CONNECTION

THE ARCHITECTURE AND DESIGN JOURNAL OF **THE YOUNG ARCHITECTS FORUM**

METRICS

Exploring how big data and parameters are changing the way we design.

October 2016
VOL 14 ISSUE 05

DATA DRIVEN

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CONNECTION is a the official bimonthly publication of the Young Architects Forum of the AIA.

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ON THE COVER:

Image by Nicholas Banks, AIA

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STATE OF PRACTICE CONTRIBUTORS

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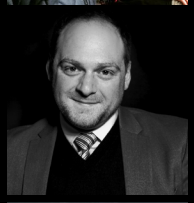

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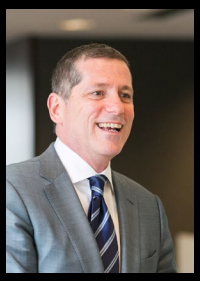
CATHY ROSSET

is the executive vice president and CEO of AIA Colorado. Originally hired as the executive director to four local AIA chapters within Colorado, she was promoted to her current position in 2013. Cathy was instrumental in merging the four local chapters into AIA Colorado and working with the five boards of directors to reorganize into one incorporated chapter with four local sections. The merger not only saved members' money, but allowed staff and volunteer leaders to shift time and resources from the governance and administration necessary to run five companies to more direct member service. Cathy is president-elect of the Council of Architectural Component Executives and was a member of the AIA's Culture Collective.



ANTHONY MOSELLIE, FAIA

has over 30 years of experience as an architect and manager on a wide variety of projects throughout the United States, Europe and the Middle East. Having joined Kohn Pedersen Fox in 1988, he currently serves as Managing Principal for some of the firm's most complex and high-profile projects. Some of his notable projects include the award-winning Buffalo Niagara International Airport and the International Terminal for US Airways at Philadelphia International Airport. In New York City, Anthony is Managing Principal for the Hudson Yards Master Plan, which is one of the largest and most complex projects in the City. Stretching between 28th and 43rd Streets on Manhattan's far west side, Hudson Yards will provide 13 million square feet of office, residential, retail, and cultural space in addition to public park space. Anthony received his architecture degree from the University of Michigan College of Architecture & Urban Planning.

ALVIN HUANG, AIA

is the Founder and Design Principal of Synthesis Design + Architecture and an Assistant Professor at the USC School of Architecture. He is an award-winning architect, designer, and educator specializing in the integrated application of material performance, emergent design technologies and digital fabrication in contemporary architectural practice. His work spans all scales ranging from hi-rise towers and mixed-use developments to temporary pavilions and bespoke furnishings. Each project is seen as a unique opportunity to pursue an identity that is rooted in technological and material experimentation as a means of challenging convention. This outlook defines the design agenda of the office, which seeks to balance both the experimental and the visionary with the practical and the pragmatic to achieve the extraordinary.

VIKKI LEW, AIA

began her architectural career in San Francisco and started practicing internationally when she returned to Hong Kong to join Foster + Partners in 2006. She has since moved on to complete graduate degree in sustainability at Harvard and acquire licensure in State of California. Her diverse portfolio includes healthcare, university, residential, financial institute, retail, mixed-use, super-highrise, and master planning. She is currently project leader of a new terminal for Hong Kong International Airport third runway expansion. Vikki's professional credentials include AIA, RIBA, LEED AP, and EDAC. Besides leading Young Architects Group, she is co-chair of Committee on Advanced Technology and Director/ Chapter Secretary of AIA Hong Kong.

ROBERT YORI, ASSOC. AIA

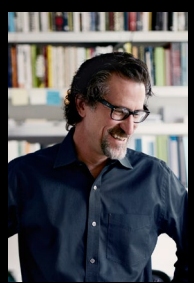
the 2016 TAP Chair, explores innovative uses of technology to better design, visualize, and deliv projects. He provides strategic and tactical consultant services to an array of architectura construction, development, and product manufacturers, and leads the Management Group the RTC Design Technology Summit. Prior to establishing his consultancy he served as th Senior Digital Design Manager in the New York office of Skidmore, Owings and Merrill, managin technology-related R&D efforts, providing strategic guidance to project teams, designing ar maintaining learning curricula and content, and training team members. At the firmwide lev he focused on knowledge sharing, big data analysis, and computational design literacy. Robe has taught at New York University and the New York School of Interior Design, and has lecture extensively at Autodesk University, RTC, ACADIA, and elsewhere.

PHILLIP BERNSTEIN, FAIA

was formerly Vice President, Strategic Industry Relations at Au todesk, where he was responsible for leading a team that sets th company's future vision and strategy for technology as well a cultivating and sustaining the firm's relationships with strategic in dustry leaders and associations. He currently teaches professiona practice at the Yale School of Architecture and consults to Au todesk on special projects. Prior to joining Autodesk, Phil practice architecture as a principal at Pelli Clarke Pelli Architects where h managed many of the firm's most complex commissions.

SHAUNT YEMENJIAN, AIA

believes firmly that architecture must have meaning in order to inspire. H strives to create, interpret, and infuse meaning into the design process Because architecture and the design process can cover a broad range o scales, he finds the process is of greater interest than the scale. This focu on the process requires energy and rigor to be applied in the developmer of core ideas and concepts as well as to construction and budgetar considerations. It also allows the client to participate and add value t the design process. With over a decade of professional experience, th projects which Shaunt has worked on match the broad range of scale which he is interested in - from art installations to multistory universit structures.



BRUCE LINDSEY

the E. Desmond Lee Professor for Community Collaboration, is dean of the College Architecture and the Graduate School of Architecture & Urban Design in the Sam Fo School of Design & Visual Arts at Washington University in St. Louis.

As a teacher and administrator, Lindsey has made significant contributions beginning design education, sustainable design education, and community desig education. He began his tenure as dean of Architecture at Washington University November 2006, and since then launched a new Master of Landscape Architectu program — the first such program in the state of Missouri, helped launch the fir doctoral program in sustainable urbanism, helped start the Center for Health Researc and Design and strengthened environmental design at all levels. Design Intelligenc named him one of the Most Admired Educators in 2009 and 2010 and in 2014 h received a distinguished professor award from the American Collegiate Schools Architecture. Lindsey is president elect of ACSA and will serve as president in 2016/1

CONTRIBUTORS - CONTINUED

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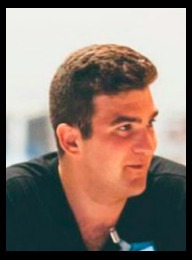
is an architect with Arrowstreet in Boston, MA. She is currently serving as Architect Licensing Advisor for both the AIA Massachusetts and NCARB. She continues her involvement by being a member of the Boston Society of Architects and their Emerging Professionals Network, BosNOMA and MakeTANK committees.

YVONNE CASTILLO

is Vice President and Director of Victor O. Schinnerer & Company's risk management program, with a special emphasis in the A/E sector. Her professional legal career includes litigation in both state and federal courts, as well as service as in-house counsel and Registered Lobbyist in the state of Texas for The American Institute of Architects (AIA) state component. Yvonne also served as Director for Business & Practice Policy at the National Headquarters of AIA. During her tenure with the AIA, Yvonne directed legislative and regulatory strategy for AIA components nationwide. She has also been active in national and international public policy forums engaging with elected officials and their staff on infrastructure development issues, including private financing of public infrastructure and other development models related to sustainability and resilience.



RYAN JOHN KING, RA

is the co-founder of FOAM and an entrepreneur, writer and architect. He has won numerous architectural competitions that explore the blockchain and architecture and published and lectured on the topic world wide. He was awarded 1st place in the Storefront for Art and Architecture and New Museum IDEAS City Contemporary Arts 2015 Street Architecture Prize Competition for the project Foamspace, which was a physical installation that stored its value on a cryptographic token given to a community. He has exhibited work as FOAM at the Chicago Architecture Biennale, Guggenheim Museum, Storefront for Art and Architecture and the New Museum for Contemporary Art.

EKATERINA ZAVYALOVA

is the co-founder of FOAM and an emerging New York architectural Designer who has realized a number of temporary projects that engage new forms of community organization and fundraising/crowd-sourcing methods. She has been awarded for her design work by the American Institute for Architects, Storefront for Art and Architecture and has been invited to lecture and lead workshops globally.

KOREY WHITE, AIA

is the 2016 Vice Chair/2017 Chair Elect of the National Associates Committee and the Chair of the National Design Services Act Coalition. At RNL Design, she is a Project Architect within the Public Studio working on transit and infrastructure projects that are imperative to strong communities and improving the quality of the built environment.

LISA CHRONISTER, AIA

is the 2016 President of AIA Central Oklahoma and founder of the chapter's Women in Architecture group. She is a past editor of the Young Architects Forum *Connection* and currently serves on the AIA Diversity Council.

RACHEL MEADE SMITH

is a design strategist at PLASTARC. With a background in anthropology and a graduate degree in design studies, she has worked in research, content development and design strategy for museums, academia, and design-centric publications. Rachel approaches the built environment as a product and producer of sociocultural conditions, and is particularly interested in design as a tool for public wellbeing.

CHIU-SHUI CHAN, PH.D.

is a Professor of Architecture and of Human Computer Interaction Program at the Virtual Reality Applications Center, and chairs the Digital Media Minor Program. His areas of research have been in the exploration of design thinking, phenomenology of designing and parametric modelling. He has developed various virtual models for the study of design cognition, visual perception, and applications of VR in architecture.

NATASHA LUTHRA

is a Principal in the Jacobs Practice Technology team. She routinely engages with clients and A/E's on all things BIM from formulating execution plans to managing the flow of data from conceptual programming to facilities management. She leads a group of talented designers that act as the tip of the spear as it relates to technology in design. She has a Bachelors as well as a Master degree in Architecture but defines herself as the ultimate problem-solver.

ALEX ALAIMO, AIA

currently serves as a Director at Large for the AIA National Associates Committee (NAC) where he promotes engagement among emerging professionals. Previously Alex served as Co-Chair of Emerging New York Architects of the AIANY chapter. Additionally, he founded Operation Resilient Long Island a post-Sandy resilience ideas accelerator. He graduated with a B.Arch at NYIT in 2013 and is currently employed by PBDW Architects in New York.

PREDICTIVE MODELING

Humans have been collecting data since the dawn of man in one form or another. Whether it was knowing where a herd of game would be, when the sun would rise, or what poisonous berries to avoid, someone was tracking it. At its core, data is about intelligence, fact finding and other information that helps make future decisions better. The modern version of data however, is much more complex. In our web 2.0 world, the concept of data has taken on a new and increasingly pervasive connotation. This modern version looks at extremely large sets of information in order to identify future patterns and predict behavior in a way that couldn't be foreseen before. Many industries have been able to capitalize on the increase in data, because they rely heavily on statistics to work. Architecture has been slow to adopt this strategy because design is much more rooted in subjectivity. However, the pace of innovation is changing and more and more applications are coming online that are natural fits in an architect's workflow.

The use of data has had its greatest impact on the built environment through sustainable design. This is because it's one of the few areas that architects/designers can measure buildings in a quantitative way. Efficiency can be measured, catalogued, tracked and optimized in order to attain better performance. It is also one of the closest processes to a scientific experiment that can achieve peer reviewed, objective results. But sustainability just scratches the surface of how data can inform design. Our modeling software, for instance, is a great example of the mass amounts of data that we embed into every single building we draw. At a basic level, we are adding information that could be used for cost estimating, structural performance, daylight optimization, and material efficiency to more complex data that includes predictive patterning.

Throughout this issue, we touch on a number of ways that data is doing more than just being numbers. Because the data we have access do is too valuable not to reuse in some form. We don't need it in order to predict a trade on the stock market or build a profile of shopping habits, but we could use it to automate redundant tasks. Or we could use it to inform decisions to corroborate what we already "feel". Like many other multi-year trends, the increased use of data and technology is not going away. As architects, we need to embrace new ideas not only to stay ahead of the curve, but because many will help us practice more efficiently and proactively. ■

Jeff Pastva, AIA

Jeff is the 2015-2016 Communications Director of the Young Architects National Advisory Committee of the AIA, the Editor-in-Chief of YAF CONNECTION and a Project Architect with JDavis in Philadelphia.

YAF REGIONAL SPOTLIGHT

Jessica O'Donnell, AIA, is a Project Architect for Kitchen & Associates in Collingswood, NJ, and is currently the AIA Young Architect Regional Director for the New Jersey Region.

What organizations are you involved in as an emerging professional?

During my time at Oklahoma State University, I was actively involved with AIAS. Upon graduation, I transitioned my involvement to my home state of New Jersey, where I hold positions with AIA New Jersey at the state and local levels. I am a founding member, and current Chair, of the AIA New Jersey Emerging Professionals Community (EPiC), which encompasses architecture students, Associate AIA members, and architects licensed 10 years or less. EPiC provides educational programming, events, and service opportunities for members to have fun, build relationships, develop leadership skills, and increase their involvement within the architectural profession. Through EPiC, I am actively engaging with local AIAS chapters to bridge the gap between students and young professionals. I also serve as a member of the AIA NJ Design Day Conference and the Legislative and Government Affairs committees. Outside of my involvement with the AIA, I am a Centennial Mentor at my alma mater. Through this program, graduates are paired with students to guide them as they look for internships, graduate, and transition to the workforce.

Please speak to your involvement with YAF.

I am in my first year as the Young Architect Regional Director (YARD) of New Jersey, where I serve as a member of the Regional Engagement subcommittee. One of my duties is to gather information from other YARDs so we can create a national database and gain a better understanding of how to effectively communicate with and engage young architects. Being a member of this subcommittee will help me achieve one of my personal goals as YARD, which is to create more member engagement from emerging professionals, specifically young architects, in New Jersey.

Being YARD of NJ has presented opportunities to attend several national AIA events, including the YAF Annual Meeting with the National Associates Committee, the Grassroots Leadership Conference, AIA National Convention, and the inaugural Speak Up — Advocacy and Action Event. I was also fortunate to be a facilitator of the YAF Mini-MBA session at the AIA National Convention this year. I found the content of the lectures relevant and useful to my career stage, while the break-out session conversations provided the perfect opportunity to learn from people across the country in different stages of their architecture careers.

What are some of the important issues young architects face in today's industry?

We need to find our voice. After finally achieving the status of being licensed, many of us wonder "What's next?" Young architects tend to feel as if they are stuck in a poorly defined transition stage where the profession as a whole does not know how to view them. We need to remind others that today's young architects are the future of the industry. As such, it is important we find our voice and take a stand on the important issues we face:

- How do we bridge the generation gap found in most offices?
- How can we position ourselves to take the next steps in our careers and help our firm transition through upcoming principal retirements?
- How do we engage the public while highlighting the value of an architect?
- How will emerging technology change the way we practice architecture?
- What impact will climate change have on the construction industry?

The answers to these questions and how we navigate through these important issues will determine the future of the architecture profession.

What advice would you give to young architects looking to get involved in their design community beyond working at a firm?

Being an active member in your local AIA chapter or section is a great place to start. AIA events are some of the best places to network with others in the industry, and these connections can lead to opportunities to get involved in other aspects of the design community. Join, or start, an emerging professional's group that includes other design organizations, such as the American Society of Landscape Architects (ASLA) or the International Interior Design Association (IIDA). Volunteer with Habitat for Humanity, become an ACE Mentor, get involved with STEM competitions, or participate in a local CAN-struction event. There are many ways to get involved; the key is to simply find something you are passionate about.

THE FUTURE OF CONNECTION

At the end of 2016, Jeff's term as editor in chief will come to a close and our new editor, Yu-Ngok Lo, will be taking the reins. As part of the transition, the CONNECTION team will be looking for new members to join the committee. Official position descriptions are currently being prepared, but if you have a general interest in helping to craft the direction of the magazine, please email Yu-Ngok with your intention and we will see how you can fit in.

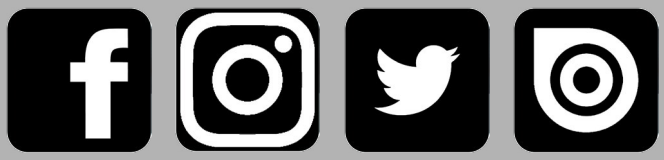
YAF RESOURCE GUIDE

AIA's Young Architects Forum
YAF's official website

YAF KnowledgeNet
A knowledge resource for awards, announcements, podcasts, blogs, YAF Connection and other valuable YAF legacy content ... this resource has it all!

AIA Trust
A free-risk management resource for AIA members.

AIA College of Fellows
Check out the College of Fellow's reciprocal newsletter to find out more about what's going on.



Know Someone Who's Not Getting YAF Connection?
Don't let them be out of the loop any longer. It's easy for AIA members to sign up. Update your AIA member profile and add the Young Architects Forum under "Your Knowledge Communities."

- **Sign in to your AIA account**
- Click on the blue "Add a Knowledge Community" button
- Select Young Architects Forum from the drop down and SAVE!

Call for News, Reviews, Events
Do you have newsworthy content that you'd like to share with our readers? Contact the News Editor, Beth Mosenthal, on twitter - *@archiadventures.*

Call for CONNECTION Articles, Projects, Photography
Would you like to submit content for inclusion in an upcoming issue? Contact the Editor, Jeff Pastva, at **jpastva@gmail.com.**

WHAT TO EXPECT AS A WORKING MOM
LESSONS FROM THE FRONT LINE

by Lisa M. Chronister, AIA

AIA Central Oklahoma's Women in Architecture group met recently to hear a panel group of "super moms" discuss "What to expect as a Working Mom." As the event announcement stated, "Forget architecture school or the licensing exam…nothing is more challenging than returning to work as a new mom." At the event, panelists discussed their return to the A/E workplace, and how they have been able to make it all work (sort of). Several important lessons emerged from the discussion:

Flex Time Is Key

The panelists worked for offices ranging from very small to very large, and all praised their firms' willingness to allow employees to come in early, work through lunch, or stay late — or a combination of all three — in order to juggle day care drop-off, doctor's appointments, or after-school sports activities.

They also cited that the firms' generous leave policies and flexible scheduling were made available to all employees to juggle various life interests. For example, employees without families could take advantage of the same leave policies and flex-time practices to participate in their own volunteer, recreation, or hobby interests. This eliminated resentment among other employees that those with small children were being given preferential treatment. "It's your time to do what you want," stated one panelist. "It doesn't matter if you are spending it to pick up your child from school or pursuing another interest that's important to you. It's your time."

Similarly, panelists suggested getting out of the habit of explaining why they couldn't work late or why they had to leave for an hour in the middle of the afternoon. A firm, unapologetic "I will be out of the office from 2 to 4 on Wednesday" or "I have to leave at 5 p.m. today" is sufficient explanation, and doesn't offer any details for others to speculate on.

Communication with supervisors is essential to making flex time work. This will ensure that tasks are completed, meetings are covered, deadlines are met, and expectations — on both sides — are met. Communication will also make it clear that the employee is being responsible for her own workload, and has a proactive plan to manage it.

As flex time becomes increasingly important to employees, and as more firms offer it, it seems clear that employees will choose to work at those firms that have flex time as a benefit. Also, it seems clear that if your office does not offer the flexible policies that you need, there are many others that do, and these may be a better fit for your needs.

Plan Financially For Your Time Off

All the panelists advocated taking as much maternity time as possible. Some had taken as little as six weeks, and others had taken as much as twelve. All agreed that ten to twelve weeks was ideal in order to allow their bodies to fully heal and for baby to get on a (sort of) regular schedule.

The panelists acknowledged that their firms' generous leave policies allowed them to take up to twelve weeks off, but cautioned that much of this time was without pay. The firms' leave policies generally allowed employees to exhaust sick leave and vacation time during maternity leave and to take the remainder of the time as unpaid without putting their jobs in jeopardy. Some firms offer short-term disability coverage that will pay a portion of an employee's salary during maternity leave.

Still, finances were an unavoidable reason that one panelist did not take as much time off as she wanted. "I was the primary breadwinner, so I had to go back to work to pay the bills," she recalled. Scrupulously accruing leave time, seeking employment with firms that offer disability coverage, and saving as much as possible before baby arrives can help employees successfully manage maternity leave.

Be Prepared For The Unexpected

Nobody expects the colicky baby, but it happens. Nobody expects the emergency C-section, but it happens. There is never a good place to pump breast milk between meetings. According to the panelists, being mentally and emotionally prepared for the unexpected is essential for the journey of returning to work.

