The symposium described previously provoked a new set of questions concerning design research models, transdisciplinary collaboration, next steps, and most importantly, the cultural realm within Hensel's call for a nonanthropocentric architectural agenda for *sustaining sustainability*. Similar to these primary mandates, the greenhouse attempts to interface and foster the *culture* of environment.

John Marzluff's message is simple: "in order to sustain connections between humans and nature, we need to put a face on biodiversity by making it personal." For Marzluff, deep ecology is also cultural. We need to place importance upon recalibrating our relationship with nature in order to address next steps in sustainable design. Sustainable architecture should therefore be less concerned with issues of optimization and energy manipulation and more emphatic about facilitating built interfaces between humans and nature. The greenhouse and lab spectacles of 19th-century France were sites of technological innovation in materials design, building construction, and fabrication. Importantly, these structures also celebrated the *culture* of environment. Material intensities in greenhouse architecture foster unique settings for relational calibrations between humans and nature. *The Greenhouse and Cabinet of Future Fossils* is a contemporary twist on such an interface, a new nature in the built environment.

CREDITS

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ARCHITECTURE OF AN ACTIVE CONTEXT

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ABSTRACT

As we stand with our feet on earth's outermost surface we build an architecture today that is much like it was several thousand years earlier, in an attempt to extend that outer shell with one of our own making. Artificial masses are built from a refinement of this existing geologic layer into materials of stone, steel, concrete, and glass that assemble to produce new pockets of space through the buildings they create. However, the sixth century BC writer Thales of Miletus put a different perspective on this: he insisted that we live, in reality, not on the summit of a solid earth but at the bottom of an ocean of air (Holmyard 1931). And so, as architecture continues to build up the outermost layer of earth's surface through a mimicking, embellishing, and enhancing of the materials which it comes from, it raises the question of why we have not brought a similar relationship to the materialities at the bottom of this "ocean" of air to create the spaces we call architecture.

If you were looking to level a complaint with the architectural profession, stating that it has not been ambitious enough in scope would not be one. Architects have never shied away from the opportunity to design everything from the building's shell to the teaspoon used to stir your sugar in its matching cup. But it would seem that the profession has developed a rather large blind spot in terms of what it sees as a malleable material with which to engage. Architects have made assumptions as to what is beyond our scope of action, refraining from engaging a range of material variables due to a belief that the task would be too great or simply beyond our physical control. So even though we are enveloped by them continuously, both on the exterior as well as the interior of our buildings, it must be assumed that the particles, waves, and frequencies of energy that move around us are thought by architects to be too faint and shaky to unload upon them any heavy obligations, that they are too unwieldy for us to control to create the physical boundaries of separation, security, and movement required of architecture. This has resulted in a cultivated set of blinders that essentially defines architecture as a set of mediation devices (surfaces, walls, and inert masses) for tempering the environmental context it is situated in from the individuals and activities within. The spaces we inhabit are defined by their ability to decide what gets in and what stays out (sunlight, precipitation, winds). We place our organizational demands and aesthetic opinions on the surfaces that mediate these variables rather than seeing them as available for manipulation as a building material on their own. The intention here is to recalibrate the materialities that make up that environmental context to build architecture.

The starting point is a rather naive question: can we design the energy systems that course in and around us daily as an architectural material so as to take on the needs of activities, securities, and lifestyles associated with architecture? Can the variables that we would normally mediate against instead be heightened and amplified so as to become the architecture itself? That which many would incorrectly dismiss as simply "air" today—thought to be homogeneous, scale-less, and vacant due in part to the limits of our human sensory system to perceive more fully otherwise—might tomorrow be further articulated, populated, and layered so as to become a materiality that will build spatial boundaries, define activities of individuals and movement, and act as architectural space. Our environmental context consists of a diverse range of materials (particles and waves of energy, spectrum of light, sound waves, and chemical particles) that can be manipulated and formed to meet our needs. The opportunity before us today is to embrace the needs of organizational structures and aesthetics by designing the active context that surrounds us through the material energies that define it.

