DESIGN FORWARD, REVERSE ENGINEER

An interview with Cory Brugger

How Morphosis manages to take risks.

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Morphosis office in Culver City. Photo: Iwan Baan.

Thom Mayne's firm Morphosis has famously roused the ambitions of clients typically reluctant to take risks—even with government agencies such as the General Services Administration (GSA). *ARPA Journal* spoke with Cory Brugger at Morphosis to see how the office uses practice as a site for experimentation. As Director of Design Technology, Cory tests ways to leverage technology for the practice, from parametrics to materials prototyping. Editor Janette Kim asked him how ideas about research have emerged within the methods, techniques, and processes of production at Morphosis.

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Janette Kim: What is the role of research at Morphosis?

Cory Brugger: As a small practice (we still run like a ma-and-pa shop), we have been able to stay process-oriented, with small agile teams and Thom involved throughout the entire project. In the evolution of the practice, design intent has always driven our projects. We start with a concept that evolves relative to the context (social, pragmatic, tectonic, etc.) of the project. R&D isn't something we're setting aside budgets for, but rather something that's always inherent and central to our design process. We find opportunities to explore technology, materials, construction, fabrication techniques, or whatever may be needed to realize the unique goals of each project.

JK: This is exactly why I thought of Morphosis for this issue of ARPA Journal. While there are architects who work in labs or on isolated test cases, I am interested in talking to people who use practice as a site of experimentation. Do you see opportunities for experimentation that arise specifically from the structure of your client-commissioned projects, or work supported by public funding?

CB: This seems to be where the industry struggles—most of the work we do that would be labeled as R&D is driven by pragmatics. While our architecture is considered more formal and conceptual, the process is driven by practical goals. When you look at the Perot Museum of Nature and Science in Dallas, for example, the design intent of a striated, organic façade made of seven hundred unique custom precast panels wasn't feasible within the budget. After visiting the fabricator and observing the processes, equipment, and skills they were using on a daily basis, we were able to reverse-engineer that process into something that could accommodate our design intent.

This holds true for most projects that the office has built. There's a conceptual driver and a formal response, whether it's aesthetic, tectonic, programmatic, or environmental—as in the case of the San Francisco Federal Building—but the resolution of the final product is ultimately driven by pragmatics.

Our job as designers is to identify the opportunities for architecture. What added value can we bring to the project as a design firm? How do we accommodate the larger strategic goal—whether it's social, environmental, or economic—or however we've established the larger goals within a project? After that, we have to find ways to support the design intent through spatial organization, tectonics, detailing, and material finishes. There are always going to be trade-offs within the projects that have more limited budgets; however, as architects we still strive to add value through our designs.

Perot Museum. Photo: Iwan Baan.

JK: Let's stay with the Dallas project as an example. What was new in the project? To what degree are you relying on proven methods or previous experience, and to what degree are you launching untested experiments?

CB: In most projects, we're applying and/or developing tools that are meant to accommodate a specific design goal. The techniques may be new, but they're built with tools that we use daily. We've done scripting and parametric modeling on most projects for the past fifteen years, but the way we're employing these tools to accommodate a design, the constraints of a project, or fabrication processes is constantly evolving—this is where our experimentation can be found.

In the Perot Museum, the façade has received a lot of attention for the technology used to develop the panels and the fabrication process, but the lobby ceiling is probably the most technologically advanced (and risky) assembly on the project. We worked very closely with the subcontractor for the ceiling, reviewing the design and developing a custom hanger bracket. In the end we didn't give them CD drawings for fabricating the panels but rather a fully developed 3-D model that detailed each individual panel to be created. The subcontractor then used the same model to locate all of the hanger points, with each *x-y-z* coordinate being verified by a robotic totaling station. This ensured that almost nine thousand points and over 35,000 square feet of metal panels were fabricated and installed accurately. All of this work was done without an integrated contract or release of liability.