Relying on a support network of family and friends can help bridge gaps in childcare coverage. Giving up on expectations for a perfectly healthy meal schedule is OK; sometimes a handful of cookies and a bag of chips really is an adequate meal. Crock-Pot meals and weekend "investment cooking" are their own essential ingredients to work-life balance. Assessing school, day care, and pediatrician locations and travel routes before you choose them can reduce travel time and therefore reduce time away from the office. Sometimes returning to work on a part-time or contract basis is the best way to meet your child's needs while giving mommy the opportunity to do the work she enjoys.

It's All Worth It

The panelists recognized that their career trajectories might "level off" during the early childhood years. After years of "climbing the ladder," they now have other priorities and may not be able to devote the extra time that major project assignments require (especially if they have opted to return on a part-time or contract schedule).

Still, the women are confident in their career choice — they really do love practicing architecture — and are certain that they could resume a more intense level of practice as the children grow older and more self-sufficient. In the meantime, they have no regrets about the time they are investing in their families and are grateful for the memories they are creating. ■

EXECUTIVE DIRECTOR SPOTLIGHT

AN INTERVIEW WITH CATHY ROSSET, EVP/CEO OF AIA COLORADO

by Korey White, AIA

Architects are using data to drive design and solve problems within our projects and our firms. As the AIA continues the repositioning effort to better serve architect members, Executive Directors have turned to data to grow membership, highlight services, and execute meaningful programming. CONNECTION sat down with Cathy Rosset, CEO of AIA Colorado to learn how her team has increasingly used data to serve the Colorado membership.

KW: How does your component use data to provide services to existing members?

CR: We look at the key findings from the AIA Member Needs Survey to see how we can shape our services, or in some cases, better communicate and connect members with resources that already exist. Continually, those surveys tell us they look to the AIA to protect the profession by advocating for sound public policy and promotion to the public.

As part of our program and service evaluation, we look at the numbers – did we reach participation and sponsorship goals? Did revenue outweigh costs? We also survey members following events to find out what worked, what didn't, and what they would like to see in the future. Together, this information helps us understand which programs and services are highly valued and which ones we need to let go so we can focus more resources on the winners. An example is our online library of books and webinars. We had some strong member champions for this concept that took the risk to invest in the technology and create content. However, usage was well below our target goals, even after promoting its existence weekly. Members we talked to often said, sounds like a great idea – surely someone needs it. But even the members who thought it was a great idea were not using it. So we let it go and now point our members to AIAU and AIA Architect for online education content because those avenues are successful for AIA. It also frees up more resources to focus on producing Code Classes, our state conference, and half-day symposiums, which are proving to be more successful at this time.

KW: What are some advantages of using data in order to better serve your membership?

CR: Decisions backed by a mix of quantitative and qualitative data are justifiable. It shows we are being considerate of what is actually happening in the market, not deciding things on a whim. We are using member resources wisely.

KW: Have you or do you intend to use data to reach out and grow your membership base?

CR: We compare our membership database with the Colorado Department of Regulatory Agency's list of architects licensed in and residing in Colorado. This helps us know who else we need to be marketing to. If we had unlimited resources, it would be great to invest in data about Colorado architecture firms and find graduates of architecture school who are now in Colorado, but not yet licensed.

KW: You mentioned that you have incorporated financial performance data. How does this streamline your efforts as a component? How does it help your board operate more efficiently?

CR: While we are not set up to track everything we do by the minute or hour, we can look at our calendars and reasonably estimate what it takes to plan, promote and execute events and meetings, and perform certain services. These time estimates have made it possible to allocate a percentage of staff and operating expenses to each thing that we do to run the organization and provide member services. This better informs our program evaluation data – it isn't simply about how much food and room rentals cost, but what time went into making it all happen. Because we have a more complete picture, the board has a better understanding of how resources are actually being allocated and can make better informed decisions. We can also see which programs are underperforming – perhaps attendance is great and the post-event surveys are all positive, but we aren't charging enough to cover the true costs. That's an "aha" moment. If the program experience will be harmed by cutting expenses, then could we raise more revenue through fees, sponsorship, or higher dues. Or, if very few members use a certain service, yet it costs quite a bit of time to produce and maintain, it may be time to let it go now, rather than charge unrealistic fees or increase dues to maintain it.

KW: Is there anything else you can tell us about using data within your components?

CR: I am curious how far the AIA's digital transformation will take us. In my dream world, I would be able to pull up a member record and immediately see what articles they click on, what local and national events or webinars they attend, which lists they subscribe to (yeah, call me big brother) – or at least general membership reports, which reflect usage and participation trends among Colorado members. Knowing this information would help me better connect with local members, understand where their interests lie, and focus our state chapter resources in the right direction. I also wish AIA had more data on the firms and organizations where our members work. Smaller chapters probably have an easier time keeping tabs on that, but it is hard to get our arms around it with 2400 individual members in our chapter.

On the flip side, we are picking up the phone on a regular basis to simply reach out and talk to members. Yes, talking is still a valid way of collecting data. I, along with my staff, call on members to get their perspectives on hot topics, find out what projects their firm is working on this year, or simply what keeps them up at night. We regularly report back to each other at staff meetings – what are you hearing? How did you respond, or how can we follow up? Any emerging trends? ■

HOW TO TALK TO YOUR CLIENTS ABOUT DATA

by Natasha Luthra

The last few years, accelerated by the rate of change brought about by technology, there has been tremendous discussion in architectural and engineering firms around the concept of our "Standard of Care" and what we owe our clients. Where does a good comprehensive design deliverable begin and, more important, where does it end?

Designing and constructing a building is expensive, but a much larger cost burden during the life cycle of the building lies in its operations and maintenance. Therefore, as architects, our standard of care must take into account what it costs to manage, operate, and maintain our designs. Our clients, who will ultimately bear this, will take over from the designer and contractor at handover and are then responsible for managing the building through its life cycle. This involves massive amounts of data. If they are tracking equipment, they must know where the equipment is located, what it is connected to, when it needs to be serviced and how to respond if/when said equipment fails.

As designers, we may not be responsible for how the equipment in a building behaves after it is put in operation. However, as strategic partners and consultants to our clients, it is in our and our clients' best interest to make this data as transparent, available and central as possible.

So, this is how to talk to your clients about data. I believe that our scope should stretch to accommodate the intent of the use, operation, and maintenance of the building – the ultimate consequences of our design decisions. To do so, we can and should set up mechanisms to record these decisions as they move through the design process. This will allow a single uninterrupted warehouse of data that can be added to at any point in the design and construction process and can be accessed throughout the life of the building.

With the advent of BIM, inherently combining the power of modeling and information, the repository of data is obvious. Many of us, though, are suspicious of adding data to the model that may not be applicable or may be changed. So we should think of the information portion of BIM as setting up two very important connections. One, as mentioned earlier, as the final and only source for this data and two, more important, as the location to virtually connect these large streams of data to the physical object itself. As the designers, we set up connections, and we set up the skeleton for the data. The contractors and facility managers then fill in the gaps about how the building is to be operated.

Once we know how to talk to our clients, we must confirm we correctly understand the who. Most major public or private clients have a design and construction team responsible for making sure that the building is constructed under budget and on time. They are the face of the client for the designer's or contractor's purposes, but they are most likely not the people responsible for the operations and maintenance of the structure itself. Like us, they have a somewhat limited responsibility in the life cycle of the building and as such may not be very receptive to a conversation about the flow of data downstream. This is where we must request an audience with the facility department. These teams are responsible for the life cycle maintenance and realize the value of data collection during the design/construction phase. Very often, however, we face resistance from these teams because they perceive the information collected during this phase as being temporary or irrelevant to their needs.

This leads to thinking about the what: The information facility managers are looking for and how can we help provide it upfront. There are four key aspects to making this flow of data as smooth and valuable as possible, and they require the input of all parties.

Naming Convention – most facility managers will have what they call a naming convention bible. This follows a very specific nomenclature for every piece of equipment or part of the building that must be tracked. Adding this information to the Building Information Model (BIM) can be the first major step to building the data connection to physical objects. Additionally, this is a good start to understanding what the facility manager is looking to track – for not all elements that go into a building must be tracked throughout the life of the structure.

Location – As an obvious but oft-overlooked next step, correctly tracking the physical location back to the BIM is an extremely valuable portion of the operations and maintenance phase. This may seem apparent, but on a large campus or intricate hospital, it may be critical. The final physical location can be tracked by using a simple system of barcoding equipment that is linked back to the BIM.

Classification – This can also be described as the hierarchy, or how one element is connected to another. For example, how a panel board is connected to individual components within an electrical system or which water heater is connected to a specific AHU. While this may seem like the task of the contractor, setting up the mechanism (like building a parameter associated with the equipment in the BIM) can and should be part of the designer's repertoire.

Attributes – These can simply be described as a particular set of attributes that the facility manager is looking to track. As we saw in point one, understanding what elements need to be tracked is imperative, and it is also important to understand what particular aspects of the equipment need to be tracked. Identifying and narrowing this list can help tremendously when isolating information that is useful from the vast trove of data generated during the design and construction of the building.

If we can address these key aspects during the design and construction phase, we would go a long way in creating, curating, and validating data that is actually useful in the operation of the building. I hope that this information can help us all understand that with a little bit of investment of time and effort from all interested parties, we can work towards a more responsible process that addresses the entire life cycle of the building, not just the parts that we must directly address. ■

CAN TECHNOLOGY CAUSE TUNNEL VISION?

by Yvonne Castillo

Heads up. The economic transformation away from fossil fuels to renewables is happening, and at a pace much quicker than you might think. That's because the markets are evolving, which makes the technologies more affordable and thus more accessible. One signal of this evolution is the activity of major Fortune 500 companies such as Microsoft, Apple, and Google. In the Spring of 2016, they met to explore ways to get off of coal and transition to renewables as their primary source of energy. In the last month, Victor O. Schinnerer & Company has learned that these companies are establishing their own energy subsidiaries to take advantage of renewable energy markets. What they have come to realize, and what's been hidden in plain sight, is the obvious: The sun and the wind are free, no-cost energy sources. The only thing needed, until now, were the mechanisms to capture, convert, and store the energy for future use.

Even major casinos, including MGM and Wynn, have offered to pay tens of millions of dollars in exit fees to utilities to have the opportunity to procure their own energy from renewable energy developers. So, when Silicon Valley, Fortune 500 companies, and investors clamor to be the first to take advantage of clean energy, other businesses, including architecture firms, ought to take some time to ask themselves: What does this all mean to me, and what opportunities am I missing?

The Need

One of the most interesting things happening in this renewable energy space is the laser-focus on technological innovation. What's missing is the impact that design can have in deploying technologies. Design has real potential to propel forward the transformation we need to meet peak carbon dioxide emissions by 2020 and reductions by 2050. Consider this: We know that 40% of energy consumption stems from buildings, the vast majority of buildings (more than 70%) were built 20 years ago, and we spend 98% of our lives indoors. Consumption isn't going away, so we must ask ourselves: What more do we need to know to embrace this opportunity?

The Building Design Solution – Where Technology Falls Short

Schinnerer poses an example of where technology addresses one issue, but does not necessarily address the bigger issue. When the sun's up, all is well; the solar panels on a home or building take in energy that can be converted into electricity and used contemporaneously by its occupants. When the sun's down, the challenge kicks in. How do we store the energy that is captured during the day so that we can use it at night or on a cloudy day when we don't have the resource available? Affordable storage technologies are ramping up at the commercial scale to address this issue, and the market is quickly developing. This technology trend will most definitely help balance out the "duck curve" (i.e., demand peaks when everyone gets home from work and the sun goes down) by providing a storage-and-use solution to the supply-demand problem. But while this is great news and meaningful progress, what's missing from this global debate is a bigger and broader solutions based approach to optimizing innovative technologies.

What we're not talking about is the fact that these technologies are being housed in buildings that can optimize the need for these technologies. In other words, the technologies are a piece of the solution, but not the end-all for reducing carbon emissions. In one word, we're talking about resiliency — designing buildings to operate without electricity and with minimal water use and still at a comfort level that's meaningful for its occupants. When buildings are designed or retrofitted with a basic demand-supply analysis and demand-supply modeling the same concept economists use) to minimize the need for air conditioning, electricity, water, etc., we're optimizing technology innovations and helping the world get to zero carbon emissions much more quickly and more efficiently. The organizing principle for this design-centric thinking is called Net Zero (or Net Positive, depending on your ambition). This is the principle that a lot of people don't know about, but that forces the supply world of renewables to connect with, and talk to, the demand world of actual consumption.

Net Zero = "Use-What-You-Produce"

Net zero occurs when the total amount of energy used in a building or home on an annual basis is roughly equal to the total amount of renewable energy produced. In the case of "net-positive," the building produces more energy and potable water than it consumes (measured over the course of a year). Notably, net-zero, or net-positive design, doesn't apply to just new construction, but can also be deployed in renovations. It is a strategy in which design professionals consider, analyze, and model aggressive conservation design strategies for energy and water use that set the stage and create the demand framework needed for energy and water supply. This demand framework is where the rubber meets the road and is the precursor that enables renewables to meet demand.

Examples of aggressive design strategies might involve enhanced envelope performance (i.e. reduced window-to-wall ratio, improved insulation, improved glazing); enhanced lighting performance (i.e. upgraded fixtures and integrated control systems that shut off lighting when occupants aren't present or when daylight is sufficient); optimized mechanical performance (i.e. ground source heat pumps, targeted HVAC systems); aggressive plug-load analyses; integration of rainwater collection/treatment systems; and high-end, commercially used composting toilets. These strategies together, among others, are the kinds of design strategies that architects can deploy holistically alongside the use of innovative technologies to make (and convert) our built world into a friend of the planet, not the enemy. As Frank Lloyd Wright mused, "Buildings, too, are children of Earth and Sun." Consider this a call to action to architects involved in the design of buildings: Get in there and help the world understand what you can do, too! ■

SIMULATION DATA AS DESIGN TOOL

by Vikki Lew, AIA

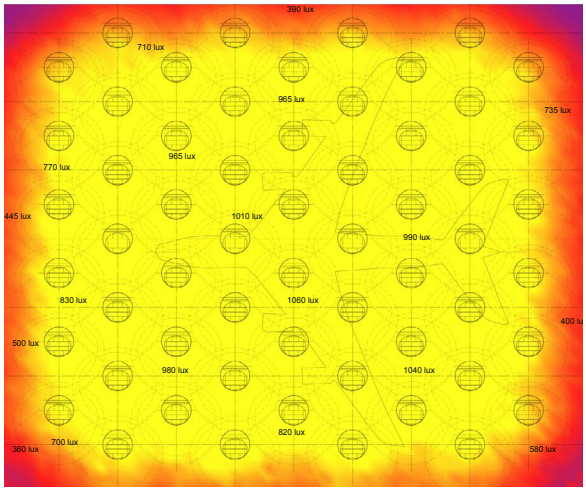
In empirical research, qualitative data refers to information that cannot be measured. Quantitative data, on the other hand, refers to measurable information that can be expressed in numbers. These methods, though typically used in academic research, are analogous to the data-driven, research-based approaches that drive sustainable design. I started taking an interest in sustainability after passing the LEED 2.0 exam, which was newly released at the time. However, the more I read about the subject from different media, the more I realized I did not have adequate knowledge to integrate sustainability into the ways I work as an architect. After I passed all ARE divisions, I explored continuing my post-graduate study to make up for this knowledge gap. Instead of pursuing another architectural degree, I took an alternative path that focused on the subject of sustainability. The program covered climate science, human health impact, and sustainable development strategies, and culminated in an empirical research thesis in which I focused on life cycle assessment of innovative façades. The research question was whether there was a case for design innovation if there were less expensive alternatives. As an architect, the most valuable skill that I have developed was an analytical expertise that provided rigor to my creative thinking.

To apply what I learned academically in practice, I found it powerful to make the case for design by integrating quantitative data. Since I was generally familiar with the principles of sustainable design and possessed technical knowledge, I was able to work for the Hong Kong office of Foster + Partners from 2006-2009. Besides my responsibilities in design and technical work, I was the sustainability lead in the office and introduced LEED as the benchmark for all projects I was involved with. It was a privilege to integrate sustainable ideas into the innovative design process.

The application of data-driven sustainable design has taken a more entrepreneurial approach. Working outside the U.S. offers me a different perspective about an architect's role in sustainability. In Asia for instance, the local architects often rely on consultants for technical work that architects in the States consider their responsibility. Take façade design for example. When selecting glazing for a project, a US-based architect's responsibilities include evaluating visual transmittance and solar heat gain coefficient. Where I'm practicing now, such tasks are often outsourced to consultants, and the architects might not even realize that such technical tasks actually fall within their responsibility. Architects miss out on a lot of opportunities to better understand the design and drive a more sustainable outcome.

We are seeing a paradigm shift in data-driven design process. Advanced simulation used to be the domain of leading firms only. However, with many of the analysis tools becoming more affordable, performance simulation is no longer available to only large firms that have the available resources. The two examples (shown here) were undertaken by setting up the software and database from scratch. First is a rooflight analysis for an airplane maintenance complex. It was completed in one week in the early stage of design development to create the design parameters. We established assumptions of glazing performance, visual transmittance and the solar heat gain coefficient, and we tested illuminance performance on the equinox, summer solstice, and winter solstice. The sectional diagrams were developed based on orientation, building form, façade and solar angle. These diagrams were instrumental in illustrating how the building enclosure related to the daylighting strategies. They do not require advanced software to create. However, it does require the architect's understanding of sustainable design principles. Through these analyses, we were able to quantify parameters such as rooflight diameter, height, orientation, opening size, glazing selection, materials, distances, and arrangement. Besides the quantitative data, there are qualitative questions that cannot be resolved by simulation. For instance, how would the rooflights interface with the roof structure? How would the details work? This is when the architect's design and technical judgment really matters despite all of the digital analysis.

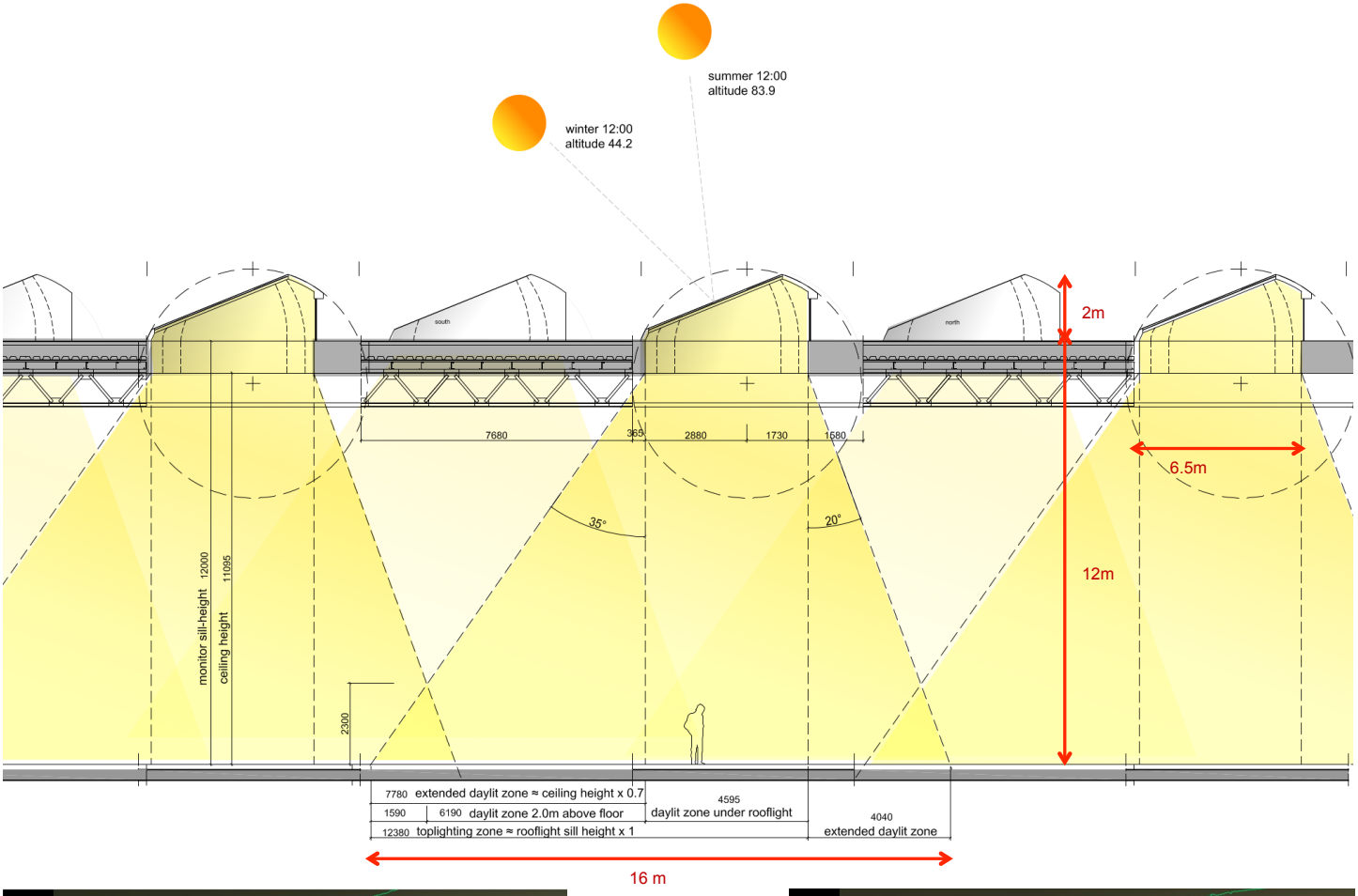
The second project is of a high-rise office building. Although a sustainability study was not included as part of the project scope, the analysis was produced as a byproduct of specifying the appropriate



Above: Illumination simulation of rooflights on the summer solstice.
Opposite Top: Rooflight spacing and daylighting zone diagram.
Opposite Right: Seasonal daylighting simulation for testing façade design.
All images courtesy Vikki Lew

solution to the façade design during the design development phase. Radiance and COMFEN simulations were conducted to check for illumination levels and façade-associated energy use. The data were then used for adjusting the window heights and configuration of the exterior shading devices. In both cases, the analytical processes were not exhaustive and fell short of full-scale parametric design. Nevertheless, the simulations were sufficient to generate applicable data to drive the façade design.

