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REDEFINING
ISSUE

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Contents

CONTEXT

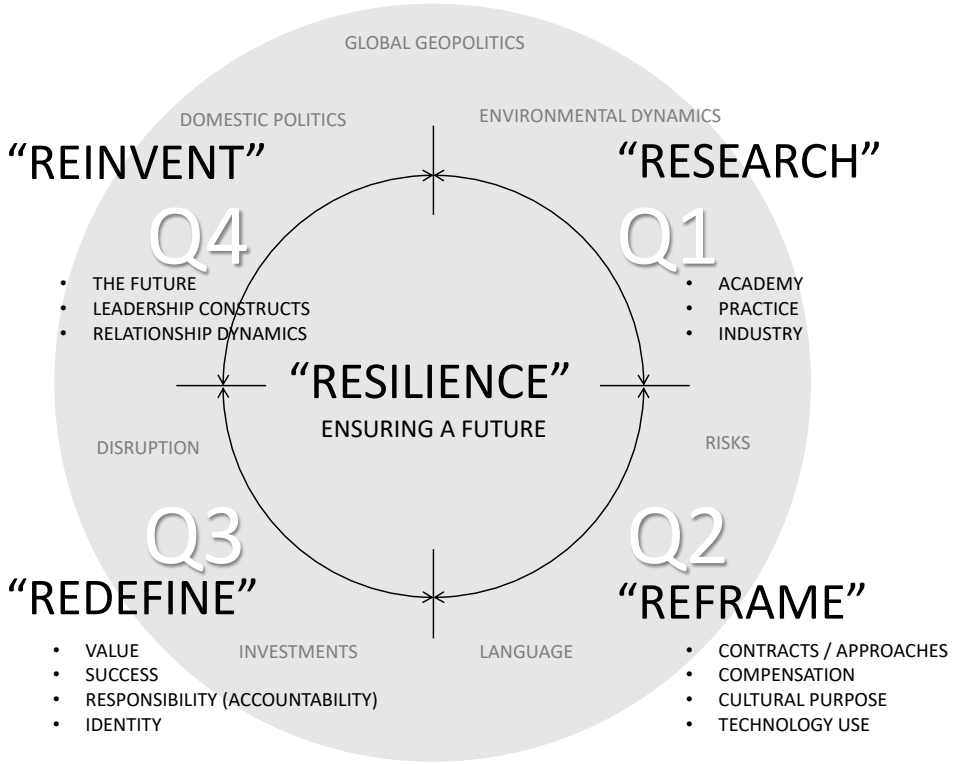
Our DesignIntelligence editorial roadmap for 2020 seems strangely suited for the world in which we find ourselves now living. It's as if we predicted the events the world would experience beginning in March. We couldn't and didn't.

But perhaps like all good plans, ours had a modicum of intentional vagueness, an open-ended framework for guiding thought and action. Or maybe we just got lucky? Whatever the case, we now find ourselves seeking a return. A return from shock and sheltering to creating and living in a new world. Certainly not a return to normalcy. That's going to take some doing.

To help us move from reacting to creating, we've gathered contributions from some expert doers and thinkers. In this quarter's collection you'll find ideas to help redefine your approach to working in a new context

Dave Gilmore's piece issues a leadership challenge: to capture the opportunity created by our current crises. Frequent

EDITORIAL ROADMAP 2020



prophet Phil Bernstein provides new directions for professional value. Informed by history and scholarship, George Johnston's observations from his new book illuminate ways forward for a redefined profession. Paul Hyett's musings on the redefinition of time, space and sequence offer an intriguing set of inquiries. Scott Simpson's informed perspective tells us what won't change. My essay, On Redefinition, suggests the need for new rules.

Liz York presents three case studies that illustrate the potential of a balanced sustainability that accommodates people, planet, and prosperity, while Bentley's Dr. Dru Crawley points to the power of science, data, and simulation to change behavior.

Finally, Irene Hwang, of the University of Michigan's Taubman College, and Ashley Steffens of the University of Georgia's College of Environmental Design share a future forward look at how design education might cope near term and thrive longer term. These springboard essays are intended to set the tone for an ongoing conversation on the future of the business of design education post-Covid.
We hope these musings and pairings will provoke and invoke you to join us. We welcome your thinking, feedback, and experiences in any form.

Our goal is to make these offerings useful as you rewrite your own rules for living, working, and serving in a more resilient world. We can bounce back. We can stretch. And we can reunite. It will take some redefining - and some time - but we'll be fine.

Michael LeFevre, FAIA Emeritus
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Getting Back
to The Truth
DesignIntelligence
Quarterly

DAVE GILMORE

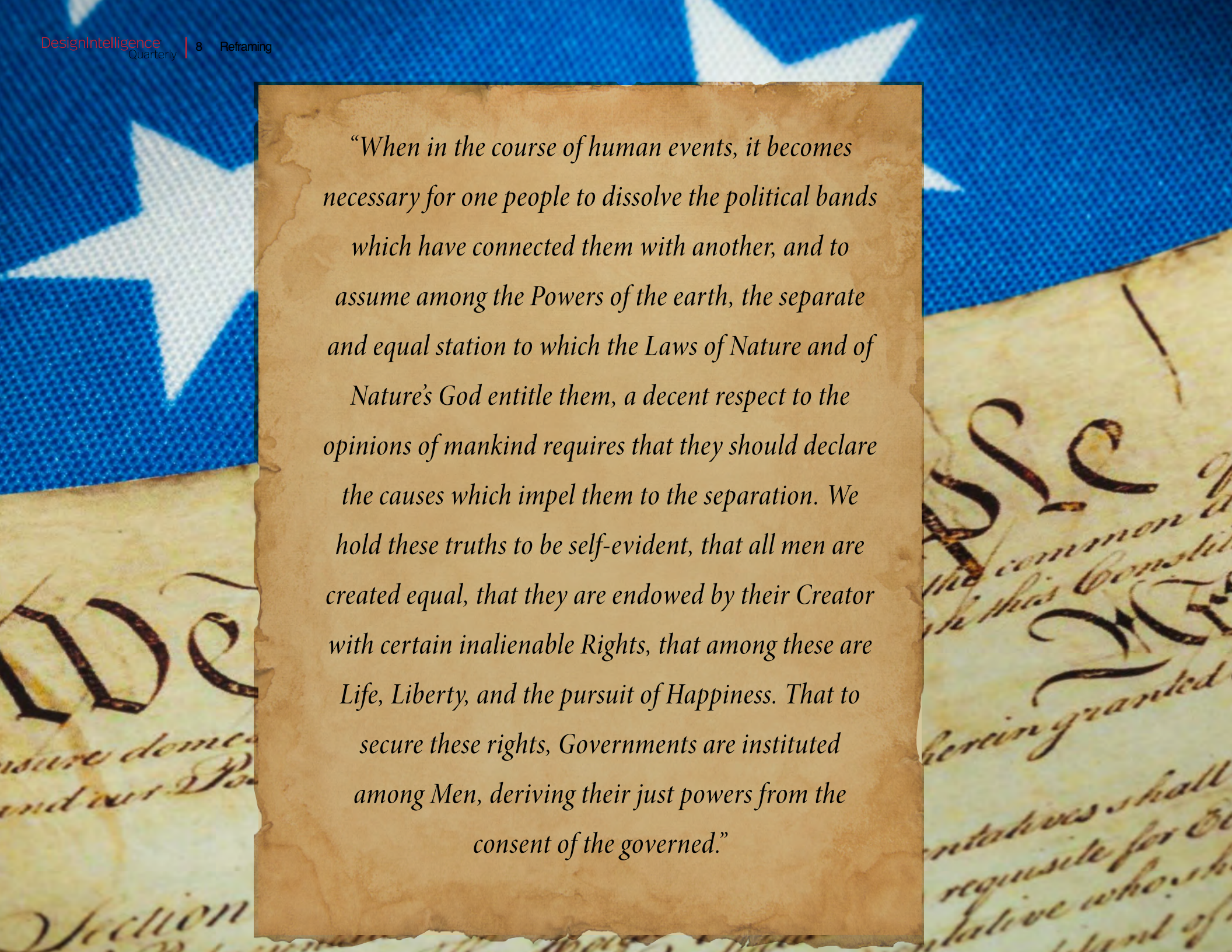
President and CEO of DesignIntelligence

Dave Gilmore reminds us that understanding and collective good are parts of a sound social contract. Independence requires dependence and respect.

The traditional construct of American society was founded on the idea of accepted societal truths. One such important truth is the notion that when people gather in a society each contributes to a common good of which all partake. Each gives up certain individual preferences in support of a broader, common need. When this occurs, all yield and accept the shared understanding. Laws are established to secure this common understanding, and all agree to abide by and submit to these accepted societal truths. As such, all come under the Rule of Law as the agreed boundary for societal behavior.

The Declaration of Independence, written eleven years prior to the Constitution of the United States, is inextricably bound to the Constitution. The Declaration's basis of truth declared, fought, and won a war, and established a nation.

When our nation's founders proclaimed their independence from Great Britain, their declaration began with these bold contextual truths:



"When in the course of human events, it becomes necessary for one people to dissolve the political bands which have connected them with another, and to assume among the Powers of the earth, the separate and equal station to which the Laws of Nature and of Nature's God entitle them, a decent respect to the opinions of mankind requires that they should declare the causes which impel them to the separation. We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain inalienable Rights, that among these are Life, Liberty, and the pursuit of Happiness. That to secure these rights, Governments are instituted among Men, deriving their just powers from the consent of the governed."

As time passes and societies mature, more accepted truths come to the fore and make their way into the category of common sense. The authors of the Declaration of Independence understood this when they wrote, "We hold these truths to be self-evident . . . ". Self-evidence parallels common sense; the given truth speaks for itself and is self-affirmed by objective and subjective judgment.

We accept other self-evident truths without question. Certain laws of physics for example. The folks at BrainScape said it well in describing some of Isaac Newton's laws:

In 1687, Newton published Philosophiæ Naturalis Principia Mathematica, the first book that laid out the fundamental laws of motion or classical mechanics. In the book, Newton laid out and explained the three fundamental laws of classical mechanics:

These may sound a little abstract, but when you think about it, these laws of mechanics are clear from everyday life. On a flat surface, a ball will remain still unless someone kicks it, or the wind blows it. On a hill, gravity acts upon it and pulls it downhill. As far as force, we all understand that being hit by a dodgeball moving 30 mph isn't the same as being hit by a car moving at the same speed. The mass of the object makes a difference in the force. And finally, we all understand that if we punch a wall, we're probably going to break our hand. We may hit the wall hard, but the wall exerts an equal and opposite force in return. Ouch!

1. *Objects at rest will remain at rest, and objects in motion will remain in motion at the same velocity, unless the object is acted on by an external force.*

2. *Force equals mass times acceleration (F=ma)*

3. *When one object exerts a force on another object, the second object exerts an equal and opposite force on the first.*

Further illustrative examples include:

- Seeds yield growth
- The sun shines during the day, and the moon shines at night
- Oxygen is necessary to breathe
- Water is necessary to live
- Fire burns
- People are organic
- Community requires agreement
- Language is necessary for communication
- Blue and yellow combine to make green
- My actions affect others

Myriad other self-evident truths qualify as common sense. We look with raised eyebrows and suspicion at those who question them, sometimes thinking they may need to have their heads examined for denying such truths.

