professional practice issue 10.1

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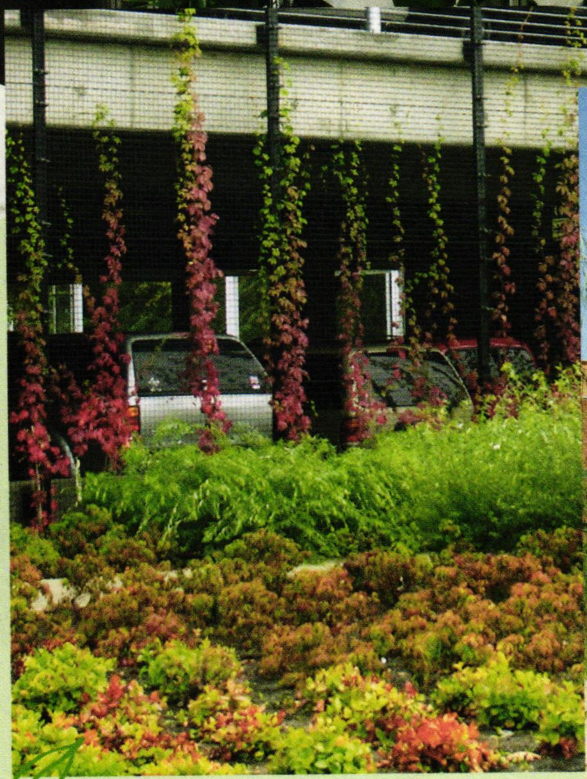
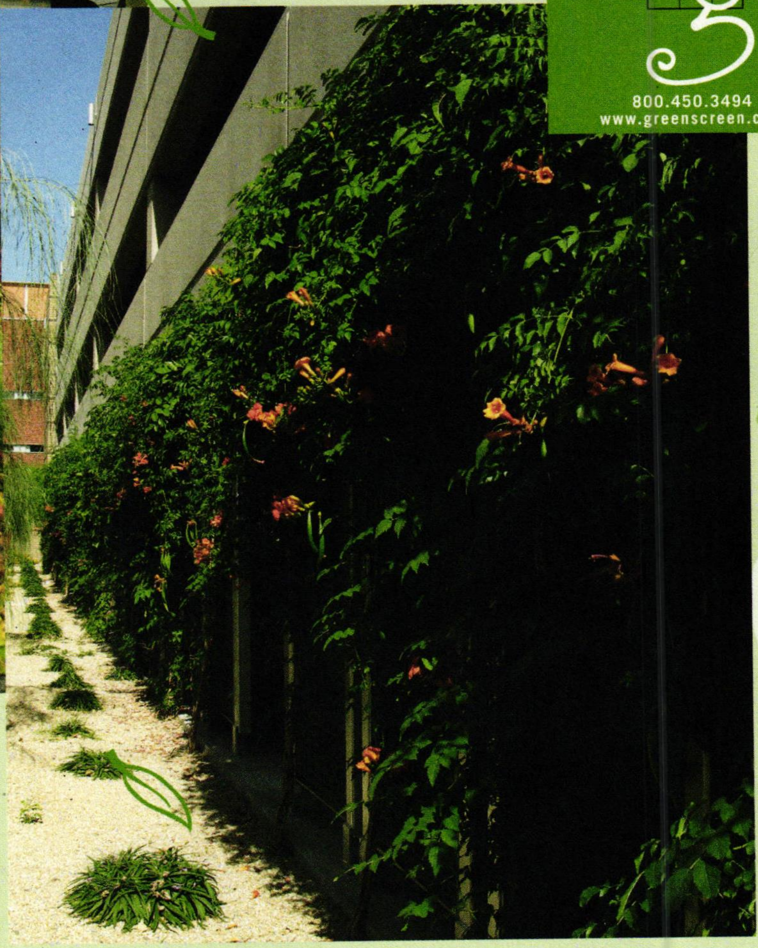


IN GROUND OR PLANTERS



THREE DIMENSIONAL
MODULAR
WALL MOUNTED
FREESTANDING
COLORS
SHAPES

GREEN WALLS

LANDSCAPED SURFACES

Content

Cover photo: BIM visualization rendering courtesy of Anderson Anderson Architecture

arcCA, the journal of the American Institute of Architects California Council, is dedicated to exploring ideas, issues, and projects relevant to the practice of architecture in California. **arcCA** focuses quarterly editions on professional practice, the architect in the community, the AIACC Design Awards, and works/sectors.

ADVERTISERS INDEX

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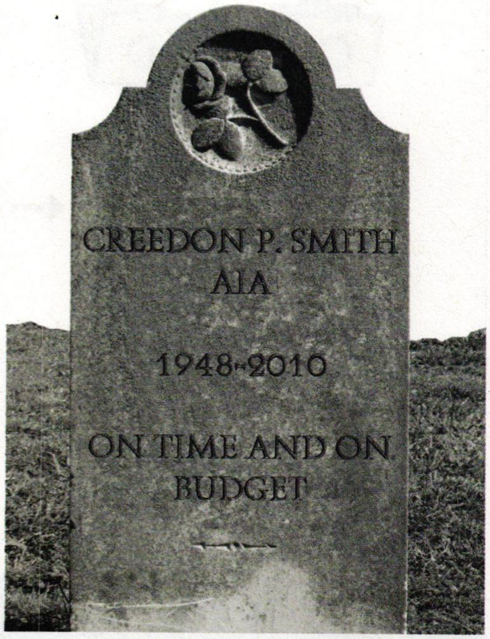

"Dog Bites Man," so the chestnut goes, is not news; "Man Bites Dog" is. That's not, in fact, altogether true: one of the most memorable American photographs of the 20th century is of a dog—a police dog—doing its damnedest to bite a man.

Nevertheless, in the main, the press—of which I write here as a member—subscribes to the notion. The architecture press, as well.

90% of the work we architects do has the newsworthiness of "Dog Bites Man," and appropriately so. Much of it, as many of us would concede, is unworthy not only of press coverage but also of the resources invested in it and of the space it takes up in the world, often for decades. One answer to the question, "What distinguishes *homo sapiens*, in kind, from other animals?" is, "We're the only creatures who clutter the world with the artifacts of our failures."

(An aside: perhaps one reason we cherish the exaggeratedly small estimates of the percentage of construction designed by architects is that we shrink from admitting how much we're actually responsible for.)

One way of looking at this issue of **arcCA** is that it's a hybrid of "Dog Bites Man" and "Man Bites Dog"—although our gentle readers may differ on which—parametric design or IPD—is the man and which is the dog. I will confess that I went into these topics with prejudices against each. Enjoying the luxury of the armchair critic, I suspected that IPD was about nothing more than bringing projects in on time and on budget; and parametric design was largely a vehicle for the indulgences of the "Damn the torpid people! Full speed ahead!" crowd. Neither of which passes the epitaph test.

While these motives are not altogether absent, the full reality is much richer and perhaps even reassuring. As Craig Hartman, FAIA, counsels in "Parametric Voices," "The past, from Borromini to Eero Saarinen, is replete with masterworks of fluid, organic space, and the future will be even more so, given the possibilities of computational design in the hands of talented architects," and, "Parametric design is a great leap forward in achieving intelligent built form, whether a teacup or a city." And Armando L. Gonzalez, FAIA, and David L. Goodale, AIA, write, in "Toward Integrated Project Delivery," "We have come to believe that IPD is not only an imminent technological delivery method. It will become . . . a design and construction methodology that has the potential to vastly increase both efficiency and quality."

"Intelligent built form" and "quality" are ever newsworthy.

Tim Culvahouse, FAIA, editor
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p.s. A special thanks to two individuals who guided me expertly through these new territories: for IPD, Nicki Dennis-Stephens, Hon. AIACC, Director of Member & Component Resources, AIA California Council; and, for parametric design, Lisa Iwamoto, Associate Professor, UC Berkeley, and Partner, IwamotoScott Architecture. Thanks also to Jim Bedrick, AIA, LEED AP, VP of Virtual Building and Design, Webcor Builders; J. Stuart Eckblad, Director, Design & Construction, UCSF Medical Center; Attorney Howard W. Ashcraft of Hanson Bridgett LLP; and Zigmund Rubel, AIA, for their guidance on IPD.

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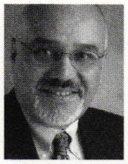

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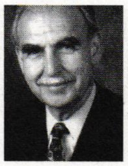

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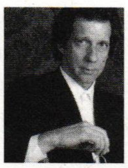

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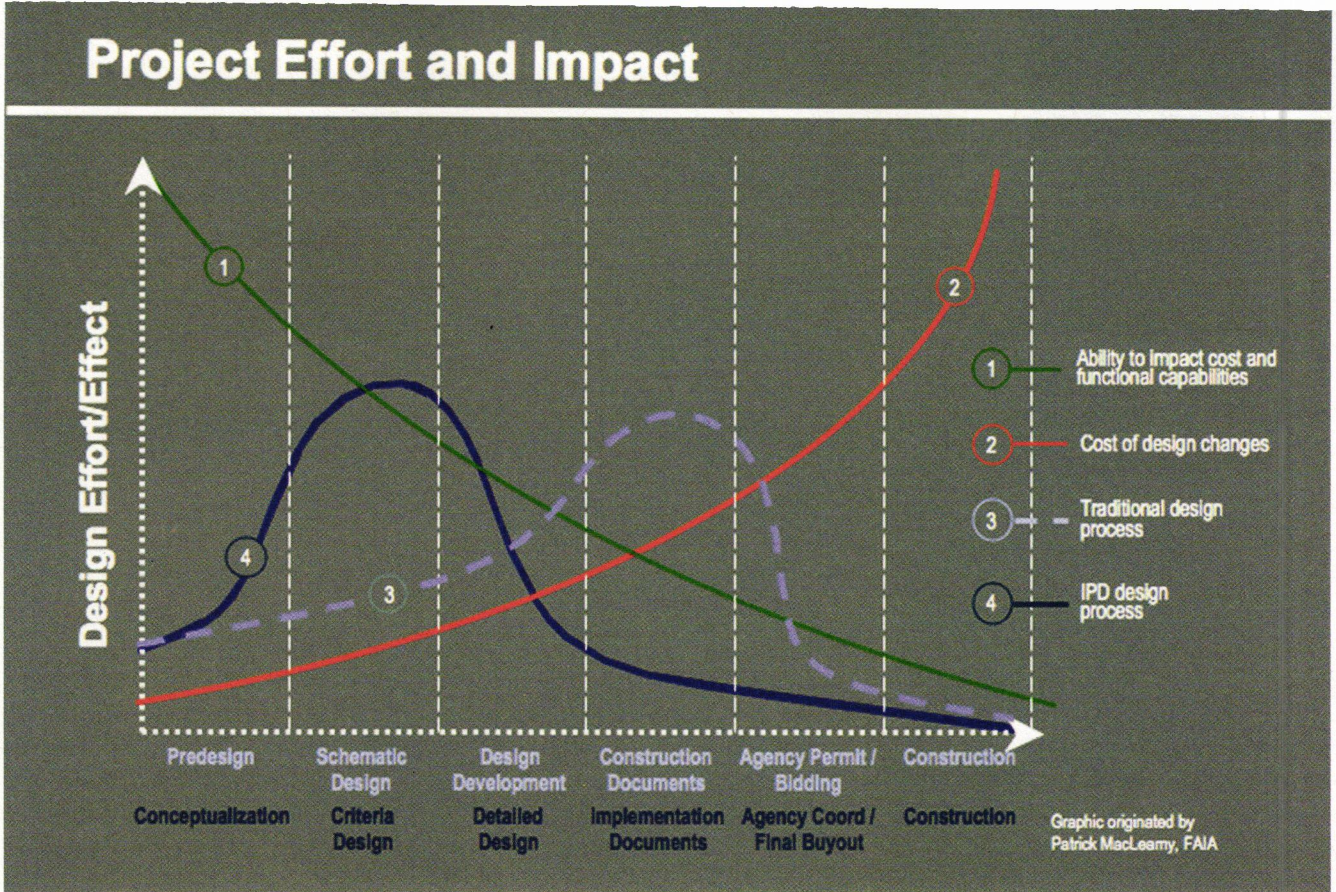


Integrated Project Delivery: A History of Leadership, Advocacy, and Commitment

Stephan Castellanos, FAIA

During my time in Sacramento as California State Architect, we embarked along with the AIA California Council (AIACC) on an effort to improve state building design and construction through the development of the Excellence in Public Buildings Program. This initiative was not simply an effort focused on improving design. It encompassed the entire arc of the delivery process, as well as maintenance and operations, as well as end user satisfaction, including a focus on sustainability.

What became very clear, very quickly was the fractured nature of the design and construction industry. Information was not shared in a way that reduced effort and improved outcomes. Technology had not penetrated the marketplace in a way that allowed for improved productivity. Statistics show that building construction is the only non-farm industry that has actually decreased in productivity since 1964. Slow to adopt new technology and mired in traditional delivery methods that are often inefficient and can become antagonistic, construction projects too often come in late and over budget. In addition, architects were seen as being incapable of producing workable construction documents, and the nature of the industry added to schedules and costs for owners.

Historically, building projects were a collaborative effort shared by owners, designers, and builders. This system began to change in the early 20th century, when states and private enterprise began to implement competitive bidding regulations requiring interested contractors to lump sum bid from "complete" design documents. Insurers convinced design professionals to shed risk by not actively participating in the craft in the craft of constructing their buildings. Eventually, trust among the major project stakeholders was eroded, often resulting in litigation over responsibilities and liabilities. Adversarial relationships among the stakeholders have impacted their ability to communicate effectively throughout project delivery. The results are cost and time overruns, dissatisfied owners and users, and billions of dollars of waste within the industry.

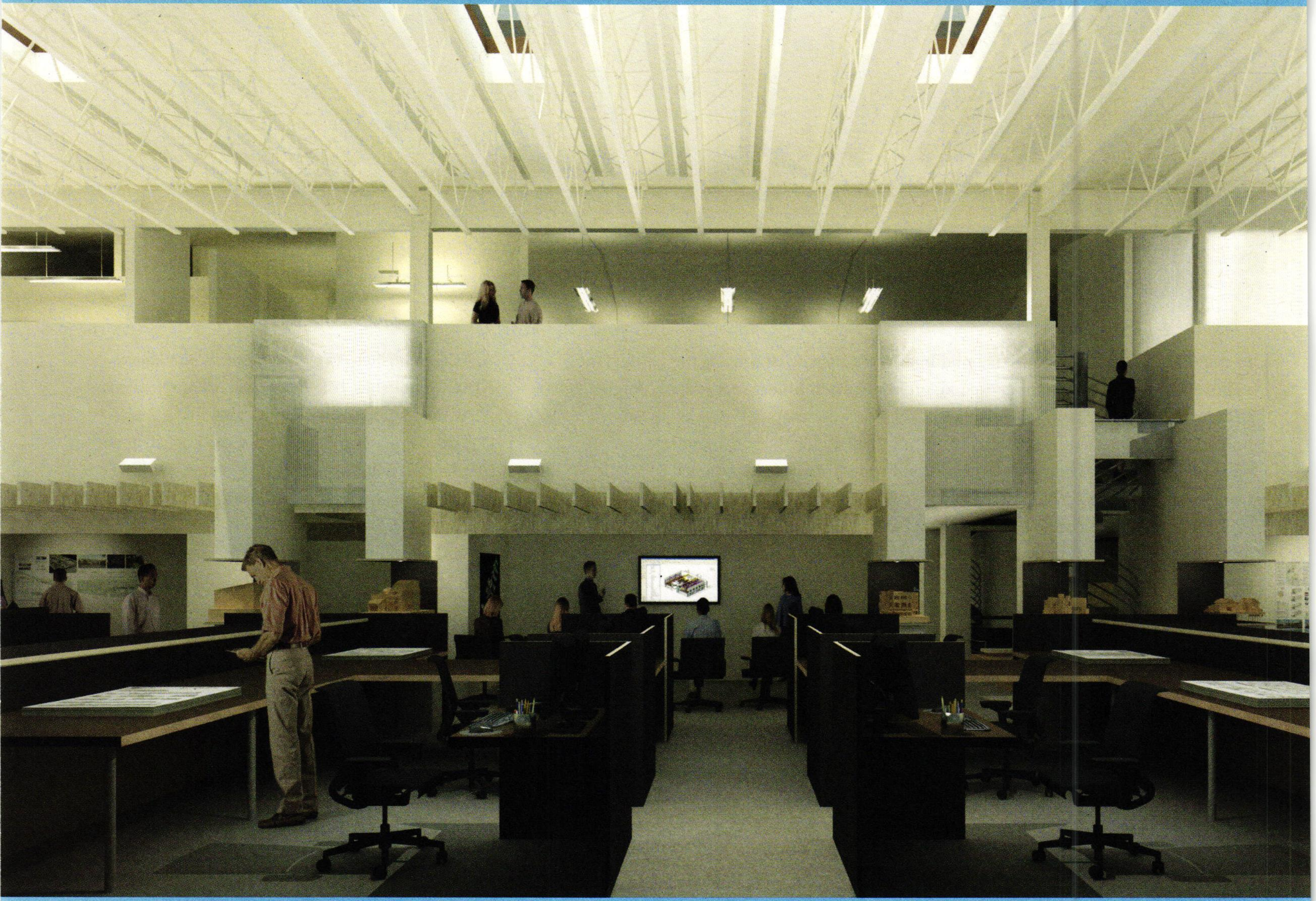
What was to be done? In 2002, the AIACC began to explore issues associated with project delivery and determine ways to improve efficiencies and better respond to client and community needs. 2002 AIACC President Carl Meyer, FAIA, convened a task force to encourage discussion within the design and construction industry about the market forces at work that would revolutionize project delivery.

