

Climates: Architecture and the Planetary Imaginary

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Dehydrated Architecture

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Water is as “natural” a part of our climatic milieu as sunlight or oxygen, and yet within the fields of architecture and urbanism it is often viewed with either fear or fascination. Across the past century, an interesting dichotomy has been consolidated, introducing a clear spatial order. While water’s value as an economic asset and major transformer of environmental conditions has led political, social, and cultural agents to mobilize it in anthropic management projects, constructing extensive hydrophilic landscapes that extract the maximum flow possible from ecosystems, simultaneously, building technology seems to have directed its efforts toward achieving a fully hydrophobic architecture—the creation of dry spaces.

Water vapor (the gaseous phase of the water cycle) is one of the most relevant factors affecting environments at all scales. Steam is the most prevalent greenhouse gas, making up between 1 percent and 4 percent of the atmosphere (as compared to carbon dioxide’s 0.038 percent). Recent developments in atmospheric representation, notably satellite imaging, have vividly demonstrated links between massive deforestation and climatic consequences in developing countries such as loss of rainfall and rising temperatures.¹ At a smaller scale, fluid dynamics modeling has contributed to discussions about real-time relationships between water and urbanization.² Finally, the construction of infrastructures, buildings, and landscapes all point to the ways in which water is *cultural* as much as technical; any given project evinces a particular attitude toward the human body and its privileged position as a sensor of environmental quality.

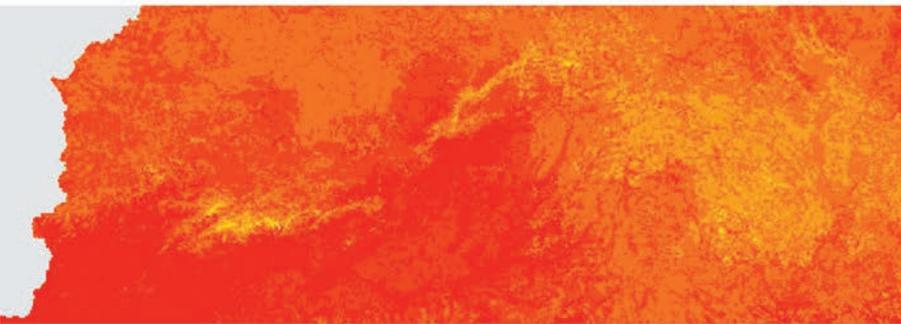
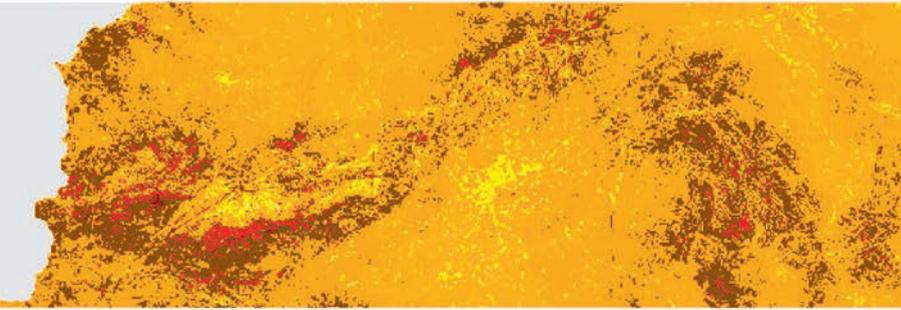
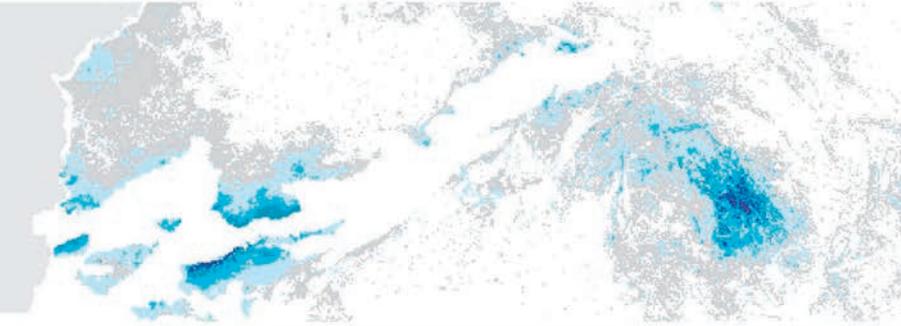
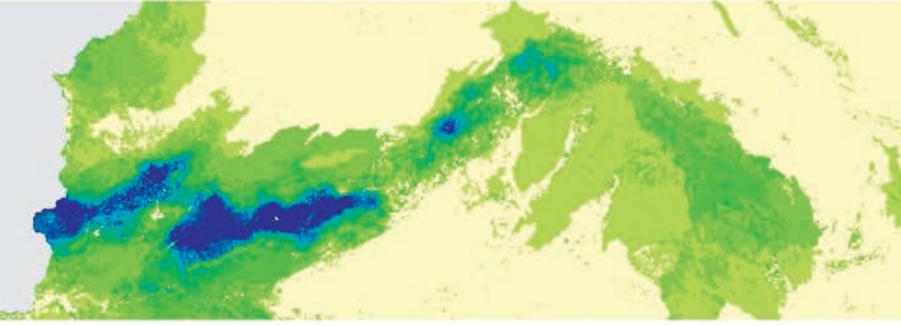
Take, for example, the construction of modern hydrologic geographies in arid climates, such as those created in the nineteenth and twentieth centuries as part of the urbanization of landscapes like the American West or southern Europe. Such projects materialize their specific modernity through an understanding of geography as hydrologic engineering. The control of water—or, moreover, the elimination of dryness—becomes seen as a form of social transformation. This is not simply a matter of irrigation but also imagination. This cultural desire for the presence of water appears in countless literary works or paintings, documenting a clear association in the collective consciousness between aridity and misery,