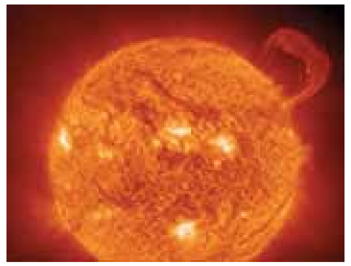

figure 1

figure 2

Looking back across the accomplishments in the field of architecture within the last two to three millennia, do we see gravity simply as a structural responsibility that had to be overcome, or did it grow as an opportunity to subvert and play against through the advent of new materials? These materials facilitate a reciprocal role between the growing spans of distance, thinness of structures or transparency, and the social activities and demands that could coincide or emerge under them. The development of reinforced concrete gave us structural shells; glass and iron expanses gave us the ability to capture exotic vegetation for growth all year round. Steel frames produced the tower and stacking of discrete programs, placed one on top of the other almost endlessly. These materials demonstrate how such advancements provoke opportunities not only in form and shape but also in the activities and events that exist within these expansive spans, transparent facades, or waterproofed structural skins. These material investigations—which increased the spans of interiors or the stacking of floor plates as buildings towered—were not neutral in their deployment. Their consequences are so immense as to go almost unnoticed by the general public, having become common and conventional.

The focus here is on these energies that currently course around our bodies and architecture. These energies have not been asked to do much more than be reproduced to mimic their current state, remaining passive when they actually have the potential to play a more active role. These energies are currently relegated to the status of a resource to be conserved and managed, a resource that should also be seen as an avenue for design innovation in architecture—much like gravity, never overlooked but also rarely thought of as not merely an obstacle to be overcome, but a design opportunity to subvert and play against.

1 ENVIRONMENTAL CONTROLS

Geometry has remained our profession's architectural translation for materiality, though the manipulation of our chemical, gaseous context—known as simply air—has seen immense growth alongside the geometries and surfaces of architecture that we are most traditionally aware of. It is important to keep in mind that this continuous discovery and manipulation of "air" has an intriguing lineage between the 17th and 18th centuries, particularly when seen against the backdrop of what the arts and architecture—whose medium of choice had been solid-state construction (stone and masonry)—were also trying to produce. Though the architect has continually turned to geometries and surfaces for experimentation and placed cultural and organizational ambitions onto stone, masonry, and glass, the scientific knowledge regarding the makeup of the substances and volumes that moved in and around these forms was simultaneously underway, just not yet in the hands of architects. The high Baroque is exemplified by Francesco Borromini's mid-17th-century San Carlo alle Quattro Fontane (Figure 3), which exemplified an ability to deliver plasticity through the geometry along the facade as well as the interior surface of the dome and its planimetric organization of space. At roughly around the same time, Johann Baptista van Helmont, a Flemish chemist referred to at times as the founder of pneumatic chemistry (Holmyard 1931) was using the word "gas" for the first time when defining specific properties within atmospheric air that defined a state of matter other than solid or liquid. While Bernini, in his Ecstasy of St. Teresa (Figure 3), was producing a lightness of clouds and a billowing of robes that obtain a near-weightlessness of his subject matter in stone, intermixed with paint and natural light from a hidden source to illuminate the entire piece, Pierre Petit confirmed Blaise Pascal's theory that atmosphere has weight by carrying a barometer to the top of a mountain to show that atmospheric pressure decreases with height (NOVA). And nearly 70 years prior to the cast iron and glass frame public exhibition structures that would emerge in England and France during the nineteenth century for reproducing exotic climates and expansive interiors of vegetation from distant lands (Figure 3), Carl Scheele, a pharmaceutical chemist, and others within the same time frame synthesized oxygen for the first time in their laboratories (Kuhn).

figure 1

Radiation. Much like steel and concrete masonry that have been tied to spans and gravity. There is another material all around us that comes from the radiation of the sun. Particles, waves and chemical components tied to energy. But energy in architecture is tied primarily to technological devices, machines and widgets that represent conservation and efficiency (green roof, solar panels, windmills). Energy has not been brought to the front as a building material—a building block material.

figure 2

"Solid-state" building blocks. From left to right: glass/transparency, by Richard Neutra; steel / spans and cantilevers, reinforced, Art Center College of Design, by Craig Ellwood; concrete/malleable, TWA terminal, by Eero Saarinen.