In 2004, the Construction Users Roundtable also responded. This group of significant clients threw down a challenge to the industry that AIACC picked up in a way that leads the movement toward real change. Clients were demanding improvement. By implementing global communication, continuous process improvement, and integrated decision making into their own businesses, they sought to increase productivity and profitability and expected the same of their partners.

The AIACC learned early on that, to be successful, we could not solely be a committee of architects. In order to break down the silos that exist between members of the team and be truly effective advocates for the issue, we had to expand the efforts to include a variety of design and construction professionals, as well as owners and members of the academic community. With subcommittees and programs focused on providing resources in the areas of education, policy, and practice, the AIACC has defined the issue and added significantly to the IPD "vocabulary," as demonstrated by the following timeline of accomplishments:

May 2006	AIACC publishes *AEC Integration White Paper*
August 2006	AIACC publishes *IPD Frequently Asked Questions*
August 2006	AIACC co-sponsors with McGraw-Hill Construction a survey of over 14,000 construction industry participants about IPD issues
May 2007	AIACC publishes *Integrated Project Delivery: A Working Definition*
June 2007	AIACC co-sponsors IPD "Change Conference" with McGraw-Hill Construction and launches the IPD website at www.ipd-ca.net
Nov 2007	AIACC collaborates with National AIA to create *IPD: A Guide*
June 2008	AIACC hosts the first "IPD Lessons Learned Symposium"
Aug 2008	AIACC publishes the *Model Progression Specifications*
Nov 2009	AIACC publishes *IPD Frequently Asked Questions #2*
May 2009	AIACC publishes *IPD: Experiences in Collaboration*
Aug 2009	AIACC co-sponsors the "IPD Seminar Series" with McGraw-Hill and Hanson Bridgett
Jan 2010	AIACC collaborates with National AIA to create *IPD: Case Studies*

In addition to this list of items already completed—and hundreds of articles and presentations produced throughout the country—efforts continue with additional case studies, policy standards, regulatory requirements, publications on implementing IPD, and client advocacy efforts. All of which are important components in making a dramatic change in the way our industry constructs our built environment. The AIACC continues a steadfast commitment to this issue. ◉



Toward Integrated Project Delivery:

A New Design and Delivery Method

Armando L. Gonzalez, FAIA, and
David L. Goodale, AIA

Traditionally, construction has involved a contractual relationship between the contractor and the client, many times a low-bid competitive relationship among contractors to secure the project, and a frequently combative relationship between the architect and contractor over performance. The economically competitive nature of this structure squanders vast energies—on interpretive posturing, and, sometimes, on litigation—diverting focus from the art of building. Integrated Project Delivery (IPD) is a design-and-construction delivery method that is designed to ameliorate this process, resulting in buildings that better embody the guiding principles of the project and better serve the client and the end user.

IPD is entered into by an owner, contractor, and architect, who agree to work together as a single entity, under a multi-party agreement. In pure IPD—the subject of this article—risk is shared on a pro rata basis.

IPD pools the goals of all parties from the beginning, resulting in a conversation enlightened by three points of view: the owner's desire for a quality building that best serves the end user, the contractor's desire to meet the owner's budget and schedule, and the architect's desire for architectural excellence. The full complement of consultants, managers, agents, manufacturers, suppliers, builders—held to their best—will each contribute collaboratively to design and construction excellence.

By incorporating the expertise and mutual trust of all parties early in the design process, construction conflicts come to light earlier, reducing the need for costly change orders or last-minute so-called value engineering, and diffusing the potential for combative relationships. The owner, as client, remains the principal end-point decision-maker, but the presentations and arguments for varying points of view happen continuously, in round table discussions, rather than in crisis—during construction documents and at the construction site.

For its office remodel, Gonzalez Goodale has abandoned the traditional office/open space hierarchy and adopted a collaborative model that facilitates the IPD process. The new space is organized in pods, where team members meet, develop, and analyze alternatives in an interactive, data-rich environment.

In-House IPD Workshops

To deepen our understanding of IPD, our studio mounted a series of workshops on the subject, inviting to the first meeting a contractor and an owner's representative, with whom the firm had worked before, to participate in this exploration.

To facilitate the workshops, we prepared agendas for sessions and visuals for enhanced discussion and assembled background materials on the topic. Sample contracts and papers on mediation and risk sharing were forwarded to participants. Attendees were asked to prepare for the meetings and to give presentations on various subjects ranging from arguments both for and against IPD to the mechanics of how IPD actually functions.

This discussion model proved critical for "re-education," as all participants came to IPD with prejudices. Our familiarity with each other and mutual respect from work on past projects helped us to work through the issues that arose. Indeed, the team has considered doing either a pilot project or a mock project to gain some experience in this new method.

It became clear right away that we needed to bring in construction litigators to discuss legal considerations, as well as insurance brokers to discuss risk sharing and the potentials to modify insurance coverage, so we invited them to present at our third workshop meeting.

Ultimately, issues that originally seemed like obstacles, such as insurance and the lack of a model agreement, sorted themselves out. Insurance companies are favorable to IPD, because it lessens the chance of a dispute, IPD insurance is available, and the AIA has recently published a multi-party agreement for IPD that is readily accessible.

Integrating the Design Studio with IPD

In parallel with our evolution toward IPD, we have been re-designing our architectural studio in pursuit of a more open, lively workspace. The layout models, at a smaller scale, IPD's notion of the ideal workspace as a "Big Room," where traditional hierarchy is abandoned in favor of collaboration.

The studio renovation is currently midway through a phased construction. The overall structure is an open, day-lit warehouse space divided into six pods, each accommodating a project team of six to eight people—one of whom will be a lead principal—each working at generous and equal U-shaped stations where communication trumps privacy. Each pod will have, as its focus, a large meeting space wired for Internet connections, teleconferencing and video, large-screen 3-D modeling technology, as well as tack-up and touch model space. The studio becomes, essentially, an open deck, with open sight lines and maximized human communications. The always visually cumbersome physical storage requirements—studio-wide materials library, resources, and storage—will be at close hand, via spiral stairs, in a loft space above the studio.

Looking forward, we envision the three parties involved in IPD not just in the conference room. We see the owner, architect, and contractor in each open-pod meeting environment, studying, analyzing, and manipulating the project alternatives on a 3D model, which is the ideal collaborative tool and an essential part of the IPD process. With the collaboration of contractor and subcontractor, models will take on the rich—and real—character of shop drawings long before the construction process begins.

After an immersion in IPD, we have come to believe that IPD is not only an imminent technological delivery method. It will become—at the collaborative insistence of its three principal players—a design and construction methodology that has the potential to vastly increase both efficiency and quality. It will also, with the architect's professional education, engagement, and leadership, become the forum for architecture, as an art, to retain—or to regain—a critical place at the table. For architects to maintain their stewardship of the built environment, it is critical that we have a key leadership role in the development of this new approach to designing and building projects. If we dally, and others less suited to the task embrace it, the built environment will suffer. ◉

Workshop agendas

Meeting 1 - review assumptions about IPD

Meeting 2 - discuss compelling arguments for IPD; review risk-sharing matrix and discuss legal considerations (attorneys present at this meeting)

Meeting 3 - insurance brokers give presentations about wrap-around policies, owner-controlled insurance programs, third-party suits (attorneys present at this meeting)

Meeting 4 - review administrative and legal aspects of IPD

Meeting 5 - review November 2009 document AIA C191—standard-form, multi-party agreement for IPD—general conditions and exhibits

Meeting 6 - discuss pros and cons of AIA IPD contract with client's, contractor's, and architect's attorneys.

"As architects administering low-bid institutional construction contracts, we've seen the damage done by combativeness and litigation. Places like Japan, where there has traditionally been a deeper respect for the craft of architects on the part of the contractor, and vice versa, often have a correspondingly higher quality of built work."

- David Goodale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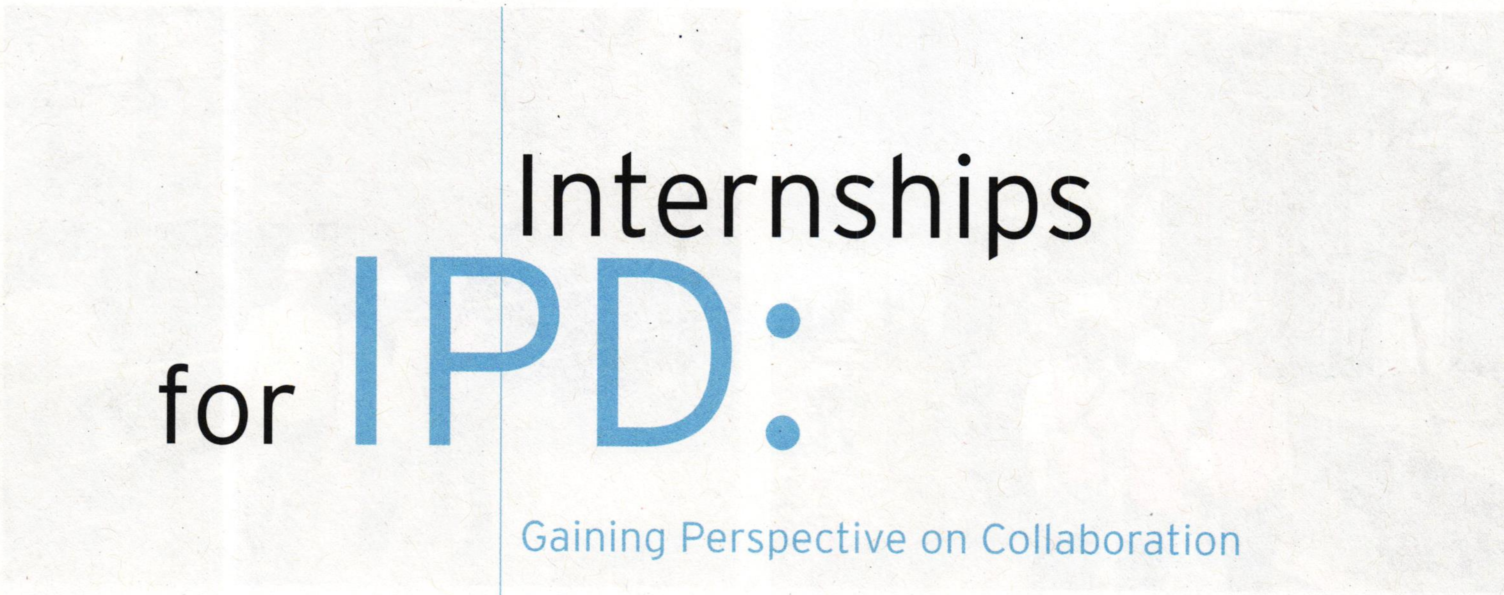
Internships for IPD:

Gaining Perspective on Collaboration



Dorit Fromm, AIA

While the big push toward integrating project delivery centers on shared modeling using BIM, the art of collaboration is not taught at a terminal. Nor is it covered in the architectural curriculum. Relationships may be aligned in contractual cooperation, but the professional paths, traditionally independent and easily adversarial, still remain familiar.

In training for the next generation, insights into the goals and challenges of other AEC team members will grow in importance, complementing insights into software. How are such skills taught and honed?

A structural engineering firm, San Francisco based Forell/Elsesser, has been conducting an intern experiment that shows promise. President and CEO Simin Naaseh had the goal of developing an internship program that would be in tandem with the firm's increasing IPD projects. Her idea was to rotate interns within the offices of owners, architects, engineers, and contractors, one month in each—a program that Forell/Elsesser terms Integrated Skill Development (ISD).

The pilot program was started in the summer of 2009. At that time, the engineering firm was part of a project team, with SmithGroup Architects and DPR Construction, working on the $119 million, 80,000-sq.ft. University of California, San Francisco (UCSF) Institute for Regeneration Medicine, designed by New York architect Rafael Viñoly. This project seemed ideal for launching this new internship program, as it would be an extension of the project's delivery process.

Forell/Elsesser contacted the other team members about sharing interns. The firm began interviewing civil and structural engineering students from top schools in the Bay Area, asking if they would be interested in splitting their time between two or three offices during the summer. "All showed great interest and excitement, and this encouraged us," recalls Naaseh.

Participating team members approved each chosen student. Each office designated a contact person who helped in the coordination of four-week stints, and each paid for "their" month of intern time.

Interns Joanna Huey, UC Berkeley and Jamie Pobre, UC Berkeley with Chuck Staley, Hunt Construction at UC Berkeley Student Athlete High Performance Center (HNTB, Forell/Elsesser, Hunt)

Interns Xiaoyu He, UC Berkeley, Nathan Cannery, Stanford University and Jamie Pobre, UC Berkeley at the UCSF Parnassus IRMB construction site. (SmithGroup, Forell/Elsesser, DPR)

Interns Jamie Pobre, UC Berkeley and Joanna Huey, UC Berkeley with Andrew Ellis, Hathaway Dinwiddie at UC Berkeley Naval Architecture Building site. (Gensler, Forell/Elsesser, H-D)

"Our aim was not to send an engineering student to the contractor's or architect's office to sit in front of the computer there," explains Naaseh. "This is not just about BIM, but about learning skills, aptitudes, and an understanding of developing and delivering a project as a whole." Interns did indeed develop an appreciation of all team members' issues and concerns. Nathan Cannery, engineering intern from Stanford University, wrote the following:

> *This internship experience allowed me to gain a more rounded perspective of the whole development process, from conception, through bidding, design, construction, and move-in. This larger vision will help me in my interactions with the other project disciplines in my future work. Also, working at Nova (UCSF's project representative) provided me with the owner's perspective, which surely doesn't center on the structural system! Who would have guessed?*

"To have engineering students 'walk' in the shoes of an architect or owner or contractor allows them to understand concerns and perspectives that are essential for truly collaborative and seamless working relationships," believes Naaseh. "I'm excited about the opportunity to contribute to the broader education of the next generation of AEC leaders. Of course, this means that we will be expanding the program and taking on architectural and construction management students here next summer. Through this process, even we veterans will learn more about what it takes to go from a silo-based to a more integrated practice."