2

See, for instance, the interactive groundwater map developed in Portland, Oregon, to coordinate actions above and below ground toward improving infiltration as a flood control strategy, http://or.water.usgs.gov/projs_dir/puz/puz.html. The Arid Lands Institute’s digital map of the L.A. region incorporates the behavior of soils, land uses, and the distribution of underground contamination to organize different hydrologic urban zones whose conditions recommend certain interventions, <http://blogs.kcrw.com/dna/hadley-and-peter-arnold-envision-hydrological-zoning-as-a-way-out>.

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Michal Kravčík, et al., “Water for the Recovery of the Climate—A New Water Paradigm,” trans. David McLean and Jonathan Gresty (Žilina, Slovakia: Krupa Print, 2007). Available at www.waterparadigm.org/download/Water_for_the_Recovery_of_the_Climate_A_New_Water_Paradigm.pdf.



Annual average real and potential evapotranspiration in the Tajo River Watershed, Spain. Courtesy of SIA, Integrated Water Information System.

while the abundance of water takes on a utopian aspect.³ This remaking of dry landscapes is a collective enterprise of gigantic proportions, one that concludes with the complete transformation of a previously arid ecosystem into a modern, efficient, productive hydrologic geography.⁴

The production of such landscapes involves deforestation and earth moving, compacting and leveling topographies to transform porous, absorptive ecosystems into smooth and impervious surfaces, thus extracting as much

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See the work of the so-called Generación del '98, a group of Spanish writers including Antonio Machado, whose *Campos de Castilla* was published in 1912, or "la Escuela de Vallecas," a group of artists centered around Benjamin Palencia in the 1930s whose work deals obsessively with aridity as pictorial argument.

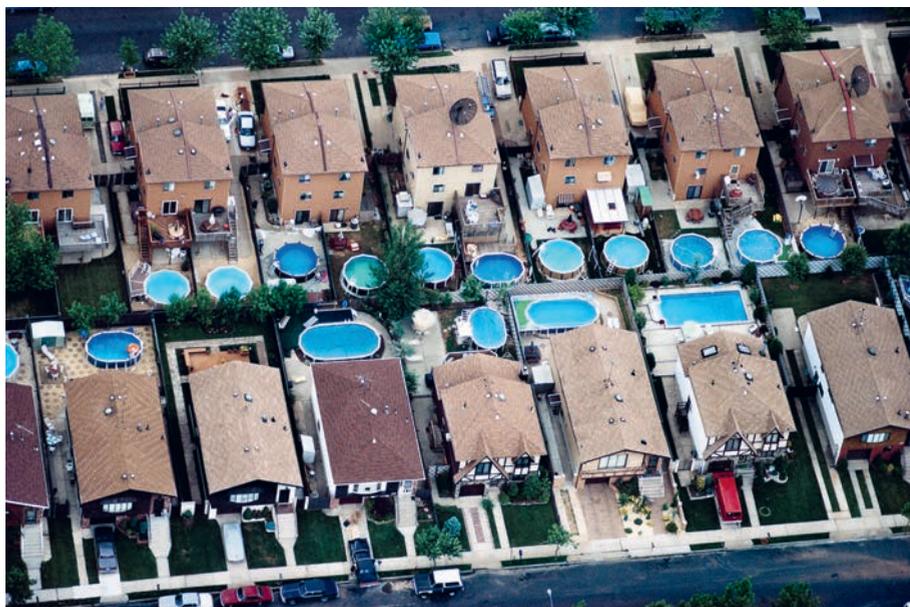
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See Erik Swyngedouw's "Modernity and Hybridity: Nature, Regeneracionismo, and the Production of the Spanish Waterscape, 1890–1930," *Annals of the Association of American Geographers* 89 (1999): 443–465, or his recent book *Liquid Power: Contested Hydro-Modernities in Twentieth-Century Spain* (Cambridge, MA: MIT Press, 2015).