CURRENT "QUESTIONING"

These days, questioning everything for the sake of questioning seems a rising trend. By itself, questioning is beneficial. It gives outlet to honest curiosity, a desire to understand. But the current questioning wave is not so honest. The current fad is to question for rejection. In this mode, shirt-sleeve bias rejects accepted truths before questions are posed.

Now, questions are too frequently posed to reject and oppose by default rather than seek truth. Too often, sarcasm and cynicism lead the assault. Faced with such immaturity, it's near impossible to have a rational, open, un-postured dialogue that seeks common good.

LET'S AGREE

As a society, it's incumbent on our survival that we agree on a few things:

- First, on a common set of societal truths.
- Second, that we formalize these into our way of living together.
- Third, to bind these with enforceable laws to ensure they are maintained.
- Fourth, as we discover more truths, to add them.
- Fifth, to nurture and respect the expertise to teach us with fact-based curricula coupled with rational, well-reasoned hypotheses that reinforce the truths we have come to accept. Such education and enlightenment ensure continuity and cohesion for society.

Speaking of expertise, why do we now witness so many baseless, foolish attacks on the expertise and experts on whom we rely to understand? Just because self-anointed critics can get to the internet, perform a cursory search on any given topic and yield pages of content, doesn't make them an expert. Nor does it remove the credibility and wisdom of the authentic experts who have earned their stature. Information and knowledge are dangerous when wielded without understanding. True intelligence seeks understanding and is marked by insatiable curiosity.

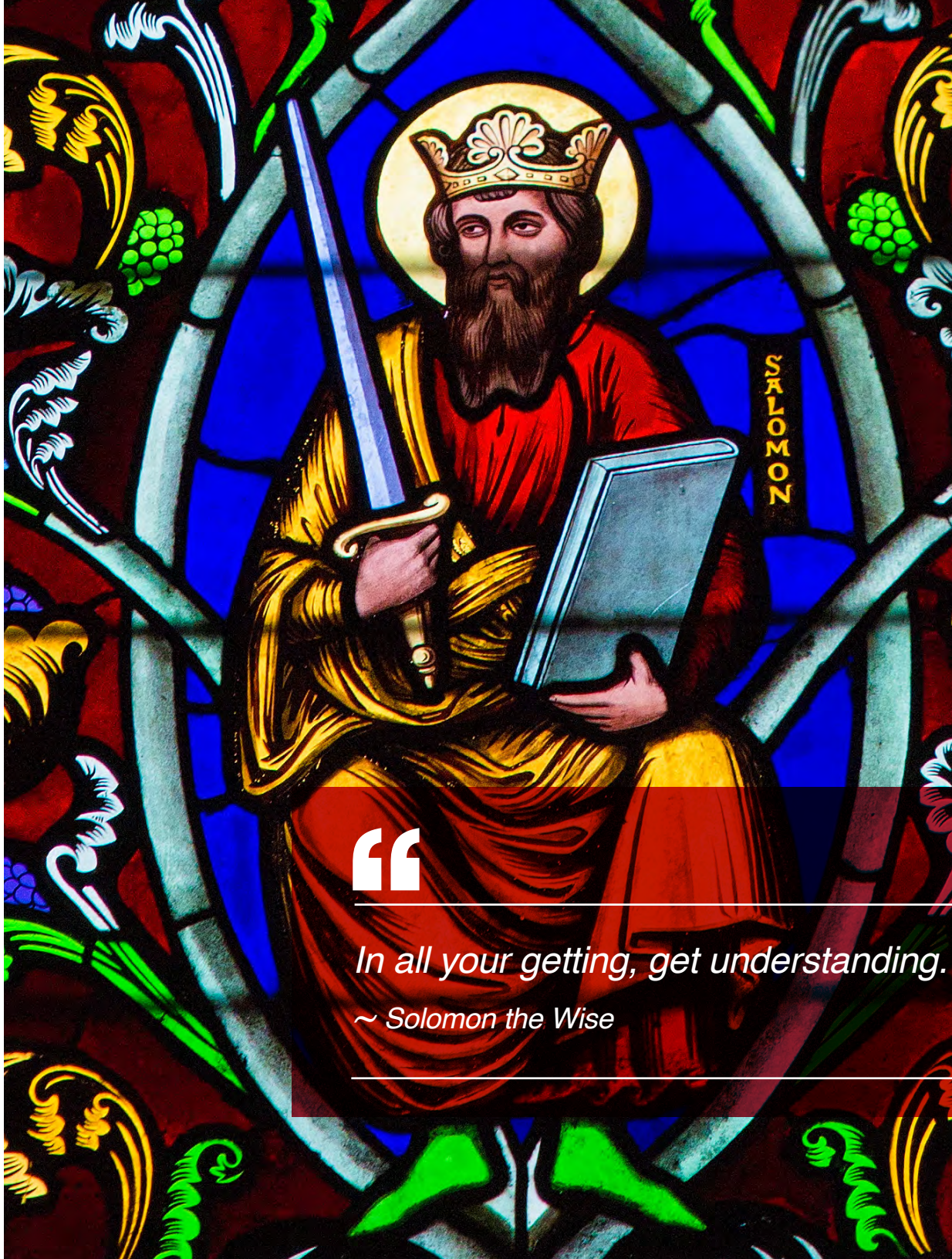
Solomon the Wise spoke sagely 3,000 years ago when he advised:

"In all your getting, get understanding."

In getting back to the truth, let's agree to consider the collective good, and set aside bias in favor of rational, fact-and-context-based analysis. With this method, and with respect for true experts and society's lessons, we stand a chance.

First, let's seek to understand. Let's get back to the truth.

Dave Gilmore is President and CEO of DesignIntelligence



On Redefining:
New Rules

DesignIntelligence
Quarterly

MICHAEL LEFEVRE

FAIA Emeritus
Managing Editor of
DesignIntelligence

To spring forward from concurrent crises, DI's Managing Editor issues a call for new rules—and the courage to break the old ones.

RULES

So many of us get hung up on the rules. For most of our educational and professional lives we were taught to work between the lines. Particularly when it came to contracts, commerce, fees, and value. For centuries, unwritten, unspoken limits constrained what we could do and what we could get paid. These were instituted by state licensing entities and adopted by owners as "compensation guidelines." Social mores and professional boundaries limited the societal reach and expectations placed upon designers and builders.

But where have these rules gotten us? Sure, they've governed behaviors and set standards for decades. Architects, engineers, and builders practiced under these conditions because we were "professionals" beholden to public health, safety, and welfare, and were held to a higher standard, a higher calling. None of this has changed.

But amid multiple concurrent crises, we are being called to answer to even higher-order standards now, such as the 2030 Commitment, and the confluence of inequity, racial, environmental, infrastructure, economic, political, and COVID-19 pandemic issues that confront us in 2020. Do we have adequate training and province to speak to racial issues? As individuals we do — in our moral, ethical, and personal beliefs and behaviors. As firm leaders we

> *It's time to rewrite the rules. It's time for redefinition.*

do — because our followers, clients and communities look to us for leadership. But will we act, or change behavior?

Too many talented, smart, hard-working design and construction professionals have labored under out-of-date, guild-like restrictions and shackles for too long. In our current context, it's time to rewrite the rules. It's time for redefinition.

NEW RULES

What kind of new rules am I talking about? In the style of politically-incorrect-by-design pundits such as Tom Peters, Bill Maher, et al, I offer the following ten areas with potential for immediate, lasting impact and positive change. More than idle theory, they represent tested principles. In fact, I believed in them so strongly I put my career on the line to implement them: beyond new rules, I created a new role. I went to work for a contractor to put myself in position to create, test, and implement these ideas.

New Rule # 1: Design Your Own Incentives to Increase Your Value

Architects should no longer allow themselves to be paid based upon outmoded compensation methods such as percentage of construction cost, fixed fees, or hourly billing rates. Value-based designers should be smart enough to design fees that reward value, service, and benefit. Examples borrowed from other industries include subscription services (e.g. cable TV, legal fee retainers, incentive-based agreements, and the cost-of-work-and-services plus a fee models employed by CM-at-Risk agreements for decades.) In these constructs, all costs are covered, and the professionals are incentivized to wake up every morning to serve their clients and projects to earn well-deserved profits. In turn, this funds research and development, professional development, community giving, and sustainable enterprises.

New Rule # 2: Ditch the First-Cost Perspective and Plan for the Whole Life Cycle

Owners, designers and builders should immediately stop thinking about projects as short-term, first-cost endeavors. People, projects, our planet, and our prosperity demand and deserve a longer-term balanced outlook. Design decisions based on short-term, shortsighted, self-serving interests and misguided criteria should be discarded in favor of operational, sustainable, long-term thinking. Owners, developers, and financers should recast their proformas accordingly.

New Rule # 3: Leverage Design Thinking at a Broader Scale

Those with the responsibility to design, build, own, and operate our physical environment should be intelligent enough to leverage their skills more broadly. Without losing the craft and value of artful, bespoke thinking, this cadre of professionals must leverage their efforts more widely to provide greater access to design thinking, more intelligent use of resources, and equitable compensation. We need to learn: our actions affect others outside our own sandbox.

New Rule # 4: Think More Deeply About Diversity, Equity and Inclusion

In the satirical worlds of George Orwell and Ray Bradbury, makers who persist in designing and building their projects with teams of their own clones would be banished to some district on another planet. The vast, diverse, connected nature of our project work and the immense responsibilities we owe to others demand the inclusion of diverse people, skills, and points of view. We must embrace and benefit from our differences. In addition to diversity of race, gender, and class, we need to celebrate the diversity of skills and thinking needed to design in today's pluralistic world. Designers need builders, schedulers, and cost estimators to keep them in check. Builders need to understand, embrace, and own the up-until-now mysterious world of design. Owners must lead.

New Rule # 5: Master New Technologies for Smarter Design Process: LEAN, BIM, VDC, and Alphabet Soup: Still Working Dumb?

Luddites who shun the application of technology and intelligent processes will suffer the penalties of market forces if they fail to adapt. Most other industries on the planet have embraced technology. They have automated and augmented their processes for huge benefit. Yet many designers and builders languish in the ways of old. In a world where we can procure goods and services in seconds, minutes, and days on Amazon, and query anything on Google in seconds, design must join the modern epoch and find ways to become lean. Building information modeling (BIM), virtual design and construction (VDC), integrated project delivery (IPD), augmented reality and immersive reality (AR/IR) are just a few of the acronyms. Go forth and master the new tools!