By estimate from the general contractor, Balfour Beatty, utilizing a coordinated 3-D model led to an approximate twelve-week schedule reduction and substantial cost reductions—a direct result of the team not having to engineer, draft, submit, and review shop drawings. This process involved a large amount of risk, which all of the stakeholders understood, but we had a strong relationship and trusted each other's process and rigor. The team knew that the end goal was to provide better quality and return for the client, and this was the easiest way to ensure this goal

In our experience, the key to realizing these opportunities lies in collaboration. Like the museum's lobby ceiling, we also benefited from working closely with the subcontractor throughout the design process for the museum's façade. As we were developing the façade, the subcontracting team was included to ensure that they understood our approach and could accommodate our assumptions. Similarly, we invited their feedback to ensure we employed their working processes in our design. To create the façade, we used silicon molds, liners, and seals—in other words, nothing the subcontractor hadn't used before. The only thing that differed from their standard process was the shape of the molds, the number of components within each panel liner, and the way in which the liners were assembled. By sharing an understanding of the conventional (and most efficient) methodologies for precast fabrication, we were able to collaboratively expand

the material's potential for design. It didn't matter what the mold was for—it could shape a shitty imitation-brick sound guard along a highway, or the façade of the Dallas Museum —it's the same exact materials, and the same exact processes.

The tools don't drive our process; we start with design intent and then build the tools and techniques necessary to accomplish the overall project objectives.

Mock-up for Emerson College façade at Zahner Headquarters. Courtesy of Morphosis Architects.

JK: Does this process require that you reinvent the way liability is defined, or change the legal structures you set up among architects, clients, and contractors?

CB: Ideally it would, but we haven't had modified contracts on any projects in the past. We have done "design assist" on a few projects, however, which does start to break down those boundaries. This allows you to work hand in hand with a subcontractor (or fabricator) during the design phases to develop the materials and details for a specific assembly. In Dallas, the GMP was awarded around 50 percent completion of the Design Development phase (DD), so for a few of the key areas/assemblies we had a design assist process from that point forward.

In general, the shift toward a more integrated collaborative process allows for experimentation. The standard Design-Bid-Build process breaks down because the design team is working in a vacuum, without understanding the equipment, the processes, and the expertise that the awarded subcontractor will have. The limitation there, or the risk from an architectural standpoint, is that you're allowing contractors to decide how to adapt the design to their capabilities. There is the process of shop drawing submittals and design reviews to help ensure the architectural intent, but the process is still (most often) one of compromise rather than collaboration.

Many of the key projects that we have worked on or are working on—the GSA projects, Cornell Tech, even Gates Hall in Ithaca to some degree—are public projects, in which you have to award a project to the lowest bidder or lowest bidder within reason among prequalified contractors. These are common institutional policies that haven't caught up with the industry. The market has always been driven by competition, but as owners start to acknowledge that the majority of expenses are attributed to post-occupancy costs, we should see additional investment in upfront costs, including integrated teams, better building assemblies, and higher-quality systems that will lower overall costs throughout the building life cycles.

JK: In contrast, was there room for experimentation in the Giant Interactive Group Headquarters project in Shanghai that would never be possible with American institutional clients?

CB: Giant is one of the most experimental projects the office has done, and it happened because of a client that wanted to participate in the development of a completely unique piece of architecture. There are a couple of great stories from the project. For example, the client's office is in the segment of the building that cantilevers over the water. It's a huge cantilever—about 34 meters—and it's three stories tall. His office is at the top, followed by a reception/lounge area, and then the meeting room with a glass floor at the bottom. His first response when he saw the design was "Can it be bigger?"