water as possible from them. These massive hydrological projects also involve constructing infrastructure whose enormous energy needs are ongoing, such as pumping stations, diversions, and desalination plants, each of which plays a role in blurring the existing topography. With their sublime and monumental character, they enact an idea of culture that portrays nature as an unlimited (and tamable) resource. But as these new hydrological landscapes extract water, desertification expands in kind. The absence of water in the soil (having been removed for human use) means no evaporation and thus no condensation. At a regional level, the conditions become extreme—greening for some corresponds with dryness for many. Soil dehydration is followed by



A golf oasis in the desert hills, Las Vegas, Nevada. Photograph by Alex Maclean.



Suburban backyard pools. Photograph by Alex Maclean.

the air dehydration, initiating anthropogenic cycles of landscape destruction over large areas of the planet. The cartography of moisture indexes economic power, even if the relationship of our daily lives to the vast implications of desertification is sometimes masked by the impressiveness of the infrastructure or the general invisibility of water in our experience of the city.

This landscape is not only built for productivity; it is shaped by cultural approaches, as well. The relocation of water and the expenditure of energy it entails are also motivated by aesthetic ideas about what qualifies as an inhabitable landscape (materialized most directly in large garden areas, lawns, and golf courses, which account for a significant volume of the water consumed in the American West and Southern Europe).⁵ The transfer of water is equated, in many situations, with a transfer of beauty—meaning that effecting change requires reimagining dryness as a source of identity with its own opportunities for expression and design, replacing the generic dream of the suburban lawn (oases in an otherwise grassless context) with another ecological imaginary.⁶ The opacity of hydrological infrastructures make it such that the general public has little awareness of the huge volumes of water that invisibly cross urban space, not to mention the environmental impacts of that flow inside and outside the city, which include desertification and heat islands.

This fascination with harvesting water in arid landscapes has not been matched by an equal interest in the role of water within buildings themselves. On the contrary, architectural modernism has generally mistrusted water. Across the nineteenth century, the city came to be designed as a waterproofed machine, whose new networks defined the flow of water and organic waste while channeling a growing aversion to both. Earthworks and drainage systems de-watered the territory of the city, followed by the construction of an extensive and watertight carpet of pavement and architectural surfaces that hides the thickness of the soil and erases water from the urban map. This act of sealing the ground prohibits the exchange of water between land and air via infiltration, moisture retention, or evaporation. Dust, mud, and puddles disappear from the modern urban environment to make way for a more sophisticated atmosphere surrounding an aseptic surface.⁷

This newfound invisibility of water enables the mineralization of the world above ground, with the city becoming a terrain of minimum biodiversity. The metaphor of the mine, for Lewis Mumford, was a foretaste of the conditions of modern urban space—organic matter has disappeared, nothing edible remains, and all environmental conditions, including light and air, are artificially assisted. The construction of the modern city has been an effort to remove the body from stickiness, muddiness, and dustiness. To borrow a phrase from Julia Kristeva, this watertight urbanism is in a sense the “denial of pierced body.”⁸

For architects, too often concerned with the realm of the visible, the undergrounding of water has removed it from their disciplinary focus for more than a century. The “hygiene” of modernism was perceptual (the production of white volumes) as well as atmospheric, in its watertight façades and frequently synthetic interiors. The modernist aversion to the messiness of the body (especially the female body) and organic matter, manifest in their glossy environments waterproofed at all scales, appears to continue today—think of the work of Kazuyo Sejima and Ryue Nishizawa of SANAA, whose laboratory-like spaces appear sealed with minimal thickness. Contemporary swimming pools further evince this conflict between water, buildings, and bodies. Only a tightly defined and polished pool with an almost radioactive

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For example, in the Los Angeles region of California, measurements from the L.A. Department of Water and Power show that these areas consume 30 percent of the water supply.

