RE-INVENTING CONSTRUCTION

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JEANNE GANG / STUDIO GANG ARCHITECTS

Issues of form in contemporary practice have a tendency to take priority over issues of construction. Today, illustration and rendering techniques—even more remote from construction—are becoming prioritized over form. This reality of our time reflects the ease with which we now employ digital media to convey ideas. However, in many projects the construction of the building itself presents an opportunity for the architect to design and create beyond the two-dimensional image. Construction materials have unique physical characteristics that are underexplored or have yet to be discovered, making it possible and exciting to work with them as generative forces for a project, rather than relying on form or imagery as a starting point. A building has the potential to be "about concrete," for example, in much the same way as a painting can be "about paint."

To create a building "about material" is not the same as to refine material and construction techniques in buildings. There are many architects who aspire to perfect their craft and whose work represents a lifetime of continual refinement.

These architects patiently improve details with subtle changes: an endeavor that spans decades and dozens of buildings. The details are often highly expensive and require elite museums or private mansions with large project budgets to absorb their cost. This trajectory of fine tuning (which some would call fetishizing) lacks curiosity, the willingness to be surprised, the thrill of bold experimentation, and the chance to make a discovery. The accomplished master is in many ways no longer allowed to explore because his clients expect him to repeat and refine specific forms and details—years of polishing a single groove create a furrow so deep that escaping it is often impossible.

How then, to create a building with an idea that begins with construction material and technique, but which is liberated from this obsession with refinement? To do so, architects must be unafraid of radical experimentation and commit to investigations that can be deployed on relatively conventional construction sites. Within the manifold constraints of ordinary construction, the search for something new requires a focus on the materials at hand, combined with the use of tactics found outside the traditional architectural office. Looking to numerous other modes of working offers alternative ways of seeing, thinking, and making.

The Cook

Before the mass industrialization of agriculture and the construction of modern infrastructure made nearly any food available anywhere, at any time of year, cooks had to both shrewdly plan and improvise each day to create delicious dishes from what was actually available. Today, with the growing popularity of the local and slow food movements, cooks are choosing to return to this way of working—challenging themselves to prepare delectable meals using only those ingredients that are naturally available in their specific location and growing season. This necessitates a certain kind of experimental approach, different from the exotic-combination zeal of those who have every food imaginable at their disposal. It also requires cooks to work with more intention, anticipating what will become available and how it can be incorporated with the staple goods already in supply. It is essential for these cooks to remain flexible and open to every sort of culinary possibility, and to making adjustments to their original menu, if they are to please palates and pocketbooks.

The creation of our SOS Children's Village Community Center project in Chicago, Illinois, demonstrates that the exploratory architect who seeks an architecture about material works in much the same way as the locally and seasonally focused cook. Given the project's limited funding (SOS is an international nonprofit organization dedicated to child welfare), the building was largely shaped by the process of securing the materials for its construction—many of which were donated by manufacturers and builders. This condition precluded honing the architect's favored details, and instead led to defining a new design process, whereby materials and details were conceived of as a flexible set of placeholder elements. Each design element, from the exterior cladding to the stair design, was treated as a variable; as each new donation was secured, it was studied in relation to all of its immediately adjacent parts. By means of that conception of the design, each donation could affect other elements, re-shuffling or re-integrating them, or even suggest new donations to be sought.

Unlike the practice of "value engineering," which eliminates or substitutes materials in favor of less expensive alternatives, here specific windows, finishes, skylights, and plumbing fixtures were all variables with equal potential. When the original donation of masonry for the exterior was withdrawn by its donor, we began to explore what the building would be like in its most raw, stripped-down condition, with its primary façade created by poured-in-place, exposed concrete donated from another source.

The choice to showcase this normally concealed material was not without issues; one of the first addressed was the problem of the cold joint—the lineation that forms when concrete pouring is interrupted and later resumed—in an exposed concrete wall. The height of the exterior wall at SOS required two separate pours, making a visible cold joint along its surface unavoidable. Rather than trying to hide, straighten or control this line, our consideration of the potential of concrete as a poured fluid led us to investigate the visual effect of the cold joint. By multiplying the number of cold joint lines and making the line of each joint more dynamic, we elevated the significance of the "casting" action in construction. Simultaneously, we varied the concrete mix design, which—because different strengths are different colors—visually intensified the differentiation between the horizontal layers. The final architecture preserves and reveals the physics of a once-fluid material in the building's "strata-wall." The building benefits structurally from the use of multiple combined concrete mixes, as the different characteristics of each mix work together to make the cantilevered entrance walls possible.