Of course, there were a few differences along the way that needed to be "integrated." It was decided that all the interns should be paid the same, no matter whose office they worked in, for fairness. The architects, it turns out, normally pay their interns less than the engineers. "We all have to be flexible in order to accomplish the bigger goal," explains Simin about their finding a wage compromise. ◉

IPD
Case Studies

Tim Culvahouse, FAIA

As the latest product of their ongoing partnership, the AIA California Council Integrated Project Delivery Steering Committee and the AIA National Integrated Project Delivery Interest Group have released *Integrated Project Delivery: Case Studies,* which is available, at no charge, at http://aia.org/ipdcasestudies. Researched and reported by Jonathan Cohen, FAIA, it examines six recent projects:

Autodesk, Inc.'s AEC Solutions Division Headquarters in Waltham, Massachusetts; Kling Stubbins, architect; Tocci Building Companies, builder;

Sutter Health's Fairfield Medical Office Building in Fairfield, California; HGA Architects and Engineers, architect; The Boldt Company, builder;

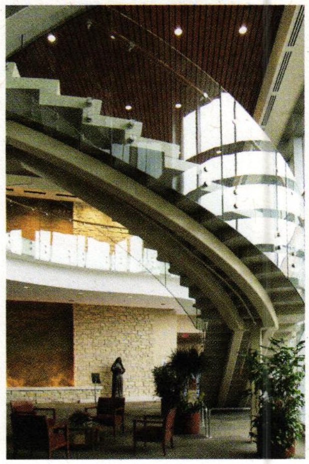
SSM Healthcare's Cardinal Glennon Children's Hospital Expansion in St. Louis, Missouri; Christner Inc., architect; McGrath Inc., MEP Engineer; Alberici Constructors, Inc., builder;

SSM Healthcare's St. Clare Health Center in Fenton, Missouri; HGA Architects and Engineers, architect; Alberici Constructors, Inc., builder;

Encircle Health LLC's Ambulatory Care Center in Appleton, Wisconsin; HGA Architects and Engineers, architect; The Boldt Company, builder; and

Arizona State University's Walter Cronkite School of Journalism; City of Phoenix, building owner; Ehrlich Architects, design architect; HDR Architecture, executive architect; Sundt Construction, builder.

opposite: Autodesk, Inc.'s AEC Solutions Division Headquarters, photo by Jonathan Cohen; above, Sutter Health's Fairfield Medical Office Building, photo by Vance Fox.



left, SSM Healthcare's Cardinal Glennon Children's Hospital Expansion, photo by Sam Fentress; right, SSM Healthcare's St. Clare Health Center, photo by Jonathan Cohen

Through data collection and interviews with project participants, the study compares project goals and outcomes, enriched by narratives of project conception and execution. The projects were not "cherry-picked" to highlight success; in fact, they (plus one other Autodesk project covered in a sidebar) were the only completed projects in the country known to have used a pure form of IPD, which, for the purpose of the study, is defined by six characteristics:

- Early involvement of key participants;
- Shared risk and reward;
- Multi-party contract;
- Collaborative decision-making and control;
- Liability waivers among key participants; and
- Jointly developed and validated project goals.

The motivation behind the development of the Integrated Project Delivery Model is to align the interests of owner, architect, and builder, to encourage the collaborative setting of priorities and solution of problems. While the ultimate goal is to create better buildings, adherence to budget and schedule remain important indicators of success.

In each case, desired schedules were realized, or nearly so. Autodesk's aggressive, 35-week schedule for design and construction grew to only 37 weeks, with the owner's decision to introduce an atrium connecting the three floors of this 55,000 square foot TI project. St. Clare's 27-month schedule was extended by three months by the owner, to accommodate the introduction of electronic medical records systems and because of a reevaluation of their plan to move during the winter holidays. Encircle's 12 month construction schedule stretched to 13 months. Sutter achieved its overall schedule, despite a 3-month delay for program revision; while Cardinal Glennon and Cronkite beat their schedules. Budgets were similarly well controlled, and change orders, except those initiated by owners, were entirely eliminated in all six projects.

While the study sought the purest examples yet available of the IPD process, it nevertheless identifies significant differences among the project agreements and methodologies. Among these variables are the terms of the contractual relationships, the arrangements for sharing risk and reward, and the particulars of joint management structures.

All but one of the projects were realized under true multi-party contracts. The exception is the Cronkite School, which was a build-to-suit venture by the City of Phoenix for Arizona State University, financed by a city bond measure. It employed a two-way owner/designer-builder contract as prescribed by city procurement regulations. As the report describes, however, "The participants decided collectively that the only way to insure that the owner's budget, schedule, and programmatic requirements could be met was to follow IPD principles in managing project delivery. The team made a conscious decision to sign the contract but not to let it dictate behavior."

Three of the projects had arrangements for shared risk and reward. The Autodesk agreement included an Incentive Compensa-

Encircle Health LLC's Ambulatory Care Center,
photo by Jonathan Cohen

Change orders, except those initiated by owners, were entirely eliminated in all six projects.

tion Layer (ICL), through which the architect's and builder's anticipated profit could be reduced or increased, based on falling short of or exceeding measurable goals. An independent evaluator gave the team "high marks ... for exceeding design expectations," and the team received the incentive increase.

In the Cardinal Glennon project, $400,000 in funds saved out of the roughly $1 million contingency were distributed at project completion—40% to the owner, 20% to the design team, and 40% to the builder and its Lean partners (MEP/FP and drywall). (Interestingly, design was already underway when the parties decided to adopt IPD.)

And for Encircle Health, "Architect and builder worked on a time-and-materials basis at a reduced billing rate, with a portion of anticipated profits placed at risk depending on project outcomes. The contract provide[d] for a performance contingency, consisting of at-risk profits, plus typical contingencies, with a formula to split funds remaining in the pot at the end of the project."

The project Narratives and Lessons Learned are rich with recommendations, not only regarding the defining characteristics of IPD given above, but also on a set of additional characteristics considered highly desirable: mutual respect and trust, collaborative innovation, intensified early planning, open communication, Building Information Modeling (BIM), Lean principles, co-location of teams, and transparent financials.

While not without critical and cautionary observations, these case studies encourage optimism. As Trent Jezwinski, The Boldt Company's project manager on the Encircle Health project, reflects,

> *I've never had a job run this smooth in 23 years. There wasn't any of that silo mentality—and to be able to move that feeling into the construction site is huge. I've never seen a project work as a team like this one did, from the top down and including the installers and guys in the field. When you have a hand in establishing the schedule and see how your trade fits into the whole process, you tend to believe in it and act accordingly. Slack is greatly reduced. The interactive scheduling process showed you the logic of where everything had to go – you trusted it and had ownership over it, and if you didn't fulfill your promises you felt you had let down the team. If you have partners who are willing to change culturally then this process could work anywhere.* ◉

Arizona State University's Walter Cronkite School of Journalism,
photo by Jonathan Cohen

Resources for IPD and Parametric Design

Integrate

Integrated Project Delivery

American Institute of Architects, California Council—resources include *Integrated Project Delivery: A Working Definition, Experiences in Collaboration,* and *Frequently Asked Questions,* www.ipd-ca.net

American Institute of Architects—resources include *The Integrated Project Delivery Guide* and various IPD contract models, www.aia.org/ip_default

AIA Contract Documents—Multi-party Agreement C191, Single-Purpose Entity C195 Transitional A195, A295,B195 www.aia.org/contractdocs

National Institute of Building Sciences, National BIM Standards (NBIMS) Committee—http://www.facilityinformationcouncil.org/bim/publications.php

U.S. General Services Administration—the nation's largest facility owner and manager's program to use innovative 3D, 4D, and BIM technologies, www.gsa.gov/bim

ConsensusDocs 300 Series Collaborative Documents—www.consensusdocs.org

Associated General Contractors of America—*BIM Guide for Contractors,* www.agc.org

McGraw-Hill Construction—www.construction.com/NewsCenter/TechnologyCenter/Headlines/archive/2006/ENR_1009.asp

Construction Users Roundtable (CURT—owners' views on the need for Integrated Project Delivery, www.curt.org

Open Standards Consortium for Real Estate—standards related to information sharing/BIM, http://oscre.org/

Open Geospatial Consortium—developing international standards for geospatial and location based services, www.opengeospatial.org

FIATECH—consortium of capital project industry owners, engineering construction contractors, and technology suppliers that provides global leadership in integrated technologies, http://fiatech.org/

LEAN Construction Institute—non-profit corporation conducting research in project based production management, www.leanconstruction.org

National Institute of Standards and Technology (NIST)
–*Cost Analysis of Inadequate Interoperability in the U.S. Capital Facilities Industry,* www.bfrl.nist.gov/oae/publications/gcrs/04867.pdf
–*UNIFORMAT II Elemental Classification for Building Specifications, Cost Estimating, and Cost Analysis,* www.bfrl.nist.gov/oae/publications/nistirs/6389.pdf

OmniClass—a classification structure for electronic databases, www.omniclass.org

Construction Specifications Institute—*MasterFormat,* www.csinet.org/s_csi/docs/9400/9361.pdf

Design Build Institute of America (DBIA—library of information related to design-build, www.dbia.org

Center for Integrated Facility Engineering (CIFE)—research center for Virtual Design and Construction, www.cife.stanford.edu

International Alliance for Interoperability (IAI) buildingSMART Alliance—international organization working to facilitate software interoperability, www.iai-na.org

The California Center for Construction Education (CCCE)—practitioner education, applied research services, and consultation to the design and construction industry, www.ccce.calpoly.edu

Parametric Design

Books

Benjamin Aranda, *Tooling,* Pamphlet Architecture 27, Princeton Architectural Press, 2005

Cecil Balmond, *Informal,* Prestel USA, 2007

Evan Douglis, *Autogenic Structures,* Taylor & Francis, 2008

Erwin Hauer, *Continua-Architectural Screen and Walls,* Princeton Architectural Press, 2007

Lisa Iwamoto, *Digital Fabrications: Architectural and Material Techniques,* Princeton Architectural Press, 2009

Branko Kolarevic, editor, *Architecture In the Digital Age: Design and Manufacturing,* Taylor & Francis, 2005

Branko Kolarevic and Kevin Klinger, *Manufacturing Material Effects: Rethinking Design and Making in Architecture,* Routledge, 2008

Branko Kolarevic, *Performative Architecture: Beyond Instrumentality,* Routledge, 2005

Neil Leach, David Turnbull, and Chris Williams, eds., *Digital Tectonics,* Academy Press, 2004

Michael Meredith, *From Control to Design,* Actar, 2008

Ali Rahim, *Catalytic Formations,* Taylor & Francis, 2006

Jesse Reiser, *Atlas of Novel Tectonics,* Princeton Architectural Press, 2006

Peter Szalapaj, *Contemporary Architecture and the Digital Design Process,* Architectural Press, 2005

Journals

Kostas Terzidis, *Algorithmic Architecture,* Architectural Press, 2006
________, *Algorithms for Visual Design Using the Processing Language,* Wiley, 2009
________, *Expressive Form: A Conceptual Approach to Computational Design,* Spon Press, 2003

Michael Hensel, Achim Menges, and Michael Weinstock, eds., *AD [Architectural Design]: Emergence: Morphogenetic Design Strategies,* Academy Press, July 2004

________, *AD: Techniques and Technologies in Morphogenetic Design,* Academy Press, May 2006

Michael Hensel and Achim Menges, eds., *Morpho-Ecologies: Towards Heterogeneous Space In Architecture Design,* AA Publications, February 2007

Michael Hensel, *AD [Architectural Design]: Versatility and Vicissitude: Performance in Morpho-Ecological Design,* Wiley, April 2008

Christopher Hight and Chris Perry, eds., *AD: Collective Intelligence in Design,* December 2006

Ali Rahim and Hina Jamelle, eds., *AD: Elegance, Academy Press,* March 2007

Links

USC School of Architecture's PARAsite: http://arch-pubs.usc.edu/parasite/

USC School of Architecture, Intensive Fields conference, video documentation: http://arch-pubs.usc.edu/parasite/intensive-fields/video-archive/

NBBJ: Parametric Strategies in the Design of Hangzhou Stadium: http://nmillerarch.blogspot.com/2009/12/parametric-strategies-in-design-of.html

computational design italy: www.co-de-it.com

Grasshopper: www.grasshopper3d.com

Ocean Design Research Network: www.ocean-designresearch.net

A Working Definition

Power Analytics Software for Design, Operation, and Micro-Grids

Jim Neumann, Vice President, EDSA Micro

With sustainability rising in importance, architects have been evolving in their thinking of projects, viewing them not as individual buildings, but as active parts of the global energy smart grid.

Energy-smart buildings are critical to our country's sustainability. Industry experts estimate that $100-165 billion is being invested in modernizing and adding intelligence to power grids across the United States over the next 20 years. More than $33 billion has been included in the 2009 American Recovery and Reinvestment Act for smart grid, energy management, renewable energy, and other forms of energy research. The expected result: a flexible, easy-to-manage nationwide smart grid.

Much research is focused on Distributed Energy Resource (DER) systems or "micro-grids," because they are intended to make standalone facilities as autonomous as possible, rather than reliant solely on public power grids.

From Promising to Practical

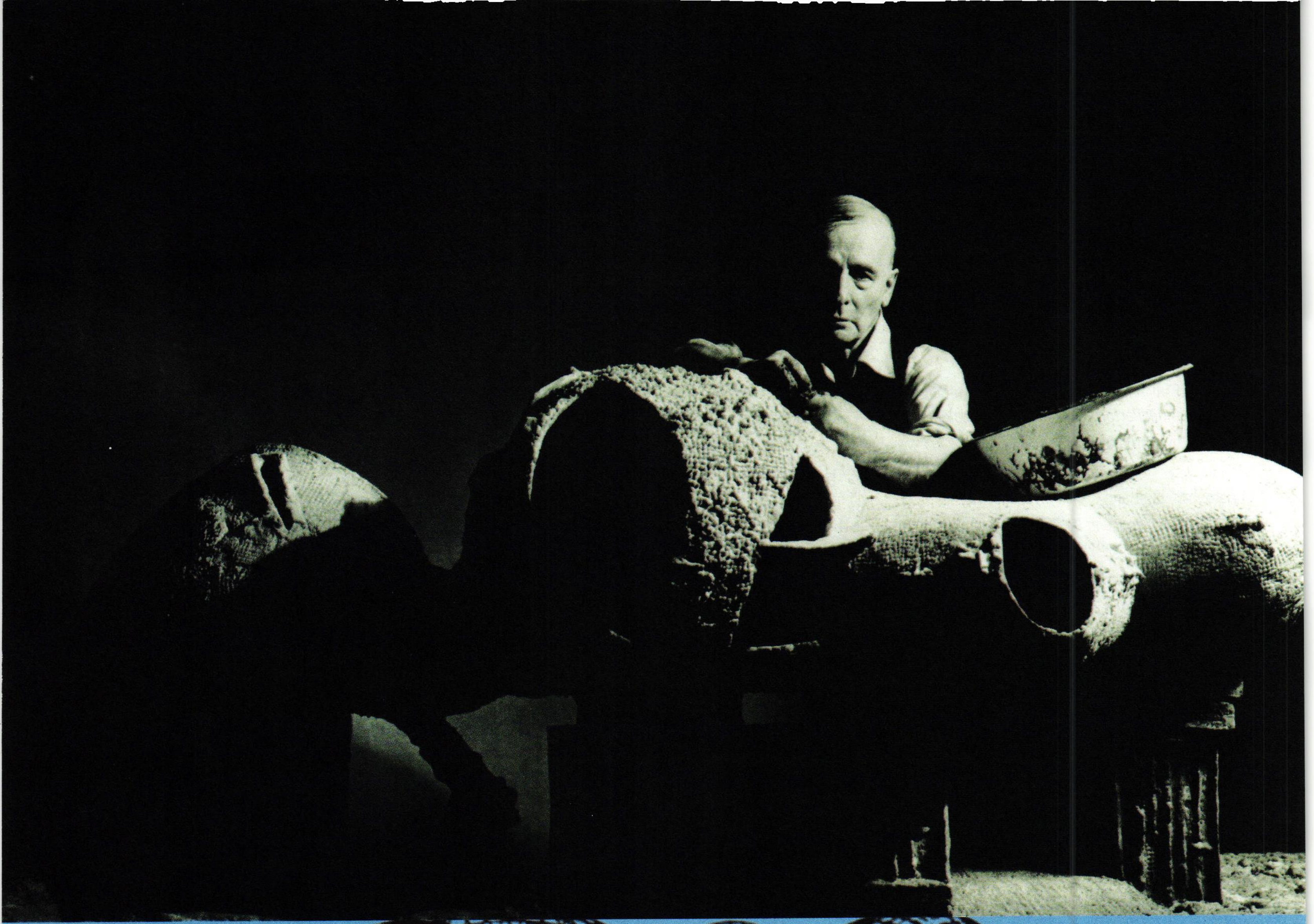
A major hurdle in the deployment of this promising technology lies in how to control energy consumption, energy management, and real-time switchovers from one power source to another. As more organizations explore supplementing their utility power with on-premise power generation, they need a way to monitor the micro-grid's power quality, utilization, and capacity in real time so they can offer excess capacity to the smart grid.