In the U.S. most clients don't necessarily accommodate this type of discourse or conversation. They're not looking for a statement from the architecture; for most, it is more of a commodity. With the GSA projects, and even with the institutional projects, we spend a lot of time (and this goes back to the pragmatics) justifying to the clients why we're making certain design moves. In San Francisco, the project was driven by the constraints of sustainability—it was set up with the impetus that we'd get rid of the heating, ventilation, and air-conditioning systems. This had a huge impact for the owner, for both the sustainability side and because the government will maintain and operate the building for the next one-hundred-plus years. When we were able to take out a substantial amount of mechanical equipment and lower the energy costs, it justified the design intent.

The office is very pragmatic in our approach to architecture. I will not say that we have never had to justify architecture for the sake of architecture, but more often than not there is no need to, because we are addressing the constraints and performance of the project.

Stair at 41 Cooper Square. Photo: Iwan Baan.

JK: One of the core principles of Morphosis's work is a belief that buildings are unfinished constructions conditioned over time by changing culture and technology. How have you or building managers altered your projects after move-in?

CB: Emerson College Los Angeles and Gates Hall have just started occupancy, and we are doing some minor adjustments here and there, typical to any project. We focus less on adaptation of a space or suggestions for its use. We are more interested to see how the occupants view the architecture. For example, Gates Hall is a densely programmed space with very deep, large floor plates. We wanted to make sure there was enough daylighting in the corridors and interior offices, so we opened up the classrooms and offices with interior glazing allowing light to pass through from the exterior façade and the atrium. Since move-in, the glass has become an active part of the school; the glass walls of the offices have become a whiteboard for students and professors to leave notes for each other. In the atrium and the café, the glass has become a chalkboard for teams outside of class or meeting rooms to use while they are having coffee. We look for opportunities for chance encounters, but we've seen that occupants have a bit more creativity than we typically give them credit for.

41 Cooper Square is a good example as well. We designed the atrium to be a social interaction space, but it has become more than that. Professors will bring their students there for lectures. People have hosted performances on the atrium stairs. Occupants take ownership of the space and adapt it for uses as they see fit. Things happened that we didn't expect, which is great. It's exciting as an architect—you've provided a space for something to happen, and the client or occupant really takes ownership of that space and makes it his or her own.

JK: In a parallel way, are you getting feedback about the performance of environmental and technological features after construction?

CB: This has started to happen more frequently, but it depends on a client who is more educated, rigorous, and explicit about their goals. The commissioning process after occupancy—even for meeting LEED criteria—is often about minimum standards. This is client-driven so we don't necessarily have control or involvement.

Cornell has an ambitious and well-organized facilities management team. They have some exciting systems in place at their Ithaca campus—they're using the lake to offset a portion of the heating and cooling for their central energy plant. Gates Hall will be an interesting project, because the owner has a very rigorous system in place for assessing building performance—they've done this for the entire campus. They know the attributes of every building and internally audit each building's performance. Ideally we'll be able to gain some insight into our building's performance from their process.

JK: What are some of the next steps that you see for the office? What do you want to try out?