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1: SOS Children's Village Community Center in Chicago: The visible striation of the joints between concrete pours was accentuated by the use of different colored concrete. Throughout the process donated building materials were used to their full potential.

By exploiting the readily available, leftover products in the building industry and construction process, we, like the cook, innovated with what we could get our hands on. Our role in the project departed radically from that of the traditional architect: we became organizers of a set of chance circumstances, remaining flexible and open to an array of possibilities that only achieved their distinctive flavor when the building was finalized.

The Prospector

Since prehistoric times, we, as humans, have looked to (or below) the earth for the materials we cannot grow or cultivate ourselves. Though mining has evolved immensely over the intervening 45,000 years, today the same basic steps still comprise the mining process. Prospecting is the initial exploratory phase in which a material deposit is sought through physical means. Once discovered, its feasibility for mining is analyzed, by measuring the deposit's estimated value against the cost of its removal, or excavation. Excavation methods have varied widely, based on the material resource type and its location, but the vast majority of removal techniques have all been extremely destructive to their natural environments.

This could be different if mining was refocused on the man-made world—if architects took the same evaluation framework and used it to locate and exploit a new resource: the built environment. The prospecting architect could mitigate the environmental degradation typically concurrent with new construction by locating materials that have already been used, evaluating their potential, and giving them new life in architecture. From leftover steel to pulverized rubber, bulk quantities of useful things pass through metropolitan areas on a daily basis. In many contexts there are salvage industries whose sole purpose is to sort, store, and resell materials from this plethora of resources. The only real issue preventing their reuse in construction is that these materials are not always in a finished condition, ready to be transferred into architecture—they currently require the curiosity and persistence of a prospector to locate and utilize.

The Ford Calumet Environmental Center project mines the city to find locally available and salvaged materials from its site and surrounding context: a historic industrial region south of Chicago, once the largest steel producing region in the United States, which is also an important resting stop for migratory birds. The Environmental Center will be a place where people come to learn about these

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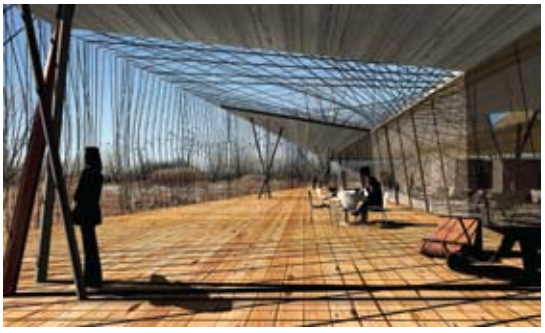

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2-3: The Ford Calumet Environmental Center was built in an area of Chicago formerly known nation-wide for steel production. Materials were sourced from local producers as well as from local scrap and salvage yards.

4-5: The design incorporated a nest-like appearance, partially to protect migrating birds from collisions with the transparent elements of the façade. The space between the exterior and interior of the building creates a deck for observation of the marsh and surroundings.

interesting and seemingly divergent identities that will be reconciled in the building's "nest-like" design.

Natural prospectors themselves, birds have an eye for the abundant and available materials that can be used for their nests. Our project team worked in much the same way: we began design by surveying nearby industry and its products, as well as the stocks of local material in salvage yards adjacent to the site, to determine what was available and potentially valuable for the project. Armed with this knowledge, we designed a building which employs reclaimed materials in new ways, profoundly redefining construction's typical method of specifying and sourcing materials. Differing types of salvaged steel sections are bundled together like twigs—in lieu of melting and reshaping them in a more energy-intensive process—to form the building's column structure. Slag and glass from broken bottles find a new purpose as aggregate in the terrazzo floors. Reclaimed bar-stock and re-bar form a basket-like mesh that wraps an expansive outdoor porch, protecting the site's migrating birds from collisions with transparent glass, which they cannot see.

Perhaps perfect salvage will one day be available on order, with a point-and-click from a desktop, but until then making architecture from nearby scrap still seems both elementary and urgent in a world that is overflowing with waste. As demonstrated by the Ford Calumet project, architectural practices can meet this challenge by cunningly prospecting available materials, mining the city for its undervalued and discarded resources.