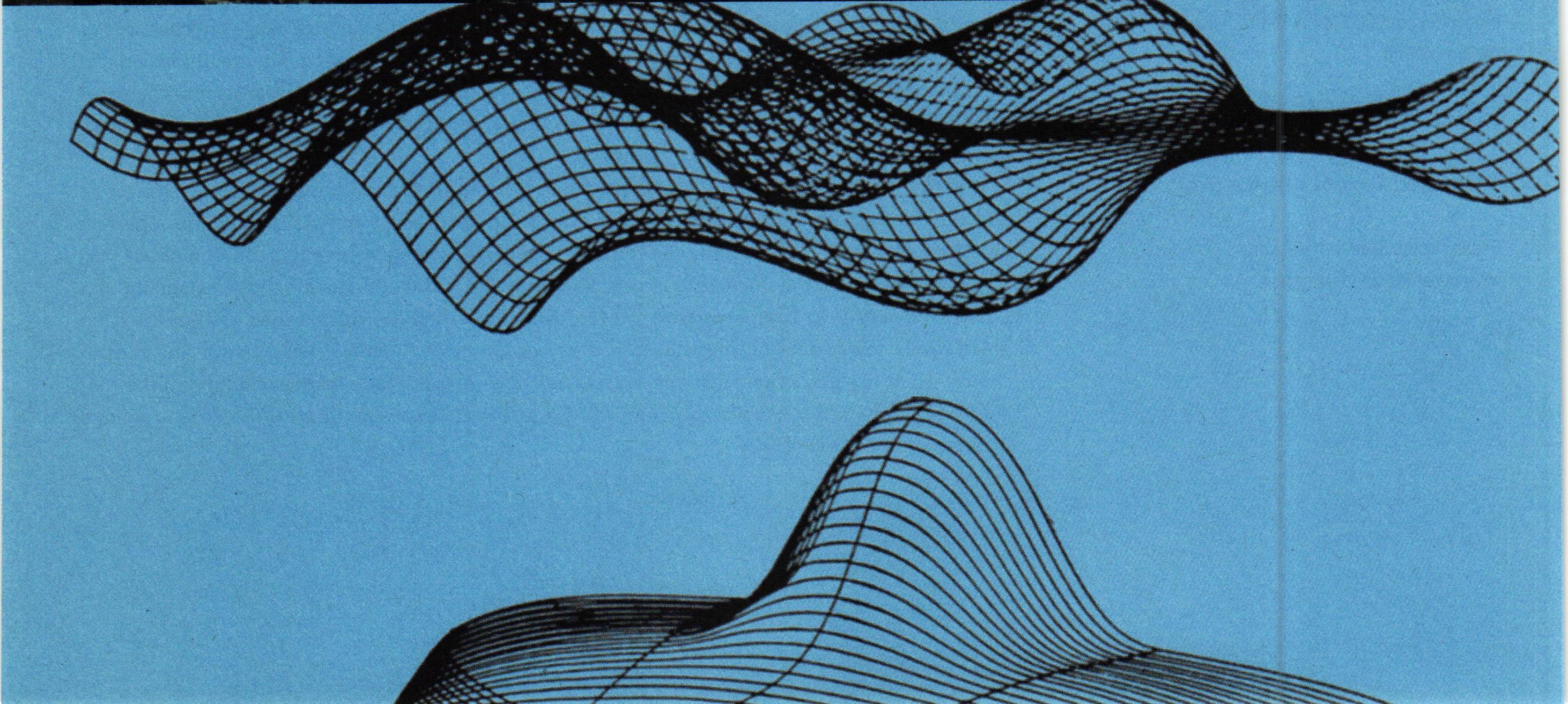
Fortunately, some technology companies are developing software platforms for the on-line management and control of next-generation hybrid power infrastructure, incorporating both traditional utility power and on-premise power generation such as solar power, wind turbines, and battery storage.

Known as power analytics, these software systems create a model-based power system and apply that model in a real-time environment. This approach allows for extensive what-if simulations based on actual conditions for energy management (including power usage effectiveness or PUE), as well as for arc flash and overall power cooling, space management, conditional alarm management, and other situations. These software systems will monitor all transactions between public electric service and micro-grid infrastructure and maintain rate and pricing information, as well.

If the industrialized world is going to be successful in using alternative energy sources to address the fragility of the national power grid, micro-grids are a promising solution. The real challenge, however, is controlling the transition from one energy source to another without putting the reliability of the micro-grid at risk. Power-wise, it is the ultimate high-wire balancing act.

In the very near future, certain software companies will be instrumental in removing the greatest obstacle hindering the widespread use of alternative energy: using power analytics to choose when to safely employ energy sources, such as solar or wind, without trading off the reliability of utility power. Such technology will aid architects significantly with the design options they can offer their clients. ◉





Parametric Design: a Brief History

Stephen Phillips, AIA, PhD

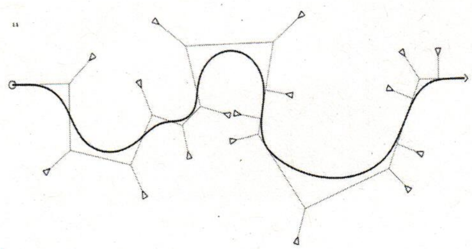
The form of the house is not amorphous, not a free for all form. On the contrary, its construction has strict boundaries according to the scale of your living. Its shape and form are determined by inherent life processes. —Frederick Kiesler

Parametric design is not unfamiliar territory for architects. From ancient pyramids to contemporary institutions, buildings have been designed and constructed in relationship to a variety of changing forces, including climate, technology, use, character, setting, culture, and mood. The computer did not invent parametric design, nor did it redefine architecture or the profession; it did provide a valuable tool that has since enabled architects to design and construct innovative buildings with more exacting qualitative and quantitative conditions.

As of a conference held by the Boston Architectural Center (BAC) in 1964, it had already become clear that the electronic era would have a dramatic effect on building design. The aerospace industries were using computers to calculate complex warped surfaces and animated flight path simulations, which fascinated architects. [opposite, bottom] As UCLA student Raphael Roig predicted in his unpublished master's thesis, *The Continuous World of Frederick J. Kiesler,* "It would only be a matter of time before computer technology would be able to reduce to constructible terms the inherent intricacies of forms similar to Kiesler's multiple-warped surfaces." [opposite, top] Kiesler and other artists and architects—including Antonio Gaudi, Erich Mendelsohn, Frei Otto, and Kiyonori Kikutake—had conceived and modeled complex structures and forms with varying degrees of technical proficiency, and Roig in the 1960s recognized that new computer technologies could assist their design and construction.

It was not, however, until the 1980s that breakthroughs in parametric design became useful to architects. Advances in the quasi-scientific field of plant and animal morphology supported innovation that could be applied with ingenuity to tectonic practices.

opposite, top: Frederick Kiesler with model for "Endless House," c. 1960, photograph by Irving Penn, © 2010 Austrian Frederick and Lillian Kiesler Private Foundation, Vienna
opposite, bottom: Boeing Company, Computer Drawings, c. 1965



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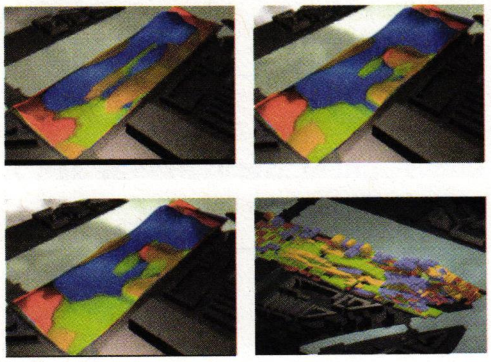

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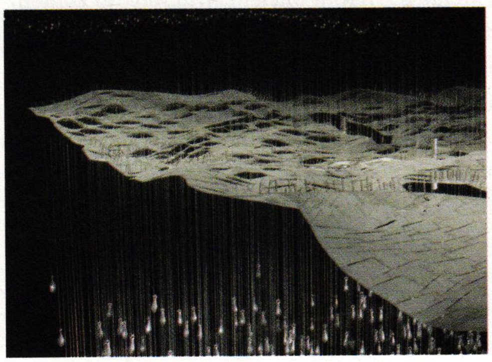

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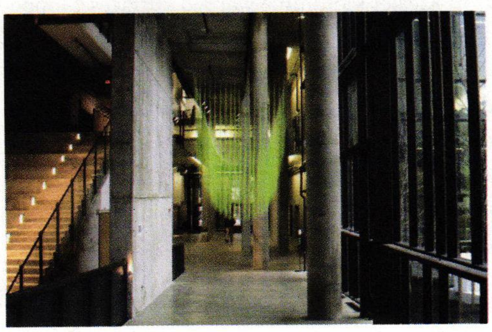

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Nature had long since developed structural systems of nuanced complexity that architects and designers had applied to structure building shapes and urban organizational patterns. Louis Sullivan, Mies van der Rohe, László Moholy-Nagy, Sir Patrick Geddes, and others, were influenced by the morphological writings of Goethe (*Metamorphosis of Plants,* 1790), E.S. Russell (*Form and Function*, 1916), and R.H. Francé (*Plants as Inventors,* 1920). Yet, despite important analytical advances made in D'Arcy Thompson's *On Growth and Form* of 1917 (revised 1942), alongside subsequent mathematical models for shaping biological patterns developed by Alan Turing in 1952 and Aristid Lindenmayer in 1968, morphology had become a sleepy science throughout the mid-twentieth-century. As with Kiesler's flowing forms, it had proven too difficult to measure and draw with detailed accuracy the evolving structures and intricate patterns of organic life. But between Benoit Mandelbrot's 1982 study in *The Fractal Geometry of Nature* and K. J. Falconer's 1990 developments in fractal theory, the computer emerged as a tool for simulating the generation of biological forms (morphogenesis). Coral, sponges, and other simple marine and plant life developing and performing in response to a limited set of measurable criteria—light, ocean current, nutrition, etc.—could be analyzed and reconstructed using parametric design models in the computer. Applying similar morphological simulations in architecture, designers in the late 1980s to mid-1990s began to use the computer alongside software developed for aerospace and the moving picture industry to "animate form."

Los Angeles architect Greg Lynn became the foremost theorist and designer to use the computer to generate what became his notorious "Blob" and "Fold" architecture. His book *Animate Form* (1999) studied the history and set the guidelines for architecture that could be calculably grown using genetic systems and codes—if only virtually in the computer. The "spline" proved most relevant for its simple and concise parametric capacity. It could be pushed, pulled, stretched, and manipulated in coordination with a set of data to produce a continuous curve that surmised an average of multiple vector information. [Images 1, "spline geometry," from *Animate Form*, 1998; and 2, installation, 3D animation diagram, in *Folds, Bodies, and Blobs*, 1998]

Ben van Berkel and Caroline Bos Studio published the 1995 "Rubber-Mat Project for Rotterdam, 2045," which outlined how to use computational tools to conceive large urban infrastructures by inputting a range of parametric criteria—set to time and motion with animation software. [3, © UNStudio]

Peter Eisenman's Musée Du Quai Branly project of 1999 provided the image of what might be possible using these design techniques, and UNStudio's 1998 trilogy *Move* showcased an evolution of complex forms from design to construction, now possible using advanced CAD/CAM-CNC milling machinery alongside new rapid prototyping technology.

The limit to many of these parametric studies—being pursued primarily by students and faculty at Columbia University, the Architectural Association, and other graduate schools—were the forms themselves, which appeared grossly inarticulate, undefined, and too difficult to construct. Besides Lynn and UNStudio, several architects began to deepen their research to engage a more detailed building scale: William Massie, Mark Burry, Mark Goulthorpe, Office dA, SHoP, Coop Himmelb(l)au, Asymptote, Jesse Reiser, Zaha Hadid, and Ocean North are only a few of the most original architects to pursue design and fabrication techniques that investigated ideas relevant to parametric systems.

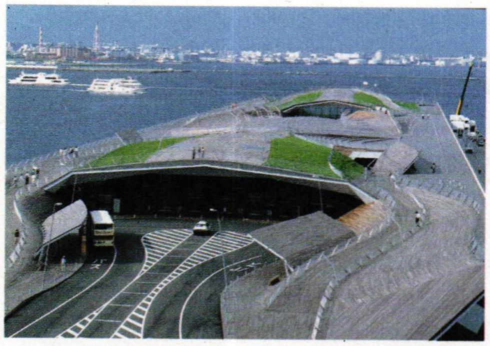
The Architectural Association's Design Research Laboratory (AADRL) and Emergent Technologies in Design (EmTech) programs were perhaps the center of international research and development on the subject. Yusuke Obuchi, now at the AADRL, presented a remarkable thesis, "Wave Garden," at Princeton University in 2002, embodying the principles of parametric design by creating an occupiable, energy-generating surface correlated to the movement of an ocean current. [4]

Jason Payne and Heather Roberge of Gnuform invented a similar if more "hairy" installation in 2003 at Ohio State University, called Man-o-War, inspired by Sanford Kwinter's highly influential study of the Epigenetic Landscape in his 1992 *Anywhere* article, "Emergence: or the Artificial Life of Space." [5]

Michael Hensel of EmTech and Ocean North produced some of the most comprehensive texts on parametric systems and morphogenetic design practices in *Architectural Design (AD)*—a magazine that provided a rich forum for the most innovative developments of the past fifteen years. "Architecture and Animation," "Versioning," and "Morphogenetic Design" were among the more important editions of *AD*.

UNStudio's *UNFold* (2002) showed how parametric design could be advanced on an urban infrastructural scale. (Neil Leach, who contributed to UNStudio's publication, would eventually develop similar urban growth strategies as a faculty member at USC.)

Perhaps most important, Foreign Office Architects (FOA) completed the Yokohama International Port Terminal in 2002, proving that complex building forms correlated to a series of imagined or perceived parameters could be organized and constructed on a grand scale with dynamic, real-world results. [6, photo by Satoru Mishima]



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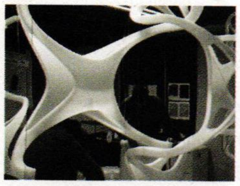

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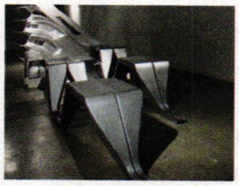

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California architects and educators consistently contributed strong, innovative leadership within this developing field. SCI-Arc and UCLA provided a rich environment to advance new computer and fabrication technology. Highlights of the work of their faculty include David Erdman and Marcelyn Gow of Servo's "Lattice Archipelogics" lighting installation (2002) [7]; Marcelo Spina and Georgina Huljich of Patterns's "Element" vacuformed installation (2005) [8] and "Rooted Flow" large scale urban proposal (2005) [9]; Hernan Diaz Alonso's evocative botanical images and structures [10]; and Gnuform's sensual NGTV floral bar (2005) [11]. With these design inventions emerged ample debate surrounding concepts of "beauty" versus the "grotesque," as architects clamored to adjust their aesthetic sensibilities to the qualities and sensations inherent to these newly emerging, computer-designed images and forms.

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In the Bay Area, architects Lisa Iwamoto and Craig Scott developed the Jelly Fish House (2005), which aligned plant and animal morphology with detailed structural study of tessellated building systems and patterns, correlated parametrically to changes in building stress and strain. [12]

Hoping to make his designs similarly more constructible, Tom Wiscombe of Emergent Architecture in Los Angeles began to exploit D'Arcy Thompson's studies of dragonfly wings to produce patterned, cantilevering spatial structures for his Paris Courthouse design (2006) and SCI-Arc gallery installation (2007). [13] Benjamin Ball and Gaston Nogues of Ball Nogues Studio, in addition, produced the phenomenal "Maximilian's Schell" (2005) out of a vortex of 504 parametrically fabricated, laminated mylar, petal-cut sheets.