Amid the paradigm shift in integrating data in sustainable design, there are specific roles for emerging professionals. It is my opinion that sustainable design is a responsibility of all architects, and it is particularly important for our generation to ramp up our positive impact. Recent issues of YAF CONNECTION have also highlighted the unique skill sets of emerging professionals, including a more collaborative and multi-disciplinary approach. All these qualities are essential to solve the complex problems that require collective expertise. In the book "Five Minds for the Future" by Howard Gardner, five cognitive abilities were outlined as prized among future leaders – the disciplinary mind, the synthesizing mind, the respectful, the ethical, and creating mind. To successfully integrate data-driven approaches in our daily practice of sustainable design, all of these qualities are prerequisite. The ability to create, however, is unique to all architects. ■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12m
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35°
20°
monitor sill-height 12000
ceiling height 11095
2300
7780 extended daylit zone ≈ ceiling height x 0.7
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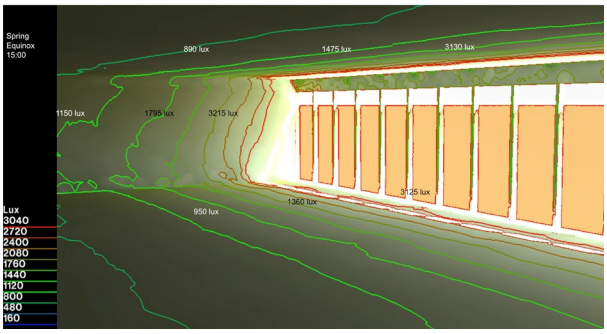
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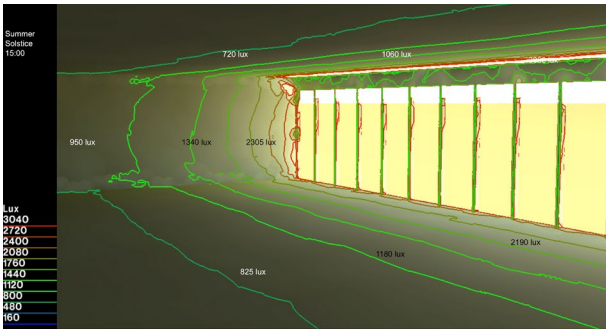
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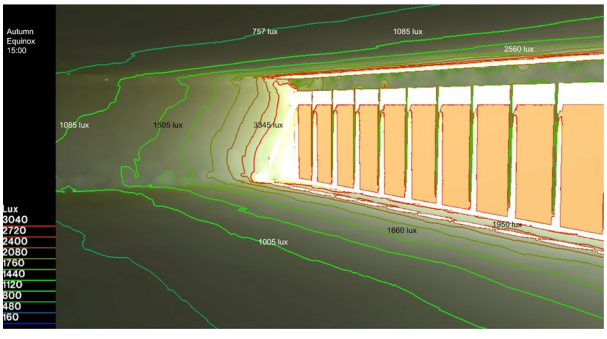
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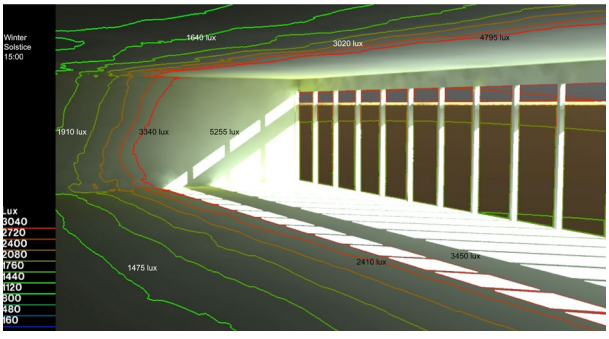
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THE VALUE OF VIRTUAL ENGAGEMENT

by Gabriela Baierle-Atwood, AIA

In a time when the generation that created Facebook is taking over the majority of the workforce, architects must consider the impact that social media has in our processes of design, our professional practice, and our outreach to the public. In his 2014 TED talk, Marc Kushner (HWKN, Architizer) argued that the ability to receive immediate feedback via social media has ignited a public dialogue at every stage of our process, not just when a building is complete. According to Kushner, this immediacy also means that the typical feedback timeframe in architecture is becoming obsolete, which is why young professionals must be aware of and build upon the value that can emerge out of using social media. Beyond breaking the feedback pattern in architecture, this approach gives design professionals the freedom to engage in audiences much wider than the visitors or inhabitants of their buildings. Social media platforms can provide insight into the preferences of our stakeholders, our communities, the general public, and our own colleagues and collaborators. For the first time, anyone who engages with a built space can become a critic, and that can bring a lot of value to our practice. The projects below demonstrate that virtual engagement tools, when used well, can gather programmatic feedback, change the public's perception of the architect, and elevate the profession.

Kushner's TED talk, entitled "Why the buildings of the future will be shaped by ... you," used the Fire Island Pines Pavilion (HWKN) as an example of sharing imagery with the community in the early phases of design. The early engagement of the users, accompanied by the release of photorealistic renderings of the building, led to an informed community ready to give feedback. Recognizing a valuable asset to the design and to the project, HWKN utilized social media as a platform to reach its stakeholders: Community members posted comments, shared the design, and interacted with it. The comment process and image sharing allowed users to take ownership of the design in such a way that it became part of their community two years prior to construction. By translating their design thinking into media content, HWKN created a much more responsive collaboration between the building's users and its designers.

One can't help but look at this example and compare it to the more usual ways our profession has engaged the public. Forums, user group meetings, questionnaires: All of these examples depend on a timeframe for feedback, which is valuable for the design team and the public and could be put to use elsewhere in the design process. So, how exactly can social media platforms help bridge that gap?

Creating a social media strategy has the potential to optimize the way time is spent and the ways to gain design feedback. Rather than an array of meetings, architects can utilize online platforms and collect information for the purposes of programming, schematic design and even design development. A pioneer of this approach to social media usage is the Surrey City Centre Library, a project by Bing Thom Architects located in British Columbia. Working with a difficult deadline and needing public commentary, Bing Thom turned to social media instead of the usual forums and presentations. They developed an outreach strategy supported by blogs, Twitter, Facebook, and Flickr, to invite feedback and engage the general public in ways a typical forum couldn't have. Like HWKN, Bing Thom translated its design process and thinking into media that was accessible 24/7, and this move allowed its community to interact from the get-go. Beyond its time-saving benefit, the strategic plan reached a wealth of stakeholder groups. A FastCompany.com article from 2011 even cites a group of young students who asked for "a place to colour and write." Highlights of the blog (still online, though inactive) are the posts with construction photos and updates by the architect. This is a simple way to keep the users up to date and promote transparency in the design and construction process at the same time. According to Bing Thom's website, the Surrey City Centre Library is "arguably the first public building in the world to be designed with the aid of social media."

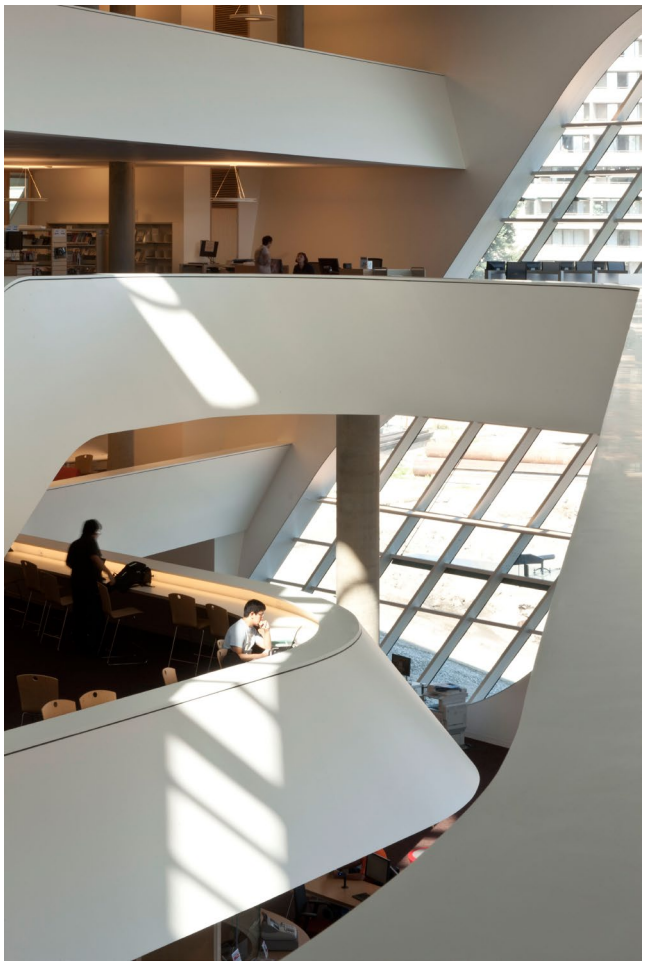
When we think of social media platforms being utilized to promote architecture as a profession, Bing Thom's project is one of many examples of its power. But more than just design-related feedback, online media platforms can be tailored to present the accomplishments of a number of lesser-known professionals, particularly, female architects. Despina Stratigakos, scholar and associate professor of architecture at the University at Buffalo, State University of New York, has written about her frustration in trying to "unforget" female architects from history. She also writes about how crowdsourcing has changed the method for doing just that.

Crowdsourcing usually involves a pool of people from different backgrounds and sectors who combine their skills to analyze a problem, propose innovative ideas, or design solutions together. This engages the mainstream public, brings diversity to the work and takes advantage of the mass involvement, usually reducing the completion time of the project. Stratigakos' piece, entitled "Unforgetting Women Architects: A Confrontation with History and Wikipedia," describes the intent to build on the force of the crowd and rescue lesser known professionals from vanishing — namely, by increasing the number of entries on Wikipedia for female professionals.

In her article, Stratigakos tells the story of how the first Wikipedia edit-a-thons for female architects came to be. Citing a New York Times opinion piece by Amanda Filipacchi, she describes the discussions that followed the subcategorization effort in Wikipedia's entries. The rhetoric was clear: It's not difficult to notice the discrepancy in ranking and defining male and female professionals. So in her June 2013 article published in Places Journal, she urged readers to speak up, to get informed, to edit, and to organize edit-a-thons. A number of editing workshops stemmed from that, and that number keeps growing. Their work has been so influential that, in May 2015,

Wikipedia awarded a grant to three collaborating groups (Architexx from NYC, Parlour from Melbourne and n-ails from Berlin) for their contributions about female architects. This engagement story is a paragon for how architects can use the power of mainstream media to change the presentation of our professionals to the public — and to our colleagues.

These projects are all very different, and are just a few of the many examples that promote virtual engagement. Individually, they build upon the power of social media to allow immediate feedback and reach wide audiences. Kushner, in his 2014 TED Talk, said there has never been a time when feedback in architecture was as instantaneous as it is today. The power of this immediacy also lies in the kind of feedback that can be earned — criticism is, finally, reachable at every phase of design. Architects must consider the benefits that these platforms can bring to our work, whether it is programming a space, showcasing a building to its community, or elevating a whole gender of professionals. Criticism is, finally, in the hands of public — let us, as young professionals, build on it wisely. ■



Opposite Page: Edit-A-Thon. Image copyright University at Buffalo, State University of New York
Right: Surrey Library. Image copyright Ema Peter, Nic Lehoux; Bing Thom Architects.
Below Right: Pines Pavillion. Image copyright Michael Moran; HWKN.

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IMPROVING ARCHITECTURAL EDUCATION THROUGH DATA

AN INTERVIEW WITH 2016-2017 ACSA PRESIDENT, BRUCE LINDSEY

by Gabriela Baierle-Atwood, AIA

The Association for Collegiate Schools of Architecture, known as the ACSA, is a non-profit institution created to advance the quality of architectural education in the United States. Representing a membership of over 250 schools, the ACSA provides platforms for discussions on the future of the profession by organizing conferences, publications, and competitions, as well as serving as long-time data providers along with its collateral institutions. The ACSA's role as both advocate and facilitator of research since 1912 has enriched architecture schools in their resources and understanding of the educational environment at large. The CONNECTION team was fortunate to interview Bruce Lindsey, 2016-2017 President of the ACSA Board of Directors and Dean of the Sam Fox School of Design & Visual Arts at Washington University in St. Louis, to hear his thoughts on the intersections between design and data.

What was your career path to the ACSA? What interested you in the role you are in now?

BL: As a faculty member for 30 years, I have been connected with ACSA for a long time and have appreciated the organization's advocacy for faculty, students, and schools. When the opportunity to become president of the organization came up, I was excited to help ACSA strengthen its position as a leader of architectural education.

When did ACSA begin gathering and publishing data on schools, students, and the profession at large? What has changed since it began?

BL: ACSA's emphasis on gathering data has been growing over the last ten years. The National Architectural Accreditation Board (NAAB) collects data on schools, which is valuable. However, the data that ACSA collects is driven by the needs of our member schools. As an organization that represents designers, it was natural that we would emphasize the quality of the graphics and clarity of the information. Our ongoing work is to better coordinate data collection with the other collateral organizations.

In light of the many ways data is shaping the profession, what can we expect of the future? What are you excited to see ahead?

BL: Data is a big topic, as is Big Data, not only for the architectural profession but many disciplines. Medicine is pushing the limits of using existing and new data sets to illuminate aspects of disease and health that become significant, because of the numbers of cases that can be analyzed. This is a part of what is allowing the concept of individualized health care to be feasible. Environmental factors are rarely a part of the data sets that hospitals track. This will change in the future as we continue to better understand the direct relationship between health and our built environment. I am excited about the possibility of seeing the lived experiences of citizens using an urban environment as a data set. Robert Pleuss, a faculty member in the computer science department here at Washington University in St Louis, has been using photographs from webcams over a long period of time to show how people use specific spaces. Such techniques have been used for a long time in urban design, however technology and the amount and accessibility of data are allowing for new possibilities.

What kind of role can you foresee ACSA taking, as a provider and compiler of information regarding the profession, given this shift towards design driven by data?

BL: ACSA will continue to focus on data that is important to our member schools. Increasing awareness around issues of diversity and inclusiveness has led to the collection of data that shows that problem, and helps schools make strides towards a more diverse student and faculty body. The AIA and NCARB are also working hard on the statistics around this important topic for the profession and for licensure. Beyond that, ACSA is also working on initiatives that will help prospective students find the right school, and help schools better understand trends in recruitment and enrollment. The AIA is predicting that over the next five years there will be a shortage of architects, so increasing the number of students studying architecture is a priority. To that end, ACSA has launched a new website — StudyArchitecture.com — aimed at prospective students to help them towards applying to architecture schools.

In what ways would you say research about trends can help impact and define the profession or our students' career choices?

BL: As mentioned above, the AIA predicts a shortage of architects over the next five years. In a profession with a volatile connection to the economy, a strong job market for architects will be an important piece of information informing a student's choice to pursue architecture as a profession. For architectural firms, trends can help guide their choices of market sector specialization and strategic direction. Trends can also show opportunities for productively bucking the trend.

How have you seen architecture schools' curricula adapt to new trends?

BL: Most schools see their curriculum as a living structure for the education of architects and environmental designers. They adapt to specific institutional circumstances and opportunities, they adapt to the faculties' understanding of the dynamic future of the discipline and profession and they adapt to the students' perspective of their future. Schools also adapt to changes in the accreditation requirements, internships, and licensure. Because of these complex relationships,

schools respond to trends and create them. To mention a few trends we see in schools, hand drawing is coming back, schools are starting research centers in relationship to health and the built environment, and they are structuring opportunities for students and faculty to engage in community design that goes beyond design build.

What would you say has been the greatest shift in the way students (and prospective ones) engage with architecture?

BL: From my perspective, students are looking for an education that is relevant, flexible, and allows them to make a difference in the world while they are a student. They are to some degree impatient, and don't see education as preparation for a professional career, but as the beginning of one. Given emphasis on the interdisciplinary nature of design, there is increasing interest on the part of students to pursue dual degrees in multiple design disciplines or other disciplines, like architecture and business.

You recently spoke at the NCARB Architects Licensing Advisors Summit about the future of architectural education, and you said a couple of things that caught my attention. One of them was, "Designs are predictions that affect both directions in time."

How do you think research about trends, and approaching data as part of a method, can change the way we "predict"?

BL: One of my favorite definitions of design is that it is a process that allows one to know what one needs to know before it's too late. In this regard, data informs but does not decide. Designers have always used as much data as they can get to help in this decision. What is different is the quantity of data available, the comparative capacity of technology, and the interoperability and transmissibility of data. This also comes with challenges: what is the difference between data and information, what data and combinations of data are important, and a new set of competencies to be innovative in the use of data. Nobel Laureate Herb Simon said something important over 30 years ago relative to limits of predictability in design. He said that, "Because design problems can never be comprehensively stated, a design solution can never be optimized." He invented a great word to describe the relationship of the solution to the problem; he said that a solution "satifices". In other words, no amount of data will determine the solution. A solution takes a team armed with data and all of the other forms of empathy, perception and representation of the problem and the environment. Designs, being predictions of a future, are drawn from knowledge of existing buildings — hence their influence on both directions in time.

You spoke something along the lines of "invention is a flower, innovation is a weed," which I thought was extremely interesting. Regarding this trend of opening up to data and incorporating it deeply into design, would you say this approach is inventive? Innovative? Or simply, mending a lack of use in the past?

BL: I am of a mind that sees our current condition as a continuum with the past and future. This leads to a belief that, at any given time, things are not the same but are similar to how they have been and might be. That said, there are what the historian George Kubler calls prime objects, after which things are never the same. These are often inventions, are unpredictable, and are fueled by numerous smaller events or innovations. It is also the case that when weeds (data) get going, something is about to happen. ■

DATA, DISRUPTION, AND DEMOCRATIZING DESIGN
A NEW BATTERY FOR PRACTICE

by Alex Alaimo, AIA

We live in an age of data and disruption; the publishing, music, and financial industries are being radically changed by data-driven technological innovation. However, the question remains: Is it possible to disrupt the risk-averse architecture and construction industry? Many are calling for rethinking the business model, but until now nothing has been terminally disruptive. However, with the advent of emerging digital technologies, there is new promise of disruption by way of a movement to democratize architecture. This endeavor would fundamentally change the prime relationship between owner and architect. Process-driven technologies being developed for other industries may have the power to fundamentally change practice, creating a new battery to drive the future of it.