New Rule # 6: Set Specific, Performative Goals (Beyond Cost, Time, and Quality)

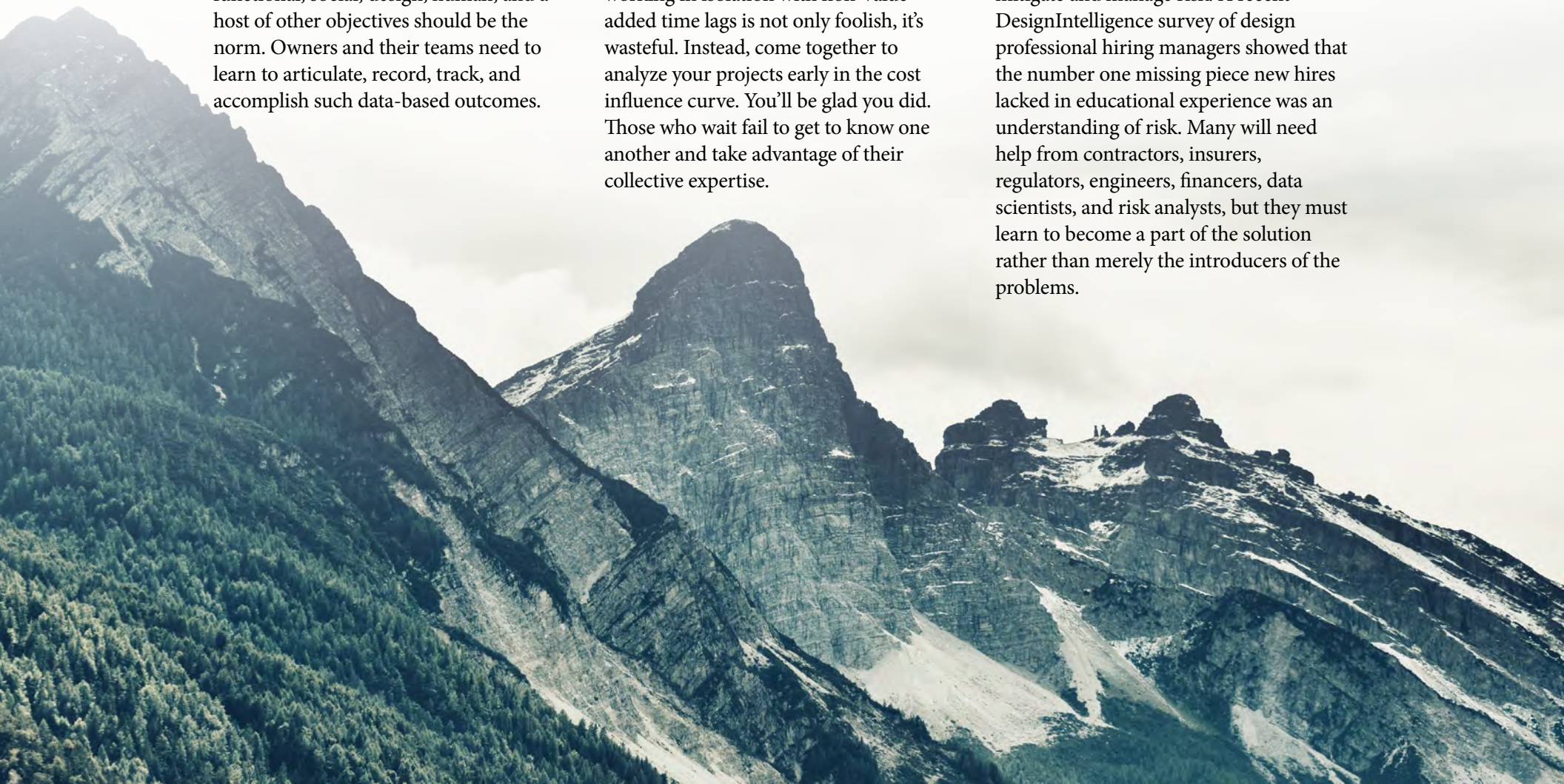
Projects that simplistically set out to be on time, in budget, and of quality will attain none of the above. We must shoot higher. We must demand and achieve more. Prescriptive programs that specify energy, sustainability, process, financial, functional, social, design, human, and a host of other objectives should be the norm. Owners and their teams need to learn to articulate, record, track, and accomplish such data-based outcomes.

New Rule # 7: Plan Collaboratively, Early, Using the Best Available Tools

Project teams who foolishly believe they don't have time to plan are forced to spend extra time executing. Multidisciplinary, interactive, technology-informed work sessions are the high-value way to collaborate. To continue working in isolation with non-value-added time lags is not only foolish, it's wasteful. Instead, come together to analyze your projects early in the cost influence curve. You'll be glad you did. Those who wait fail to get to know one another and take advantage of their collective expertise.

New Rule # 8: Embrace Risk

Designers must learn to embrace risk rather than simply introduce it. By their very nature, design activities intentionally seek new combinations and creative ideas. Hence, risk is a prerequisite to reward. While we're not taught to speak of risk in school, the new designers of the future must open their arms and learn to mitigate and manage risk. A recent DesignIntelligence survey of design professional hiring managers showed that the number one missing piece new hires lacked in educational experience was an understanding of risk. Many will need help from contractors, insurers, regulators, engineers, financers, data scientists, and risk analysts, but they must learn to become a part of the solution rather than merely the introducers of the problems.



New Rule # 9: Create a Culture of Service

The closed-culture, mysterious world of design must open its eyes, doors, and arms to the service relationship. Designers focused solely on "their" design to the detriment of their clients, projects, and the environment will ultimately fail to build strong networks, and their businesses will fall behind. For too many years designers have introspectively over-focused on their craft, aesthetics, and the art of architecture, to the exclusion of their clients' needs. Designers of the future must embrace the objectives of their clients and teammates — as all others in the business world do. The narratives of projects such as the Farnsworth House, Fallingwater, and thousands of others that did disservices to their clients due to their architects' self-interest are fine examples of what not to do.

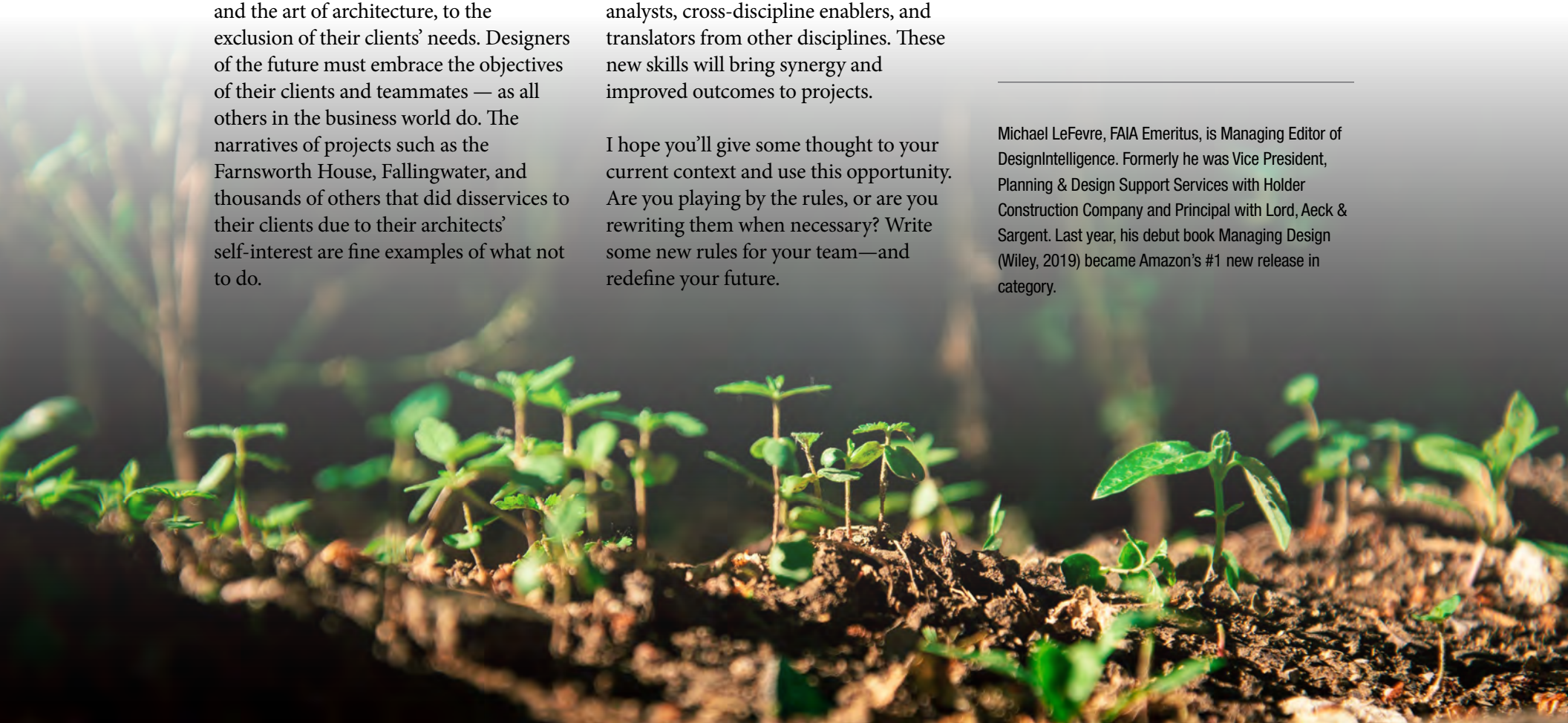
New Rule # 10: Bring in New Teammates with New Skills – and Improve Outcomes

Designers, builders, and owners must shed their biases and actively seek radically new kinds of participants for their project teams. Designers should seek complementary teammates such as contractors, schedulers, cost estimators, and design managers to keep their processes in check. They should seek the skills of technology experts, energy analysts, cross-discipline enablers, and translators from other disciplines. These new skills will bring synergy and improved outcomes to projects.

I hope you'll give some thought to your current context and use this opportunity. Are you playing by the rules, or are you rewriting them when necessary? Write some new rules for your team—and redefine your future.

As we look to spring forward from an insane beginning of a new decade, let's agree to question the status quo and rewrite some of those old rules to suit our new world and new ways of practice. Here's to the leaders willing to redefine social practices, value, and process in the years ahead. Only then will we be positioned to reinvent ourselves to serve our fellow mankind, the public, and the planet in the myriad ways they need us—ways in which we listen to and love one another.

Michael LeFevre, FAIA Emeritus, is Managing Editor of DesignIntelligence. Formerly he was Vice President, Planning & Design Support Services with Holder Construction Company and Principal with Lord, Aeck & Sargent. Last year, his debut book Managing Design (Wiley, 2019) became Amazon's #1 new release in category.



Design Education Resilience: CORONAVIRUS's Impact and Beyond

DesignIntelligence Quarterly

ASHLEY STEFFENS

Associate Professor & Associate Dean, Academic Affairs, University of Georgia, College of Environment + Design

How to cope with largely-studio-based design education in a new world order? UGA's Ashley Steffens offers an insider's historical perspective, scenarios, and a challenge to continue the conversation.