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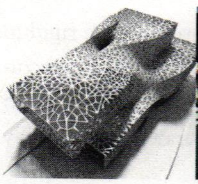
Tessellated patterning systems soon became fundamental to structuring complex organic forms, and complementary aesthetic theories on ornament, decoration, and elegance began to dominate architectural discourses. Works and texts by Ali Rahim at PennDesign at the University of Pennsylvania and Alejandro Zaera-Polo and Farshid Moussavi of FOA, now respectively at Princeton University School of Architecture and the Harvard Graduate School of Design, fueled these discussions—alongside developments in computer programming and scripting to facilitate a wide range of detailed structural tiling and patterning sequences. Designers inspired by Stephen Wolfram's formative programming research in *A New Kind of Science* and *Mathematica* developed a wide variety of "Voronoi-esque" tiling scripts to create varied ornamental structures and/or purely decorative, "skin deep" motifs. Thom Faulders of Faulders Studio and CCA captured this moment in history most succinctly in his screen façade for Studio M's Airspace Tokyo of 2007. [14] Benjamin Aranda and Chris Lasch described, developed, and published many of these scripting procedures in their *Tooling* (Pamphlet Architecture #27, 2006).



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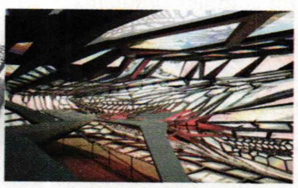

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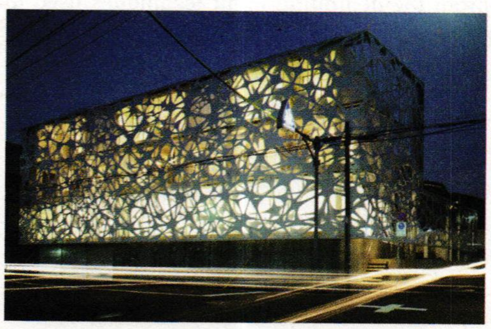
Ultimately, on the scale of constructability, Gehry Partners and Morphosis have proven to be the driving forces behind building innovation on the West Coast in the last twenty years. Investing in CAD/CAM technologies since 1989, Gehry proved that architects could take the lead not only in design, but also in managing the techniques of advanced building systems and their detailed construction. By 2002, Gehry and Partners created Gehry Technologies, a research and technology team committed to supporting advances in the field. The Guggenheim Museum Bilbao (1997) and the Walt Disney Concert Hall (2000) demonstrated how well



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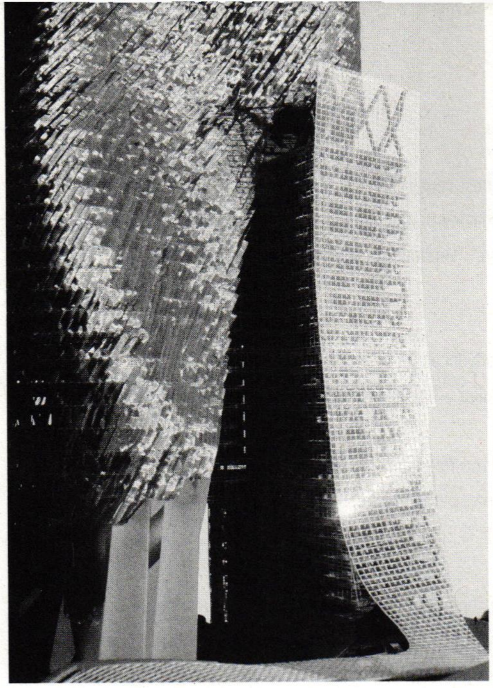

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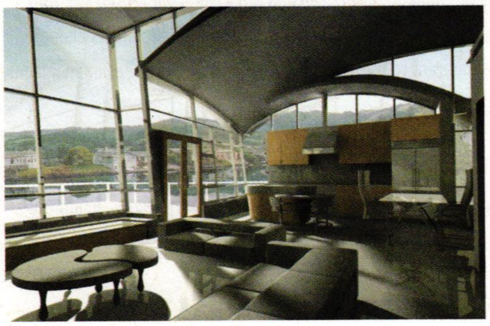

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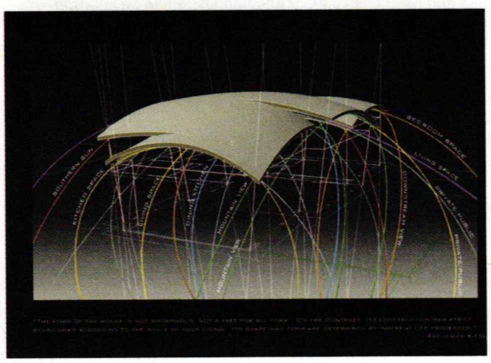

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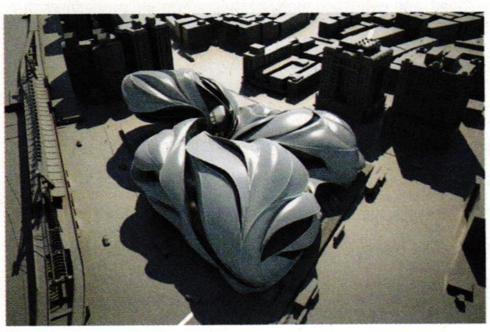

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these techniques could be implemented. Delivering the new Caltrans District 7 Headquarters (2004) to downtown LA in record speed, Thom Mayne and his team at Morphosis also proved it was possible for architects to design innovative, environmentally conditioned buildings that could be constructed more cost-effectively by working directly with manufactures and fabricators. The computer proved useful not only for design, modeling, and fabrication, but for construction administration, as well. Morphosis's Phare Tower may very likely prove to be the most advanced building to date to use parametric design technology and fabrication processes to achieve built form. [15, photo of physical model by Michael Powers]

Offshoots of these larger firms have made notable contributions to parametric design on a much smaller scale. Margaret Griffin and John Enright (formally of Morphosis) working with Dr. Anders Carlson—a structural engineer educated at Caltech—exploited CNC milling processes to invent and construct curvilinear plywood "I" joists to produce complex building structures. SPARCHS, working with Rogan Ferguson (formerly of Gehry and Partners), also alongside Carlson, investigated similar plywood CNC milled structures, in addition to continuous tension shell technologies, to build a series of roof planes correlated parametrically to shifting environmental conditions using Computer Aided Three-dimensional Interactive Application (CATIA) software for their Seadrift House (2004). [16, 17]

Herwig Baumgartner and Scott Uriu of B+U architects (both formerly of Gehry and Partners) developed innovative software for correlating varying parameters, from moving crowds to urban sounds, to inflect the patterns and shapes of their building designs in, for example, their Taipei Performing Arts Center competition entry (2008). [18]

The speed at which the architecture profession has been developing within the field of parametric design has been phenomenal. Much of this success can be attributed to the synergy occurring over the past fifteen years between the vanguard firms and the schools—UCLA, SCI-Arc, UC Berkeley, Cal Poly, USC, and CCA, among others—educating students with the skills needed for experimental practice.

Not everyone, however, has been enamored by computer design or the promises of parametric systems. At the same conference at the BAC in 1964, Christopher Alexander, then an assistant professor at UC Berkeley, warned that architects might "fatally distort the nature of design by restating design problems solely for the purpose of using the computer." He did not believe that there were design problems—environmental or architectural—so complex that they required a computer to solve, and he was not convinced that architects would not oversimplify design complexity to meet the limited input and operational capacities of their computers. The computer simply may not be able to keep pace with the facility of human intuition for inventing architectural forms and deriving design solutions for complex problems.

Mathematical parametric and algorithmic procedures most often have proven far too rigid to productively engage the complex cultural, societal, economic, and political projects facing architects today. Designing buildings and cities using parametric and scripting design tools may often appear visually stunning, but for the most part these designs tend to incorporate far too many blind assumptions to be able to respond with nuance to real world situations.

Today, many leading designers who engaged in parametric design over the past ten to fifteen years would to some extent agree. Moving away from the delimiting input techniques used to derive building forms and urban topologies, the design vanguard has been focusing more on the performative and affective qualities of architecture design and its practice. ◉

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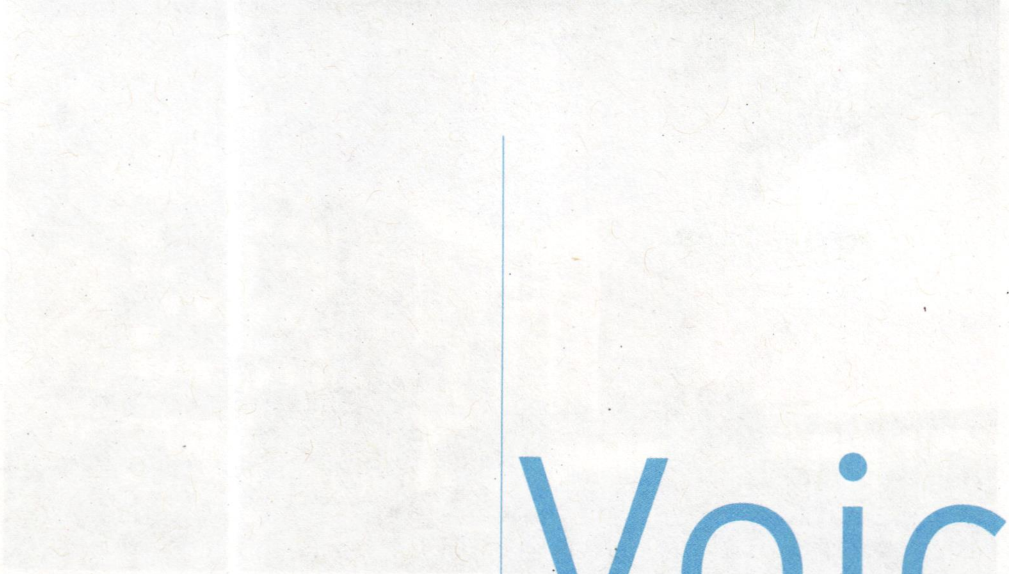


Parametric Voices

The Editor asked a dozen some-odd architects to reflect on the current state of development of parametric design, offering, as prompts or provocations, the following questions:

1. *One correspondent has remarked, "[parametric design] is really different from wanting a wall somewhere." Do you agree? How so?*
2. *In the early days of algorithmic form-making, a noted practitioner of the genre, in response to my query whether it might be the case that all these oddly-shaped buildings were just repeating the anti-contextual sins of modernism, reassured me by saying, "Don't worry, Tim; it's just cult work." Is it?*
3. *Of course, the previous question assumes, incorrectly, that parametric design is necessarily biomorphic or otherwise wiggly. While some celebrated work would suggest as much, parametric design can employ conventional formal vocabularies. Should it? What is the potential for integrating parametric techniques into normative practice?*
4. *What misconceptions are apparent in my questions so far?*
5. *How would you characterize the goals of parametric design? Its promise? Its limitations?*
6. *How do you view the relationship between parametric design and Integrated Project Delivery?*

Here are the responses, which in some cases refer back to one or more of these questions directly, in other cases do not:

Mark Anderson, FAIA, Principal, Anderson Anderson Architecture, San Francisco; Associate Professor, UC Berkeley

There may always be cult-like enthusiasms associated with any new technology, giving rise to opaque language and theory and often conflating particular forms

Autodesk Gallery, San Francisco
Anderson Anderson Architecture/McCall Design Group, photo by David Wakely

Palomar Medical Center West, CO Architects

favored by that initial user group with the essence of the technology itself. This probably was initially true of the enthusiasm for parametric modeling by architects exploring its range of potential. There isn't anything formally specific to parametric design, however, and its use in both academic study and professional practice is already far beyond theoretical studies and abstract formal explorations.

There have long been two threads in parametric design in architecture, the more down-to-earth applications in BIM modeling being earlier, more invested in by software manufacturers, and more broadly disseminated in daily practice. More experimental applications are only recently becoming readily available for broad investigation by architects who do not themselves have access to custom software design knowledge and scripting tools. Just in the last year, new software such as Grasshopper have widely re-ignited an interest in scripting and parametric design among students and experimental architects beyond a limited minority. At the same time, old-line parametric BIM modeling tools, such as Revit, which are closely based on conventional practice and conventional architectural forms, are also edging closer to being a common software expectation in everyday practice. While these two tools are vastly different, they both represent efforts to capitalize on increasing computer power to change forms of practice and avenues for creative experimentation based on logical application of a profusion of available information.

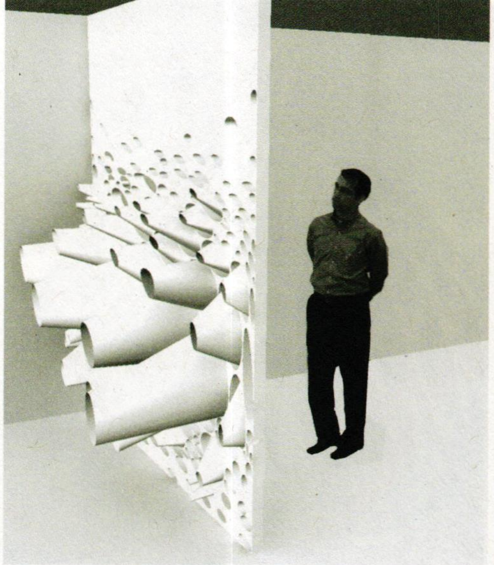
The most interesting promise of parametric design is not directly in its ability to experiment with new forms or to facilitate a more efficient and accurate practice of documenting construction. The fundamental importance of parametric modeling is in its potential to utilize the vast riches of environmental data that the progress in computer tools makes available for consideration. For example, where analogue calculations of sunlight or seismic forces have traditionally been applied at a gross scale focused on worst-case instances and then applied uniformly across all or significant portions of a building, parametric modeling tools can process data and respond adaptively at a micro-scale across surfaces and structures. It becomes practical, within the limits of design time, design consciousness, and even limited fabrication budgets, to make a continuum of design adaptations unique to the particularities of many more conditions encountered on a project site. This potential to shape a building according to a far broader and yet more precise range of criteria suggests many changes and improvements in design and construction process, in fabrication logic and affordability of customization, in fine-grained sensitivity to environmental, social, and cultural context, and—not least of all—in the resultant profusion of utterly logical and yet wildly unexpected and totally cool new spaces, forms, and experiences.

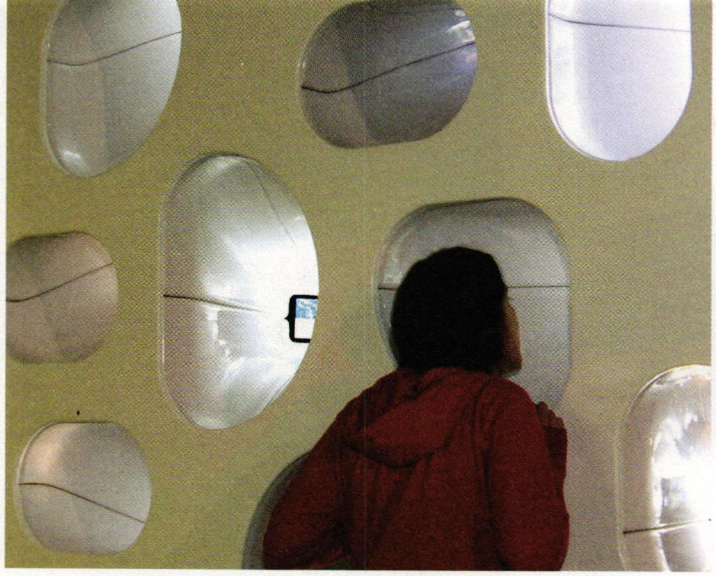
Of course, some malevolent cultural force might also parametrically limit divergence from particular norms—new dimensions in misguided community design standardization—fixing robotic governors on this hot rod engine of progress and putting all of this promise to evil risk. This is one good reason to appreciate any cult out on the *avant garde*—let's hope that they can stay well out ahead of any technological catch-up by nay-saying reactionaries, and stretch our imaginations along the way.

Phil Bernstein, FAIA, LEED AP, Vice President for Industry Strategy and Relations, Autodesk; Lecturer, Yale University

In the work sponsored by Autodesk at Yale, we are interested in a couple of questions with regard to parametric modeling. One is, are we seeing the incorporation of substantive contextual or other data into the modeling of building form, or is it still mainly indulgent shape making? A second is, where and when will we be seeing a seamless integration of, for example, Rhino and Revit, such that a cutting-edge designer might participate in a robust IPD process?