As the understanding of the chemical makeup of our atmospheric surroundings progressed during the next century, it made its most striking and public debut in the form of military weaponry during the First World War, engaging the very environment the human body moves through as never before. Peter Sloterdijk makes the argument that the discovery of the environment took place in the trenches of World War I through gas warfare and that the 20th century will be remembered as the age of warfare that chose not to target the body of the enemy through projectiles (bullets, rockets, missiles) but by making the environment itself impossible to exist in (Figure 4). The gas warfare of World War I saw to it that poisoning the context that the soldier's bodies operated in would secure their demise. This targeting of context (as opposed to targeting the individual body) was utilized on such a mass scale during the second battle of Ypres on April 22, 1915, with the deployment of chlorine gas (Sloterdijk 2009), that it is believed that nearly one-third of the casualties were gas related. To overcome the chemical alteration of the context that our respiratory and vital organs have become so adapted to, defenses were designed through the use of a mask that protected the eyes, mouth, and nose. This enclosure surrounding the face provided a filter between the body and the gas surrounding it, producing a hermetically sealed cavity that could then filter and compensate against the poisoned context that existed on the other side of that rubberized canvas and glass boundary. The body's relationship to its context was hostile, and so that act of sealing it off from that environment formed a bubble that enclosed the body in an independent context in order to protect it so that it could move about unscathed.

The focus here goes beyond the scientific discoveries that would produce the noxious gas itself. It stands as an example of chemically augmenting the surrounding environment that the body moves through, targeting the human senses to produce an active context. Geographically specific boundaries were created that produced degrees of intensity of the gaseous concentration, a gradient edge that positioned the soldiers in a varying degree of enclosure, either near the periphery or deep

figure 3

From left to right: San Carlo alle Quattro Fontane, Francesco Borromini, interior (1638–1641); Ecstasy of Saint Teresa, Giovanni Lorenzo Bernini (1647–52); Decimus Burton and Richard Turner, Palm House in the Royal Botanical Gardens, Kew/Surrey, England (1844–1848).

figure 3

figure 4

figure 4

Gas warfare and the mediating mask. Gas warfare of World War I saw to it that poisoning the context that the soldier's bodies operated in would secure their demise. Targeting one's context needed for living over that of the individual body was born on a mass scale during the second battle of Ypres on April 22, 1915, with the deployment of chlorine gas.

inside where the effects of the gas were most strongly felt. These pockets and fronts of intensity demarcated and subdivided the battleground, influenced the movement and strategic deployment of soldiers, and at times enveloped their bodies into its interior when the winds unexpectedly shifted. The gas produced geographically defined areas within the fields where it was released. Carried by the winds, the particles would eventually dissipate, but for a period of time, physical territories were defined in which the body could locate itself as being either enveloped and inside of, or on the periphery (with a varying degree of intensity), or outside of the gas.

If, as Sloterdijk says, the environment was discovered in 1915 with the chemical manipulation of air, then it is clear that architecture chose to continue in the direction of the filtered mask. In doing so, architecture defined itself as an act of "mediating context" and not as an act of designing the variables of chemical and energy systems that would make up an active context, refraining from engaging these designed materials of the active context as the architecture that would envelop you and not simply mediate them. Architecture took to the technologies and material advancements for mediating its surroundings rather than working with the material properties of the context itself to produce an architecture. A mediation of context is a choice; it keeps the variables from reaching the body or desired activity, but does not alter their makeup. On the other hand, an active context is one that has had those same variables reconstituted so as meet the needs of the body or activities desired.

Mediation is a long-running trajectory in the architectural profession—and not one that just emerges in the late 19th century with the advent of air conditioning, though it certainly intensifies because of it. (This discussion is well covered by Gail Coopers Air Conditioning of America, as well as writing by Michelle Addington, and therefore will not be covered in further detail here.)