Most young architects are aware of the practice model learned in professional practice class and get glimpses of its shortfalls in their early careers. Clients propose a problem, and architects offer to solve it for a fee, based on a percentage of the cost of construction. The key relationship is between the owner-architect, one that goes back to when architects were patronized by wealthy clients. This limited practice model has worked, but younger architects yearn for a more accessible, democratic model for design and construction, and data-driven technologies may hold the key to unlock this potential.

George Valdes, architecturally trained, turned his misgivings about the profession into action by launching a career in the tech industry with the startup IrisVR. He explains that disruption happens when the fundamental assumptions of an industry are challenged. He cites the example of Netflix and the brick-and-mortar video industry. They first challenged the physical store, then the actual media, and finally the production of content. For George, the key is to challenge the assumption of how architects traditionally receive work, i.e. referrals. He outlined Houzz's novel ways of obtaining clients as a model that enables architects to solicit work outside their personal network. Furthermore, he believes emerging architects have the opportunity to operate their practices radically differently than ever before by taking lessons from the emerging world of tech and its data-centric culture.

In working at IrisVR, he has learned several key lessons driven by data that could be powerful if applied to architectural practice. To start, they have been able to automate most of the production and event management by using platforms such as Slack. Embedded bots communicate tasks, organize meetings, and correspond with customers. This allows for a transparency of communication in which software engineers see how their work is impacting customers' needs. Next, they are able to record all the interaction their customers have with their software. This data allows them to see what is being used and where to troubleshoot. Finally, adopting a process of feedback and correction to constantly improve their product is at the core of tech startups. If emerging architecture firms can adopt some of these ideas into a product, service, or process for evaluating buildings, they can transform practice.

George sees a future where architectural practice reflects the innovation and lessons of the tech industry, and there are other emerging firms adopting the startup model for practice. The key distinction for technology companies is their mission to develop a process or technology, whereas architecture essentially delivers a discrete building. FOAM is an example of a practice of architects that functions as a tech company exploring an emerging technology, blockchain. Ryan John King and Ekaterina Zavyalova of FOAM have been exploring the opportunities and implications of applying blockchain in architecture in order to fundamentally change the owner-architect relationship, using data-driven technologies to disrupt the profession.

Blockchain sounds esoteric and shrouded in mystery, and for many it's a challenge to describe. It started in the development of the online currency Bitcoin. However, blockchain is not a currency, but rather a technology that was used to make Bitcoin possible. Basically, blockchain is what keeps someone from going back to ‘double dip’ by changing data and taking their money back. Unless there is a verified and trusted digital record that no one can alter, online currency would not be possible. Thus, blockchain has become the third-party intermediary that creates an encrypted, public digital ledger enabling secure transactions and proving that one party has paid the other something of value. The role of banks was to maintain a secure ledger, and blockchain has the opportunity to eliminate this. In this way, it threatens banks, which are grappling with its application in the ‘fin-tech’ domain.

Although it was built to solve the dilemma of an online currency for Bitcoin, it has potential applications beyond that. The concept of Decentralized Autonomous Organization, or DAO, is being explored and runs on blockchain. In DAO, several rules or parameters govern an organization, and certain events trigger actions. Blockchain technology is used to ensure trust and allows these actions to occur without the threat of tampering. In this sense, the entire administration of a company can be automated without the chance for human error or foul play. It's being explored in the stock market, but proved to be more fantasy than reality when an early attempt was hacked. Something like a fully transparent DAO could be applied to the organization and funding of projects with crowdsourced stakeholders.

Not much attention has been given to blockchain’s disruptive power in the architecture and construction realm. FOAM has a vision for how blockchain can flip practice on its head by enabling equity-based crowdfunding. A distinction needs to be made between ‘reward’ crowdfunding and ‘equity’ crowdfunding. The former essentially offers a reward or product in exchange for investment in a project.

Kickstarter is the prime example. Equity crowdfunding exchanges an ownership stake in an entity, which can take many different forms. The core idea is that blockchain could be used to create a transparent and trusted way to bypass traditional financial institutions and allow the public sale of equity to a mass audience. Architects can then use this blockchain-driven platform with the public to propose and accept projects, fund, and execute them.

Up until now, under SEC rules, it was illegal to offer equity to the public. Previously, only "accredited investors" making over $200,000 in combined income were allowed to buy equity, keeping the majority of the public from participating. In May of 2016, Title III of the 2012 JOBS Act (Jumpstart Our Business Startups) took effect, enabling equity crowdfunding to take place for everyday investors and allowing up to $1 million of funding to be raised online. Like a miniature public offering. FOAM aspires to apply this to architecture projects and change the fundamental owner-architect relationship. It envisions a platform on which projects can be proposed and equity can be raised for a project. Blockchain would enable the secure management of heterogeneous, crowdfunded ownership stakes, without the backing of a major financial institution. This new method of funding could revolutionize the practice of architecture by democratizing the financing of projects.

Furthermore, FOAM's vision includes a new way of practice. Where instead of being organized into firms, architects would collaborate through an online platform on a project-by-project basis. A proposal could be made, and interested designers, investors and the public could all buy equity in a project and contribute to its development. This essentially eliminates the black-and-white relationship between owner and architect and creates a new realm of possibility for practice. Architects would be able to invest in and own their projects instead of performing a service for a client. FOAM hopes that equity crowdfunding serves as supplemental funding. At the same time, it would create a new business model for the architect.

FOAM is developing the back-end blockchain mechanics of a platform to achieve all of this. Much stands in their way, including legal and insurance challenges, and it is seeking funding to move forward. Despite these challenges, the hope is to create a platform that would open up architecture to the public and empower people and the architect to own the built environment, all run on a secure blockchain technology. However, would this be enough to disrupt the fortified ramparts of practice? If this model works, it could level the playing field and let a crop of millennial designers challenge the conventions of the profession.

Whether it's blockchain or bots, data is the new battery of practice at the core of disrupting the profession. The exciting part is, there are opportunities for a plethora of new models that can create a data-driven design economy. Some startup firms may develop the "software" of space or new tools for automating practice and streamlining collaboration. If designers are natural entrepreneurs and data is a new medium to work with, it's only a matter of time before digital natives embrace and apply it. A new dawn of practice can emerge if this data-driven battery can charge new practices that democratize design for the masses. ■

BETTER BIM
AN INTERVIEW WITH ROBERT YORI, ASSOC. AIA

by Jeff Pastva, AIA

JP: BIM has become ubiquitous in architectural firms, yet many still strip out the latent information in order to produce 2D representations of models. What are some incremental steps that firms can take in order to maintain the embedded information, without the workflow process being too cumbersome?

RY: It's important to understand why that latent information is stripped out, or maybe never included in the first place. Is it relevant? Does it communicate the architect's intentions? Is there confidence in the model and the skills of the modelers?

The first step in creating more inclusive models is to identify what new types of information can improve a firm's deliverable. For single-family residential projects this might be product or cost information. For larger projects, it may be the inclusion of material information to be managed in the model instead of separately. Sometimes, it's simply a matter of producing a 3D view of a particular detail or condition.

In addition to thinking of data processes and systems from the design side, it's important to maintain flexibility to accommodate client needs that may arise. Particular data structures may be required for compatibility with their existing tools. Facilities management, in-house design teams, archival policies, other consultants, and more can all drive needs from the client side, and every client could be different.

JP: Describe how data is integrated into the workflow of a deliverable. For example, how is data organized, what should be added, and when should it be delivered (in a perfect world)? If this applies to typical project deadlines (SD, DD, CD), please elaborate on how the information scales throughout a project at milestones.

RY: The best starting point is to chronicle how a drawing set develops through the traditional phases of SD, DD, and CD. It's also good to keep "the golden rule" of documentation: draw it once, reference it everywhere else. Given that BIM is a database of sorts, this is a fairly straightforward approach.

I'll give one example of how we organized our partition types at SOM. SD level content was generically constructed but data-rich in other ways. The library consisted of four families/types:

- CMU — rated
- CMU — non-rated
- Gyp. board — rated
- Gyp. board — non-rated

Material and fire rating information is important at this granularity in schematics for early pricing conversations with CMs. Those two key bits of information — material and fire rating — match the granularity of the estimator's work, so the more clearly we could communicate them, the less we ran the risk of misinterpretation.

Using the same idea, generic content can be created that still makes meaningful distinctions among building components, but still remains sufficiently abstract. Exterior walls are a good example. Perhaps there are a few finishes being investigated, but nothing finalized. Generic content could be made that still contains meaningful information — such as "exterior material A" and "exterior material B." When information is encoded in the model this way, it becomes easier to develop the content as design decisions are refined. As material decisions are made, the process of updating the model involves adding incremental bits of information rather than having to replace many elements.

In other scenarios, such as fast-track projects, phasing and packaging data can be included in the model elements. Programming exercises can include target program areas, and comparisons can be made to verify the program needs (targets) are being met (actuals). From a contractor's perspective, the model could carry information about which trade or subcontractor would be performing work associated with the model elements.

JP: For projects that are delivered traditionally (vs. IPD), how can BIM data be used or conveyed in a way that is useful for contractors?

RY: BIM affords the design team an opportunity to develop a design more thoroughly in a given amount of time. As in the "walls" example, the model can be structured in a manner that provides meaningful information but remains flexible for design changes. A model is useful for the contractor by being cogent and thorough, with minimal gaps in the information. Fewer opportunities for misinterpretation lead to more clearly understood scopes.

Regardless of BIM's capabilities, in a traditionally delivered project, it remains essential to communicate and document the end result and leave means and methods to the contractor.

JP: What is the Owner or GC's learning curve in order to participate in IPD? If it's too steep (and therefore perceived as expensive), how can architects take the lead on that delivery model so that less will be lost in translation?

RY: IPD and design-build delivery methods share much of the same DNA, so if owners and GCs have experience with design-build, then there's not that much different from a collaboration standpoint.

IPD differs fundamentally from other methods in that, strictly speaking, IPD's revenue-sharing model is a cooperative one. Rather than each party operating in financial compartments, profits (or losses) are shared among the team. A textbook IPD agreement also includes 'no fault' language that prohibits each party from suing each other. The goal being that the parties focus on working cooperatively with common interests and goals. This is perhaps the steepest part of the learning curve, since it deviates so dramatically from traditionally delivered projects.

JP: What are some examples you've seen of a BIM model being used as an innovative communication tool? Think beyond a coordinated model and discuss the next generation of collaboration.

RY: This really runs the gamut. Just last week, I was working with an architect to modify a house design, and we were able to immediately understand how different ceiling height options impacted the plan layouts. Higher ceilings equal more space for stairs.

In enclosure design assist scenarios, I've seen entire models consisting solely of node connection coordinates. This is often the common language that the design and fabrication teams speak — designers can derive the coordinates from their models, and the fabricators can use the nodes as a basis for their fabrication models. These models are often communicated as text files or spreadsheets rather than 3D geometry.

In client interactions, the BIM can be used to more clearly communicate the project through more easily understood representations, such as perspectives and renderings. Some clients respond well to "live sessions" in which ideas are explored through the course of a joint meeting.

In general, I'd say next-generation tools are less about BIM capabilities and more about communication. Most software manufacturers offer cloud-based products, which can dramatically lower the costs for small practices and dramatically increase opportunities to de-silo through greater ease of sharing.

Interoperability is also increasingly important. Gone are the days of single-manufacturer software applications and suites solely being used. Programming and customization are on the rise, and a greater percentage of the design and delivery team are using applications to improve their processes and products. With such diversity comes the need for high-fidelity, application-agnostic interoperability. We're starting to see maturity in IFC and in intermediary services such as Flux.

JP: Generally speaking, BIM has seen more of its power unleashed on larger scale commercial and institutional buildings. How does it translate to the residential sector, where most of the coordination is done in the field with lower-tech methods? What data is most important at smaller scales?

RY: Successful use of BIM, regardless of scale, is about providing the right information to the right people at the right time. Smaller scale projects and/or firms can benefit tremendously from increased ability to think through a solution more completely. Software doesn't replace professional expertise, but it can augment one's abilities — not unlike how calculators or spreadsheets can assist us with our mathematics.

As an earlier question alludes, BIM is not only about coordination. It represents the possibility of thinking through a problem more completely, and to clearly communicate holistically derived solutions through data. ■

THE COMMITTEE ON SOCIAL SCIENCE AND ARCHITECTURE
A BRIEF HISTORY

by Rachel Meade Smith

Every generation of designers seeks to humanize the built environment in innovative ways. And yet, such initiatives — from the environmentally deterministic reforms of the nineteenth-century city to the flawed modernist schemes of the twentieth — have revealed a lack of insight into the human experience. The AIANY's Committee on Social Science and Architecture, founded in February 2016, also aims to create a world better serving human needs, and thus situates in a long lineage of likeminded attempts. The novelty lies in the methods proposed to achieve it: namely, using data science alongside qualitative and quantitative methods of research, thus calling upon social science to bolster the social and economic performance of architecture. Luckily, the time is ripe for change: Advancements in technology point to boundless possibilities for accessing nuanced user insight, and policymakers — so often the gatekeepers to real change — are increasingly prioritizing a safe and accessible built environment. But the successful leveraging of social research in architectural practice depends upon a tactful engagement across disciplines. Conflicts of language, objectives, and workstyles are inherent to such arrangements, making polymathic entities like the Committee for Social Science and Architecture crucial players. By bringing diverse voices and expertise to a shared space, the foundations for symbiotic, rigorous collaboration are now being laid.

At the August 2015 installment of AIANY's "Edge Dialogues" series, then-President Tomas Rossant, AIA, prompted a panel of architects and social scientists to consider the following questions: What is the value in bringing together the disciplines represented in the room? How might their fields mutually benefit from closer collaboration? The result, in addition to a lively conversation, was the founding of the AIANY Committee on Social Science and Architecture by Melissa Marsh, Assoc. AIA, founder and executive director of PLASTARC, and Evie Klein, Assoc. AIA, architect, planner, and doctoral student in environmental psychology at CUNY. Established as a catalyst for research, discourse, and advocacy, the committee works to generate productive engagement between the social sciences and architecture and, in turn, a built environment more enlightened to human needs.

Rossant's prompt may have been the decisive moment in the committee's origin story, but the conversation derived from a longstanding need for more formalized relations between architecture and the social sciences. Despite architecture's primary role in shaping everyday life, conventional practice invests little towards empirically understanding human experience as affected by the space that contains it. The social sciences — including sociology, physiology, ergonomics, geography, anthropology, cognitive and neurosciences, and psychology — offer a trove of tools for uncovering nuanced insight into individual perception of the world. But without cross-disciplinary interest or communication, these tools remain inert towards the task of constructing the built environment, and thus much of everyday life. The Committee on Social Sciences and Architecture was envisioned as a way to mend this gap and produce new modes of practice in the process.

The committee has since advanced this goal through a series of public programs on human behavior and the built environment, data-driven design, and innovation in architectural education and research. Initial conversations acknowledged the obstacles to overcome — particularly the ingrained reluctance to invest in research. It's easy to advocate for the ROI of hard scientific research, but less so when it comes to qualitative, subjective metrics such as happiness and well-being. In response, the committee spent the last several months bringing successful exemplars to the public stage, highlighting how both innovative and tried-and-true methodologies drawn from the social sciences can empirically illuminate the softer side of human experience. The inaugural event, "Program Cubed: Shaping Our Intentions, Our Experiences and Our Buildings," unpacked the multiple meanings embedded in the word program, asking how architectural, social, and digital programs shape the production, experience, and modification of space. Emphasizing the use of evaluative research and metrics, panelists discussed the often subtle and, at times, invisible tactics for shaping user experience towards such states as safety, acceptance, and belonging. The event stressed the value of social data for understanding the effectiveness of programs (in all the word's iterations) in improving how spaces, from the health clinic to the city street, serve users.

An early spring event, "Exploring the Past, Defining the Future: The History of Social Science and Architecture," revealed a lengthy history of engagement between architecture and the social sciences. The disciplines' evolving relationship was charted from the early urban settlement of Çatalhöyük, Turkey, circa 7,500 BCE, whose organization illustrates early architectural attention to human needs; to the nineteenth century's more fraught interpretation of the built environment as means of social exclusion; to mid-twentieth-century American studies on the psychological effects of urban overcrowding. Prefaced with this narrative of longstanding mutual relevance, the committee's additional spring programs emphasized areas of practice, such as age-friendly and health-promoting design, currently deriving particular benefit from the tools of social research.

At "Connecting Research and Age-Friendly Design," the increasingly urgent question of how to build cities and buildings for an aging population was discussed through projects like AARP's Livability Index, an online tool scoring communities based on "livability

categories" such as housing, transportation and environment, and environmental gerentology work mapping the location and frequency of seniors' injuries through a combination of spatial and ethnographic analysis. Late September's program, "Designing for People Using Evidence: LEED, WELL and what's next?," underscored the committee's position on architecture's relevance to public health. Contemporary epidemiology increasingly refers to the notion of social determinacy, which implicates the natural and built environments, and social and cultural conditions in affecting overall well-being. In turn, evaluating the role of the built environment is becoming more crucial and more complex. Innovative approaches to this complexity are taking shape in the production of new architectural standards, and in the work of practices operating outside the norms of conventional architecture. Discussion of the WELL building standards — which, following in the footsteps of the revolutionary LEED standards, offer an evidence-based method for measuring building qualities related to health and well-being — supplied testimony to an emphatic shift in architectural practice. Recalling the last decade's overhaul towards environmental accountability, the WELL standards point to a future in which architects are pointedly implicated in the state of public health. Work by urbanist Leah Meisterlin presented digital technologies as powerful forensic tools for measuring social qualities of urban space, extending the conversation around well-being to include questions of economic and political agency.

Covered here is just a taste of close to a dozen programs hosted by or associated with the committee since its founding in February. These, promoted via a public Meetup group, also included the 2016 FitCity conference in June and the AIA New York State Design Conference in October. Each gathering stressed how the social sciences, and particularly the tech advantages offered by data science towards easy data collection, allow us to know increasingly more about our spaces, and at multiple scales. This supercharges our ability to better tune healthy and ecological environments today. The committee expects a steady regimen of cross-pollination and dialogue in the coming year, with a roster of events highlighting projects that successfully bridge the gap and a Chicago Committee chapter in the works. ■

Above: Attendees watch a presentation at the Committee's Summer Social.
Middle Right: Melissa Marsh speaks at "Program Cubed: Shaping Our Intentions, Our Experiences, and Our Buildings."
Right: Katrina Johnston-Zimmerman from City ID presents on the historical intersections of social science and architecture.

BREAKING THE BLOCKCHAINS OF PRACTICE

AN INTERVIEW WITH RYAN JOHN KING AND EKATERINA ZAVYALOVA

by Alex Alaimo, AIA

FOAM DAO is a decentralized architecture office founded by Ryan John King and Ekaterina Zavyalova that operates globally in conjunction within the revolution that decentralized blockchain technology had unleashed. As an office working on a number of projects, they are also developing a crowd-equity funding platform for the architecture industries called FOAM, where any user can start, join, or invest in an architecture project.

AA: Your installations with FOAM DAO attempt to illustrate how blockchain works. Briefly explain what blockchain technology is through your work.

RJK: I'll start by describing what blockchain is first and then discuss how we created a physical representation. A blockchain is a distributed database of transactions that are recorded, encrypted, and shared among a network of computers. It maintains a growing list of chronological transactions, or blocks, which are added to a chain of all preceding blocks. Each computer connected to the network stores a live copy of the ledger. This distributed ledger technology has the potential to generate a simple and efficient infrastructure for new financial services and to process and reshape global finance.

Blockchains can also be made programmable in order to execute autonomous smart contracts. A smart contract is written in computer code and automatically performs the terms parties have committed to in an agreement. Once a smart contract has been deployed onto a distributed ledger, the need for direct human involvement is eradicated and the contract can act as an economic actor in its own right.

Our first installation, built for the New Museum IDEAS City Festival called Foamspace, sought to explore the concept of this digital currency in the context of a temporary installation. Because the installation was to be temporary, we wanted to solve how we capture, store, and mobilize value generated during the festival. Our answer was to issue and digitally distribute Foamspace Coin. This coin served as a token of membership and as a way for people to have a formal representation of their participation in the project. The physical installation itself consisted entirely of factory-standard expanded polystyrene (EPS) blocks and served as a visual metaphor for the Bitcoin blockchain.