REDIRECTION REQUIRED

COVID-19 has changed the course of design education. When shelter-in-place orders restricted faculty, staff and students from returning to campuses, educators began to understand the enormous impact this mandate would have on traditional face-to-face (F2F) teaching. How would they find the resilience to reinvent historically studio-based curricula? While online teaching resources had been available for years, many professors were ill-prepared to make that transition. After all, learning new technologies is rarely at the top of anyone's priority list, especially given no pressure to do so. But that was all about to change.

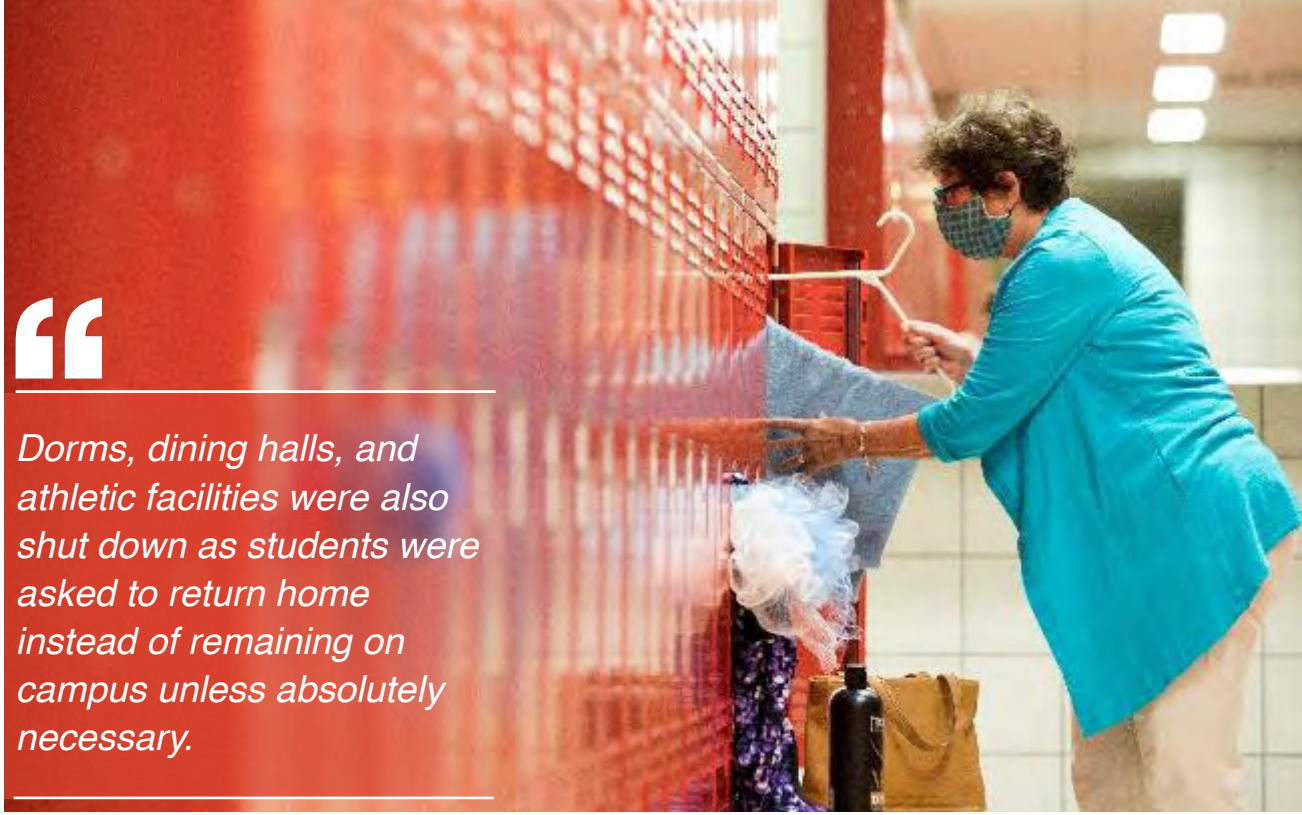
Downtown Athens kiosk illustrating COVID's campus life impact. Photo by artist Mux Blank

ACCESS PROHIBITED

In March 2020, Universities across the country banned all but essential staff from buildings. Administrators tasked with supplying educational resources and IT needs for faculty quickly transferred course materials from F2F to virtual for synchronous and asynchronous online teaching. Deans and Department Heads activated untested contingency plans for facility access. A host of questions sprang forth. How would students collect their studio equipment when they were sent home from spring break? Even with laptop computers required, how do you teach a class if students or faculty don't have reliable WiFi? How do design professors perform a desk critique when there is no desk? These, and many other questions needed immediate answers and solutions.

SHOCK AND RECOVERY

After the initial shock, the education system set foot on the road to recovery. Administrators organized students in small groups to collect on-campus equipment and evacuate dorms. University leaders sent messages of comfort, understanding, and assistance. Faculty reached out to students with messages of support and patience, despite many unknowns ahead. Organizations such as the Landscape Architecture Accreditation Board (LAAB) and The American Society for Landscape

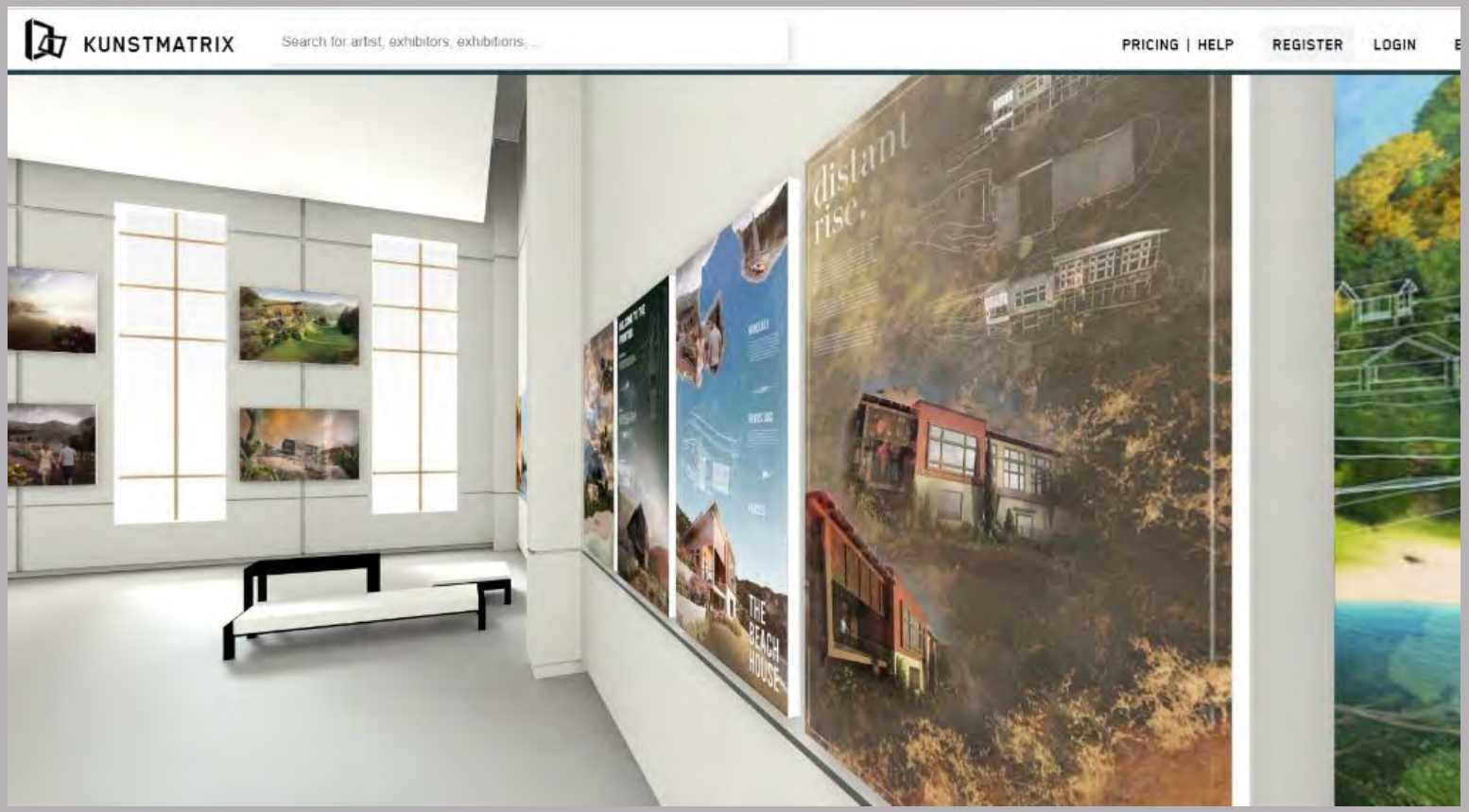


Dorms, dining halls, and athletic facilities were also shut down as students were asked to return home instead of remaining on campus unless absolutely necessary.

Architects (ASLA) supported educators with webinars and articles, and The Council of Educators in Landscape Architecture (The CELA) facilitated discussion groups to begin sharing information across the country.

With government isolation measures in place, the business of business shifted to a business of support. Upper level administration provided vast amounts of information and resources, but it was still up to faculty to identify how to virtually teach and measure outcomes. Professors faced daunting tasks, including finding the right technology for achieving desired results. What's more, Universities were recommending faculty develop synchronous teaching, asynchronous teaching and a third hybrid model, in case of more system shutdowns or limited internet capacities. This required revising 2-3 months of work for 3 different scenarios in a week or two of transition time.

When it was time to go live with virtual teaching, most faculty developed unique course instruction and communications to facilitate online education such as using blogs for daily communication, virtual galleries to display work, Zoom annotation for project review and 'desk crits', and alternative testing methods.



Virtual Gallery of UGA CE+D Advanced Graphics student work. Developed by CE+D Lecturer, Jessica Fernandez.

CHALLENGES AND SURPRISES

By the end of the Spring 2020 semester, virtual design education had been explored and it was time for some feedback on the state of things. University of Georgia College of Environment + Design (UGA CE+D) student evaluations asked two simple questions:

1. What positive strategies or approaches did this instructor use during the remote instruction phase of the Spring 2020 semester?
2. Additional Comments: Please use this space to share additional comments about your experiences during the remote instruction phase of the Spring 2020 semester.

Although responses were lower than normal, anonymous student comments identified challenges and surprising successes.

In addition to student evaluations this year, UGA Faculty were asked to fill out self-reflection assessments. Faculty comments also evidenced new empathic outcomes such as the following survey questions and anonymous responses:

Which course modifications were most/least successful in terms of my ability to effectively identify student progress and barriers to learning along the way?

"I was amazed how complex my student's lives are. The idea that they all went home to a happy nuclear family turned out toabe a grand myth. A few actually came back to Athens to live because their home situation was untenable. The only way to work through that was to stay in constant communication with them."

My professor made an online design studio, which I never thought would be possible. He delegated the work as individually as possible to ease communication. He even gave us online software training to make us efficient during these times. He intensified efforts to collaborate with students for their final presentation, so we didn't get overwhelmed by the new normal.

- Anonymous Student Evaluation

It was difficult for me in all honesty. Attempting to do studio well, remotely, was hard without the everyday interaction with other students. I did find myself becoming more proficient with online software what I would not have otherwise. I am a hand rendering fiend.