A real BIM process (rather than just form modeling with a tool like Rhino or Maya, neither of which are BIM, because they are not "building aware") carries with it by defini-





UCLA Design | Media Arts "Second Natures" exhibition, DurfeeRegn, photo by Roberto Paz

tion "substantive contextual data," since the entire construct is tectonically aware. What the designer chooses to do with that information is the real question. Some of our research at Autodesk now involves overlaying BIM metadata (what we call contextual data) with scripting and algorithmic templates to help inform or drive the design process.

The question of a "swirly designer" participating in a pure IPD process is provocative. That designer has to be willing to participate in a process that gives him/her deep responsibility for things beyond the swirl. Gehry would embrace such an idea; Libeskind, less likely. Revit is making good strides on the swirly front and will eventually render the distinction in tools meaningless, in my view. It's not the swirl that's relevant—it's the role of the architect.

Thomas W. Chessum, FAIA, CO Architects, Los Angeles

Integrated Project Delivery (IPD) is the information hone that sharpens the parametric design tool. In and of themselves, these two progressive devices of architectural practice offer exciting resources for the pursuit of a higher architecture, but their greatest potential is found when combined; they potentially reposition the architect into a role that reconnects the profession with the idealized architect of the Greek origin of the word *arkhitekton* (*arkhi*-, chief + *tekton*-, builder), i.e. chief builder.

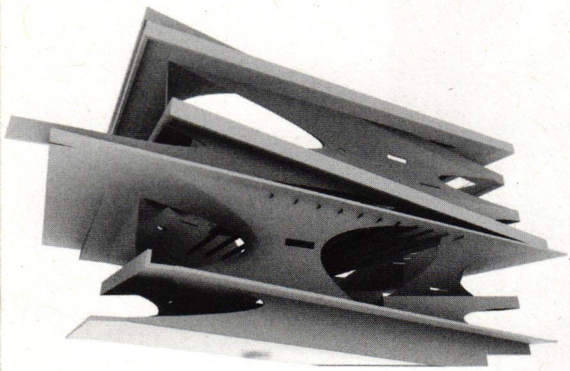
Integrated Project Delivery, with all its possible variants, contractual formats, and intentions, provides, of greatest import, the ability for the architect to truly collaborate with the building and materials craft in the creative act of architecture, from concept to realization. The resulting collaboration among the parties (designer, builder, owner) ultimately informs and enriches the architecture to the extent that it is embraced as a resource and essential part of the tectonic responsibility of the profession. On its own, the parametric design tool, whether purely design-focused or Building Information Model (BIM) virtual architecture, makes it feasible for the architect to accept and manage extensive and varied constraint information during the design process and to carry that knowledge in its architecturally resolved form forward into the realization phase. The parametric tool becomes a resource, reference point, and place of origin for other parties in the endeavor.

When joined, IPD and the parametric tool find their true complement. IPD gains the vehicle by which the knowledge of all parties is shared in an open, transparent, and understandable venue, and the parametric design tool gains the quality and breadth of information that can be used to enrich the architecture. The architect, as the originator and source of this collected and organized knowledge captured in virtual architecture, becomes the center of this activity seeking architecture in its fullest realization.

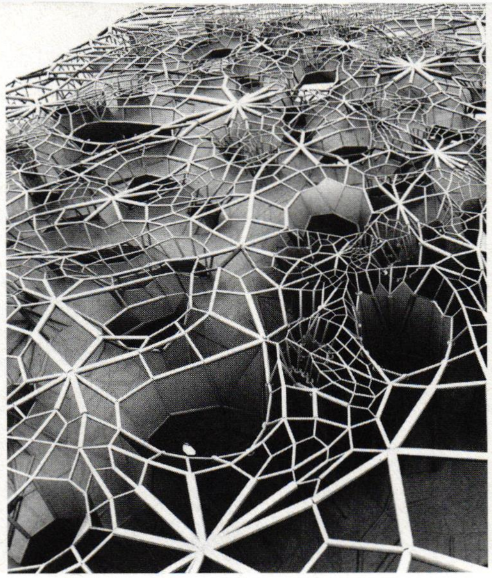
Tim Durfee, Principal, DurfeeRegn, Los Angeles; Research Professor, Art Center, College of Design, Pasadena

Whether it was Dylan going electric at Newport or Nintendo turning 32-whole-bits, there will always be someone who is going to get in a twist when a new technology threatens to disturb the tasteful establishment. Despite the historically close connection that the design and construction of buildings have with technology, architects can be notoriously reluctant to embrace new ways of working. While some of the forms generated with parametric software can still provoke, it is the inherently relational way the software operates—rather than the forms it is capable of generating—that holds the more profound implications.

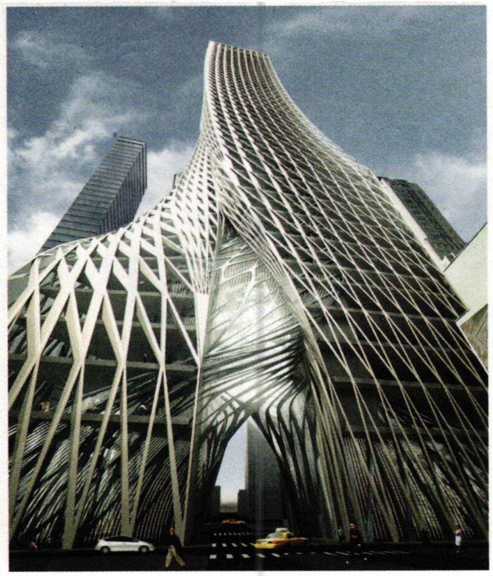
The centuries-long construction of systems for designing the not-yet-built has formed architecture years ago into a sort of relational science. In this period of vast networks, however, this disciplinary capability to understand things in terms of their association to other things will expand a chain of coordination beyond the BIM-like technical synchronization of an architectural project to effect far-flung,



Schindler's Paradox Box, Griffin Enright Architects



GEOtube Salt Tower Proposal, Dubai, Faulders Studio



Edgar Street Towers, IwamotoScott Architecture

external systems—from huge municipal services, to private real estate agencies, to personal Twitter feeds.

In addition to the expansion of connections horizontally across systems, current software also helps to realize the ancient aspiration for relational systems across scales: from the nano, to the object, to the building, to the city, to the networked globe. This capability to generate and control information in a scale-less environment furthers a shift away from an emphasis on the dimensional to the relational, where elements are defined more by intrinsic and scalable values than by fixed points in space.

As software continues its natural evolution toward more perfect simulation of the natural world, architecture will be re-cast as a (mere) expression along a scalar continuum of fundamentally interrelated elements, including the political, social, cultural (the 'software' of the city, to architecture's 'hardware'), and, eventually, including the 'natural' world itself.

John Enright, AIA, Principal, Griffin Enright Architects, Los Angeles; Assistant Professor, University of Southern California

Parametric design is ultimately a more significant manner for architects to deal with *information* and *process*. Information within a design problem is a varied but steady stream that feeds design from conceptualization to realization, yet process involves the manner in which information is implemented toward a given problem. Much has been written regarding this "feedback loop" between information and process, which exists at many levels, whether that be within the eye and the hand, the verbal and the mind, or the physical and the visual. What digital computation has begun to achieve in architecture today is a more rapid and dynamic feedback loop between how architects manipulate and conceptualize information vis-à-vis process. It has enabled a multiplicity of reiterations to be examined in relation to the parameters that are defined by the designer.

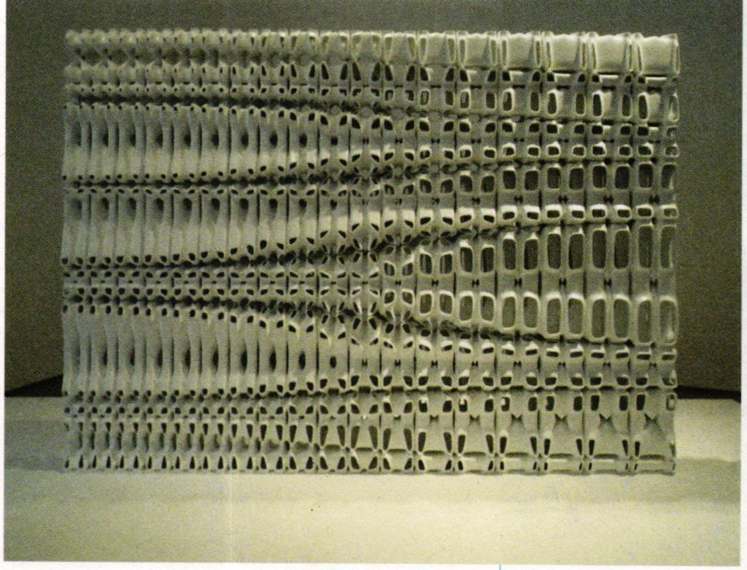
Thom Faulders, Faulders Studio, Berkeley; Associate Professor, California College of the Arts

In many ways, parametric means for achieving design goals are already normative and conventional: not in the pejorative sense of conventional, meaning "uninspired," but in the context of the widespread use and deployment of parametric modeling techniques to derive architectural intentions and manifestations. In my office, the parametric tools fall under two headings. One is as a form generator: we'll have a certain design direction in mind, and new and unanticipated results emerge through the shifting input of various data factors. You might call this a type of digital empiricism: we must experience the results and gauge the often-unpredictable effects after the fact, as opposed to theoretically directing the product beforehand. We can decide to place a wall, but we might not always know precisely where it will land, as its location is related to and influenced by an entire set or family of parameters.

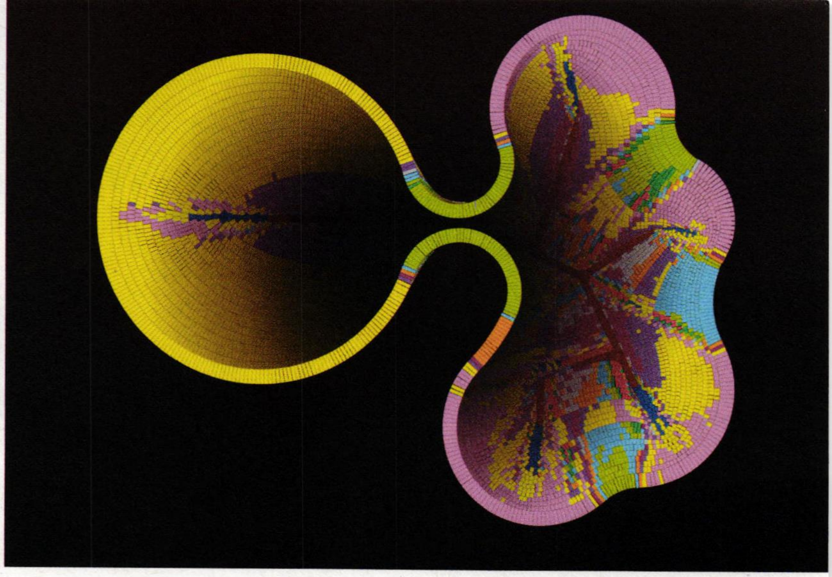
Our other means of using parametric tools is that they allow us to achieve and quantify for construction/fabrication a complex array of forms—ultimately our design intensions as related to whatever we are trying to address architecturally. Parametric software is often a shortcut that allows us to create very complicated or difficult-to-construct designs, in that the embedded information can not only continue to be altered, but also captured for direct fabrication output. For me, this is not solely about form generation, but the ability to respond architecturally to a degree that would be quite formidable without the use of these technologies.

Lisa Iwamoto, Partner, IwamotoScott Architecture, San Francisco; Associate Professor, UC Berkeley

Parametrics privileges relational and conditional criteria in the design process. What relates to what? In what order? With what



Migrating Formations, Contemporary Architecture Practice



Community Center, Uganda, reflected ceiling plan, MOS

kinds of constraints? Asking these questions is not particularly new to the architect; parametric software simply forces us to ask them in a direct and literal, though often highly complex and sophisticated, manner. Deciding which relationships to highlight therefore shapes the design process, whether it is about programmatic adjacency, cost estimation, form generation, structural or environmental performance, or integrated building systems.

In our office, the parametric process is geared to our design interests, which vary dramatically with project type and scale. Voussoir Cloud was scripted to synthesize intentionally opposed structural form and performance criteria in relation to material behavior and localized geometry, as well as to streamline the fabrication process. Conversely, the initial massing of Edgar Street Towers developed from relationships between the building volume, zoning envelope, and site conditions of the local and larger Manhattan street grids. Here, parametrics afforded rapid design permutation and iteration.

When you ask about the promise and limitations of parametric design, they really have to do with the imagination and agility of the architect. As with many technological and design movements in the past, certain branches become overly prescriptive and dogmatic in their approach. This is certainly a danger with parametrics, because it can be seen as a problem solving optimizer or design justifier without dealing with the unquantifiable qualities of design—the qualities that ultimately make for good architecture.

Hina Jamelle, Director, Contemporary Architectural Practice, New York; Lecturer, University of Pennsylvania. Philadelphia.

If used properly, contemporary digital techniques can be a powerful tool in architectural design, construction, and cost management. Models that acquire intelligence are a great benefit to architects in general, as they can incorporate manufacturing data and cost variables in the same models that generate the architectural design. We have sat down with clients in Tokyo and changed a variable showing what the outcome is on the design in real time. Once the client was satisfied with the design and its cost, the model was sent directly to the manufacturers. This enabled us, the architects, to direct the fabrication process and achieve the design intentions while saving materials and costs. It also empowers the architect again as we control the entire process from design to manufacturing.

Parametrics are a tool. One needs to control the tool by developing particular techniques and having these techniques so refined that the architect can guide their outcome. In our case, a design sensibility guides the use of this tool by specifically developing spatial techniques. For example, the chisel was readily available to all sculptors, but there is only one Michelangelo. In the same way, what differentiates certain architects working with parametrics is their ability to develop a set of techniques and to control them to such an extent that other factors become important—such as an aesthetic sensibility, innovative solutions to clients requirements, or some such thing that provokes new architectural questions or solves familiar architectural problems in new ways.

Michael Meredith, AIA, Principal, MOS, New Haven, Connecticut, and Cambridge, Massachusetts; Associate Professor, Harvard University

Parametric design is just a way of thinking of the interdependence between the part and the whole. It is not about fragmentary design or collage. It's not a radically new idea, just a new way of organizing parts and wholes. Previously, we used the *parti*, regulating lines, diagrams, etc. as the methodology for organizing elements.

There is always a danger of conflating the technique of producing architecture and its image. Parametric design already exists, and it's producing incredibly banal buildings, so the technique isn't necessarily corresponding to the image. The wiggly stuff is part of a sort of neo-expressionist attitude that uses para-

Hangzhou Stadium, China, NBBJ

metric design, but there was an expressionist architecture that was post-modernist and modernist and classical. The question of whether one's work is expressionist or normative offers a false choice. I have no desire to be a normative practice, nor do I have a desire to produce expressionism.

Techniques and methodologies are wonderful provocations, but no longer enough on their own as architecture. The brilliance of Formalism was that it was explicitly against the pseudo-science of Functionalism, which was turning the architecture profession into a technical service industry. In that world, engineers trump architects, because the architectural project becomes one of optimization. Formalism reframed architecture as a cultural historical discourse, but as Formalism has evolved and changed over time it has become the positivist endeavor that it was explicitly fighting against: make a formula that makes form. We're now in a weird situation in which both Formalism and Functionalism are no longer useful, and we need to find new narratives for architectural production.

Nathan Miller, Designer and Parametric Specialist, NBBJ, Los Angeles

Architects have been engaged in algorithmic form making since well before computers entered into the discipline. Antonio Gaudi's work using chain models to find the optimal structural shapes for his La Sagrada Familia is one example of such analogue, algorithmic form making. We could even go so far as to say that the system of classical column proportions outlined in Vitruvian texts is a formal algorithm. The difference between *now* and *then* is that advanced digital tools have enabled architects to consider the algorithm in much more precise and quantitative terms.