AA: People are familiar with the concept of crowdfunding, but what is the difference between reward crowdfunding and equity crowdfunding?

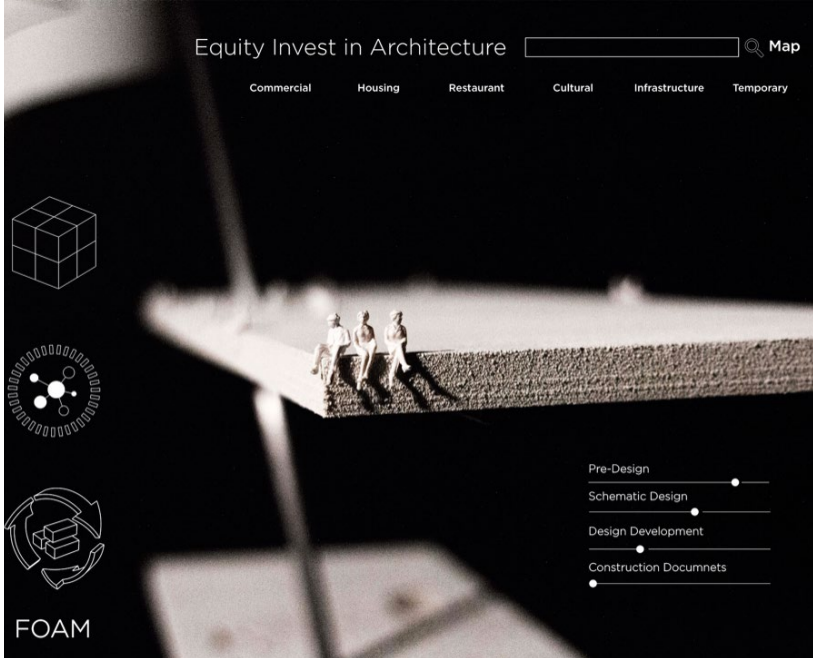
RJK: Reward based funding platforms, such as Kickstarter, allow backers to donate to projects they believe in. As a reward for their donation, users receive some sort of perk or object. However, the user does not become a financial stakeholder. In the equity crowdfunding model, the crowd does not donate to a project or business, they invest. Thanks to Title III of the JOBS Act signed by President Obama in 2012, small businesses are able to sell financial securities to the crowd, which can invest without being accredited with the federal government. This is accomplished through licensed funding portals, which the FOAM platform aims to be. This new development is estimated to open opportunities in new crowd markets and has enormous potential for all industries.

The American Institute of Architects has already endorsed this law, stating that "there is significant promise for attracting investors to smaller real estate projects and getting them off the architect's drawing board." When combined with the transparency, security, and immutable record keeping abilities of blockchain technology, powerful financial tools are more accessible than ever to the public and those who have projects that need to be funded.

AA: What specifically about blockchain would be applicable to practicing architecture firms?

RJK: Practicing architecture firms could evolve in a number of ways with blockchain technology. For example, architects are restricted by relying on clients for work, on fixed design fees and/or a percentage of the construction costs, and by not retaining a financial stake in their designs. With blockchain technology, architects can be empowered to initiate their own projects and allocate equity in the built environment on a transparent and global network. This allows the end user to become a financial stakeholder in an urban ecosystem of profit sharing.

Internally, blockchain systems for architectural designers could open new freelance markets for both workers and firms. One of the ways this is accomplished is similar to a stock option in tech start ups. In exchange for some risk, workers are awarded equity in a real estate project at a discounted rate. As the project gets closer to completion, the value of the equity rises and could either be sold on the secondary market or the worker could collect the property's cash flow like a dividend. The payment structure would occur on the blockchain, and would introduce a new architecture business model based on "spatial investment portfolios."

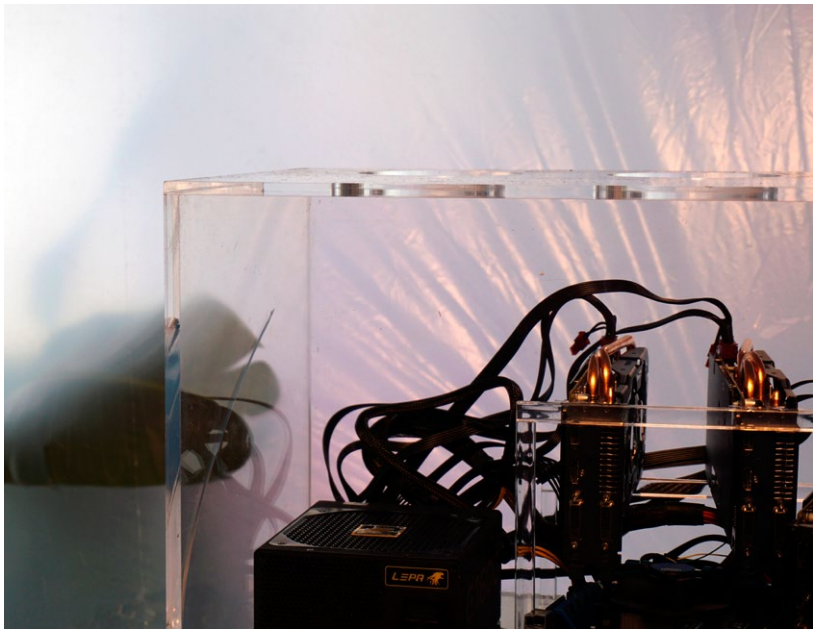


AA: What are the implications of smart contracts in practice?

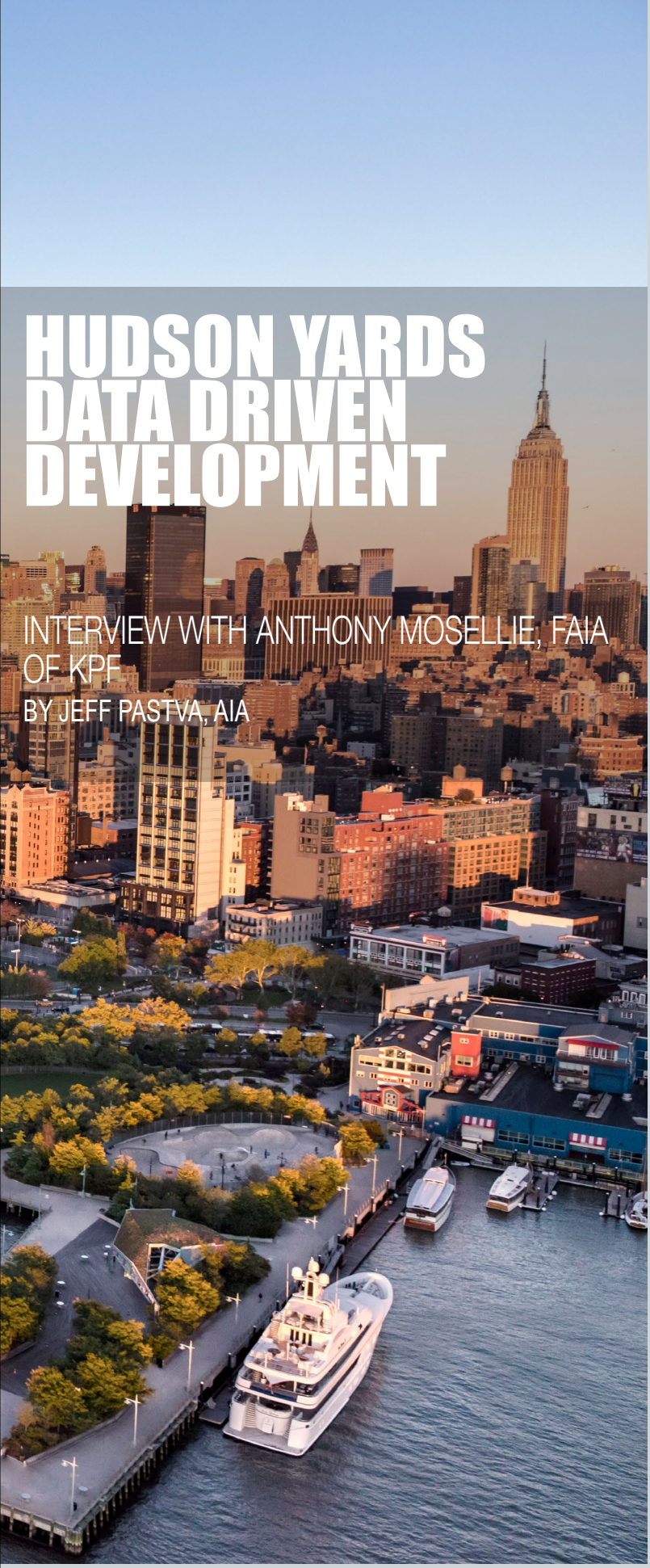
RJK: Smart contracts can be used to manage and govern individual projects and range from decision making and budget management to expense tracking, schedules, timesheets and agreements with sub consultants or freelancers. Each project can set its own decision making parameters for distributing equity, adding new users to the project, and deciding how to spend funds in a virtual boardroom. With smart contracts, the end user can become a financial stakeholder, increasing the public accessibility to architecture. Enabled by this technology, we envision a new form of collaboration where the lines between architect, client, and even building are much less distinguishable than it has been historically.

AA: Moving forward, do you see the FOAM platform working solely within the architectural space or the technology space requiring venture capital?

RJK: The platform will take up the potential of blockchain technology in relation to architecture, and has the ambitions of connecting architects to each other and opening new freelance markets. This can increase the overall revenue of the industry and make architecture projects more accessible to the public. Since we have a background in architecture and are familiar with the frustration within the rigid industry, we are attacking it to release the creative and economic potential of architects. We have garnered exposure through international public installations, talks, workshops, and events with institutional partners. FOAM is positioned at the forefront of the blockchain technological revolution and our team consists of architects and blockchain developers. ■



Above Right: Foamspace landing page.
Middle Right: Custom Ethereum mining rig for Tropical Mining Station. Image courtesy of FOAM.
Right: Foamspace as the physical representation of the Blockchain as part of IDEAS City Festival. Photo courtesy of Varvara Domnenko.



HUDSON YARDS DATA DRIVEN DEVELOPMENT

INTERVIEW WITH ANTHONY MOSELLIE, FAIA OF KPF

BY JEFF PASTVA, AIA

This month's CONNECTION takes a deep dive into the people and projects that are changing the way we use data in the design process. Traditionally, data has a more scientific or technological connotation, but with progress in the building, design, and construction industry, there are far more touch points now that allow for feedback. One of the most forward thinking developments, in addition to being the largest in North America, is the Hudson Yards project on the west side of Manhattan. The project has a number of complex firsts, but the CONNECTION team specifically focused on the data that is collected and analyzed from systems and sensors and the data that is provided by users.

One of the first delivered products of the projects, 10 Hudson Yards, was designed by New York City architecture firm KPF. KPF is also responsible for the master plan, which calls for 13 Million SF of retail, residential, and commercial space above the Hudson rail yards below; the platform constructed over the rail yards; the 90-story 30 Hudson Yards; the retail podium, 20 Hudson Yards; and 55 Hudson Yards. The project itself is a mastery of engineering that includes on-site energy co-generation, engineered soil, and massive structural capacity, but it also has the goal of interacting with the users of the space in unique ways. For example, even though the data collection protocols are still being set up, the data that will be collected include: heating/cooling load patterns, circulation/traffic patterns, purchases made within the site, weather, natural light, air quality, activity levels, etc.

While the ability to understand the collected data has evolved over the course of the project, Anthony Mosellie, FAIA, from KPF said, "The documentation of the project started in 2011, which was well before the Hudson Yards innovative use of Integrated Project Delivery (IPD) had been fully implemented. Since then, both the industry and the sharing of information with the construction industry has matured. The first stage of the project is now complete and occupied so the client can now track data to inform the design of the subsequent stages." Just because the full power of IPD hadn't been realized yet, didn't mean that the design side was any less technically challenged. He went on to say that, "From a design standpoint, Hudson Yards was the largest BIM project ever. Every aspect of the development was documented and integrated with the construction so the ability to optimize the operational aspects of the initial building and enhance the design of the future buildings is assured."

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HUDSON YARDS
NEW YORK

ENGINEERED CITY

Hudson Yards will be far more than a collection of tall towers and open spaces. It will be a model for the 21st century urban experience; an unprecedented integration of buildings, streets, parks, utilities and public spaces that will combine to form a connected, responsive, clean, reliable and efficient neighborhood.

CONNECTED NEIGHBORHOOD

Communications will be supported by a fiber loop, designed to optimize data speed and service continuity for rooftop communications, as well as mobile, cellular and two-way radio communications. This will allow continuous access via wired and wireless broadband performance from any device at any on-site location. We're as good as future-proofed.

- Digital antennae service (DAS) for cellular and two-way radio
- Rooftop satellite
- Wireless responders
- Fiber Loop

RESPONSIVE NEIGHBORHOOD

Hudson Yards will harness big data to innovate, optimize, enhance and personalize the employee, resident and visitor experience. Supported by an advanced technology platform, operations managers will be able to monitor and react to traffic patterns, air quality, power demands, temperature and pedestrian flow to create the most efficiently navigated and environmentally attuned neighborhood in New York.

- Building data-capture sensors (systems, equipment)
- Electrical and thermal sub-metering
- Environmental sensors (air, noise, other environmental factors)
- Advanced technology platform

CLEAN + RESPONSIBLE NEIGHBORHOOD

Progressive cities are moving toward organic waste separation systems to reduce landfill costs, methane emissions and greenhouse gas emissions. Hudson Yards makes organic waste collection convenient and space efficient by utilizing grinders, dehydrators and bioreactors to convert food-service organic waste to dry fertilizer at 10% of its initial weight and size.

Additionally, nearly 10 million gallons of storm water will be collected per year from building roofs and public plazas, then filtered and reused in mechanical and irrigation systems to conserve potable water for drinking and reducing stress on New York's sewer system.

- Organic-waste disposal system
- Stormwater Tank

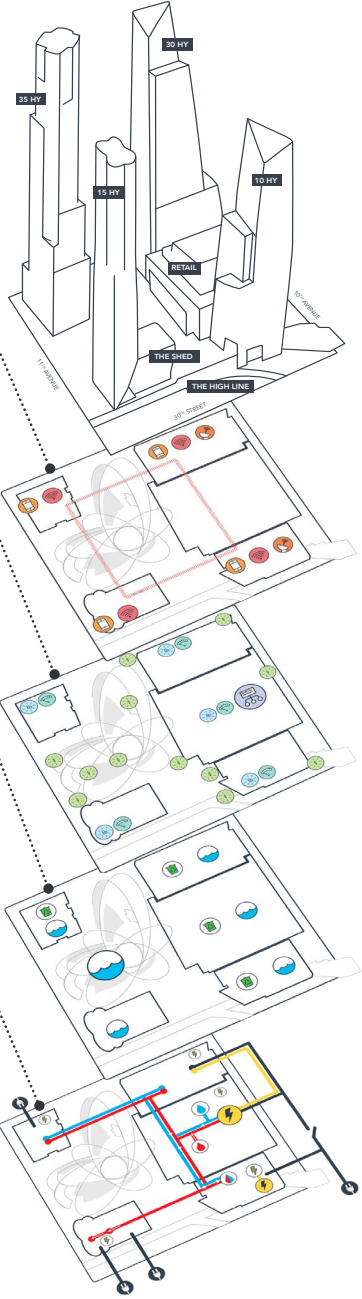
RELIABLE + EFFICIENT NEIGHBORHOOD

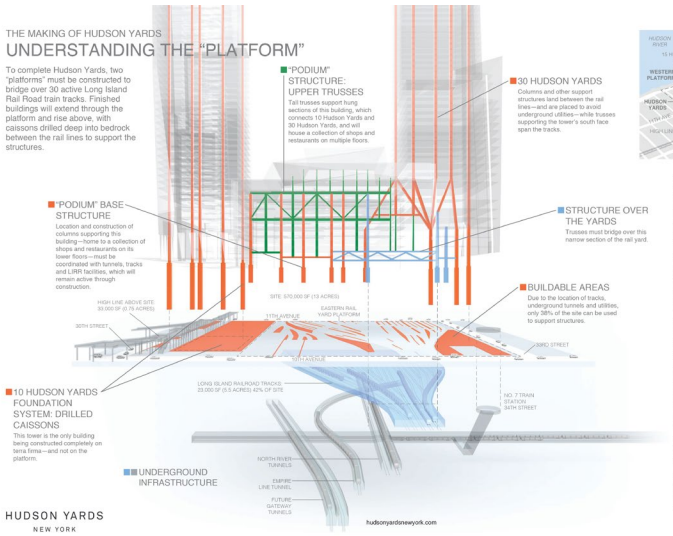
Whatever the disruption—super storm, brown out—Hudson Yards will have the onsite power-generation capacity to keep basic building services, residences and restaurant refrigerators running. It doesn't hurt that being built above a rail yard means our first level is well above the flood plain.

Hudson Yards' first of its kind microgrid and two cogeration plants will save 24,000 MT of CO_2e greenhouse gases from being emitted annually (that's equal to the emissions of ~2,200 American homes or 5,100 cars) by generating electricity, hot and chilled water for the neighborhood with over twice the efficiency of conventional sources.

- 14.4 megawatts of cogen
- 15 megawatts of Tier 4 diesel generators
- Con Ed Utility Grid
- Microgrid Breaker
- Hot/Chilled water plant
- Hot/Chilled water line

HudsonYardsNewYork.com





Glossary

10 Hudson Yards. A 52-story (1.8 million square foot) office tower on the corner of 10th Avenue and West 30th Street that will house the world headquarters of Coach, Inc. and the North American HQs of L'Oréal USA and SAP.

30 Hudson Yards. A 66-story office tower (2.6 million square feet) on the corner of 10th Avenue and West 33rd Street. At 1,296 feet, the tower, headquarters for Time Warner, Inc., will be the second-tallest office building in New York City.

Caisson. A large-diameter pipe drilled into rock and filled with concrete. At Hudson Yards, more than 300 caissons will be installed to support buildings and the platform.

Eastern Rail Yard Platform. A 10-acre deck being built above Hudson Yards. It will support six acres of open space, four towers, a cultural center and 1 million square feet of shops and restaurants.

Empire Line. Amtrak rail line that runs along Manhattan's west side, linking Penn Station to Albany.

Gateway Project. Amtrak's plan to build two new rail tunnels under the Hudson River to connect Penn Station and the Northeast Corridor. A concrete shell has been installed below Hudson Yards to secure a path for the tunnels.

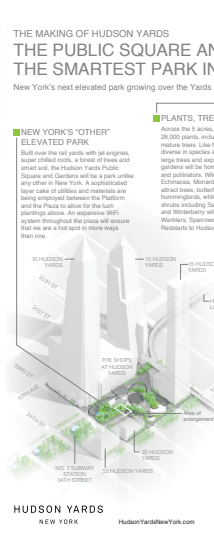
Hudson Yards. The 28-acre rail yard—framed by West 30th Street to the south, West 33rd Street to the north, 10th Avenue to the east and 12th Avenue to the west—where LIRR trains are "parked" between runs. The yard also includes an indoor maintenance shop, 12-car-long cleaning platform and various employee-support facilities.

LIRR. Long Island Rail Road commuter system, North America's busiest. It transports 350,000 riders daily.

No. 7 Subway Extension. A 1.3-mile extension to the Flushing (Queens) line, moving its final stop from Times Square to Hudson Yards. The project opened in 2015 and is the first to be able to accommodate more than 40,000 commuters during peak times.

North River Tunnels. Built in 1904 as part of the original Pennsylvania Station project, today these two passenger tunnel 443 trains and more than 600,000 riders daily.

Truss. A structural system of beams, bars or rods that support a roof or bridge.



Since the data specific to the operation of the initial buildings is starting to become available to Related and the design teams, they are responding to rapidly changing constraints (inputs) that are affecting the formal output. Density, which often translates to occupant comfort in the form of SF/person, is driving layouts. So are land and construction costs. It's understandable that the NY real estate market, and by extension the architectural product, has to evolve to meet the supply/demand of future tenants, but the development also has to balance these first costs with operational budgets. Like many of their projects, the size and scale of Hudson Yards costs real money to run on a daily basis. In order to meet those goals, the project needs to perform in an optimized fashion. The downstream benefits of integrating BIM early are already paying dividends.