The Nomad

Most of the industrial world measures success by mass. The more tons of concrete a plant produces, for example, the more successful it is perceived to be. A powerful alternative model is provided by the concept of "lightness", as it is inherently understood by nomadic peoples. Working as a collective, nomads transport themselves and their provisions from place to place. Their transient way of life is characterized by few material possessions and a deep connection to nature. Their portable habitations are designed to be as light as possible, without sacrificing strength and protection, and adaptable to varying climate and site conditions.

Learning from the nomad, architectural practice can expand beyond the obvious lightweight fabric tensile structures, to pursue a more holistic notion of

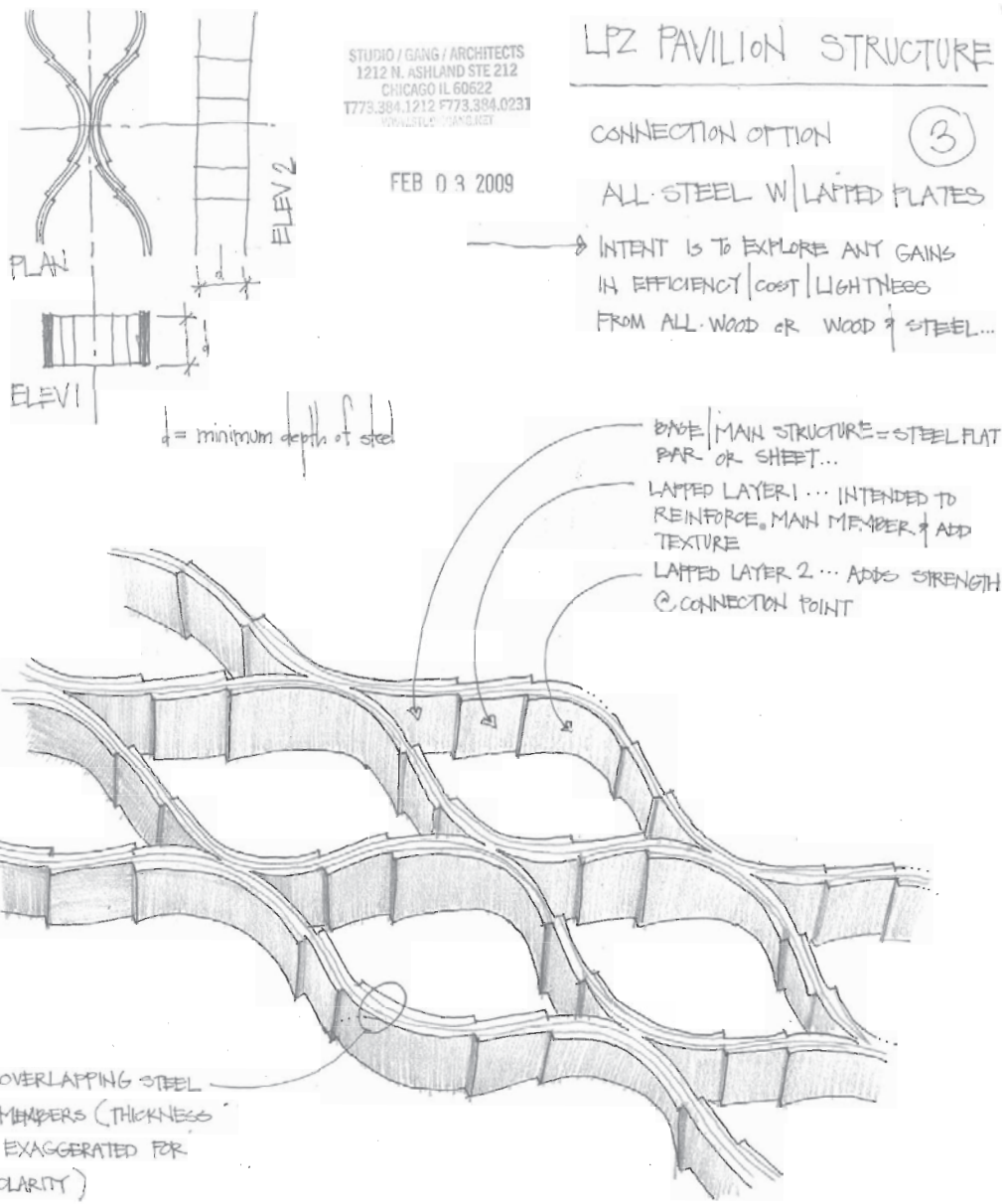
"lightness": one which seeks adaptability and a deeper connection to the environment through considering the structure's relationship to its climate and ecology. Interesting new possibilities for design and construction arise as we begin to consider reducing weight, materials, and their environmental burden in more complex ways.