-Anonymous Student Evaluation

What did I do as an instructor to reduce student apprehension and anxiety during this time of disruption? What might I do more of next time?

"I reached out to all students and asked them what they needed to move forward and collaboratively worked with them to shift internal and external deadlines given that we needed to postpone field labs or research. Student anxiety was high given that some of our research is seasonal and the next research season would require extensions, so we're trying to figure out ways to retool research projects and keep grantors updated on our status."

Which course modifications were most/least successful in terms of my ability to maintain student engagement in their learning?

"I don't think anybody should overlook the inordinate amount of additional time that it took to individually work with students more often that class meet to make sure they're engaged, had a clear understanding of expectations, etc."

What (if anything) might I do differently in the future to build flexibility into my course, in case of other (hopefully less significant) disruptions to my teaching?

"Master zoom, master ELc, master distance learning software, build a home recording studio, improve my keyboarding and typing skills ……or retire."

And retire, he did.

EXPERIENTIAL LEARNING

The next big challenge was about to surface: SUMMER. Many design education programs include experiential learning and internships as typical summertime educational activities built into curriculum planning. By March, when campuses closed, many students had finalized summer plans for study abroad, work study programs, or professional internships. Although on campus summer courses would continue online, study abroad programs and off campus courses were closed due to travel restrictions and shelter-in-place mandates. Internships, even those already accepted, were tentative as firms also transitioned to alternative work practices. Many administrators were forced to weigh the consequences of delaying these critical professional experiences, which necessitated extending the time for graduation – an unwelcome byproduct among University administrators. Alternative options began to surface, such as allowing students to work in related positions like nurseries, construction or landscape maintenance industries; overlapping internships into the following fall semester; developing projects with alumni or state ASLA chapters; or reducing the number of hours required.

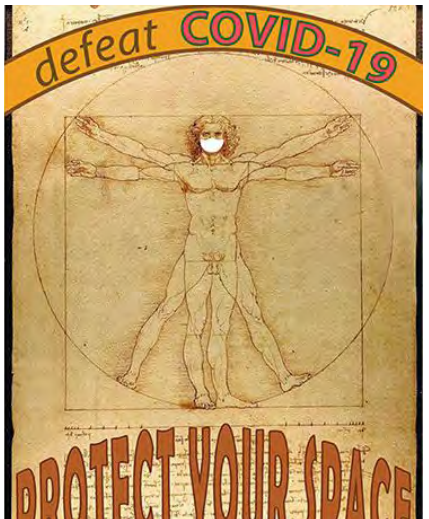
THE JOURNEY CONTINUES

The journey continues with unknown consequences of F2F teaching expected to resume in the fall. Across the country, Universities are unveiling elaborate policies and procedures for staff and administration to return to campuses over the summer in preparation for faculty and student return in August. Some strategies will require self-monitoring and actions such as contact tracing for those testing positive for the Coronavirus, wearing face masks/coverings, regular temperature checks, hand washing, and eliminating all non-essential work travel. Additional tactics for a safe return to UGA's campus include social distancing, additional cleaning and communication through signage.

Even with the best intentions and all these measures in place, it is highly unlikely traditional F2F teaching will remain the default course of action. Many contingency plans allow for individuals with compromised health conditions to continue working or taking courses virtually. As a result, educators will need to develop a hyflex teaching model to meet the dual demands of teaching F2F as well as providing virtual courses for students who cannot return due to underlying health risks. Other educational scenarios will continue to reshape design education and redefine the studio experience.

Above — Landscape Architecture students attending UGA Cortona – Italy Studies Abroad Summer Program. The 2020 program was canceled due to CORONAVIRUS travel restrictions but hopes to return in 2021.

Below — Landscape Architecture students present final projects at 18th century exhibition hall, Palazzo Vaagnotti in Cortona, Italy after attending UGA Cortona – Italy Studies Abroad Summer Program



SCENARIOS

Inside Higher Ed recently published "15 Fall Scenarios: Higher Education in a Time of Social Distancing" which includes options for schools to consider such as:

- delaying F2F teaching
- block planning
- shifting academic calendars (e.g. Fall to Spring and Spring to Summer)
- full F2F teaching
- hybrid online and F2F teaching
- offering a gap year, or
- revising curricula

One scenario, the "First-Year Intensive approach" allows first year students primary access to on campus facilities, with a hybrid of options for sophomores, juniors and seniors. The Freshman Experience has long been a focus for Universities, as evidenced by the rise of Freshman seminar courses intended to provide a positive freshman experience with small class sizes and diverse topics. This approach bodes well for the early development of the studio culture which continues long beyond a student's educational years. The studio culture as a unique pedagogical environment has historically been the vehicle of choice for developing design thinking, collaboration, and problem solving. Now, educators will need to develop strategies to foster the studio culture amid the potential for alternating days for F2F classes to accommodate limited classroom occupancy. They will have to re-imagine

Posters designed by Professor Amitabh Verma take a creative stance on communicating the importance of social distancing by staying 6' apart.

group projects in keeping with social distancing measures, alternatives to testing, and identify alternative methods for experiential learning and other off campus activities until travel restrictions are lifted.

OTHER IMPACTS AND EFFECTS

Another CORONAVIRUS-related task will be managing virus-related faculty and student absences. When faculty are sick, who takes over their classes? When students miss class to comply with a standard 2 week stay at home measure, how are they expected to make up all that work? These situations strongly suggest the need to be prepared for a wholly virtual classroom and consider creative solutions when prolonged absences occur.

LEADERSHIP, DESIGN THINKING, AND CONVERSATION ARE WELCOME

These measures and their ripple effects will demand close monitoring. Like previous social, political, and economic challenges, they will dictate new ways of building supportive learning communities and disseminating professional design education amid crisis. In tandem with creative approaches by leading design educators they will redefine how we teach and learn design in the challenging times ahead.

Continuing the dialogue - and sharing of tactics and coping strategies, in any form - is welcome.

Ashley Steffens is an Associate Professor, Associate Dean of Academic Affairs at The University of Georgia, College of Environment + Design and Past President of The Council of Educators in Landscape Architecture. With a Bachelor of Environmental Science and Masters in Landscape Architecture, she has taught hand and computer graphics, community design with applied engineering, plant identification, and construction for over 20 years. In addition to teaching, she has authored numerous articles on graphics and is Co-Author of Computer Graphics for Landscape Architects: An Introduction. She can be reached at steffens@uga.edu

> *How a student begins their college experience may be the best predictor of how their college experience will end.*

Reframing the
Value Propositions of Building

DesignIntelligence Quarterly

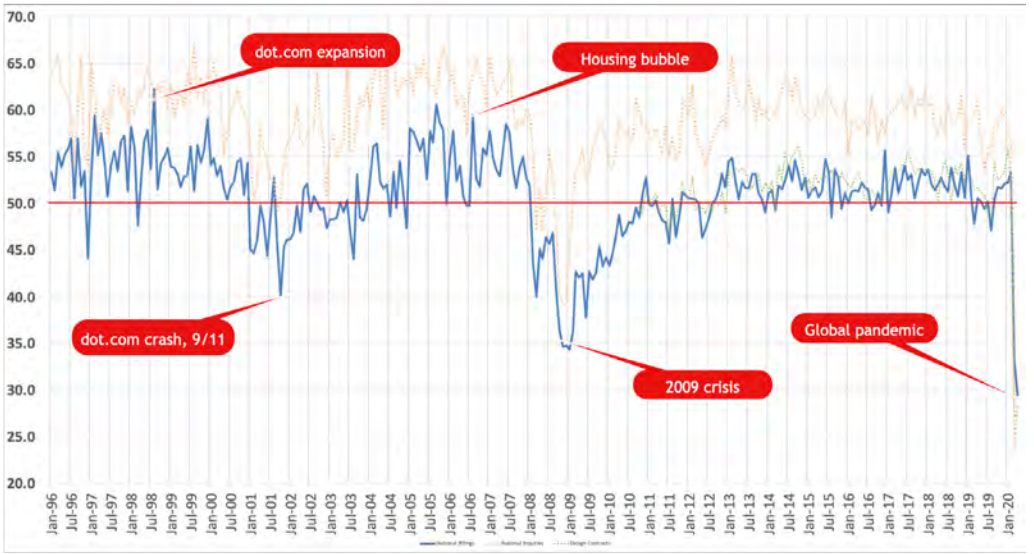
PHIL BERNSTEIN

Associate Dean & Professor
Adjunct at the Yale School of Architecture

Phil Bernstein investigates agency, project delivery, and building performance as future value proposition paths

In February of this year, I gave my annual lecture to our students about the economics of the architecture profession, a traditional kick-off to our spring career development festivities. More than sixty firms had signed up to interview our seventy-odd soon-to-be graduates after the March break. Updating my slides from the previous year, and with all indicators looking just fine, I suggested to our troops that while our industry was past the usual deadline for a recession (on the usual seven-ish year cycle) there were no ill signs on the horizon. I projected a graph of the history of the Architectural Billings Index since 1996 that showed the ups and downs in the building economy including the dive of 2009, and I intoned that "while you will probably see several recessions during your career, the 2009 crisis was a once-in-a-generation aberration." If only.

By March, that graph looked awful, with the lowest ABI data ever recorded. April was even worse:



Architectural Billings Index, 1996 - mid 2020 (Source: American Institute of Architects)

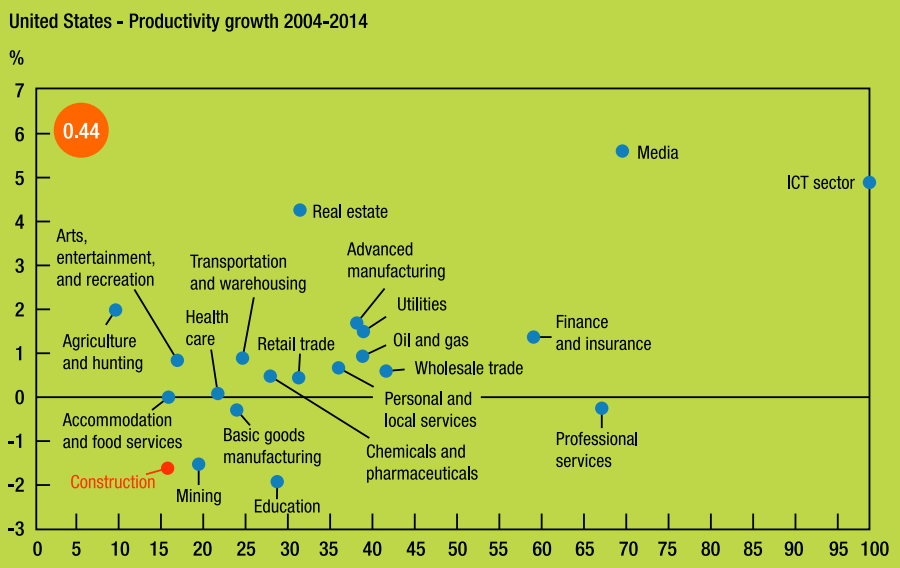
I had to change the scale to make the rapidly descending data fit — needless to say, a catastrophe. Sign-ups for our recruiting event, transfigured over spring break to a virtual affair, deteriorated accordingly. A third of the firms said they were still hiring, another firm "weren't sure" but offered "informational practice interviews," and the last group disappeared from the radar completely, unresponsive to our queries. A proxy, perhaps, for the potential future of the profession writ large.