Two of the ways that Hudson Yards is evolving in the optimization is through modeling and future proofing. According to Anthony, "We were able to help Related by adjusting the residential massings and orientation at the West Yards, map potential views, and let Related rate them as favorable (or not). We set internal criteria for what was seen positively, such as the potential for sunlight, which helps establish added value to potential buyers." Anthony also said that there was an inherent goal to make the masterplan flexible so as to increase the opportunity to respond to market needs in the multi-year development. This was applied both in the form of spatial and technological methods.

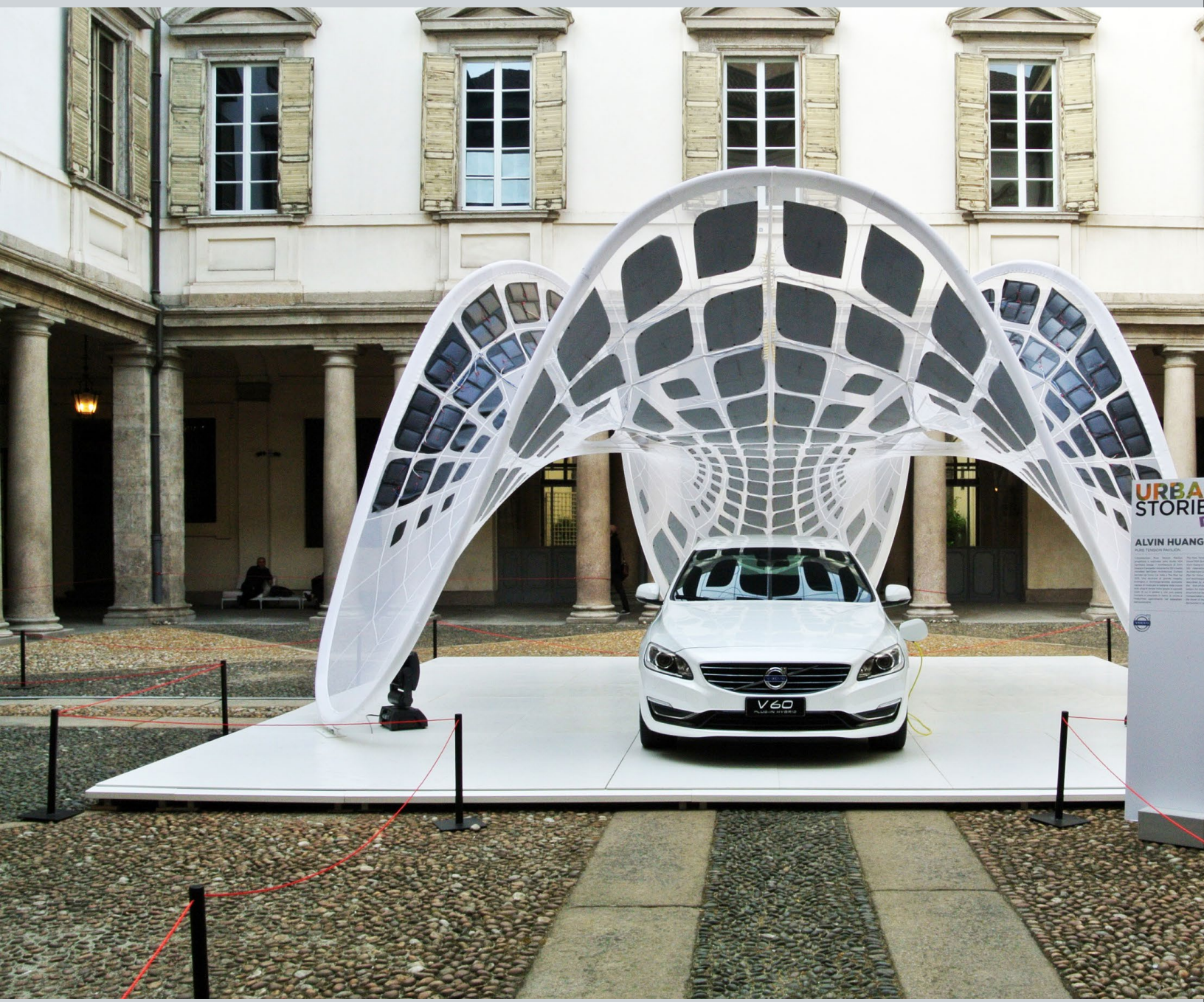
Even though data isn't yet fully informing design through an evidence based or post occupancy way, Anthony said that the data embedded in BIM models has made the shop drawing process much more efficient. He elaborated, "Right now, the industry's log jam to manufacturing system components is based on engineering or fabrication capacity – which is compounded by the traditional process of the shop drawing submittal. When the integrated model is used as a base, there is much less interpretation of what was bought and what the contractor must deliver. Some architects believe that they are ceding control when they deliver a model, but often, the architect has to give up some control to adapt to a hyper competitive environment where the contractors often have the upper hand. Because of this, I believe that digital fabrication is the next generation. Young people want others to follow them with an embrace of the method." Sharing models does occur in joint venture projects and is increasingly becoming the deliverable. This has the potential to blur the line on intellectual property. However, according to Anthony, when dealing with model sharing, copyrights don't get in the way because, "The owners often own the copyright. This allows them to get the best building for the best price and gives them [the owner] the ability to complete a mega term project with a full complement of architects and design professionals, if necessary. This more integrated approach can be more efficient. In the end, it should free up more time for architects and designers to be creative. That's always a good thing." ■

Previous Page: Hudson Yards viewed from the Hudson River. Courtesy of Related-Oxford.
Opposite, Top Left: Diagram of the engineered city. Courtesy of Related-Oxford.
Opposite, Bottom Left: Diagram of the structural platform. Courtesy of Related-Oxford.
Opposite, Top Right: 10 and 30 Hudson Yards with Retail, looking northeast. Courtesy of Related-Oxford.
Opposite Bottom Right: Diagram of what made the park smart. Courtesy of Related-Oxford.
Above: 55 Hudson Yards, viewed from the High Line. Courtesy of Related-Oxford.

NOW NEXT FUTURE

INTERVIEW WITH ALVIN HUANG, AIA **SYNTHESIS DESIGN + ARCHITECTURE**

BY SHAUNT YEMENJIAN, AIA



Architecture should question, not answer. It has, at various periods in history, focused on one or the other: Vitruvius answered; Piranesi questioned; Modernists answered; Deconstructivists questioned. On October 28th, Dr. Dana Cuff, Tad Costerison, Sara Hovsepian, Lawrence Scarpa and many more leaders working within the intersections of architecture, digital design, fabrication, robotics, coding, big data and research will be sharing with us the means in which technology can serve architecture at Now Next Future (NNF). The one-day conference will be held at UCLA and is the third iteration of the biannual event. NNF brings together thought leaders from interrelated disciplines around design and architecture with the purpose of presenting work and research to a larger audience and, perhaps more importantly, to engage and spark conversations that can lead to more projects that further question.

Alvin Huang, AIA is one of those thought leaders. As principal of Synthesis Design + Architecture, his firm produces realized and unrealized architecture that show how technology can serve and enrich design. The distinction of built work, however, is important for two reasons. For one, it can be experienced and critiqued to see where and how technology can change the way architecture addresses solutions. Two, it is an actual product that can impact a far greater population than the design-centric audiences that participate in the discursive evaluation. Furthermore, Alvin believes in the importance of the outcome over the process.

During the course of our conversation, the topics ranged from the adaptive methods that SDA's work has created from construction management methods and the importance of human creative input in value engineering parametric design to the applicability of this level of design thinking at various scales. While the boundaries were not preconceived, the topics seemed to fit into the overall themes to which they are presented here. Much like the architecture of Synthesis D+A though, the process and the means in which the information is presented is less important than the outcome. In this case it can be described as progressive architecture set in the age of technology intent on achieving one of the same core values that has been present in architecture for centuries – communicating ideas.

Performance is Function

SY: The notion of performance comes up quite a bit in both the work that you aspire to do and the work you are doing. What does "performance" means to you as your practice moves forward?

AH: Obviously we all know the modernist ethos "form follows function", but I've struggled with how function is often perceived exclusively as utility. In our work, we're just beginning to equate function more with performance to show that it is not just utilitarian, but also performative. The most obvious connection is the relation to structural or environmental performance, but I'm also interested in what I call visual performance. This is the ability for something to intrigue or produce a dynamic interaction between the viewer and the user. Looking at those kinds of performative things as elements can drive the design as opposed to be just being something the design produces.

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SY: Performance doesn't always make it into the design vocabulary, so can you please expand on how it is defined within your practice and your work?

AH: I was able to work with clients in the mid to late 2000s where pretty much anything could be done if enough money was thrown at it. This really informed my early career – then all of a sudden that money went away. That had a direct and powerful impact on form because it could be value engineered out. That led me to look at people like Felix Candela, Pier Luigi Nervi or Frei Otto, great design engineers where form and performance are identical. The form could not be value engineered out of the project because the performance is coming from it. That's something really important to me.

SY: How does this approach inform design?

AH: I'm very interested in moiré patterns and how variation is a visual performance. It allows us to place intensities in certain places, have things open up, or change in opacity and porosity. It engages people to walk around the work and even though it's static, it seems dynamic.

SY: Can you share an example from your work in which this notion of the form being the function can be applied? I.e. without that form, there is no project.

AH: The Pure Tension Pavilion. The form and the structure are entirely equivalent. You cannot have the form without that structure and you cannot have the structure without that form. If you were to try to make that out of orthogonal elements, it doesn't work. The distribution of forces is discovered through digital form finding called dynamic mesh relaxation. Using that process, we were able to discover forms that have inherent structural principles. In our case, a tensioned skin against a rigid frame. It is the combination of those two things which produce that form.

The Human Input + Digital Input Dance

As part of the discussion on the Pure Tension Pavilion, Alvin went deeper into practical applications used during the design process. Digital technology and design tools helped enhance production of something both complicated and extremely expensive, which could turn out to be project killers for most responsible projects. But the way Alvin's team used the digital tools, and combined them with their human input, is a strong example of how the two [human and digital] are inseparable when this kind of architecture is to be built.

AH: The frame is built from CNC bent aluminum tubes and the tensioned skin is a vinyl encapsulated polyester membrane. We went through a very rigorous rationalization process where the frame started completely free-form and the pricing came back exponentially out of our budget. Essentially, the fabricator was converting our free-form geometry into rational arcs, which produced some 5,000 different radii. Since they have to program the machine for each radius, the cost was adjusted proportionally higher. We challenged ourselves to reduce it and got it down to exactly five arcs. The end result was a design that appeared free-form, yet was built from five arcs.

SY: Is there a set expectation as to when human intervention, architect, or decision maker inform the design process takes place?

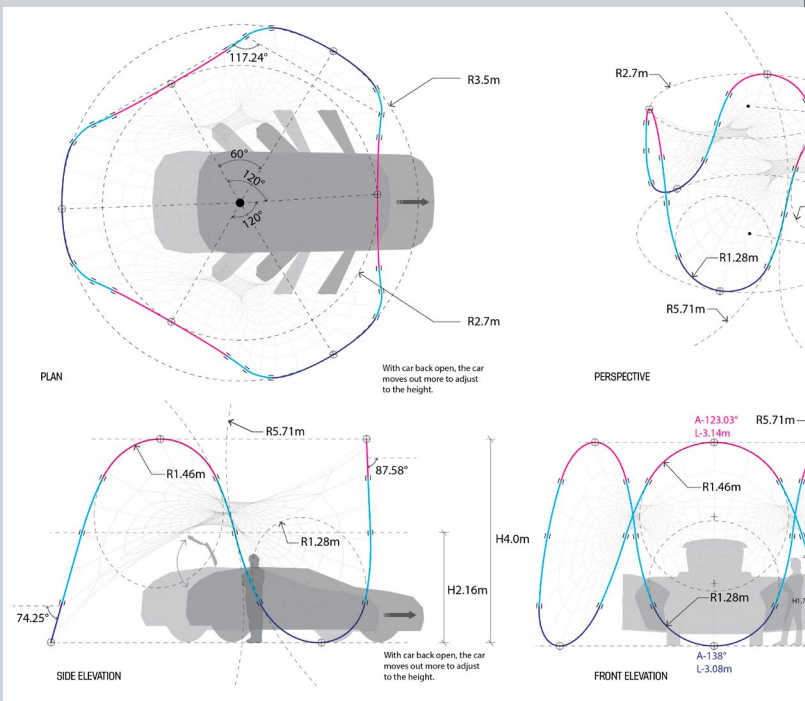
AH: I would say for us it always happens early. That's where I would say the question drives; the technology is responding to questions that are about the basic fundamental purposes of architecture. It is about people, materiality, and the design problem, as opposed to being about a technological question.

SY: You mentioned an interesting project you are doing with IBM where data spatialization is distinct from data visualization. It seems the human led design decision also happened really early.

AH: The question drives. The IBM Watson project was not about simply wanting to do something cool with data. The data ended up being the way in which we could answer the questions. We see this in academia, where the novelty factor tends to drive. There's an interest in doing something that's never been done before. In [architectural] practice, it's the other way around. We ask how can we improve the efficiency and effectiveness. We're interested in using a generative process not to do something new, but as something that can help us effectively answer questions that we're interesting in asking.

Questioned Methods

SY: Your office operates at many scales - from large scale mixed use projects to singular product designs. Is there a difference across scales in your work?



Previous page: Pure Tension Pavilion. Image courtesy of Synthesis Design + Architecture.
Above Left: Frame rationalization studies. Image courtesy of Synthesis Design + Architecture.
Above Middle: Visual skin. Image courtesy of Synthesis Design + Architecture.
Above Right: Central World. Image courtesy of Synthesis Design + Architecture.

AH: Scale is a big issue. A lot of our ideas become more legible at smaller scales, but they are there at the larger ones too. Parametric modeling, at its base level, is about modeling relationships. For example, the Groove at Central World was a parametric model which worked with a very regular grid. The overall relationships of the massing allowed us to make minor tweaks with openings, doors, leasable area, and the client was able to respond to and quantify decisions on the spot. Since we're always describing relationships, there is potential to transcend scale; there are an infinite number of relationships we can hardwire into the model.

One of things we're quite interested in doing [and are doing] is parametric dimensioning. The work we have in Asia is handed over to locally based architects at the DD stage. Here we're trying to move away from documenting physical or numerical dimensions, and focus more on documenting relationships. This way, if the local architect has to drop a ceiling six inches, they know they need to coordinate it with a related spandrel. If they actually change a dimension, they don't just add a few inches, but rather they divide equally. A lot of the drawings for the work we are doing in Asia have started moving towards this 'dimensioning by relationship' rather than 'by number.'

Concluding Thoughts: Technology in Service of Design

Towards the end of the conversation, Alvin touched on the general premise that seems to come up with his work and so many others working within a computational realm: How can technology serve design?

AH: Within the computation realm, there has been a lot of talk about a bottom-up approach – architects being the designers of the code rather than the designers of the form. The form is a result of a series of processes [that come from the computation]. I think this notion of computation, technology, digital fabrication, etc. is working within our work and that they are serving the big ideas. Even more than a service, they help us to think-through the design. One of the fallacies of the prior generations is that the 'computer does all the work.' The computer is not doing all the work. You could not tell Oscar Niemeyer that the French curve did all the work. The French Curve was something he mastered and became a tool that he was able to think with. Because of that he was able to produce masterful work. The French Curve, in and of itself is dumb. The computer, in and of itself is dumb – but you can imbed it with intelligence.

SY: Whether top-down or bottom-up, we're discussing an architecture that is predominantly driven digitally. Will the idea generation part of the process within architecture be produced in a predominantly digitally driven domain in the future?

AH: I look at architecture in a similar way I look at music. What matters in the end is good music and bad music. I think if you can make good architecture through clay models – that's fantastic.

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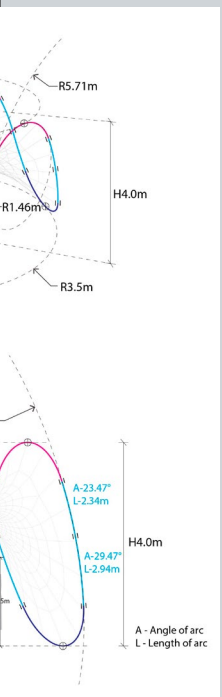
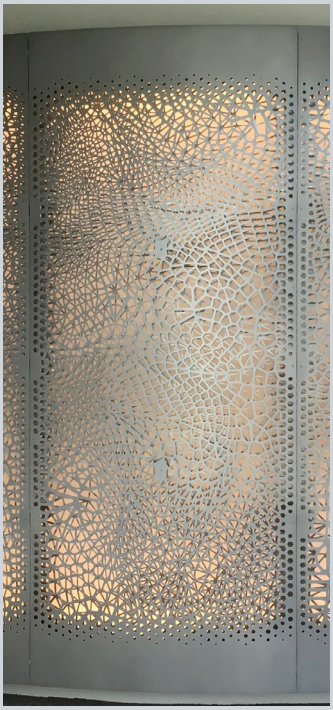
Now Next Future is a one-day conference focused on how technology enables design – now, next, and in the future for the architectural profession, hosted by the AIACC. The conference is geared largely but not exclusively toward emerging professionals, who play a critical role in both using and defining technology for the profession. If design prowess is the goal, the conference speaks to the medium to get to our destination. Additional information about the conference can be found here: www.nownextfuture.aiacc.org ■





DATA OPERATION, DIGITAL ARCHITECTURE
AND THE PHENOMENON OF DESIGN THINKING

by Yu-Ngok Lo, AIA

Data and its representation has become integral to the architectural design process. Decisions related to many different aspects of a building, such as orientation, façade and material are driven by data collected through different means and computer programs. However, how does data influence creativity and styles? How is data being used in related fields outside of the architectural profession? The CONNECTION team caught up with Professor C.S. Chan at Iowa State University to discuss these issues. He is an expert on researching the relationship between design and data and its application.

YL: Data, Big Data specifically, is becoming more and more of a cultural norm. But it appears confined mainly to tech firms, marketing agencies, and other metric-driven industries. How do you think "data" affects the way architects design? Do you think data drives creativity and styles?

CSC: In the 21st century, data not only drives individual creativity and style by cognition, but also group creativity and style. To explain this theory, we should review the historical concepts of how data has been applied by human beings.

In the early 1950s, an information processing theory was proposed to describe how human beings process information in everyday thinking. That theory has been further developed into the cognitive science that studies human thinking in order to replicate it in machines. Design data, as information regarding design constraints, goals, facts, and issues of the architectonic elements, is reflected throughout the design process. The generation of forms by designers involves strategically making unique associations between data, discovering special representation for the data, and creating unconventional data for generating forms, while solving design problems. Any of these operational aspects would generate surprising design creations. As long as the creation is novel in form and valuable in market, they are products of creativity and innovation. Similarly, the processes of cognition, operating on design data, are the driving force of creativity.

Following this trend, we can say that design thinking is the process of evaluating, manipulating, utilizing, and operating upon design data. If similar sets of data are applied operationally more than three times in design, there would be a recognizable set of features that appear in products. These features, as the phenomenon of repetition, would be recognized visually, manifesting a style, and casting certain cultural influences. Therefore, a creative designer would cognitively operate a special set of data to generate original, novel, and recognizable features with market value. If a designer keeps operating on a set of stylistic data for a period of time, then generates a new set of data, the repetition and group recognition of these repeated stylistic elements influences the design profession stylistically and creatively.

YL: Beyond the scale of the individual building, how do you see data being used in urban planning?

CSC: I see greater use of Building Information Modeling (BIM) and Geographical Information System (GIS). In urban planning, the scale of study always relates to an area, community, or a city; which needs huge sets of layers, including geometries, numerical attributes, and rules of agents for execution. When the scale gets bigger, the huge sets of data and the complexity associated with processing it, make the study even more difficult. Thus, a new field of "Big Data" has been developed to explore efficient ways of analyzing, managing, and distributing data. I am sure the future handling of data in urban planning will need more help from the field of artificial intelligence.

For example, planners base their study tasks on defining variables, look for appropriate forms to set up data, collect information, and analyze correlations between variables to justify and conclude hypotheses or theories. The studied planning tasks, for instance, could be traffic patterns, zoning analysis, city infrastructure, or time layers of building data. This data could be used to show the form, pattern, or history of a region for design, planning, evaluation, and decision-making.