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Seminal texts such as *Scenes in America Deserta* by Reyner Banham, or Gilles Clement’s later works, have contributed to diversifying our references by linking notions of beauty to greater biodiversity. The development of a specific vocabulary for dry forms—a common lexicon for design and scientific disciplines—is another necessary project, creating a tool that can assign each component of the landscape a value on which to project its evolution.

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See Mirko Zardini, “El suelo en la ciudad moderna y el predominio del asfalto,” in *Naturaleza y artificio: el ideal pintoresco en la arquitectura y el paisajismo contemporáneos*, ed. Iñaki Ábalos (Barcelona: Gustavo Gili, 2009).

8

Julia Kristeva, *Powers of Horror: An Essay on Abjection* (New York: Columbia University Press, 1982).



Mussel Choir, The Living, Natalie Jeremijenko, and Mark Shepard, Postmasters Gallery, New York, 2014. Photograph by David Benjamin, courtesy of The Living.

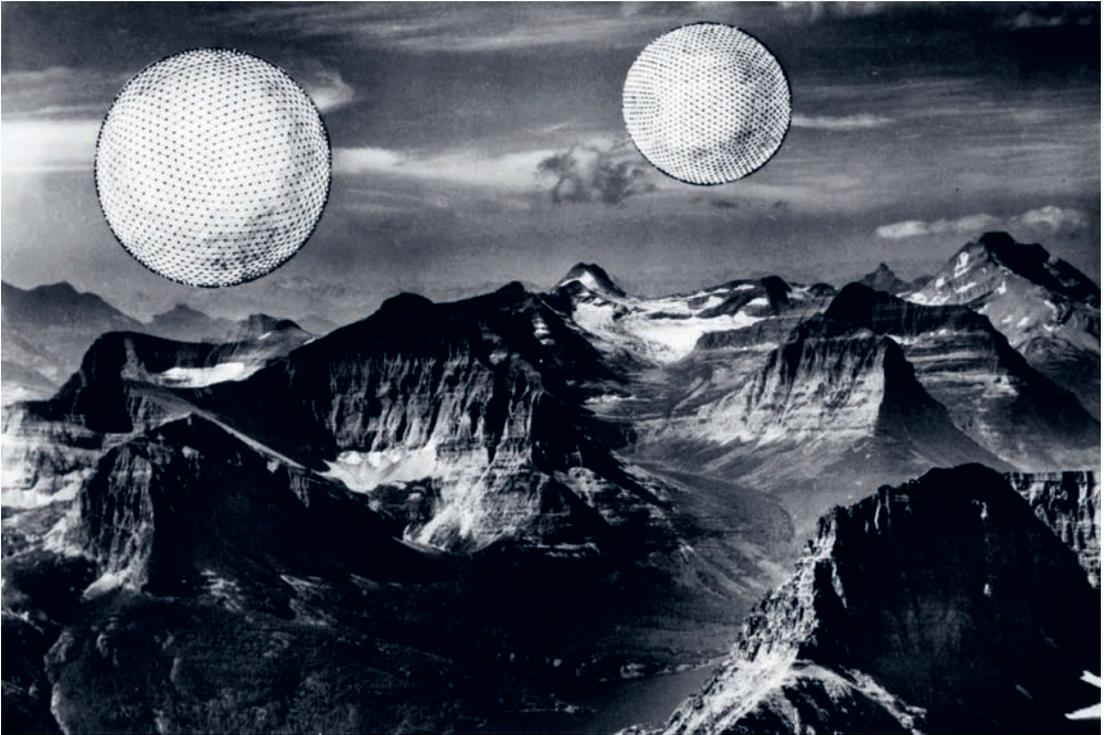
color (demonstrating disinfection and sterilization) makes possible the social experience of diving with other bodies.