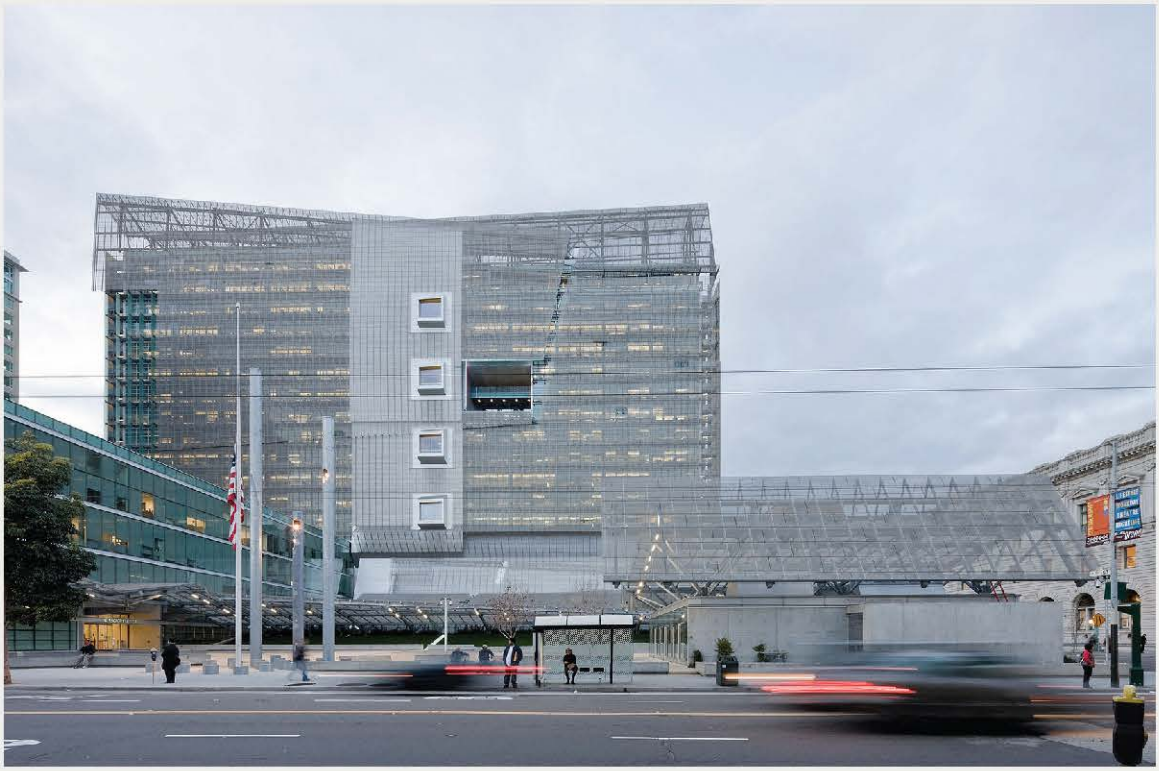
CB: I obviously have to be impartial. Our goals are always focused on the projects, but there are also opportunities for techniques like parametric modeling to be driven deeper

into the overall ideation of the project. The metrics don't necessarily have to address environment, design, or fabrication but could factor cost, GIS data, or even social (media) data. We should explore not only technologies in our field but also technologies that are happening in other disciplines and in a social context. There are a lot of opportunities; it all comes down to finding the right projects to explore these methods.

JK: Do you have any other thoughts regarding research?

CB: It's an exciting time. The industry is changing, the tools are changing, and, at a slower pace, mentalities are changing. The biggest transformations are happening in some of the least obvious projects. The most advanced owners and most detailed contracts in terms of shared risk-reward and integrated project teams are being driven by hospitals and medical facilities, where they need to ensure integration of building systems and guarantee the proper installation, function, and reliability of mechanical and medical equipment. In these projects, the life-cycle costs rather than initial costs become a bigger focus. In general, we are all in this same space, trying to explore, trying to find the best way to navigate an industry that's inevitably changing but still resistant to that change.

In the end, design is a process; our job as architects is to find the best solutions for the given problem(s). As a profession we need to continually ask—not only ourselves but our peers, our clients, our consultants, and our contractors—what can we do to add value to each project? The end goal shouldn't be to accommodate a function or to meet a present need but rather to improve the built environment and enhance the experience of those who use our spaces. Research and experimentation is central to this process.



San Francisco Federal Building. Photo: Iwan Baan.

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Cory Brugger directs the development and implementation of advanced design technology for Morphosis Architects. He provides day-to-day oversight of BIM integration and CAD production for the office and its multidisciplinary project teams. For more than ten years he has successfully managed the integration of CAD and BIM technologies on projects ranging from residential design-build to high-rise office towers. At Morphosis, Brugger's primary focus has been on the integration of parametric design tools and virtual building models into design and delivery processes. He holds a Bachelor of Architecture from Philadelphia University and a Master of Engineering from the Product-Architecture Lab at Stevens Institute of Technology.

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