YL: What are some of the means to translate data into useful information for architects/planners?

CSC: Data, as a representation of machine information and human knowledge, must be converted into visible forms for application and operation. The following examples provide some thoughts for architectural design. Most of these methods deal with digital drawing and modeling.

The first example is to map digital and analog data for design thinking. In this case, schematic sketches are first digitized after they are hand drawn. Then they are processed in PhotoShop and combined with images from modeling data. During this mapping process, the model image and the sketch images are modified to optimize the design results.

The second example is to apply data for different purposes. A digital model of a proposed design is created in a solid modeling platform. The geometry data of the model is converted to get energy data, and displayed with color codes to signify the level of energy performance. Another process begins with digitizing a building model in Revit and applying the BIM data in order to calculate the construction costs to arrive at a construction schedule. The same set of geometrical data used by energy analysis tools above can also be used to calculate the energy cost and to generate specifications.

The last example is to translate verbal data into numerical data in urban planning, which is what we are working on now. Here, we use satellite photo and urban maps as the base, convert geographical information into geometries, construct shapes of the urban blocks as cells in CAD, develop logical rules to represent socio-cultural factors in GIS, and finally use cellular automata and multi-agent modeling techniques in GIS plug-ins to simulate the patterns of urban development. The key effort of this study is to convert patterns of human settlement into operable data for prediction and evaluation. All these examples relate to the concepts of utilizing data across platforms for research in design.

YL: Why do you think human interaction is crucial in the field of architecture? What constitutes the Human Computer Interaction (HCI) program you teach at Iowa State (ISU)?

CSC: Human interaction is particularly important in digital architecture. Software and hardware developers must pay attention to how the digital platform guides and aids design. The learning curve, user-friendliness, and system efficiency are the criteria of good interactions between humans and machine. Similar principles apply to the interaction between the living space and the dweller. User-centered design in spaces is one of the current design trends. All these notions under consideration were originated from the human interaction led by the IT sector.

The course, as a part of the HCI program, was on solid modeling and its conversion to display in the virtual reality environment. I also did some research exploring the methods of converting a solid model to VR model, experimenting with a VR city model, and simulating urban regulation in the VR models as well.

YL: Could you talk a little bit about Artificial Intelligence (AI) in architecture and its implementation to date? What will its future be?

CSC: AI is the field of exploring human intelligence and simulating intelligence in machines. After it was founded in 1956, a number of studies in architecture were conducted. The most impressive was the concept of shape grammar, developed in 1970, because it has a similar format of a condition-action pair of production systems, which is an early AI system format. Another influence of AI in architecture has been the architectural IT development of intelligent design tools in drawing and modeling systems. These systems have the functions of architectonic elements of walls, windows, doors, and stairs, which represent a kind of design knowledge for users to extend their design thinking. In the future, design-related software and hardware will have more intelligent design sub-routines installed to help schematic design, design development, and robots to automate building fabrication and construction.

YL: Getting into specifics, you have conducted a project in the past to measure the efficiency of an office space without its physical construction. How was data extracted and used to influence design decisions in this case?

CSC: That was a project funded by the AIA and GSA to test cognitive productivity through VR simulation. We constructed a VR model in a six-sided virtual environment to represent the GSA lab in Washington, DC. We changed the materials and color of the lab environment, and added sound to represent background activity. Subjects tested how the changes of materiality and color in space would affect human perception. Results showed that the change of material affected people's perception and preference of the space more than color; this provided information for selecting furniture, window openings, and levels of lighting (see Chan, 2007).

That project was a difficult one among the research projects I conducted, due to the limited speed of machine execution and the constraints of connections across facilities in our lab. Yet, the stereoscopic 3D visual results shown in the lab were very impressive and generated a few conference papers.

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Chan, C. S. (2015). Style and Creativity in Design. SAPERE Series, Vol 17, Switzerland: Springer, ISBN: 978-3-319-14016-2.

YL: One of your publications, *Can Style be Measured*?, has a very interesting topic. Can you tell us a bit about this project?

CSC: Style is a cultural symbol used to differentiate patterns of gesture in dance, rhythm in music, performance in drama, texture context in literature, and design in painting, sculpture and architecture for understanding socio-cultural phenomena. My interest was to apply scientific methods to theorize how a style is generated, formed, and recognized. After a number of hypotheses were proved, I found out that an individual style could be defined by the number of times a feature appeared in design products.

In fact, a style could even be measured by number of features to show the strength of style through perception, i.e. more features appearing across products would powerfully express the style. The concept was tested by having a group of 31 subjects sort 33 photo images of architectural designs into piles representing the same style. These buildings were designed by Frank Lloyd Wright and Vernon Watson, Richard Meier and Michael Graves, Charles Moore and Robert Venturi representing Prairie Style, New York 5 Style, and Vernacular California Ranch Style, respectively.

Outstanding and representative features appearing in these photos were applied by viewers to recognize the style. Among them, photos of Prairie Style had eight to eleven common features, New York 5 Style had five to six and the Vernacular Style had three to five. The theory was that the more features a style had, the more easily recognizable it would be, and subjects would put more photos of similar buildings into the same pile to classify them.

Results of the experiment showed that the number of piles sorted by the 31 subjects were 55 for Prairie, 49 for New York 5, and 78 for the Vernacular. This implies more features hold the same style together. Another experiment had the same group of subjects look at 33 photos of designs by Wright, and rank how likely each photo resembled the Prairie Style. The experimental data showed the number of features and the resemblance score are in positive relation. Thus, the degree of a style is related proportionally to the number of common features that appear in the building, and we could conclude that a style could be measured by the number of features through perception.

YL: Anything else that you would like to elaborate on?

CSC: Design thinking has been discussed recently, and here are my comments on this new topic. Design thinking relates to how designers think in the design processes. The study had been approached from the cognitive psychology perspective, and has gotten a lot of understandings on the cognitive mechanisms that move the design processes ahead. Yet, when design is conducted by a team today, the group work environment in a global design aspect is different than the solo design and unique vision of an individual major architect. Thus, the cognitive aspect in the team work situation definitely has been changed by this cooperative efforts.

In order to make the design processes smooth and productive, we should study the nature of group design-thinking cognition for the purposes of providing understanding, exploring means, and collecting information for making efficient and creative group designs. I am sure that it would be beneficial for those firms that are working on international projects with multi-international partners. It is because of that different culture has different design approaches. ■

#yafchat

AIA YAF
@AIAYAF
Follow

Q1: What does mentorship mean to you? #YAFchat
2:05 PM - 21 Sep 2016

Geoffrey L Crowley
@Geoffllc
Follow

A1 #mentorship to me is ppl working with each other to learn from each other to become better at a task they are engaged in. #YAFchat
2:08 PM - 21 Sep 2016 · Sunset Hills, MO, United States
2

Adam Schwartz
@adamschwartz42
Follow

A1- to me, mentorship is paying it forward, conveying what you have learned to someone who can benefit from your experience #YAFchat
2:08 PM - 21 Sep 2016 · Alexandria, VA, United States
2

Kurt Neiswender
@kurtneiswender
Follow

A1 Mentorship is professional development through mutual interests and shared experiences. Note: it is a Two Way Street! #yafchat
2:11 PM - 21 Sep 2016
3 3

Stephanie Silkwood
@StephSilkwood
Follow

A1. Mentorship is guidance, encouragement, and creating opportunities for growth and development #yafchat
2:12 PM - 21 Sep 2016 · San Jose, CA, United States
1 2

AIA YAF
@AIAYAF
Follow

Q2: Does a mentor have to be in your field? What other field have you had a great mentor from? #YAFchat
2:13 PM - 21 Sep 2016

Kurt Neiswender
@kurtneiswender
Follow

A2 it is a must to explore mentors outside of architecture so that we begin to understand what future clients will be like #yafchat
2:17 PM - 21 Sep 2016
5

Stephanie Silkwood
@StephSilkwood
Follow

A2. I think it's beneficial to have mentors from within and outside of the profession. It helps to have different perspectives. #yafchat
2:16 PM - 21 Sep 2016 · San Jose, CA, United States
3

PJA Architecture
@pja_arch
Follow

A2: No- as culture becomes more collaborative, everyone benefits by learning from someone outside their profession #yafchat @AIAYAF #mentor twitter.com/AIAYAF/status/…
2:16 PM - 21 Sep 2016
1 2

Sandbar Architecture
@SandbarArc
Follow

A2: Mentor does not need to be in your field, but should be a leader in the subject to be learned by the mentee | @AIAYAF #YAFChat
2:17 PM - 21 Sep 2016
1 1

Moderated by the 2016-2017 AIA YAF Public Relations Director Lora Teagarden and hosted by the AIA **Young Architects Forum** (YAF). The yafchat for the month of September focused on **#Mentorship.**

3,695 Twitter Followers

AIA YAF Monthly Tweet-up
21 September, 2-3:00pm Eastern Time

Theme: **Mentorship**
Hashtag: #YAFChat

AIA YAF
@AIAYAF
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Q3: What's the best place to find a mentor? What's the worst place - where you've learned to steer clear from? #YAFchat
2:18 PM - 21 Sep 2016

Lawrence Fabbroni
@lfabbroni1
Follow

A3:By self-selecting mentors. Choose someone knowledgeable/inspiring. Identify common interests. Make the case for mutual benefit. #YAFchat
2:21 PM - 21 Sep 2016
2

Stephanie Silkwood
@StephSilkwood
Follow

A3. The ideal mentor match happens naturally with those you interact with. Increasing interactions can promote good connections. #yafchat
2:22 PM - 21 Sep 2016 · San Jose, CA, United States
5

Sandbar Architecture
@SandbarArc
Follow

A3: The office and volunteer organizations have been a great source for us to find mentors | @AIAYAF #YAFchat
2:24 PM - 21 Sep 2016
3

Geoffrey L Crowley
@Geoffc
Follow

A3 AIASTL has an awesome mentorship program where 4 individuals w/ different experience come together for a year to learn from eo #YAFchat
2:26 PM - 21 Sep 2016 · Sunset Hills, MO, United States
2

AIA YAF
@AIAYAF
Follow

Q4: What's bad advice you've received that you'd tell others young/new in the profession to ignore? #YAFchat
2:28 PM - 21 Sep 2016
1

Geoffrey L Crowley
@Geoffc
Follow

A4 That you don't need you liscense since the firm won't let you seal drawings anyway. Horrible advice for a young professional #YAFchat
2:31 PM - 21 Sep 2016 · Sunset Hills, MO, United States
2 3

Adam Schwartz
@adamschwartz42
Follow

A4: If anyone tells you that you need to run yourself ragged as an EP, don't listen. Have a life outside of work! #YAFchat
2:31 PM - 21 Sep 2016
1 4

PJA Architecture
@pja_arch
Follow

A4: bad advice in this profession is relative... the worst advice is to wait to take the ARE #YAFchat @AIAYAF #mentorship twitter.com/AIAYAF/status/…
2:31 PM - 21 Sep 2016
2 6

Lawrence Fabbroni
@lfabbroni1
Follow

A4: Proj managers who tell employees not to bill time b/c it shows loss. Have to know what work costs in order to know worth. #YAFchat
2:33 PM - 21 Sep 2016
7

#yafchat

AIA YAF
@AIAYAF

Follow

Ok, inverse. Q5: What's some of the BEST advice you've received from your mentor(s)? #YAFchat

2:37 PM - 21 Sep 2016

Stephanie Silkwood
@StephSilkwood

Follow

A5. Get licensed early (before life gets complicated)! #yafchat

2:38 PM - 21 Sep 2016 · San Jose, CA, United States

7

Sandbar Architecture
@SandbarArc

Follow

Q5: Perform tasks just beyond your comfort zone. If you aren't at least a little uncomfortable, then you aren't growing. | @AIAYAF #YAFchat

2:39 PM - 21 Sep 2016

3

Lawrence Fabbroni
@lfabbroni1

Follow

A5: Knowledge and expertise mean little in business without strong personal relationships. You work with who you trust. #YAFchat

2:39 PM - 21 Sep 2016

1 3

PJA Architecture
@pja_arch

Follow

A5: You are your own best advocate. #YAFchat @AIAYAF #mentorship @CJordan_AIA twitter.com/AIAYAF/status/…

2:39 PM - 21 Sep 2016

1 3

AIA YAF
@AIAYAF

Follow

Q6: How do you cultivate/foster your mentor relationship? #YAFchat

2:45 PM - 21 Sep 2016

Stephanie Silkwood
@StephSilkwood

Follow

A6. Spend time with mentors outside of your workplace. The best advice often comes through casual conversation. #yafchat

2:48 PM - 21 Sep 2016 · San Jose, CA, United States

1 1

Sandbar Architecture
@SandbarArc

Follow

Q6: The relationship between mentor and mentee must be intentional to help it flourish | @AIAYAF #YAFchat

2:48 PM - 21 Sep 2016

1

PJA Architecture
@pja_arch

Follow

A6: regular meetings, additional time spent outside profession[aka not in the office] #YAFchat @AIAYAF #mentorship twitter.com/AIAYAF/status/…

2:49 PM - 21 Sep 2016

3

Lawrence Fabbroni
@lfabbroni1

Follow

A6: Look for ways you can help them. Don't expect a 1-way stream of info or help. Make the relationship valuable for both of you. #YAFchat

2:53 PM - 21 Sep 2016

3

About the Moderator
Lora Teagarden AIA

Teagarden is a Project Architect at RATIO Architects in Indianapolis, IN, is the Public Relations Director for YAF AdCom and serves on the Equity Alliance web leadership team. She also serves on her local AIA Indianapolis and YAF board, is the creator of #AREsketches, and owns a small business.

AIA YAF
@AIAYAF

Follow

Q7. Are you in a mentor position now? What have you learned from your mentee? #YAFchat
2:53 PM - 21 Sep 2016

Geoffrey L Crowley
@Geoffc

Follow

A7 Every day, biggest lesson is patients & understanding for others #YAFchat
2:55 PM - 21 Sep 2016 · Sunset Hills, MO, United States
1

Adam Schwartz
@adamschwartz42

Follow

A7: I'm attempting to be a mentor through @WashingtonDCAIA for those starting on the #ARE! #YAFchat
2:58 PM - 21 Sep 2016
1

PJA Architecture
@pja_arch

Follow

A7: don't stop asking questions, don't be satisfied by 'good enough'. #YAFchat @AIAYAF #mentorship twitter.com/AIAYAF/status/…
2:59 PM - 21 Sep 2016
1 5

Adam Schwartz
@adamschwartz42

Follow

A7: biggest lesson: appreciate everyone's range of experiences to understand licensure from different perspectives #yafchat
3:01 PM - 21 Sep 2016
1

EXPLORING DESIGN DATA

AN INTERVIEW WITH PHIL BERNSTEIN, FAIA

by Phillip Anzalone, AIA

Phil was formerly Vice President, Strategic Industry Relations at Autodesk, where he was responsible for leading a team that sets the company's future vision and strategy for technology as well as cultivating and sustaining the firm's relationships with strategic industry leaders and associations. He currently teaches professional practice at the Yale School of Architecture and consults to Autodesk on special projects.

Prior to joining Autodesk, Phil practiced architecture as a principal at Pelli Clarke Pelli Architects where he managed many of the firm's most complex commissions.

Phil writes and lectures extensively about practice and technology issues, has been published in Architectural Record, Architecture, Architecture+Urbanism, Design Intelligence, Fast Company, Fortune *and* Perspecta *and quoted in T*he Economist, Vanity Fair, Dwell *and* The Wall Street Journal.

Phil is co-editor of Building (in) The Future: Recasting Labor in Architecture *(2010) and* BIM In Academia *(2011), and co-author of* Goat Rodeo: Practicing Built Environments *(2016). He is a Fellow of the American Institute of Architects, Senior Fellow of the Design Futures Council and former Chair of the AIA National Contract Documents Committee. He is a licensed architect in California.*

Phillip Anzalone had a chance to speak with Phillip Bernstein about the relationship between data and computation in the design profession and as part of the built environment as a whole.

PA: With practice working within a digitally ubiquitous environment, what do you feel the role of data is in relation to design?

PB: It's clear that data is washing over the design process, so architects have to decide how they're going to respond accordingly. Big-data strategies affect daily life, and there will rapidly be an expectation by clients that the design process will be informed by its use. This suggests two possible opportunities for the building industry in general and architects in particular: the use of big data as the basis of design strategy (more on that later) and the creation of a knowledge base of building performance that could broaden our insights across the built environment.

PA: How does one quantify historically subjective values such as aesthetics, theory, cultural impact, and other aspects of design that are not as easy to model numerically?

PB: I suppose there is some expectation that, as a technologist, I believe the ineffable aspects of design would be better suited to algorithms. As I have argued elsewhere, there are plenty of opportunities to use computation to enhance design and the capabilities of designers without replacing the essential human questions that separate architecture from building. There will likely be a time when, through machine learning and other data-driven approaches, it will be possible to evaluate certain questions of how a building is expressed and understood, but I don't think that flow will be reversed in a way that a computer could create design that was important. Further, as architects are empowered via computation to be more technically adept, new sorts of insight about what it means to design will emerge, keeping the "ineffable" ahead of the "computable."

PA: What are your thoughts on the direction of proprietary data and open data? What things do you feel should be open, and what should be closed?

PB: There are several questions here, and it's increasingly obvious that intellectual property law is behind emerging approaches to practice. In a recent article in Architectural Design, David Ruy suggests that these questions for architects revolve around three issues: authorship (who actually creates a design that is reliant on so many collaborators and connected data created by others?); ownership (who is the rightful owner of that data, and what rights do they have?) and service (how much of the information inherent in instruments of service is simply an artifact of the work architects do for clients and not something to be owned?). It's a terrific construct to begin examining the question, which is further expanded by questions of proprietary software data formats, almost a fourth category. As regards Ruy's triad, I suspect that the IP version of "hybridization" will emerge with an accompanying legal theory of interdependent, "mashed-up" data.

From a strictly legal perspective, the architect's concerns are two-fold: retaining control of ideas they generate in the form of those "mash-ups" and managing the resulting liability from their use, authorized or otherwise. So strategies for "closed" data serve these ends, while "open" data might support the larger mission of understanding what buildings do and how they work.

PA: Machine learning processes and expert knowledge systems could start to become part of AEC practice as the value of "big data" becomes realized. How do firms cope with the intellectual property questions that come along with this change?

Proprietary software formats will likely become artifacts of a previous age as well. While once, at least in architecture, everyone fought over the efficacy of the AutoCAD/DWG file format as a successor to the exchange of paper, the explosion of file formats necessary to make an AEC project go continues, and hoping that "open data standards" will solve the challenges of making those tools work together is a fool's errand. More likely to emerge will be underlying exchange protocols not unlike how the modern web,

or even a common spreadsheet, work today, where access is ubiquitous and tools understand where to go to find the data they need to operate. Thus I conclude that these questions will largely fade away with the emergence of new data infrastructures that are more modern. Code will always be "closed" in this regard, but data must be open to interaction to be functional.

PA: We know that changes in contracts can be connected to data-driven design through building performance metrics. Do the analytical processes become tied to the contract, or are they retained by each party? Are we going to see negotiations in which algorithms and performance criteria are used to rate performance?

