Architectural Press, 2011), 50.
24. Gang, 35.
25. Information courtesy of Studio Gang (email 3/21/2012).
26. Kate Orff, "Q&A," in *Rising Currents: Projects for New York's Waterfront* (New York: Museum of Modern Art, 2011), 98.
27. Jennifer Wolch, "Zoöpolis," in *Animal Geographies*, Ed. Jennifer Wolch and Jody Emel (London: Verso Press, 1998).
28. Kate Orff, "Interview," *Harvard Design Magazine* 33, (Fall/Winter 2010–11): 22
29. Pilot project information courtesy of SCAPE (3/8/2012).