Mediation is an act that by its nature selects and rejects variables from the environmental context offered, picking and choosing which can be used for the benefit of the activities occurring on the other side of the surface and which need to be rejected and protected against. This includes the building envelope as well as the use of vegetation on the exterior of buildings and the tree canopies in gardens that create shade. The surfaces of a building, whether made of brick, concrete, glass, mesh, or any form of perforated surface or aperture, are the outlines of building typologies set to mediate the environmental context. And when the surface is not mediating exterior climatic contexts, it acts as a hermetically sealed membrane around internally generated climates, operating in collusion with industry standards to maintain and provide common notions of comfort zones, sealing within the energies that produce these homogeneous interiors.

The sealed masks around the face became emblematic of the directives that architects and engineers would take as building envelopes and mechanical systems became the hallmark of the profession. Innovation would be understood to take place in envelope technology (rain screens, waterproof membranes, glazing, insulation) and the mechanical systems for producing climatic control, rather than the engineering and architectural controls of the material variables that exist on the other side of the envelope. As of now, little is asked from these energies other than to reproduce and imitate ideal climates to supply a rather subjective level of comfort to our bodies. A trajectory was defined for designing the products that would mediate our context over the design and control of the energy systems themselves, the larger environmental context within which these envelopes exist. This assumption that architecture's fundamental act prior to all others is that of mediating the environmental context will shift to one that intentionally acts to alter, re-inform, and design an "active context" of these energy systems as the architecture itself.

As in the example of gas warfare, we do intentionally influence our context; we simply do not do it under the guise of architectural (spatial and organizational) design. We already influence our environmental context daily, only as a by-product condition, often unintentionally and certainly not through a designer's controlled intention for architecture's benefit. We only need to look to the heat island effect in cities like Atlanta and Houston, and to the resultant microclimates outside buildings as they exhaust heat and energy, to see that we actually do augment and influence these local climates. Even the most passive building exceeds its formal constructs; there are shadows cast from the building, winds produced or blocked, and solar radiation reflected from the glass surfaces. It just so happens that these are accidental conditions, completely unintentional by-products of the built environment with no real design intentions for garnering the responsibility of dictating organizational and spatial strategies. Architecture's self-diagnosis in identifying itself as a profession that mediates the context to provide for the human body and its activities denies many of the very actions it already carries out. Architecture has yet to lay its burdens of providing for the body, its collected objects and the activities it shares in, onto an architecture that defines its creation and existence as the active context. The shift is less about a technological rift and more about an ideological one. This<?>requires an awareness that this is not a substitution of one over another, but that opportunities exist within an active context that are not available in an architecture of mediation.

2 ARCHITECTURE AS THE ACTIVE CONTEXT

Although it may not be obvious at first glance, some of the most interesting examples regarding this active context can be found in the buildings of the 2008 Summer Olympics in Beijing, even though the colossal collection of stadiums seemed to be more of a showcase for curtain wall and facade design than anything else. As the project designs focused primarily on the structures that would house the Olympic events, discussions began to turn to the air quality of the venues and the potential implications this would have on the performance of the athletes. So many aspects of the sports are meticulously monitored and controlled, from the chemical supplements consumed by the athletes to the equipment (swimsuits, bikes), yet the environmental parameters that the bodies move through are often left to existing conditions that the specified calendar day and geographic location provide. These issues of environmental context are only addressed in the broadest sense when choosing where to locate the Olympics for that particular year, or in the case of Beijing, preventing the use of cars and vehicles for several days leading up to the games to alleviate the particulates in the air. That the environmental context plays a role in affecting competitive sports is common knowledge, but the control of these variables is generally left to choosing the host city and hoping for good weather. Runners, for instance, know that their performance is tied to the oxygen content in the air, making it common practice to train at higher elevations in the days leading up to a race, which can increase their endurance when they return to compete at lower elevations. This can have a major effect on their race times.