Proposals like The Living's *Mussel Choir* and Décosterd & Rahm's Omnisports Hall have synthesized with accuracy this ambition to rethink architecture's relationship with water and the organic, pointing out alternatives for managing urban metabolism.⁹ The former employs mussels as living sensors for an urban water-quality-monitoring system. The movement of their shells reveals the presence of organic matter, much of it from the sewage network that combines fluids that have passed through and across other bodies. In the latter, the building is treated as a device that channels flows of matter and energy, establishing productive collaborations between species and biotopes. The indoor air is directed across soil to reduce its temperature before being breathed by athletes. The sweat of their moving bodies is extracted from the sports room by the mechanical ventilation system, where it is condensed and used to irrigate food crops grown in the bar courtyard. The architects' ironic conception is disturbing, transgressing invisible but rigid conventional hierarchies by revealing how human bodies, the living world, and inorganic matter are connected by the same flows. Both projects question our definition of waste and shift our conception of cleaning from disinfection to fertility, giving rise to new ways to think about urban metabolism, the position of water, the shape of architecture and the city, and the perception of biodiversity in the urban ecosystem.

Beyond their relationship with organic matter and hygiene, modernists' visceral aversion to wetness also played out in their increasing design engagement with the qualities of interior air. The advances in HVAC technology and easy access to energy that marked the twentieth century gave rise to an architecture whose form and materiality was no longer connected to climatic concerns. Greenhouse-like buildings with lightweight, sealed envelopes, and seemingly infinite interiors with mechanized climates, are part of a conceptual lineage connected to the environmental utopianism devised in the 1960s and 1970s by designers like Buckminster Fuller or the countercultural

9

Mussel Choir was an installation created by The Living with Mark Shepard and Natalie Jeremijenko for the American Pavilion at the 2012 Venice Architecture Biennale. Décosterd & Rahm's Omnisport Hall was a competition entry submitted in June 1998 to the City of Neuchâtel, Switzerland; for project narrative and images, see www.philipperahm.com/data/projects/salleomnisports/index.html.



Project for Floating Cloud Structures, Buckminster Fuller, 1960. Courtesy of the R. Buckminster Fuller Estate.



Restless Sphere, COOP HIMMELB(L)AU, Basel, Switzerland, 1971. Photograph © Katharina Vonow.



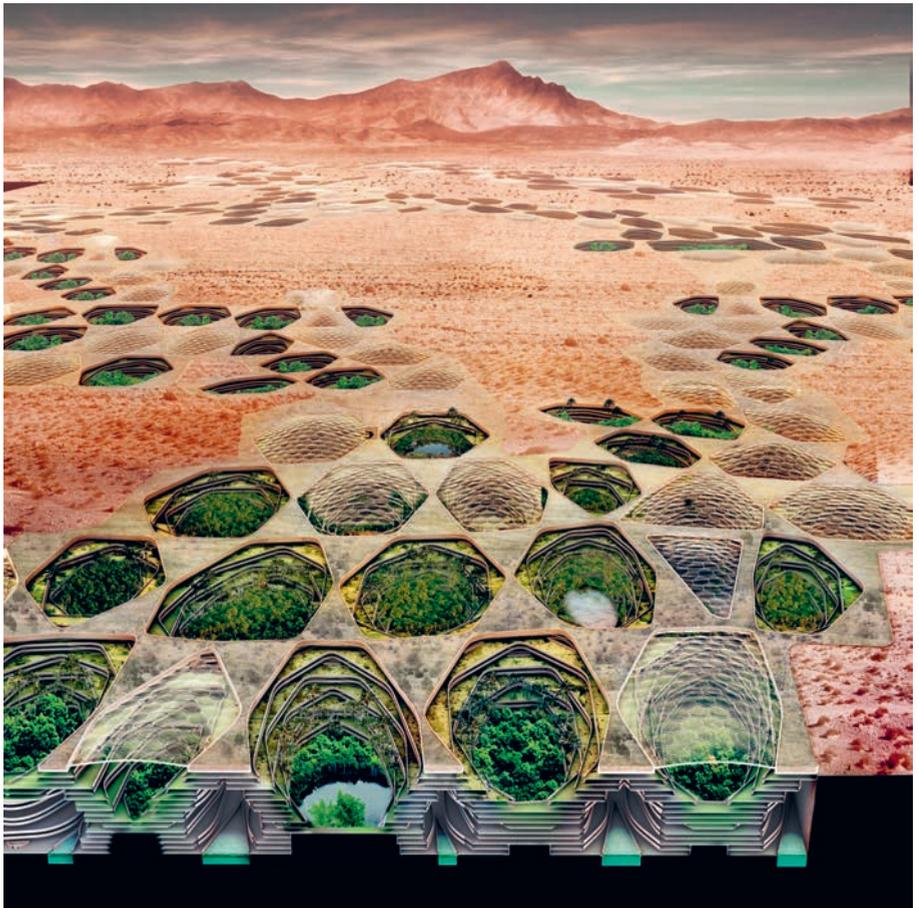
"Mobile Office," Hans Hollein, 1969.