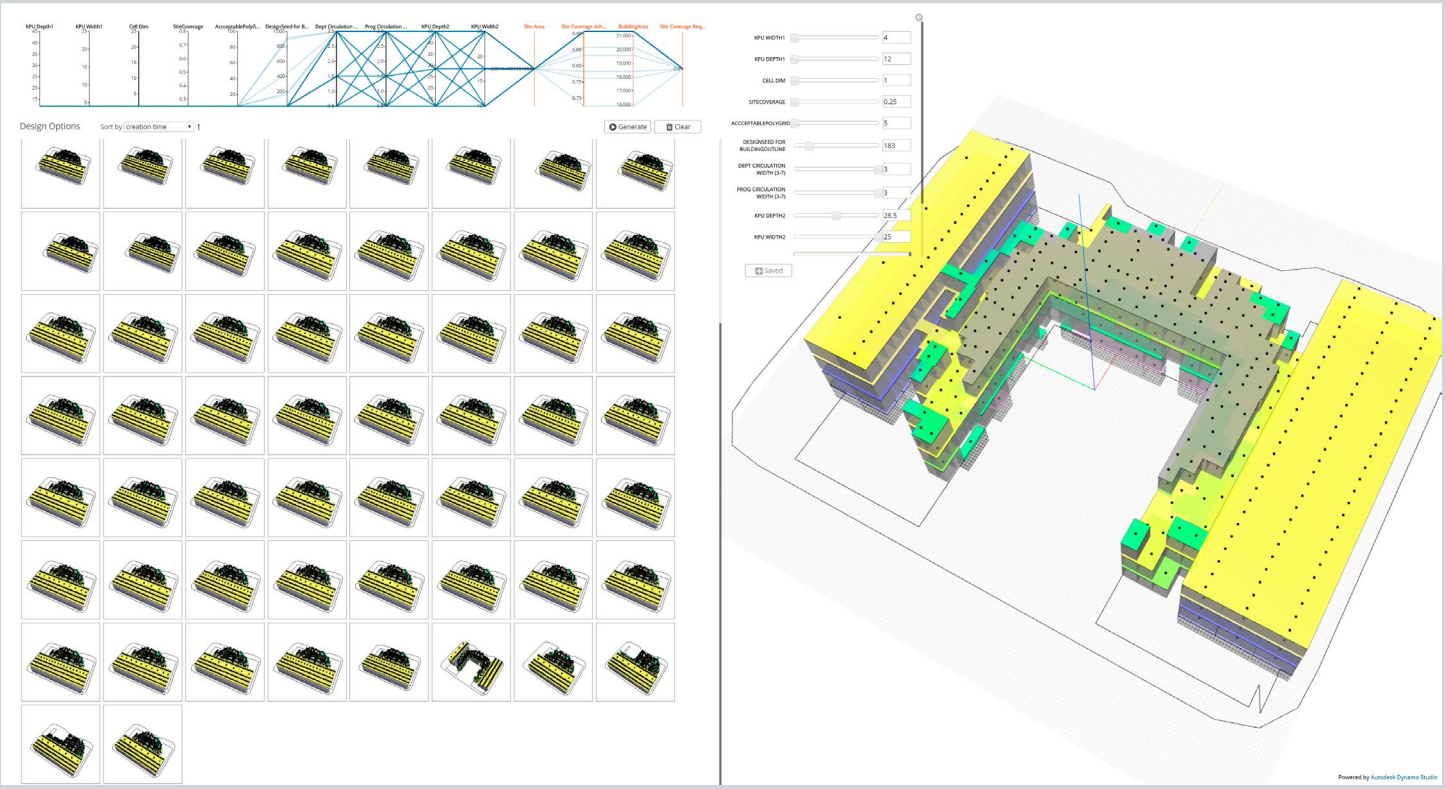
PB: I think there are actually three concepts to be addressed here. A contract is just a legal artifact that, in the best cases, represents the business deal that the architect, owner, and builder make to execute the project. So the first question is "what does that data mean" relative to the architect's obligations to provide his/her service? Data provides the basis for measurable outcomes, so contracts will naturally evolve to reflect more than the typical scope of service for the architect, but rather specific targets for what the architect should be accomplishing relative to those services. Today those targets are likely considered uninsurable warranties of service by the insurance companies, but technology through simulation makes it possible to predict, and therefore make promises based on, all that data.

This raises the second question, how do you validate those measurements? Today, lots of assertions are made by architects who write scripts to generate certain kinds of results, but those scripts are not really validated in any way beyond the architect's judgment. In order to get to an outcome-based contract like I describe above, I believe third-party validation of data analysis will be necessary, something akin to today's UL or ISO seals of approval. If you're making a commitment based on energy performance, for example, your BIM data will require validation through an energy-analysis engine like DOE/2 that has been properly certified by outside experts. Contracts will stipulate this in their terms.

Third, there might be a "next generation" of contracts possible, as anticipated by the systems today that run exchanges like Bitcoin, which is based on a system called "blockchain," complete records of transactions that describe all the previous interactions with the virtual ledger of Bitcoin use. Imagine an AEC contract based on this theory, where a tightly integrated design/construction team establishes protocols based on the expectations of exchange of information and value (money and/or risk) for data in a project, and the "contract" that glues all that together was a different sort of blockchain? This is, of course, a complete 180-degree swing away from today's traditional, common law contracts based on textual explanations of obligations.

PA: How do we connect physical computing and IoT technology to the data developed and analyzed by the AEC community?

PB: While it's clearly early days, the "nervous systems" of today's buildings are getting more capable and data-rich. Energy, water use, human motion, temperature/humidity, even room use are collected for many facilities, and the number of IoT-enabled data receivers will continue to explode. Right now, much of that data lives behind protected fire walls and in proprietary formats. The challenge for our community is two-fold: How do we share this stuff, and how do we make it useful? As I mentioned above, AEC needs means by which we can collect, share, and learn from building performance data that these sensors provide, and right now I'm unaware of any systematic strategy for how to do so. The opportunity, however, is enormous, particularly in the emerging world of machine learning, which enables us, with the assistance of computation, to reason inferentially about huge expanses of heterogeneous data. Perhaps a first step would be a central repository where such information, sufficiently anonymized to protect the privacy of its generators, could be parked and examined. From there, we could work toward structured access, evaluation, analysis, and the research necessary to truly harvest the insights that lurk within.

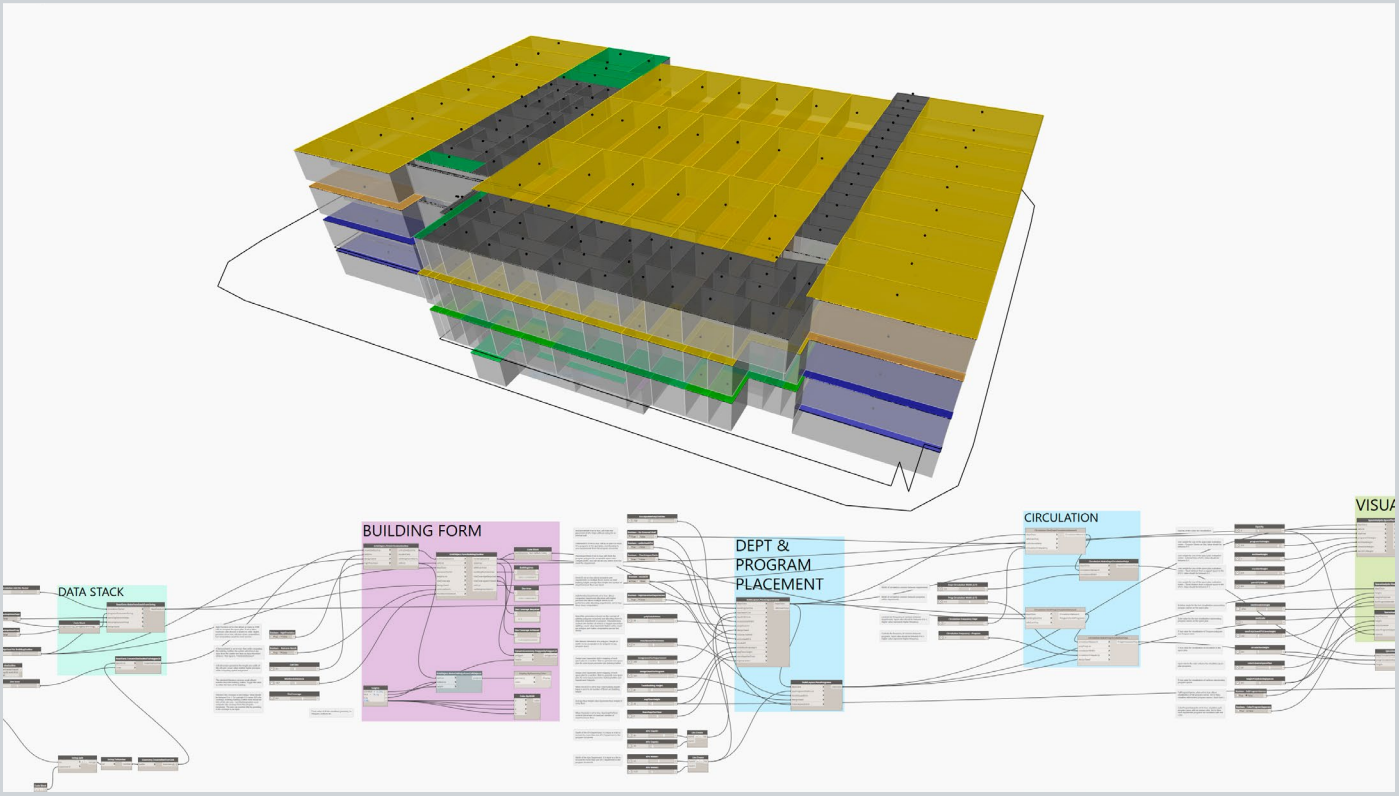


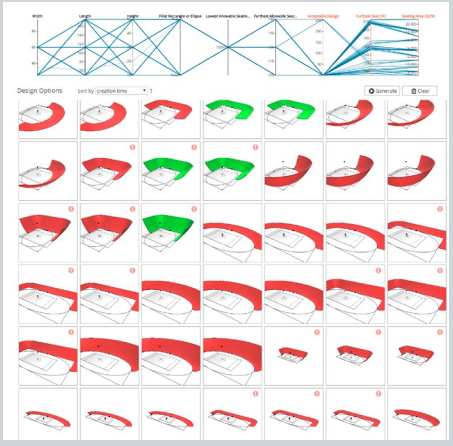
PA: Who do you feel owns the data harvested in post-occupancy monitoring?

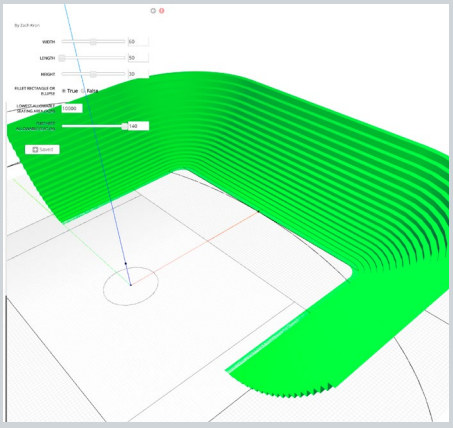
PB: There's little doubt in my mind that every client to whom this question might be posed would answer "that data are unequivocally mine." How that information might be used, and whether it could be stripped of identifying markers as I describe above to be more broadly helpful to the industry, remains to be seen. But I suspect that caution will prevail early, particularly as clients contemplate the possibilities of what unexpected and potentially harmful insight might be gained about them from careful examination of that data. I'm not sure what the line of argument might be for the designers or builders of the artifacts that create such information to claim it belongs to them, any more than a patient's medical records belong to the doctor who ordered the tests. I'm reminded of certain bio-tech start-ups that have attempted, with limited success, to patent portions of the human genome they "discovered" as the result of their product development research. It seems likely that we would cast a similarly critical eye on the idea that building-sensor information belongs somehow to the architects, engineers, and suppliers whose work produced it.

PA: Can you speak a bit about the opportunities you see in academic and professional partnerships within the field of data-driven and performative design?

PB: In my (admittedly jaundiced) view, technology's effect on architecture today has been largely defined and driven by practice and the marketplace rather than the academy. After some early, and well-understood, provocations in the intersection of scripting and complex geometry where technology largely remains today in schools, bigger questions of digitally driven project delivery, building information modeling, industrialized construction, new means of making (like additive manufacturing) or cloud-enabled computing (of which big data is a subset) are being asked and answered in offices and job sites rather than studios and laboratories. The generation, organization, and use of big data in architecture is mostly untapped and is therefore a terrific opportunity for both studio-based and more traditional research to carve out and define new territories of innovation and insight for practice and, by extension, performative design.







PA: Now that you are expanding beyond Autodesk - what's next?

PB: After sixteen years as a software exec, I want to get closer to architecture again in some form, but that remains to be seen. While I'll remain a part-time consultant to the company working on some of strategic projects, I'm looking forward to doing more teaching, research and writing, and less traveling and sitting in meetings. It will certainly be nice to have some time to consider the next step. ■

All Images: Examples of computational BIM design interface.
Images courtesy of Autodesk Inc. © 2016 All Rights Reserved.

CONNECTION

THE ARCHITECTURE AND DESIGN JOURNAL OF **THE YOUNG ARCHITECTS FORUM**

2016 EDITORIAL CALENDAR

FEBRUARY
MEDIUM

This issue focuses on the theme of BROADCAST and how architecture is and will be consumed by architects, clients and the public.

CONTENT DUE 1/21
PUBLICATION MID FEBRUARY

APRIL
POLITICO

This issue focuses on the themes of POLITICS AND ADVOCACY and on architects who are in or pursuing public office through election or appointment.

CONTENT DUE 3/24
PUBLICATION MID APRIL

JUNE
WORKFORCE

This issue focuses on the theme of EMPLOYMENT TRENDS and on addressing the needs and job categories that support recruitment, retention and retraining initiatives that meet common firm and organizational objectives.

CONTENT DUE 5/26
PUBLICATION MID JUNE

AUGUST
STATE OF PRACTICE

This issue focuses on the theme of EVOLVING BUSINESS MODELS, on that state of the current profession and how it will evolve to meet future needs.

CONTENT DUE 7/21
PUBLICATION MID AUGUST

OCTOBER
DATA DRIVEN

This issue focuses on the theme of METRICS and how big data and parameters are changing how we do business.

CONTENT DUE 9/22
PUBLICATION MID OCTOBER

DECEMBER
EDIFICATION

This issue focuses on the theme of SCHOLARSHIP and how architecture is a career of lifelong learning.

CONTENT DUE 11/17
PUBLICATION MID DECEMBER

CALL FOR SUBMISSIONS

WE ARE CURRENTLY SOLICITING CONTENT

CONNECTION welcomes the submission of ARTICLES, PROJECTS, PHOTOGRAPHY and other design content. Submitted materials are subject to editorial review and selected for publication in eMagazine format based on relevance to the theme of a particular issue.

If you are interested in contributing to CONNECTION, please contact the Editor-In-Chief at **jpastva@gmail.com**

CLICK HERE for past issues of
CONNECTION

SUBMISSION REQUIREMENTS

All submissions are required to have the attachments noted below.

Text
Submit the body of your text in a single, separate Word document with a total word count between 500-1000 words.

Format the file name as such:
[yourlastname_article title.doc]

Images
Submit all images in JPEG format at a minimum resolution of 300 dpi RGB mode. Include captions to all images in the body of your e-mail transmittal.

All images must be authentic to the person submitting. Do not submit images with which you do not hold the rights.

Format the file name(s), sequentially, as such:
[yourlastname_image1.jpg]

Author Bio
Submit a brief, two-sentence bio in the following format:

[yourlastname] [AIA or Associate AIA or RA] is a [your title] at [your company] in [city, state]. [yourlastname] is also [one sentence describing primary credentials or recent accomplishments].

Format the file name as such:
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Author Photo
Submit a recent headshot in JPEG format at a minimum resolution of 300 dpi grayscale in RGB mode.

Format the file name as such:
[yourlastname_portrait.doc]

WHAT IS THE YOUNG ARCHITECTS FORUM?

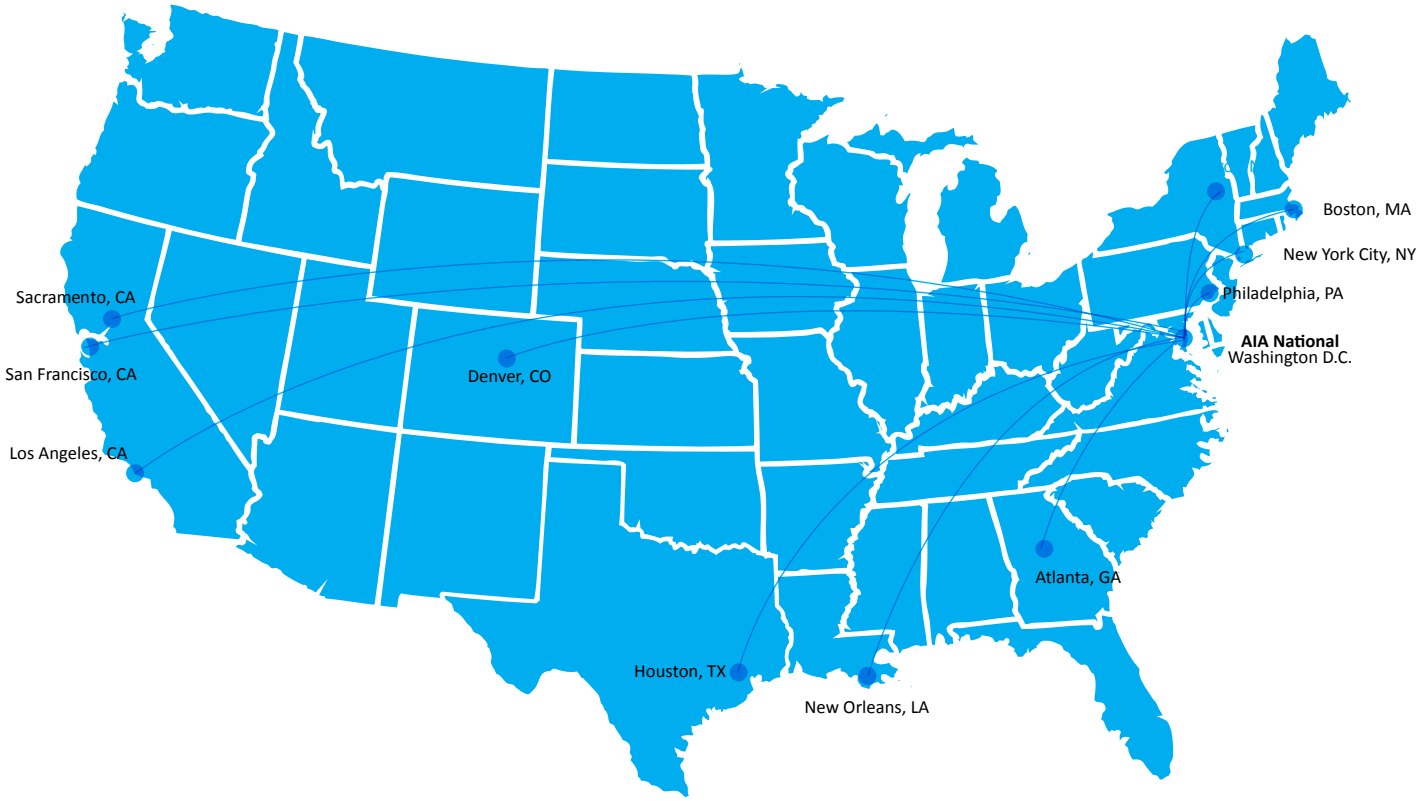
The Young Architects Forum is the voice of architects in the early stages of their career and the catalyst for change within the profession and our communities. Working closely with the AIA College of Fellows and the American Institute of Architects as a whole, the YAF is leading the future of the profession with a focus on architects licensed less than 10 years. The national YAF Advisory Committee is charged with encouraging the development of national and regional programs of interest to young architects and supporting the creation of YAF groups within local chapters. Approximately 23,000 AIA members are represented by the YAF. YAF programs, activities, and resources serve young architects by providing information and leadership; promoting excellence through fellowship with other professionals; and encouraging mentoring to enhance individual, community, and professional development.

GOALS OF THE YOUNG ARCHITECTS FORUM

To encourage professional growth and leadership development among recently licensed architects through interaction and collaboration within the AIA and allied groups.

To build a national network and serve as a collective voice for young architects by working to ensure that issues of particular relevance to young architects are appropriately addressed by the Institute.

To make AIA membership valuable to young architects and to develop the future leadership of the profession.



GET CONNECTED PUT YOURSELF ON THE MAP

THIS ISSUE FEATURES CONTRIBUTING ARTICLES FROM THESE MAPPED LOCATIONS.

I AM A
I AM A
I AM A

Jennifer Rhoades, Assoc. AIA
Member Since 2012

Sam Garcia, AIA
Member Since 2009

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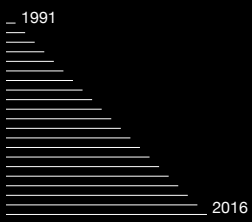

YOUNG ARCHITECTS FORUM

CELEBRATING 25 YEARS OF ADVANCING THE CAREERS OF YOUNG ARCHITECTS