Competitive swimming is the event where the relationship between the context and the body that moves through it is brought most clearly to the foreground. Not surprisingly, there were discussions at the 2008 Olympics regarding the potential for unfair advantages resulting from technologies and gear available to the athletes. In the case of swimming, the issue was the use of one-piece swimsuits that covered the body from the ankle to the neck. Some swimmers wore more than one suit so as to create buoyancy from air pockets between the two layers. In 2008 alone, 70 swimming world records were broken, 66 records were broken in the Olympics, and there were races in which the first five finishers were ahead of the existing world record. By 2010, regulations were passed stating "Men's swimsuits shall not extend above the navel or below the knee" (FINA 2010). However, the actual medium that each of the swimmers move through is equal to all, giving no one competitor an unfair advantage. Therefore, it is always being improved upon through the creation of what is referred to as "faster pools." Faster pools, and therefore faster competitive times, is an expression used to describe the results of a series of techniques deployed in the design of the pool to result in less resistance for the swimmers as they move through the water. The depth of the pool, the extra swimming lanes and overflow gutters on the sides of the pool for dissipating turbulence, and line ropes that separate the swim lanes known as wave eaters, are all techniques for improving and reducing the interference and turbulence given off by the swimmers, thus making the pool faster.

One of the questions raised during the Olympics by former Olympic medalist and swimming commentator Rowdy Gaines during the broadcast was if this particular Pool—the Beijing National

figure 5

Pools. Beijing National Aquatics Center, PTW Architects, CSCEC, CCDI, and Arup.