atmospherics of Hans Hollein and Coop Himmelb(l)au. Conceived and located in wet geographies, their atmospheres are defined by brightness and completely dry air, in accordance with the modernist distrust of water, moisture, and shade. The substantial gadgetry of air extraction, filtration, and dehumidification is the hidden inverse of these transparent sealed envelopes and glossy finishes, ensuring the kind of ventilated and dehydrated environment that is considered optimal for health. Though designed to protect against the various forms of pollution seen by the twentieth-century city, such buildings have since revealed the inconvenience of inflexibility, their high dependence on energy, and above all, the clinical pathologies of sealed atmospheres. They have tabled the discussion about exterior environment by mitigating its effects and obscuring our awareness of whether these environmental effects come from inside or outside.

These typologies and constructive solutions meant for wet climates have been moved, unfiltered, to more arid latitudes, further drying already dry air. A paradoxical notion of comfort—one associated with

sealed glass envelopes and air heating devices, which base their performance on dehydrating the air—has spread everywhere, beginning with office and commercial buildings and now applied to many other programs. Along with other factors such as the massive use of fossil fuels, these dehydrated and waterproofed architectures have proved to be little-recognized but effective tools in building new climates. The utopian projects' ambition to design the entire urban environment has been overwhelmed by this uncontrolled experiment, whose systematic addition of building-scale actions has resulted in large domes of altered, hot, and extremely dry air, floating above metropolitan areas as a particular form of landscape desertification.

During the last two decades, interest in environmental issues has brought this fascination with atmospherical densities into the realm of the quantifiable and useful. The Modernists' light, technified archetypes centered on air design have been treated as the starting point for sustainability in architecture, and architectural diagrams have been filled with vectors and arrows. But in working from these archetypes without interrogating their essential cultural assumptions, many of today's architects overlook powerful missing variables that could be integrated into a sustainable approach. Expanding the theory and practice of sustainability, including rethinking large-scale environmental projects in arid and desertified lands, requires assembling and examining references that go beyond sunny, dry atmospheres.



Matsys, Sietch Nevada Project, 2009.

Rather than aiming for absolute environmental control and seeking the thermal anesthesia of rationalized, positivist interiors, some architects have recently started to work with moisture and shadow—with denser, heavier environments like forest interiors or spaces dug out from the earth. This combination is essential in spatially defining an oasis, the traditional public space of arid lands. Oases have historically been linked with a mode of operation based on scarcity of resources and a mutually beneficial relationship with the natural environment. They constitute a necessary model for building interiors and exteriors in dry urban areas. Unlike those of previous sealed archetypes, the “envelope” of an oasis comprises discontinuous layers of plants and soil permeable to ecological flows, which together form an outdoor yet defined and thermally controlled space. Using little energy, oasis dwellers establish alliances with living systems and carefully manage local air and water cycles to create cooled exterior zones. Their approach and techniques should become part of architects’ conceptual set of tools for designing in arid places on an environmental scale, complementing and supplementing technologically advanced solutions. The potential of such notions can be recognized, for instance, in Matsys’ Sietch Nevada project for the exhibition *Out of Water*, which envisions colonizing the American West with excavated units, similar to the traditional courtyard wells of the Sahara desert.¹⁰

On the other hand, Modernist interest in the air has evolved into contemporary architects’ engagement with the “cloud” and projects exploring plastic and sensorial celebrations of water, constituting water’s return into contemporary architecture. The approach to climate design manifest in Prada Poole’s El Palenque pavilion, shown at the 1992 International Exhibition of Sevilla, exemplifies this trend.¹¹ Its façades and roof are hybrid materials, simultaneously solid, liquid, and gaseous. Its thermodynamic behavior is regulated by the vaporized cloud surrounding its tentlike roof, its façade (formed by liquid water), and its radiant concrete foundation, which is cooled by an embedded water circuit that transfers heat to the ground. Its cloudy consistency exhibits the beauty that energy-efficient systems can create.