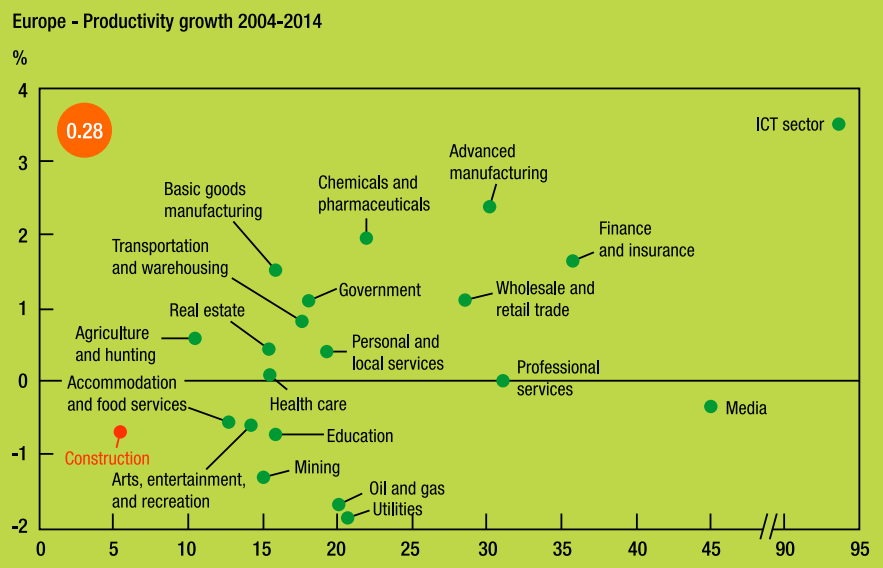
Those of us of a certain age have seen many of these oscillations in the building industry's economic curve. I started my career out of college during the 1979 energy crisis (Carter), left graduate school to join the 1983 savings and loan downturn (Reagan), survived the jobless recession of 1990 with a job (Elder Bush), and lived in the corporate world during the dot-com crash of 2002 (Younger Bush) and the housing collapse of 2008 and 2009 (Younger Bush again, passed along to Obama). One would think that repetition yields wisdom, but I can't say with certainty that our profession takes any particular lessons from these existential perturbations.

Perhaps the greatest missed opportunity was 2009, a recession during which the structural and performative challenges of architecture and building were clearly understood, and most of the economy had turned to digitally driven productivity growth, with the notable exception of building. This graph, produced by McKinsey Global Institute, tells that story well:

The Information/Communication/Telcom sector ("ICT") in the upper right corner of this correlation of digitization and productivity sets the pace at 3.5% growth and 93% digitization.

Construction is at the opposite end, with negative growth and anemic digitization, wrapping the entire missed opportunity in a neatly correlated diagnosis. Related symptoms include commoditized pricing yielding thin margins, low expectations of quality and service, the near impossibility of precision pricing and schedule conformance, labor challenges, ambiguous distribution of responsibilities, and a lousy risk/return ratio.





Industry Digitization versus Productivity, 2004-2014 (Source: McKinsey Global Institute)

The implications of the pandemic for the built environment have not yet come into view, and likely will not do so for many months to come. What is apparent from this side of the epidemiological and economic abyss, however, is that the responsibilities of architects and architecture will be reframed in significant ways:

- Abandoned space made redundant by home working and business failure must be repurposed; the role of buildings that instantiate economic and social inequality examined and redefined; the relationship of those buildings to public infrastructure like transportation rethought;
- the contributions of building to global warming reduced;
- the health implications of building occupancy understood and optimized;
- the definition of the public's health, safety and welfare, the raison d'etre for licensure, questioned and potentially refactored.

We should admit that we largely wasted the last crisis. Perhaps now, with the building industry facing its most dramatic survival challenge since the Great Depression, we can reframe our processes and results and exit this crisis resolved to change building in a real way. Doing so means examining and reframing three essential elements of the industry value proposition:

- agency (the roles and responsibilities of designers and builders as they deliver projects)
- project delivery strategy (the relationships of the demand, design and construction elements of the supply chain that actualize buildings), and finally
- building performance (how buildings work during their lifecycles rather than how closely they adhere to objectives of cost, schedule, and putative quality).

In doing so we might shift our attention from small-bore experimentation with tactics to a radical shift in the value propositions of design, construction and operations.

REFRAMING AGENCY

The dis-integration of the building supply chain is a well-understood phenomenon that traces its roots back to the original distinction of design as separate from construction (Alberti, in the Renaissance) through the professionalization of the practice of architecture in America during Reconstruction, and then the liability crisis of the 1980s. The first two decades of the twenty-first century saw further dispersion of responsibility and control as the technical complexity of building began to far exceed any entity's ability to singularly understand, much less comprehensively control it. The romantic ideal of the "Master Builder" is compelling but utterly obsolete in a world where even the simplest construction project involves hundreds of people, from designers, contractors, on-site construction workers, inspectors, funders, and building product manufacturing personnel and supply chains stretching across the world.

A return to the notion of Master Builder is not the answer to the problems in buildings that result from the disaggregation of process, nor will it address consistently poor outcomes in our industry. The desire itself signals a wrong-headed strategy for a solution that conflates power and control with results. I am reminded of some of the early days of building information modeling (BIM) as we worked on the argument for its implementation. Leaders in the industry associations of architects and builders each told me, when not in the company of the others, that BIM was the tool that would finally allow them to wrest control of the process away from their perceived adversaries. Architects hoped the power of information would ensure that contractors met their design ends; builders were sure that BIM would obviate the need for nettlesome architects, and so on. Needless to say, this was neither an effective nor particularly efficient approach, since it failed to get to the root of the problem: the lack of useful, precise information to support proper decision-making. Controlling a decision is not the same as making a good decision.

Generating, delivering, and deploying that information effectively is not improved by increasing the control of its creation and management. Rather, it is enhanced by empowering its creators to work toward goals that support overall project objectives, be they cost conformance, design excellence, schedule control, or building quality. In today's approaches, the acts of creating and consuming those data are a function of heavily commodified business

transactions. These exchanges constrain the agency of designers to explore problems deeply, builders to define their information requirements necessary to build effectively, and ultimately, owners to generate goals that can drive all the players toward agreed-upon ends. This is a topic suited to a much broader exploration than can be accommodated here, so let's examine this question from the perspective of designers as an example of how models of agency might be re-examined in a post-pandemic world with different building expectations and demands.

George Johnston, in his recent insightful examination of the history of the profession *Assembling the Architect: The History and Theory of Professional Practice*, traces the precise arc of how the American architecture profession, wrestling with the emergent discipline of general contracting at the turn of the twentieth century, defined our role as "agents of the Owner" in the constellation of delivery, largely in an attempt to take the side of the gentlemen class rather than the mechanics. In doing so, architects aligned themselves in opposition to builders (who were convinced architects wanted too much control in any case). The unintended consequences of this approach can be seen in today's practice. Combined with the traditions of lowest first-cost fees, this putative "agency" operates in three modalities: defining the "design intent" of the ultimate construction result; assuring, in a limited fashion, that the builder adheres to said "design intent," and protecting the public's health, safety and welfare.

Each component bears re-examination in post-pandemic construction, starting with the deliverables of design intent, most clearly manifest in the traditional working drawings that are the primary vector of the architect's decisions pointed at the contractor (through the contract for construction with the owner). Much as performance-based specifications made early attempts to define what a construction assembly should accomplish (rather than specifying exactly what it should be), technology today can, through robust digital modeling, simulation and analysis, become more projective about the end state of building. A more modern and effective revision of the concept of working drawings might be less about the graphical representation of the abstract state of a completed building, and more infused with performative and instructive data about how that building might work and be assembled based on highly resolved predictive models of the design itself. Doing so means delivering much higher value to both the builder and the client than is possible through orthographic drawings and is a lever point to redefine the potential risks and return of the design proposition.

Many things about the architect's responsibility likely change as a result. A good example is the vaguely understood process of "construction observation." This evolution of the architect's nineteenth century role as construction coordinator (as described by Johnston) has morphed into today's risk-averse responsibility to "generally assure conformance to the construction documents." Is it possible that the architect, as the party primarily responsible for a robust digital "prediction" of a performing building, could more usefully collaborate with a competent building toward better ends — technically, aesthetically, and epidemiologically?

Which raises a second, and potentially more existential, possibility. In a world where global warming, social inequity, and repeated pandemics are intimately bound with building, questions of public health, safety, and welfare — and the architect's responsibility for them all — arise with new urgency. As society re-examines the role and meaning of building in addressing these questions, architects could consider broadening our

responsibilities in answering those questions. Doing so would deploy our design skills in addressing the core problems facing society, create new contexts for the creation and use of our design information, make licensure even more relevant, and perhaps finally push us out of the inexorable orbit around the fixed-fee, low-margin sun.

REFRAMING PROJECT DELIVERY STRATEGY

A change in the roles and responsibilities of architects cannot occur, however, in a supply chain vacuum. This suggests that the underlying principles and structures of project delivery must be re-examined, delaminated, and potentially redefined. But the roots of those systems run very deep in the history and psyche of the American building industry.

Johnston suggests that the basic diagram of delivery — architect designs, contractor bids, owner selects, construction commences — was the de facto delivery model from Reconstruction through the expansion of the U.S. in the early twentieth century, refined by the evolution of professional standards and prototype contractual models generated by the competing constituents of design (the AIA) and construction (various contractor associations). It was only in the latter decades of the twentieth century that other modalities — construction management, design/build — were defined and emerged as canonical approaches supported by standard contracts and other protocols. By the early 2000s, an increasing dissatisfaction with the risk/return equations of building combined with the collaborative possibilities of BIM catalyzed the integrated project delivery movement, and with it another typology, IPD. Almost twenty years later, however, IPD remains a provocative but largely ignored option to deliver a project.

The pandemic creates a breach into which new delivery approaches, driven by the current extensive investment in so-called BuildTech, may step. A combination of economic pressure created by reduced demand for building (and potential over-supply of construction capacity), combined with the deterioration of the construction labor workforce (due to health and immigration constraints) will force construction toward automation, industrialized processes, and pre-fabrication. BuildTech companies will supply tools driven by computer vision, big data, high resolution data collection through sensors and drones, and artificial intelligence and machine learning. The inputs for such systems should originate with design data created by architects, first as geometry and perhaps in the future with integrated DFM (design-for-manufacturing) deliverables. The definition of construction documents is likely to evolve significantly as a result.