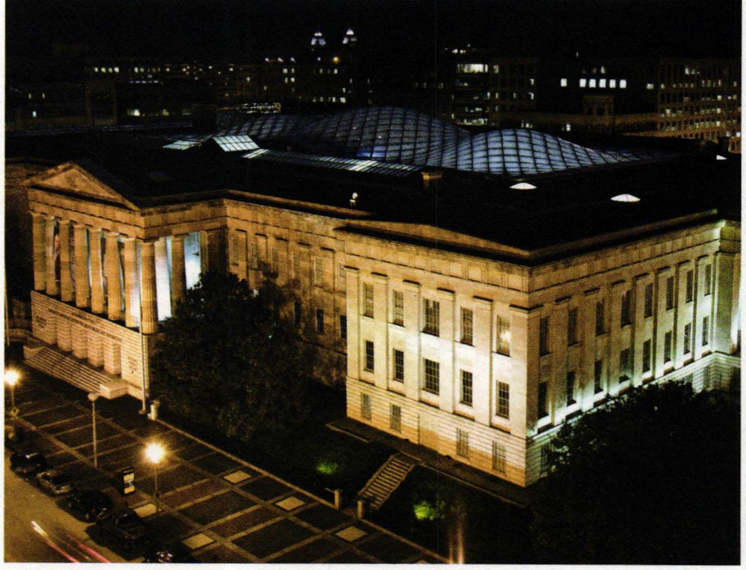
In general, algorithmic design is about defining the precise rules and constraints that govern a design and then testing variations within those constraints. At its best, algorithmic form making is not a closed, 'anti-contextual' process leading only to interesting shapes. It is, instead, an *open process* in which the specifics of site restrictions, environmental conditions, material properties, and construction methods can all be choreographed into a robust form-making or form-rationalization algorithm.

Parametric design is primarily the *design of processes* and does not necessarily presuppose a particular kind of form. This process is valuable in any circumstance that requires the designer to leverage advanced computational tools to engage complex design problems. For a project that tends to be geometrically normative but programmatically complex, such as a hospital, the architect may want to invent a custom algorithm to help solve space adjacencies or factor in rules from the building code quickly and efficiently.

Due to its strong link to technology, we cannot divorce a conversation on parametric design from a conversation about the digital tools used by designers. Nor can we divorce it from a discussion on problem-solving processes, which often require that an architect create and/or develop custom toolsets (scripts, plug-ins, software) independently of what is given in out-of-the-box CAD/BIM packages.

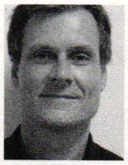
In short, to consider parametric design today is to consider that the architect not only designs buildings, but also the processes and tools used to design it: as Marshall McLuhan wrote, "We shape our tools, and our tools shape us."

In a parametric paradigm, the architect understands the design process as the systematic, precise, and holistic choreography of information itself. In lieu of stacks of 2D sheets or large, platform-specific 3D models to describe a complex design, the architect may instead opt to share a mathematical function, script, or database in which parameters and creation instructions can be explicitly defined in no uncertain terms. All toward the objective of creating a precise, performance-based architecture that is responsive to the increasingly complex problems facing the built environment today.



Smithsonian Kogod Courtyard, Foster + Partners with Buro Happold; photo by Ken Rahaim

Flex Physical Therapy & Fitness, Pierluigi Serraino, photo by David Wakely



Greg Otto, Principal, Buro Happold Consulting Engineers, Inc., Los Angeles; Adjunct Professor, University of Southern California

As an engineer, I like to think about parametric design as performance-based design, where parameters are optimized according to performative requirements. Having been trained as an architect, however, I am not interested in *uber*-efficient, engineered systems; rather, I am interested in complex, multi-variable systems in which compromise between competing performative requirements is revealed, resulting in hybrids—optimized solutions for particular sets of conditions, be it location, climate, use, etc. In such cases, strategies go beyond the purely formal.

Parametric design is often misappropriated within architecture to describe highly formal work using the digital medium. As one of my professors at MIT consistently reminded me, "garbage in is garbage out," and certainly this adage is true in architecture. Parametric design is about relationships. If the relationship is only among spatial coordinates, then the proposition is nothing more than a formal fetish hiding behind a misappropriation.

Parametric design should be a standard working methodology within architecture. It certainly is integral to our interdisciplinary working. It is an extension of the old "option analysis" methods used to establish highest value solutions. Now, with microcomputers, we can run tens of thousands of options within a short time frame to identify highest value solutions defined by a wide spectrum of criteria: performance, cost, constructability, and so on.

Experience tells me that the bias of architecture is the formal, and in operation it forges a silo not unlike that of the HVAC engineer who cannot see beyond his duct to realize there is a bloody beam in the way! Parametric working requires interdisciplinary collaboration that is simply not taught in current architectural education. Real content (coming from outside the profession and found in the sciences) is essential to make parametric design valuable beyond the "bitchin'" object.

Parametric design offers a new opportunity for the architect to regain the role of master builder. It requires, however, a new paradigm of working. While it is easy to point one's finger at the architect, it is not completely fair; the bigger question to ask is, "Where will the architect find partners for such collaborations?" Certainly, the education of the building engineer is an even bigger failed project.

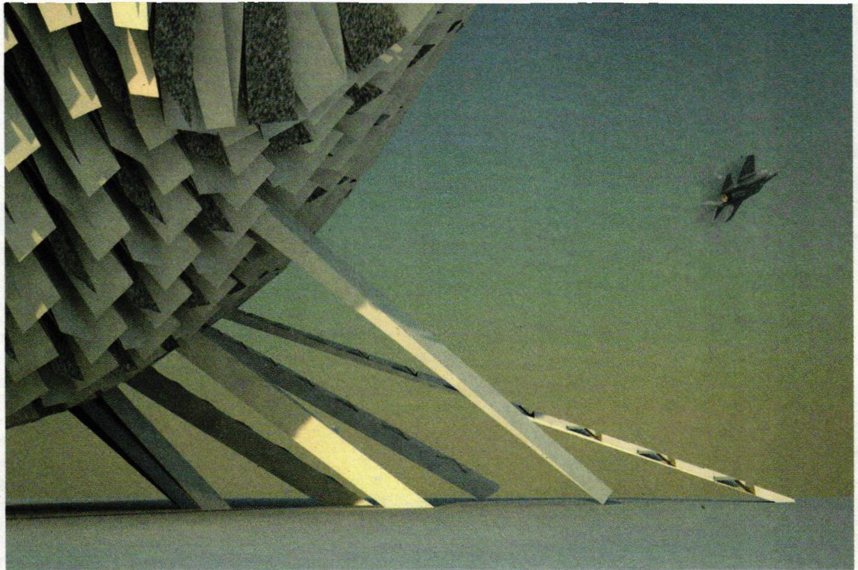
Pierluigi Serraino, Assoc. AIA, Architect (Italy), author, History of Form*Z, Alameda

Although not mutually exclusive, parametric design can take place without Integrated Project Delivery and vice versa. The only common denominator of these two areas of research is that they both require the use of digital technology. Their dependence on the computer, however, makes them too much distant cousins to be a cozy family.

By intervening at a topological level, parametric design deals with shape optimization per specific criteria stated prior to its recursive process. It connects form searching to a set of performance-based objectives that will yield a shape unknown in its geometric identity to the designer. No predetermined geometry makes parametric designs recognizable when compared to other kinds.

The British Museum Great Court Roof by Fosters and Partners is a publicly visible example of this innovative approach, in which built form is free of historical memory and results from tangible engineering challenges: to mediate in structurally efficient terms the transition between the rectangular edges of the inner courtyard and the circular perimeter of the rotunda.

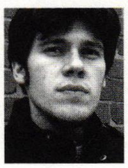
Integrated Project Delivery is a distinctive approach to the merging of interdisciplinary expertise into a fully coordinated built artifact. It falls under the rubric of professional practice and has virtually no impact on design expression. Its acronym is dangerously close to the IDP (Intern Development Program) and throws even the specialized audience into easy confusion. But, in essence, it



Jet Noise Wall, Andersen Air Force Base, Guam, Nick Sowers

is another response to the inherently risky business of building, for the client's benefit and the joy of insurance companies. Can it really work, though? Architecture is still a field where proper names have more cachet than anonymous teams. Firms in which the cult of authorship reigns are poor candidates for IPD—too much flatness in the hierarchy.

If the designer is after the *ineffable space* that so spellbound Le Corbusier's audience, in all likelihood it will be parametric design that will yield that dream.



Nick Sowers, M. Arch. Candidate, UC Berkeley

My thesis project, which is just getting under way, will lean heavily on the new possibilities offered by software such as ArcGIS, rhino+grasshopper, and a sound-scripting tool called Supercollider. I am looking at jet noise on Guam, which is due to increase with the largest military buildup in the Pacific since Vietnam. The thesis will develop an architecture that responds parametrically to the sets of data that are made available by environmental impact reports on jet noise, as well as the geographic data on the civilian side: census data, density, etc. It is an architecture of negotiation via an armature of parametric design.

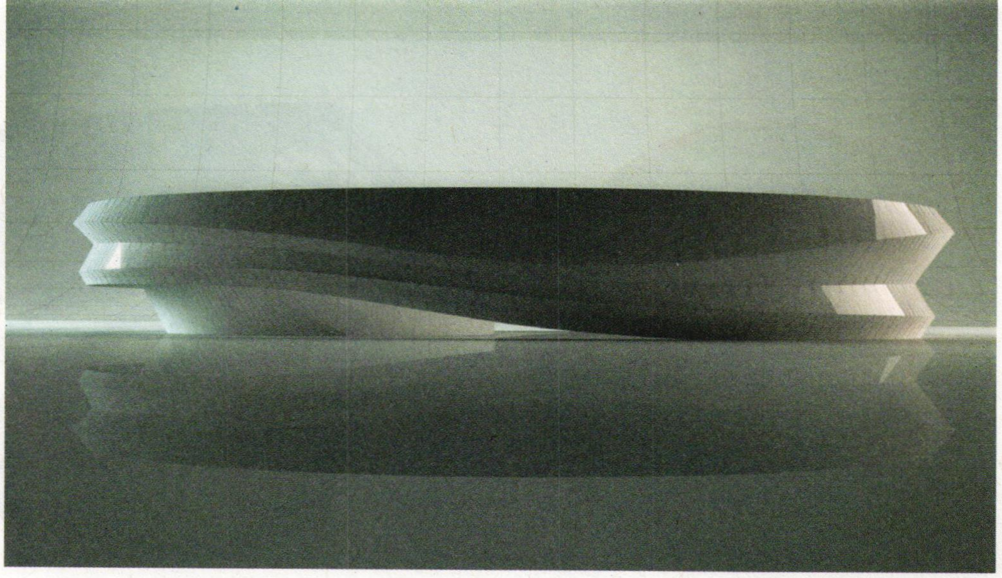
My understanding of the statement, "[parametric design] is really different from wanting a wall somewhere," is "parametric design is meant to be a means for evolving new materials, new structures, or new theories on space, and not so much a tool to just do what architects do (put a wall somewhere) in more automated ways." If that is what is meant, I don't necessarily agree. The "somewhere" in that statement can be parametricized in interesting ways. A wall that is trying to find the optimum solar gain, for example, might emerge from a very complex set of calculations, the tracking of which could be very exciting. Placing a wall based on principles of solar gain is not a new process to architects, but how we do it could be changing entirely. Parametric design is changing the *ways* architects do things, not necessarily changing *what* we do.

There are these GPS-controlled drone bulldozers (http://www.toolbase.org/Technology-Inventory/Sitework/gps-tools), which theoretically could give a Zaha some new, territorial-scale, 3d printing capabilities; or, more likely—and what the machine was developed for—do the grading for suburban tract homes at a fraction of the labor cost. Parametric modeling is permeating the world in which architects operate, without architects even introducing the tools.

There's always a desire to push the limits of a new tool or system for designing, but that doesn't mean breaking all the rules to do so. The more powerful parametric work isn't striving to exist on a new planet, but is rather remaking and remixing what is already around us. SHoP's work, in particular the façade they did on 290 Mulberry (http://www.shoparc.com/#/projects/featured/290mulberry), evokes the more pragmatic ideals of parametric design. The basic idea is using parametrics to make it cheaper to do more complex work.

While it might seem contrary to the contemporary trend for using parametric design to realize ever more complex and fantastic visual landscapes, parametric design has the possibility to release architecture from the tenacious hold on design by the regime of visual culture, i.e., the production of images for magazines. I'm talking about other ways that we understand space, in part related to David Gissen's book *Subnature*. Can parametric design include more atmospheric, even previously unwanted spatial phenomena like dust, gases, and mildew? Of particular interest to me, it will open new possibilities for design of the sonic environment. We can map sound in ever more complex ways, which might actually yield simple architectural forms—but having the power to shape sonic environments beyond the context of the music hall, even to build cities based on sound: that would be cool.

Parametric design has the potential to provide a unified front line to the multiple scales that assail the designer. In my thesis, for example, noise absorption analysis at the material scale could work in tandem with right and following page, Skidmore Owings & Merrill LLP, project for a rapidly growing Internet company in China, creating a physical place for experiments in social/digital interaction and for large-scale internet game performances, concerts, fashion shows, and other art and cultural events. Exterior form study and plan and partial elevation views of parametric model illustrating structural stresses.



macro-scaled analysis of jet noise contours in order to produce a sound-attenuating barrier. Via rhino+grasshopper and arcGIS, I am able to combine manifold site and atmospheric parameters into a single mechanism.

Limitations? The human mind is the only limitation. Our scripts will only be as smart as we make them. There's also a danger to believe that, because something is designed parametrically, it is correct. We have to keep our "hand" in the design and be skeptical about what the computer turns back to us.

SOM San Francisco

arcCA *addressed our questions to Craig Hartman, FAIA, design partner in SOM's San Francisco office. Craig, in turn, sought the thoughts of his design team.*

Carrie Byles, AIA, Managing Director

There is no requirement that parametric design be wiggly. SOM has used parametric tools to optimize the application of a window wall system for complex buildings. The equations driving the model are set up to use rectilinear components with as much repetition as possible, to reduce construction cost while optimizing the performative aspects of the wall through environmental analysis tools. This complex analysis would be practically infeasible by hand and is ideally what the power of parametric design is all about, allowing the architect and engineer to explore a greater number of more complex options to push building design to a higher level of performance and elegance.

With the new awareness of climate change and the urgent requirement for higher performance buildings, multi-disciplinary design powered by parametric design and tighter integration of real time environmental analysis is here to stay. When we look back in time to this decade, there will be a perceivable shift in the quality and performance of our buildings, as well as in the form of the built environment.

The greatest limitation right now is that architects don't always have an ability to approach their designs as mathematical equations. It can also be frustrating to reach a point in the process and realize that you want to change an aspect of the design model that you had not thought to make one of the variables. On the other hand, there is no reason to be overly dogmatic about parametric design's application; there is much to be gained from integrating PD into one's practice in specific areas of design, research, and analysis.

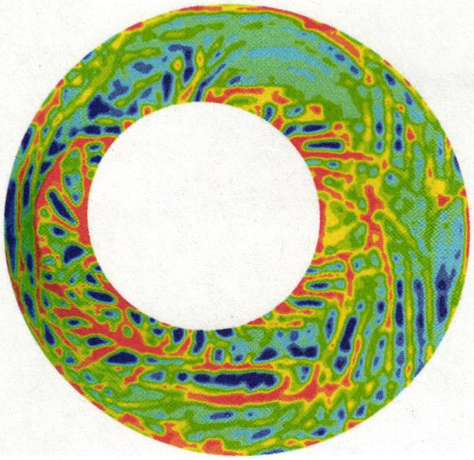
Structural Group: Mark Sarkisian, Eric Long, and David Shook

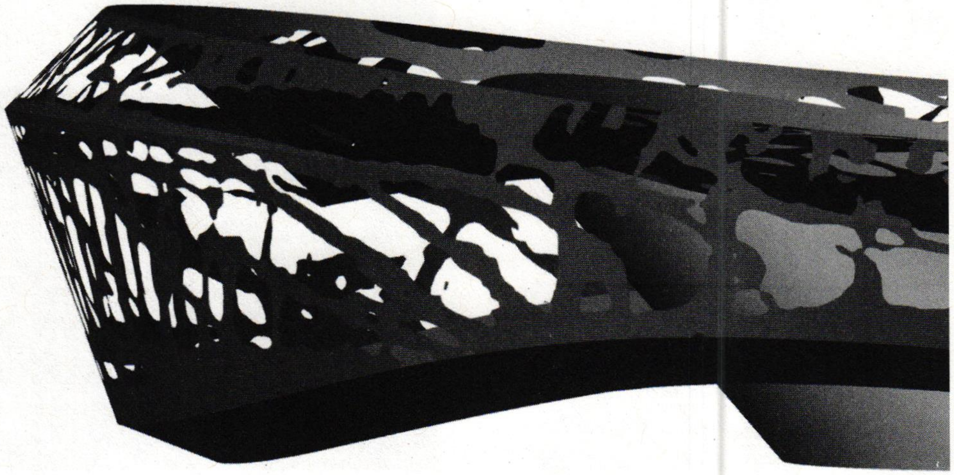
The power of parametric modeling is the actionable execution of ideas. Parametric design is the utilization of quantitative rationale to achieve design. It is an exciting field of study, but one that is often misused. Designers need to spend the appropriate time and effort developing a sound basis for the development of forms and systems.