Subsequently, analytical studies of the behavior of the form in relation to moist air have been advanced through the development of agricultural greenhouse prototypes for arid landscapes, and through experiments like those carried out by research groups such as Watery or the Blaustein Institutes for Desert Research.¹² Others go further in creating an image of hydrophilic

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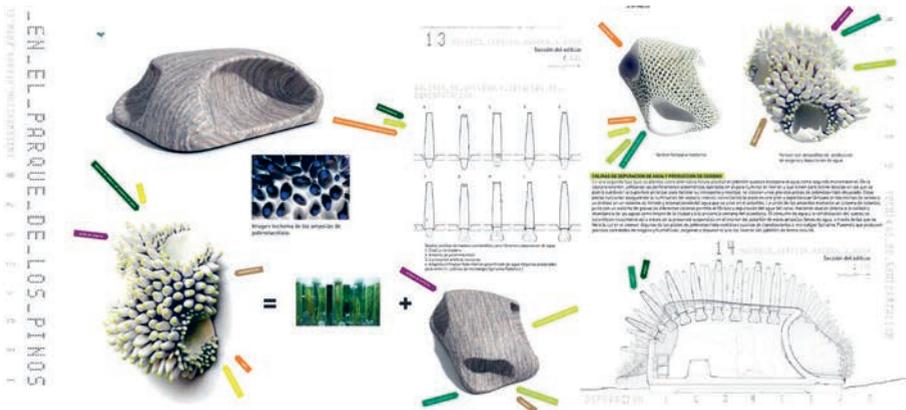
“Sietch Nevada” was exhibited at *Out of Water* in 2009; for project narrative and images, see <http://matsysdesign.com/2009/06/25/sietch-nevada>.

11

Precedents of the El Palenque pavilion include E.A.T.’s Pepsi Pavilion for Expo ’70 in Osaka and more recent examples like Diller Scofidio’s Blur Building, exhibited at the Swiss Expo in 2002.

12

For information on greenhouse research, see Martin Buchholz, ed., *Overcoming Drought*, a report published and funded by the European Union in 2009, <http://www.user.tu-berlin.de/marbh/ImplementationGuide.pdf>. For information on Watery, see www.Watery.de. Projects conducted through the Blaustein Institutes that are particularly relevant include the work of Limor Shashua-Bar and David Pearlmutter.



Parque de los Pinos Urban Intervention competition entry, AMID (cero9), 2008.

architecture. For instance, AMID (cero9)'s 2008 proposal for Pinos Natural Park in Madrid, "Social Oxygen Balloons," takes a biotech approach, making the process of transpiration that takes place in its pavilion walls (the building cools itself by storing and evaporating water) visible at a macroscopic scale. The section describes a prickly body, like a hedgehog, whose "spikes" are elongated capsules embedded in the façade that feed plantation algae. These methacrylate blisters almost double the volume of the curved shell that encloses the interior space. They act as miniature greenhouses, connecting the pavilion's interior and exterior atmospheres through transfers of matter and solar energy—they collect and store rainwater, which, metabolized by the algae, becomes oxygen feeding the vegetation of the park. Visibly sweating, these cyborgs exhibit that they are active processors of water and air.¹³

There have been many propositions about how we might control global warming technologically. On the atmospheric scale, there has been speculation about seeding clouds for artificial rain or producing clouds of special gases to reflect solar radiation. But the local scale plays a vital role as well, and the composition of the air can be influenced by the hydrology of the ground—the systematic retention of water, the moisture of the soil, and evaporative cycles are crucial for the larger climate. Our technological culture exists in a complex exchange with our changing notion of the body, and water has played a crucial role in that techno-social relationship. The correspondences between urbanization and desertization, between cleanliness and mud, between bright, dry air and the moisture outside are deeply ingrained in our imaginations, and these correspondences offer implicit starting points from which to think about the design of landscapes and buildings.

These cultural constructions can evolve toward a coexistence with fluidity, toward a notion of sanitation closer to fertility than to sterilization, and toward a preference for hydrophilicity instead of drainage. This involves reconsidering things like urban metabolism and environmental quality, and it means recovering the place of water within urban structures and public space. Architecture has specific tools that can help intensify our perception of hydrological processes and give form to the climatic imaginations of other disciplines as well as our own.

15

For more on the project, see David Gissen, "The Material Transformations of AMID (cero9) Social Oxygen Balloons," *Architectural Design*, vol. 80, no. 3 (May–June 2010): 40–45.



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