But rather than whole new delivery systems emerging to accommodate these emergent obligations, the industry will

likely move to episodic, rather than wholesale, integrative approaches. This can already be seen in new companies big (WeWork, Katerra) and small (Blockable, Skender) who are crossing single barriers of the design/build/deliver supply chain. High resolution information and assembly automation make these opportunities possible. IPD may have established the broad principles under which some of these relationships may develop, but it's more likely that value will be created at a smaller scale in episodes in the supply chain. Designers can provide the information that is the binding agent of many of the resulting transactions.

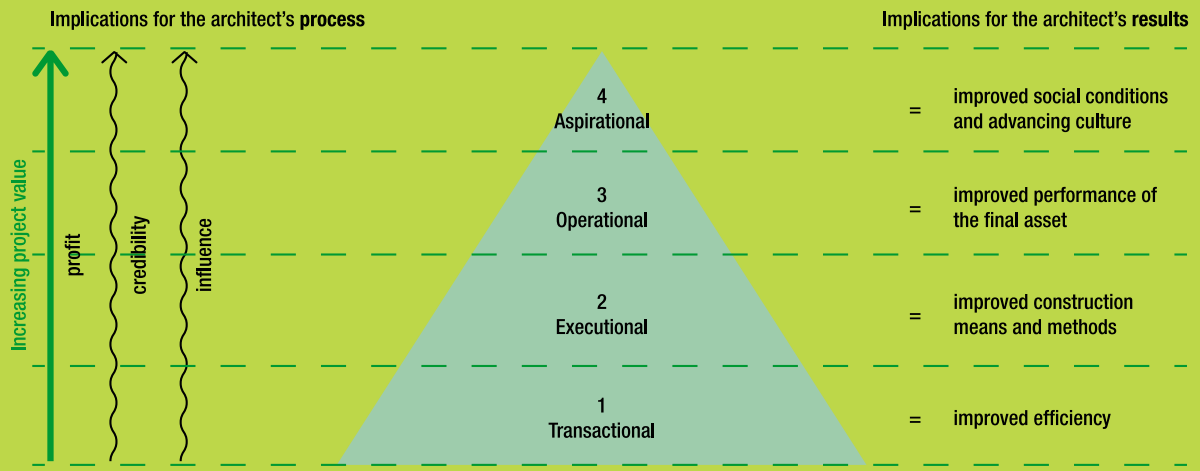
REFRAMING BUILDING PERFORMANCE

Questions of agency and delivery are the supporting cast in the larger opportunity for reframing the value of the design and construction process, however. Right now, each is circumscribed by the mismatch between the reasons clients build buildings and the methods by which they obtain those buildings. Lacking a common understanding of how to organize and optimize the delivery of a building, process is driven by a desire to accomplish lowest first cost. But owners do not build to save money, but rather to make things happen: deliver services, provide productive workplaces, educate children, and make people healthier. They just want to spend a reasonable amount of money to do so. In a post-pandemic world, we must add "keep occupants healthy and safe" to that list.

Building process could be focused on these objectives rather than lowest price: measuring the success and value of a building based on how it actually performs, rather than what it costs and how long it took to deliver (two goals rarely met today). I have defined such objectives in a hierarchy of performance value, where the base of the pyramid is improving the efficiency of the building process, and the top displays the highest-order objectives clients need their buildings to fulfill:

Changing the agency of architects and builders and refactoring the systems in which they exercise this agency, is only interesting when the delivery system is predicated on a process where buildings are created to actually do things (perform), rather than being consumed as commodities. The risk of the enterprise becomes the risk that the building doesn't actually do the things asserted by its designers and builders; but the return is the willingness of clients to pay for those sorts of results.

A building is a form of social contract between its owner and its occupants, and the citizens of the neighborhood or city where it is created. In exchange for the



Value Hierarchy (Source: Architecture Design Data: Practice Competency in the Era of Computation, P. Bernstein, 2018)

privilege of absorbing resources, space, and the opportunity cost of an alternative, buildings should serve to improve the social conditions in which they exist. This is a form of performance that, should architects choose to deploy the necessary tools and learn to do so, could transform the entire enterprise of building.

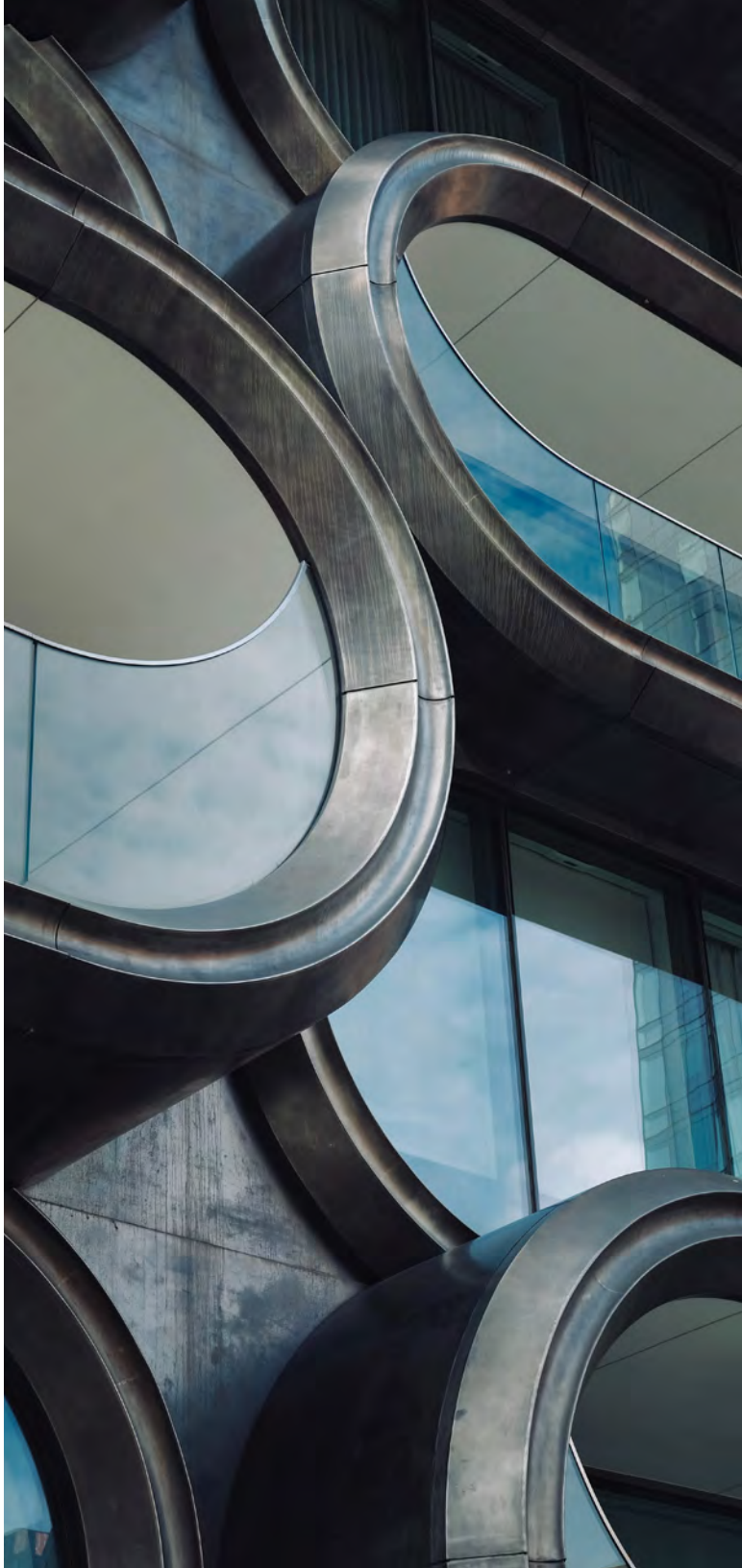
THE FUTURE VALUE PROPOSITIONS OF BUILDING

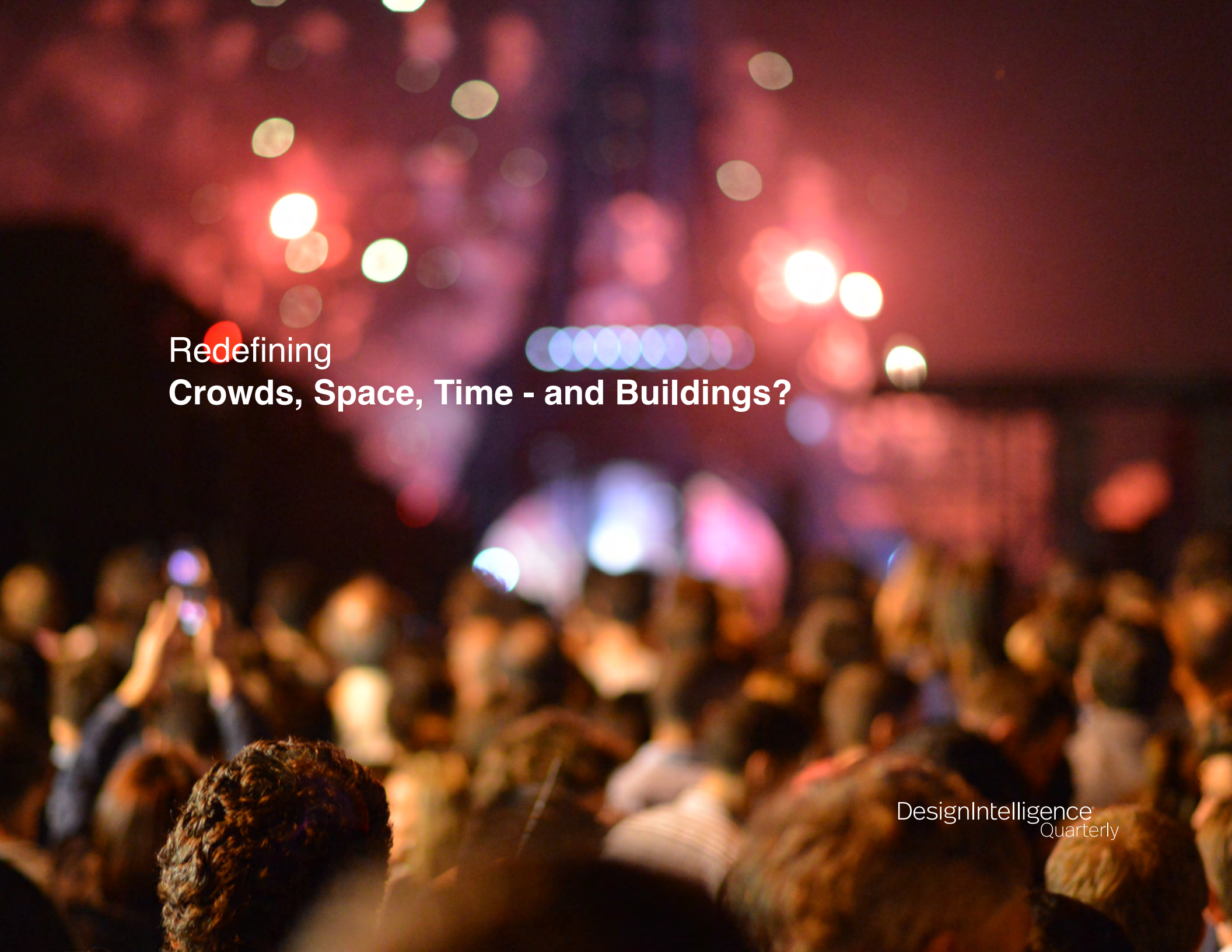
It seems that my upcoming summer will be spent in full-blown pandemic planning mode as architectural education, much like the profession itself, readies itself for the uncertainties of the future. We are relying on our skills as architects to prepare for the resulting contingencies, studying (with the help of detailed BIM datasets and simulation tools) the occupancy, configuration, circulation, and air dynamics of our spaces. In collaboration with colleagues from the Schools of Medicine, Nursing and Public Health we combined our architectural expertise to fully understand the potentials and future uses of our buildings under radically new circumstances. Forced into new ways of thinking, analysis, and collaboration to face new realities we are cautiously optimistic that our pedagogy will be different, but equally effective under these new circumstances.