The search for this sort of lightness helped drive the Lincoln Park Zoo South Pond project, in which we revitalized an urban pond in the center of Chicago. Originally designed in the early 20th century as a shallow reflecting pool, it was wastefully replenished by city drinking water. In its new iteration, the redesigned pond is substantially deeper and filled by rainwater runoff that is filtered by plants around its perimeter. As the water level fluctuates with the seasons and the weather (including drought), a visit to the pond becomes an experience connecting visitors to these natural cycles.

Two structures enhance visitors' experience of the pond habitat. The boardwalk invites people to meander along a path, exploring both the water side and land side of the riparian edge. The boardwalk leads to the education pavilion, at the eastern edge of the boardwalk. Constructed of prefabricated wooden elements and fiberglass pods, it forms a sheltering arch for educational classes. Each member of its lattice-like structure is curved in two directions. The bending action used to make the wooden elements, similar to that of bent wood furniture or boats, provides additional strength and allows the pieces to be smaller and lighter. In the case of the pavilion, the pieces were light enough to eliminate the need for large construction machinery; instead, only two persons were needed to assemble the structure using steel connection plates and simple tools. Cladding the structure's outer surface are pod-like, lightweight fiberglass domes that were also able to be assembled by hand, each of them lifted into place by a single person.

Mimicking nomads, architects who design for lightness achieve inventive solutions as they explore using less material with greater strength. This recognition of the dynamic natural cycles of a project's site and context, and the design of spaces that offer people, as users of the architecture, a direct connection to those cycles is an equally important strategy toward reinventing construction with a deeper ecological purpose.

As we worked on the three projects, acting as the cook, the prospector, and the nomad, we found that each project grew richer—in a way that a simple formal gesture never can. Being as attentive to the working process as to the building form injected a whole new range of possibilities for each project. It allowed us



6: Lincoln Park Zoo South Pond project. One of the options analyzed for the pavilion's structure.

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7-8: The pavilion could be assembled in one day with a minimum of two people, and no heavy machinery.
9: Fiberglass domes used to clad the openings that provide shelter from the elements.
10-11: The pavilion is both a site for program, such as public Yoga classes, and an icon for the park. In the evening the pavilion is lit, and creates a focal point along the pond.

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greater freedom with the design, and a stronger connection to the essence of each site and all of its constituents. Like the cook, we assembled with what we had, like the prospector, we found and extracted what was of use, and like the nomad, we sought lightness and simplicity.

The discoveries made during the design of the SOS, Ford Calumet, and Lincoln Park Zoo projects could never have been achieved through the use of drawing alone. Instead, we developed unexpected and radical design solutions by implementing a variety of tools and methods, including innovative physical models, prototypes, material testing, and—of particular importance—collaborations. These intense working sessions with builders, engineers, and craftsmen challenged all involved to try new methods outside their traditional boundaries of expertise, and resulted in increased knowledge and additional tools for each team member to use, both on the project and into the future.

This collaborative and multi-faceted way of working, contingent on an architect's willingness to leave behind the confines of software programs and expand traditional modes of practice, is critical if we are to reinvent construction. Great possibilities for innovation arise when we take cues from innovators outside architecture and attempt to see the world anew through their eyes. Architecture is a fluid profession, one that is not only evolving but radically changing. New architects hoping to reinvent construction might find more inspiration in learning from the cook, the prospector, or the nomad, than in serving as apprentices to the masters of refinement.

About the author: Jeanne Gang leads Studio Gang Architects, a practice generating some of today's most innovative and creative works of architecture. Her projects confront pressing contemporary issues, including climate, urbanization, and technology. Published and exhibited widely, her work has been shown at the International Venice Biennale, the Smithsonian Institution's National Building Museum, and the Art Institute of Chicago. She is an Adjunct Associate Professor at the Illinois Institute of Technology where her studios have focused on megacities and material technologies.