The incorporation of normative practice is important to keep costs at reasonable levels and novel ideas realistic. This can be done in an automated fashion by generating a set of 'interpreting rules' for the application of a parametric design.

One misunderstanding is the notion that parametric design is generally targeted to exterior form making. The true power of parametric design lies in the ability to incorporate a multi-disciplinary set of design variables, such as structural engineering, MEP systems, and environmental analysis, to enhance traditional goals of form, context, and space making.

Its promise lies in the discovery of new ideas, concepts, and relationships to design high performance buildings based on multi-





disciplinary objectives. Its limitations lie in the natural tendency to exert bias to a pre-developed solution and the need to rationally interpret the results.

The power of parametric design can be further exploited by the integration of contractor-influenced variables such as fabrication, delivery, cost, and schedule into the architectural and engineering design goals. A truly collaborative environment, free of egos and fear of litigation, is necessary to fully integrate parametric design into the IPD process.

Craig W. Hartman, FAIA, Partner

First, it is important to distinguish between digital design and parametric design—and the formal speculations with which they are often associated, such as the blob architecture of 1999-2000 or more recent organic/biologically based architectural forms. Parametric design is essentially digital design with an embedded value system. Both are simply tools. They can be used to arrive at, or even generate, form, but the nature of form—orthogonal, fluid, or otherwise—is decided by the architect, not the tool.

The reason fluid architecture is most often associated with digital and parametric design is simply that the visualizing, dissecting, and quantifying of non-orthogonal form and volume are much easier using computational systems rather than traditional handmade drawings and models. This architecture is not a cult experiment. The past, from Borromini to Eero Saarinen, is replete with masterworks of fluid, organic space, and the future will be even more so, given the possibilities of computational design in the hands of talented architects. But whether the future looks more like Borromini or like Hilberseimer is not necessarily a question of computational design.

Putting formal questions aside, parametric design is a great leap forward in achieving intelligent built form, whether a teacup or a city. At SOM, we are using it across all disciplines—graphic and product design, engineering, urban planning, and architecture. It allows us to quickly understand the intersection of multiple variables ranging from economics to performance to form. It is very much in its infancy, but it is without question the most powerful new development in architecture. As a tool, parametric design promises to make buildings and cities more efficient, livable, and sustainable, because we can quickly understand the integrated performance results of design decisions.

As applications become commercially available, they will inevitably become integral to every design practice. And, without question, the nature of design practice will continue to quickly change—as it is in our own studios—absorbing specialists and researchers who are capable of manipulating and advancing the tools.

Where does this lead? One might speculate that architectural form could become very deterministic. That once all the proper design values are loaded into supercomputers, artificial intelligence and value-based parametric design will spit out the perfect city, building, or tea cup with the push of a button. But architecture is a cultural art form of humanist values. The ethos, talent, and vision of the architect using the tool remain the critical factors. Despite the tools, the sensibilities of a Borromini will still be welcome. ◉

David Meckel, FAIA

BIM Use

Two-thirds of BIM users have been using BIM for three years or less.

http://www.bim.construction.com/research/

2009 BIM Awards

The AIA Technology in Architectural Practice knowledge community's annual awards honor projects that have strategically used Integrated Processes and Interoperable Models. Citation Winners:

Cooper Union for the Advancement of Science and Art
New York, NY
Morphosis
Autodesk Headquarters
Waltham, MA
KlingStubbins
Cellophane House
New York, NY
KieranTimberlake Associates
IP/BIM Academic Studio
University of Wisconsin-Milwaukee
School of Architecture and Urban Planning

Honorable Mentions

Autodesk Customer Briefing Center
San Francisco, CA
Anderson Anderson Architecture & HOK
UC Medical Education Facility
Aurora, CO
Fentress Architects
Cornerstone Art Center
Colorado Springs, CO
Antoine Predock & AndersonMasonDale
Regional Library
Vancouver, WA
Miller Hull Partnership
New England Camp
New Hampshire
Ann Beha Architects
Making Corrections With Design Curricula
University of Wyoming
Montana State
University of Nebraska-Lincoln

www.aia.org

Investments in BIM

Current investments in BIM are most likely to be in BIM software and developing internal collaborative BIM procedures.

Highest to lowest investment

BIM software
Internal procedures
Marketing BIM
BIM training
New hardware
External procedures
Developing 3D libraries
Software interoperability

http://www.bim.construction.com/research/

SmartGeometry

The SmartGeometry Group is a non-profit organization started to encourage collaboration between AEC professionals in practice, academia and research who are interested in using computational and parametric approaches to design.

http://www.smartgeometry.org/

Project Participants Rate Value of BIM

Presentation and visualization of architectural design and spatial coordination are the top areas for project participants.

Highest to lowest value

Presentation and visualization
Spatial coordination
Client engagement
Space planning and utilization
Shop fabrication
Quantity takeoff
Less time documenting
More time designing
Structural analysis
Shop drawings
Cost estimation
Crew and labor planning
4D scheduling
Energy analysis
Submittals
Operations and maintenance
Turnover and closeout
Jobsite safety

http://www.bim.construction.com/research/

FLUX: Architecture in a Parametric Landscape

This recent exhibition profiled forty projects from around the world that Integrate digital practices in the design and fabrication of architecture. The projects were organized into these categories.

Stacked Aggregates
Modular Assemblies
Pixelated Fields
Cellular Clusters
Serial Iterations
Woven Meshes
Material Systems
Emergent Environments

www.cca.edu/about/press/2009/flux

Emerging Body of Knowledge

Number of results when searching for the following terms

In the Avery Index to Architectural Periodicals.
29 - Parametric
35 - IPD
92 - BIM

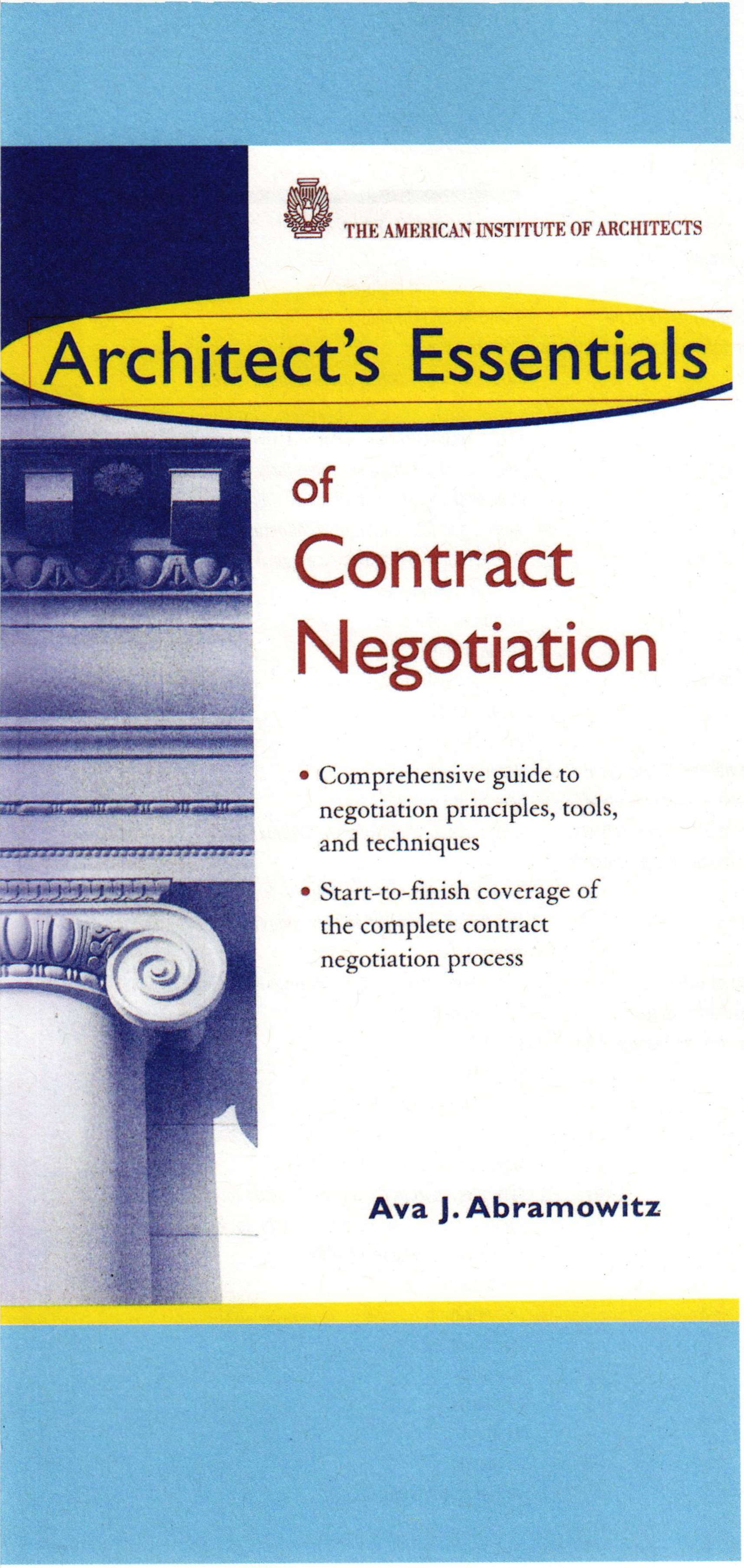
http://library.cca.edu/

Algorithmic Language

Seven terms from the index of Kostas Terzidis's book Algorithmic Architecture *that might not be so easy to work into casual conversation.*

Amphiboly
Discretization
Heteromorphic
Heuristic
Periplocus
Petaflops
Stochastic

www.architecturalpress.com



Book Review

Architect's *Essentials of Negotiation*, second edition,
by Ava J. Abramowitz
Hoboken, NJ: John Wiley & Sons, Inc., 2009

Michael Strogoff, AIA

Architects, by and large, excel at solving problems, gaining consensus, and crafting strategic solutions that satisfy disparate sets of stakeholders. Why then, do most architects loathe negotiating? And how can architects capitalize on their skills, shift their perspective, and level the playing field when negotiating with owners, program managers, contractors, and others integral to the complicated and messy business of producing good architecture?

This is the subject of Ava Abramowitz's second edition of *Architect's Essentials of Negotiation*, in which the author prods readers to become more assertive and reframe their egocentric views. She also implores architects to stop perceiving as mutually exclusive their several needs—to manage their own risks, command fees commensurate with their value, produce inspiring and responsive architecture, and help clients achieve their goals.

(A quick disclosure: I was asked to write a book about negotiating that would complement this second edition. The concept was that Abramowitz's book would discuss negotiating concepts, while mine would take a more "how to" approach. At the time, I was helping plan the AIA national convention in San Francisco; to maintain a semblance of sanity, I respectfully declined.)

Because I had read the first edition of Abramowitz's book and remembered it quite well, I thought I would read in their entirety only the new sections of this edition and scan the rest. But as I started reading the foreword and introduction, I got hooked again. I read a section that interested me, then another, and so on until I discovered that I had read the entire book. And it made no difference that I had read it out of order. This is a business book, not a novel, and even though later chapters build on basic negotiating principles that are covered in the beginning, the author tells you upfront that it is not important to read it in order. And right she is. Her conversational style keeps you engaged, whether you read sequentially or jump around among sections that most interest you.

The book will give you a boost of confidence that you have most of the skills necessary to be an effective negotiator. And it will likely empower you to step outside your comfort zone when negotiating, which will increase your effectiveness and enable you to make difficult choices, such as not accepting a commission. The book does an outstanding job of framing essential negotiation concepts: separating the people from the issues; focusing on principles instead of interests; maintaining alternatives to reaching an agreement; constantly probing for ways to enlarge the collective rewards; and aligning risks with those in the best position of managing those risks.

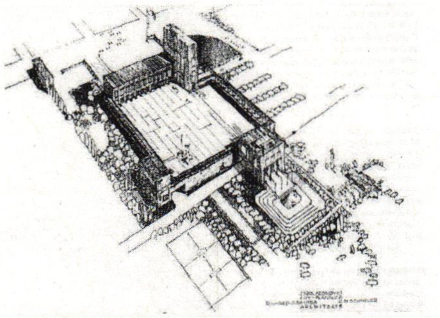
This edition successfully fills a gap in the original: skillfully told vignettes illustrate how to develop creative solutions that bridge disparate interests. Most architects will relate to her stories and will recognize some of their most difficult clients.

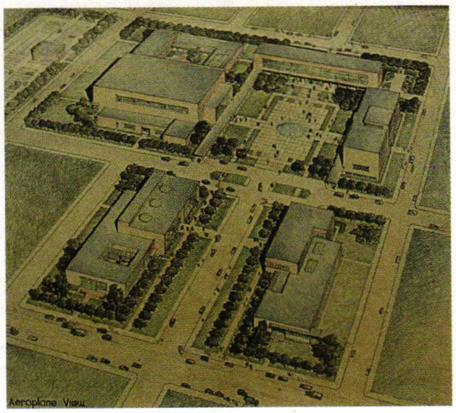
What the book is short on are two critical aspects of negotiating. The first is how to reach agreement with an unreasonable person who is also a desirable client (other than general suggestions such as "Don't get angry, get with it" and "Build on differences"). More real life examples, told by architects demonstrating how to respond to unreasonable terms and unruly behavior, would have made portions of the book more valuable.

The other area pertains to a negotiator's ingrained, personality-driven fears. Yes, most negotiating skills can be learned. But, in my experience, a negotiator's personality has more influence on an outcome than any amount of training and knowledge. One of my colleagues, while a highly effective marketer, is a lousy negotiator for one simple reason: he lives in fear of losing a client and of not pleasing other people. How does one get past this or any other of the dozens of reasons that people avoid conflict and concede too easily in a negotiation? While Abramowitz offers advice that will empower some architects and repeatedly encourages architects to stand up for their interests, this basic challenge still exists. Most architects are smart, analytical, creative and articulate. At the same time, many of us possess fragile egos and avoid confrontation. While *Architect's Essentials of Negotiation* is a must-read for architects, who have to negotiate constantly, I'm hoping that the 3rd edition provides more insight into overcoming these challenging obstacles. ◉

Richmond Civic Center Revitalization

Tim Culvahouse, FAIA





"We are living in an age of clear and well diversified objectives, and architecture must meet these objectives. We are now living in a mechanical, rational, abstractly imaginative age and our architecture should bear the imprint of the age."

Thus proclaimed the 1930 proposal for "A Civic Center for the City of Richmond," by the Architectural Group for Industry and Commerce (AGIC), a collaboration of planner Carol Aronovici and architects Richard Neutra and R.M. Schindler (left, top). Interrupted by the Great Depression and World War II, the development of the Civic Center did not proceed until 1945, with a new design (left, bottom), by Timothy Pflueger, renowned architect of Oakland's Paramount Theater (1931) and San Francisco's Castro Theater (1921), Pacific Telephone and Telegraph Building (1925), and Pacific Stock Exchange (1928). The ensemble of City Hall, Hall of Justice, Auditorium/Art Center, and Public Library was completed in 1951 under the direction of Plueger's younger brother, Milton (Timothy Pflueger had died in 1946), with landscape architects H. Leland Vaughan and Adele W. Vaughan.

The first phase of a comprehensive revitalization of the Civic Center, under a master plan developed by Perkins + Will, has recently been completed by Nadel Architects with site design by WRT. The City Hall and former Hall of Justice, now known as 440 Civic Center Plaza, achieved LEED™ Gold certification. The Civic Center Fine Arts Collection, implemented under Richmond's Percent for Art Ordinance, comprises eight specially commissioned, site-specific works by Archie Held, Gordon Heuther, Daniel Galvez, John Wehrle, and Marion Coleman, and fifty-six additional works by Bay Area artists. ◉