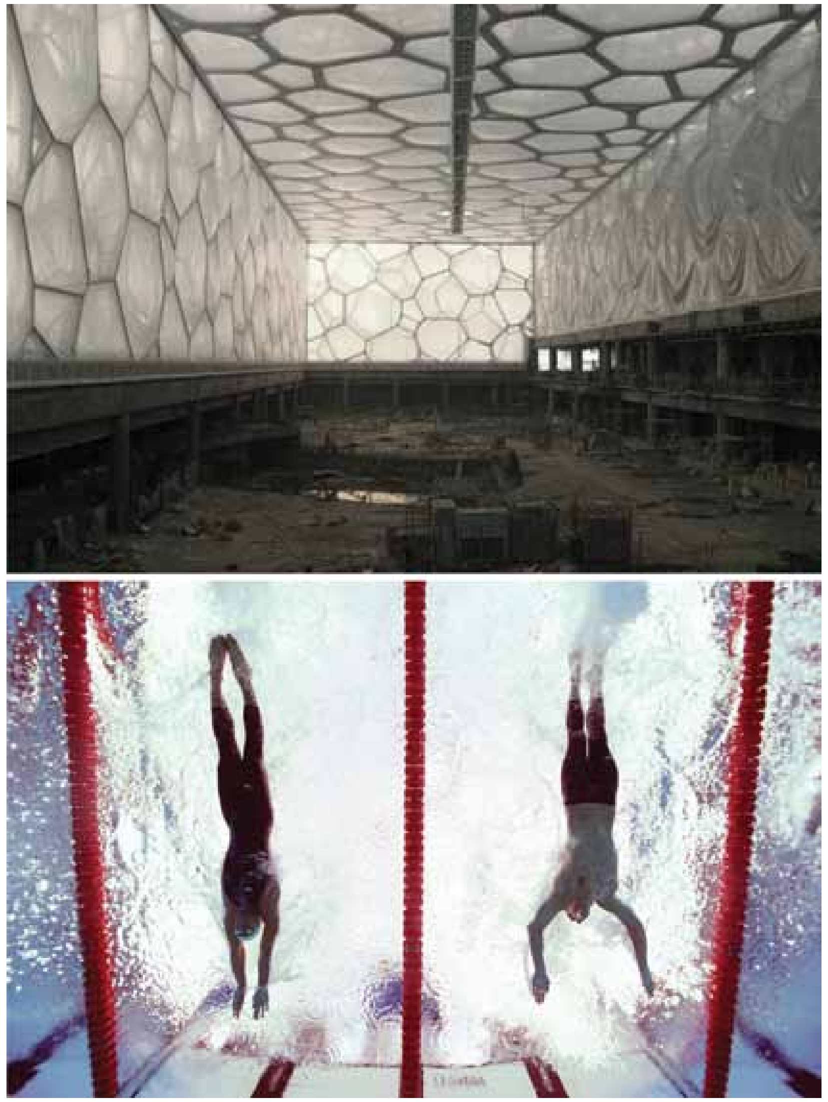

figure 5

Aquatic Center by PTW Architects, CSCEC, CCDI, and Arup (Figure 5)—had reached its apex of design through these techniques, which were based, as all pools are, by shaping the geometries that hold the pool water. Gaines stated that if pools are going to get faster, if records are going to continually be broken, the focus might not be solely on the surfaces that mediate the turbulence and currents within the pool water by dissipating or absorbing them but also on the water that fills the pool (Berkes 2008). This would be the design of the active context that the body moves through in competition—not the cleaning and temperature control of the water that we see now, but a recalibration of the properties that will increase the body's performance when moving through it. A new frontier in swimming performance might exist in the evaluation of the chemical makeup of the water itself, in the salinity, buoyancy, and chemical components of the water and its feedback relationship to the athlete's movement through it. The active context the athletes move through becomes the focus of design attention in the same way as the architecture that shapes the pool's outer forms or the equipment that the athletes use to compete with. Looking to alter the "active context" that one is a participant in is a viable option. For architects, such an incentive for sparking the imagination is immense.

This enhancement of the context in sports is seen as an equalizing maneuver that affects each athlete equally, not allowing any particular individual to be at an advantage. Sports, including the Olympics, seek excitement for their viewers and sponsors by continually pressing forward and breaking new competitive records, much as we saw with Michael Phelps and swimming in 2008. It is because of this that pressure exists to seek these advancements. Knowing that controversy exists regarding individuals' unfair advantages through gear and chemical enhancements within the body, sports are always looking toward the playing fields that the sports take place on. Pool water now is treated much like architectural interiors, something to merely be tempered and cleaned for the body to inhabit. Olympic pool water is maintained at 77–82 degrees Fahrenheit with filtration and chlorine treatments to prevent algae infections and keep it clean, just as buildings are maintained with internal air temperature of 68–72 degrees with 45 percent relative humidity and air particle filtration. The temperature control and cleaning that occurs now in pool water is addressed as an elimination of variables, not the creation of new ones. Much like our climatic interior controls, they are specified and controlled to create a baseline condition formulated from our ideals. In this case, the ideal is a clean, temperature-controlled, waveless open body of water.

But unlike surfaces of tracks that athletes run on, or artificial turf that soccer and football is played on, pool water is something that the body moves through. The pool, however, is a step beyond, as it deals not with engineering a product that increases the performance of the human body, or relocating an event at one oxygen-specific altitude or another. Changing the properties of the space in which the athletes move is designing our environmental context. The focus of design is the water itself, not the structure that houses it, and not a large departure from the context on dry land that our bodies move through.

Our designed context is a thick air of particles, fluctuations, spectrums of light—energy systems that become materials as architectural responsibility is moved from the surfaces that mediate context to the building up of the materials to make architecture the active context. This active context becomes a composition of materials around us, charged with the chemical and electrical compositions that the body moves through. Like a body of water with currents, thermoclines of demarcations are often sudden and striking in their contrasts in temperature change from one inch to another. The intensification of the environmental context creates a frothy makeup of particulates, a paraplasmic flow of overlaid variables that the body comes in contact with and moves within. Currents course through sites at varying frequencies and intensities, overlaid upon one another, each engaging the sensory perceptions of the body differently.

The most elemental version of one of these pools that we can each recognize would be the results of cities' infrastructural systems or buildings' mechanical systems running under an outdoor expanse during the winter months. The exhaust grates or wasted energy dumps released from a building on the grassy patches outside build up with the expended heat, warming the soil and surrounding air. When snow and ice cover the surrounding region and plants have gone dormant, this little area shows contrasting signs of growing grass, melted snow, and the gathering of unfortunate people that have no other place to go to stay warm. This is an anomaly redefining a geographic locale within a broader context. These contrasting microclimates exist nearly everywhere, from the geothermal pools of Iceland to the oasis formed by underground rivers and aquifers from the Sahara to Peru. These energy dumps on the exterior of buildings are not much different, yet they are singular and simplistic in their deployment since they are essentially a defect condition, unplanned by anyone. They rarely have intricacies with nested subdivision; instead they act as binary on-and-off conditions. But they do serve as a primitive example of what these architectural pools might become. If they were to take advantage of a wider breadth of materiality and control available to the architect, they could advance to absorb the responsibilities and demands we associate with architectural discipline. These accidental hiccups on the grassy patches outside buildings are only a glimmer of the diverse constructs and worlds to be devised.

These pools are chemical particles and waves of frequencies that produce a viscous volume of disparate materialities, designed to work in parallel with each other. They are designed pockets of coursing energy fields that structure and organize space as well as create and hold their own aesthetic proclivities. The characteristics of pools differ from our association of interiority and rooms in which geometric form and surface are used to demarcate on which side of that condition the body resides. The creation of an architectural pool is formed from gradient intensities that do not produce the same dichotomy. The physical properties of the material energies that construct these spaces consist of their own strengths and limitations, which inform their abilities, size, shapes, and aesthetics of the spaces they produce. The extent of a room's size is no longer defined by the extent of spans, shaped enclosures, or apertures in surfaces that provide access and light. Lines and surfaces therefore do not act as the primary means for defining spatial edges; instead, currents and points of intensity overlap to demarcate edges and thresholds that redefine architecture's existence.

The attempt here is to do more than simply "condition" exterior spaces, or produce recognizable climates. Engaging these "active contexts" as pools is not a reconstruction of an understood climatic ideal. These pools of design seek not simply to move activities and events associated to the interior and displace them to the "outside," but also to acknowledge that such a discussion will have fundamental repercussions on the social experiences as well as the definitions of these programs. The intention is to seek new territories of design, texture, and social interaction—to tease out the spatial and social implications that arise when "walls" and "geometry" are no longer our primary means of spatial organization. The context that our bodies move through daily is material ready for our design engagement, a site of action, of nuanced materialities that are now only lumped into a single category of energy, not recognized for the opportunities they present.

As we approach architecture as an active context, we enable projections and speculations of how these typologies of space will become the catalysts for seeking new spatial boundaries that inform organizational activity and social engagement. Our architectural spaces will consist of these active contexts that our bodies will experience, encased within gradient energy boundaries that course around us directing and informing our spatial surroundings. They need only to be embedded with the responsibilities we now associate with geometries. To do this, the active context needs to amplify the existing energy systems we are already commonly aware of, heightening them to become architectural materials and buildings blocks. As material energies, they will construct an active context into architecture, define the boundaries of movement, and absorb the spatial loads that currently rely solely on geometries and surfaces.

ACKNOWLEDGMENTS

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SMART DISASSEMBLIES:
OR, HOW I LEARNED TO TAKE THINGS APART

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ABSTRACT

Taking things apart is easy. How something works, or even what it is, is irrelevant to its dismantling. If assembly can be perceived as a rational act, then disassembly is certainly its counterpart: an intuitive, foolproof, and mindless errand of the seemingly curious subject. It is in this unflattering description, however, that disassembly warrants an analysis of its smart potential

Smart Disassemblies locates the exploded view drawing, a representation that conveys the instructions for assembly, within its architectural legacy, from its origins in the Renaissance to its more contemporary appropriation by Thom Mayne and Daniel Libeskind. The categorical rules, and the part-to-whole relationships they imply, gleaned from these precedents are then subverted toward the end of disassembling an object. The proposed rule sets (Point of Explosion, Point of View, and Explosion Sequence) and their variants are tested through their application to a complex assembly of objects, a jazz quintet.