As we stare down the convergence of three simultaneous crises — a fractured economy, a global pandemic, and social unrest connected to Black Lives Matter — those of us who design and build might feel peripheral to the key issues of the day. Nothing is further from the truth. To make such a conclusion is to deny the central value of the built environment in answering each of these questions — and the skills building professionals can bring toward real solutions. Buildings are the platforms that house our economic engines. They constitute the physical context in which social equity can be reached (or destroyed). They mediate our relationship with the environment, epidemiologically or otherwise.

Perhaps this particular crisis, unlike its predecessors, will inspire us to acknowledge the shortcomings of our current protocols and design a future for the built environment that the world truly deserves.

Phil Bernstein is Associate Dean and Professor Adjunct at the Yale School of Architecture, where he has taught since the 1989 recession. He was formerly a vice president at Autodesk, and principal at Pelli Clarke Pelli Architects. He writes, lectures and consults frequently on technology strategy, project delivery and design agency, and is a Senior Fellow of the Design Futures Council.

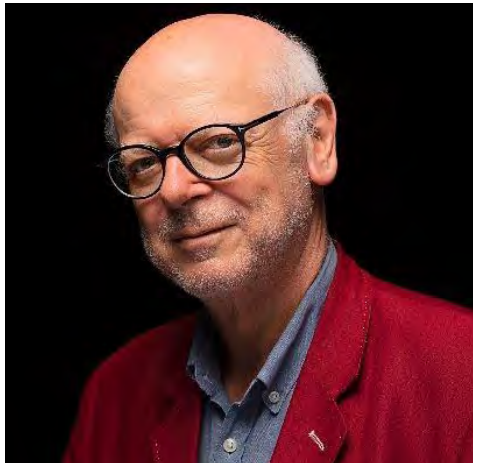




Redefining

Crowds, Space, Time - and Buildings?

DesignIntelligence Quarterly



PAUL HYETT

RIBA and Honorary Fellow of AIA

Paul Hyett shares musings on life, togetherness and technology in the United Kingdom.

WE ARE INDEED LIVING THROUGH INCREDIBLE TIMES.

Aside from the seismic socio-political and economic changes that were already rocking the stability of our western boat, we are now in the midst of an unprecedented pandemic: COVID-19 has ripped around the globe in double-quick time, wreaking hitherto unimagined havoc in its wake. Our current reality is akin to a B Grade Sci-Fi movie. You know the plot: alien virus runs amok; world brought to a halt in epic crisis, and then the movie wraps up and we get on with life as normal.

But this movie has no foreseeable end, and the daily horror only worsens. New norms displace other new norms as this hidden, ruthless, and cruel virus impacts evermore severely on our economies, manufacturing outputs, distribution systems and ways of life.

THE SHOCK HAS BEEN PROFOUND. THE CONSEQUENCES INCALCULABLE.

Here in the UK, Orwell's world has arrived with a bang. The clocks are indeed striking thirteen. Virtually tagged courtesy of our new phone apps, our movements are now monitored and recorded; those we meet, identifiable and traceable. Such policing will hereafter remain routine within our land until either the virus has been destroyed, or more likely, a cure can be found. This is all for the common good, of course, but the less authoritarian our society, and the more we prize freedom, the harder it is to submit to such controls.

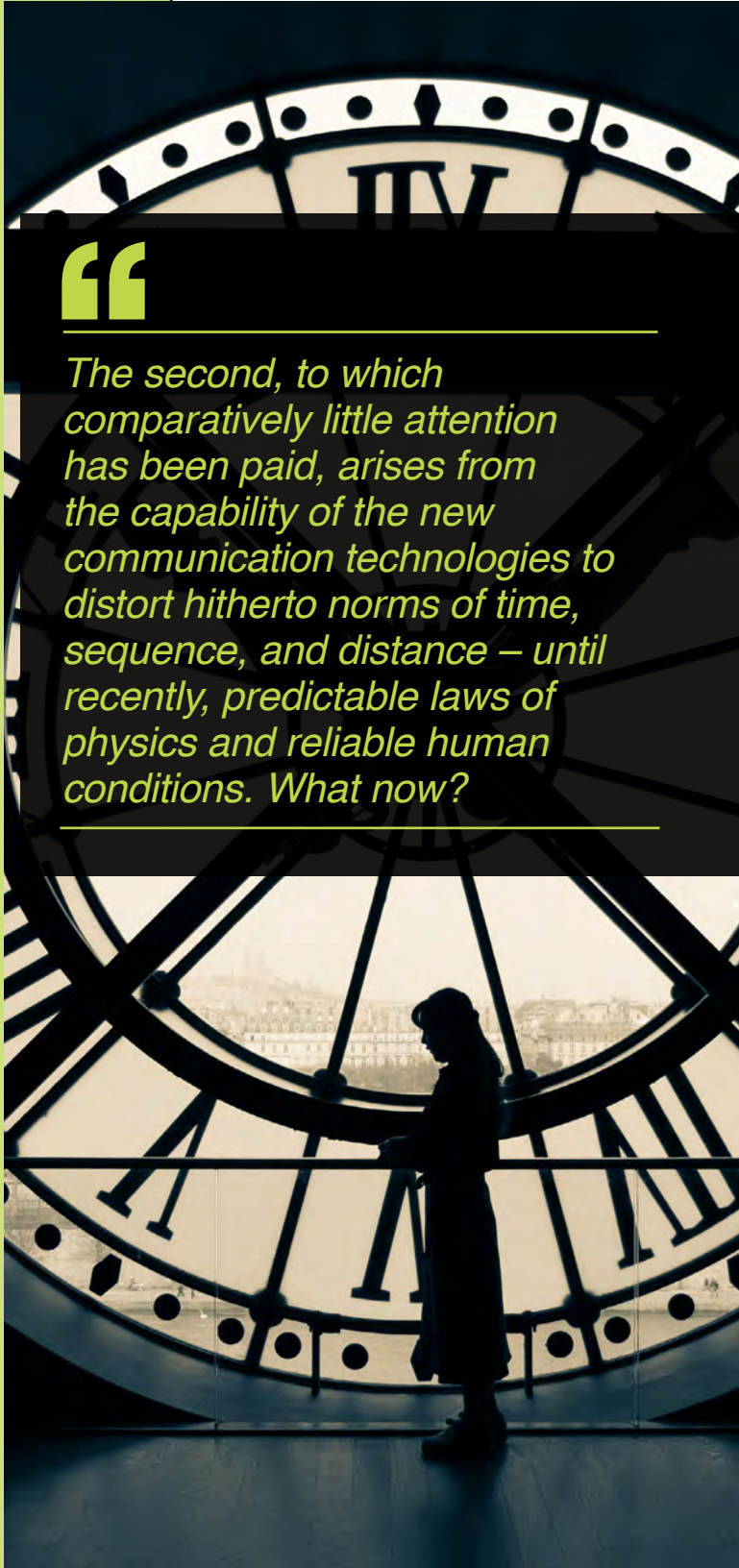
AND WHEN IT IS OVER AT LAST — WHAT KIND OF FUTURE AWAITS US?

The next step will surely be viral-intelligent and responsive buildings. At points of entry, shopping centre security systems will automatically measure our temperature and bio-recognise our profiles; pathogen monitoring systems will detect any offending micro-organism emissions and, when appropriate, alert the authorities. Likewise, for theatres, cinemas, pubs, and clubs. In Benthamite fashion, those whose condition threatens the good of the majority will have been spotted even before they reach the top of the escalator. Whether you freely turn right or find yourself 'firmly guided' left into the restraining arms of authority will be a consequence of the surveillance and analysis systems incorporated into the very architecture that surrounds us.

Courtesy of ever more efficient technologies that observe, manage and alert, while we will once more soon be free to enjoy our buildings with a sense of normalcy, 'Big Brother' will be ever-present in the metaphorical rafters, watching over you and yours.

As we tiptoe back to some kind of normality to a world in which we can once again gather within our buildings for work, trade, worship, learning, pleasure and fun; where we can sit at the same tables and drink at the same bar; where we can queue and jostle, cheer and clap, huddle and all the rest, we should think carefully about the broader directions architecture will take beyond the immediate imperative of viral protection.

Pre-Covid, two big agendas were already well underway. Much has been written about the first: ecologically responsible design. It is gratifying to see so many responsible corporations, professional institutes, and practitioners view this as critically important. The second, to which comparatively little attention has been paid, arises from the capability of the new communication technologies to distort hitherto norms of time, sequence, and distance – until recently, predictable laws of physics and reliable human conditions. What now? We are figuratively at a nano-second to midnight on the environmental clock.



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Since the human species gained any self-awareness—since any kind of social order first prevailed—our experience of events was only sequential. Since mechanical became prevalent, time has ticked in regular fashion, and we experienced the beginning before the end. Above all, time and distance were intrinsically related: information travelled at the same speed as humans.

In his great essay "The Monastery and the Clock," Lewis Mumford noted that the clock was introduced as both a means of tracking time and a method of "synchronising the actions of men." Think where we are now: for many, the rhythms of the working day and week have been all but destroyed by the fax machine and by email. Gone are the office rituals of opening the morning post, 'getting letters out by last collection that day', and all the rest. Others benefit from these new, asynchronous "structures"

By the 1970's, the ability to watch that far away motor racing Grand Prix 'live' in your own home was taken for granted. Today, we expect to see the race from the vantage points of the competing car; to watch a recording at a time to suit ourselves; and even to fast-forward to see the end, then rewind to see the pit stops or a crash. In sports, maybe it's an earlier set or those three match points at Wimbledon. Certainly, for media, and much "work", chronology can now be abandoned at will. Buildings are still responding to these changes.

But home viewing is not enough. We crave the same-time, same-place experience of watching with friends. The play and players can be somewhere else, but we must get to where the atmosphere is. That is why in January 2020, some 62,000 people packed into the Millennium Stadium in Wales to watch, courtesy of the big video screens, their national rugby team play New Zealand in Auckland. And that's why Maverick supporters trek into the American Airlines Centre in Dallas to watch their side play the Lakers in LA. It seems

World Cup Match, Big Screen Viewing, Old Town Square, Prague

togetherness is an essential part of enjoyment, but what are the implications for designers and builders?

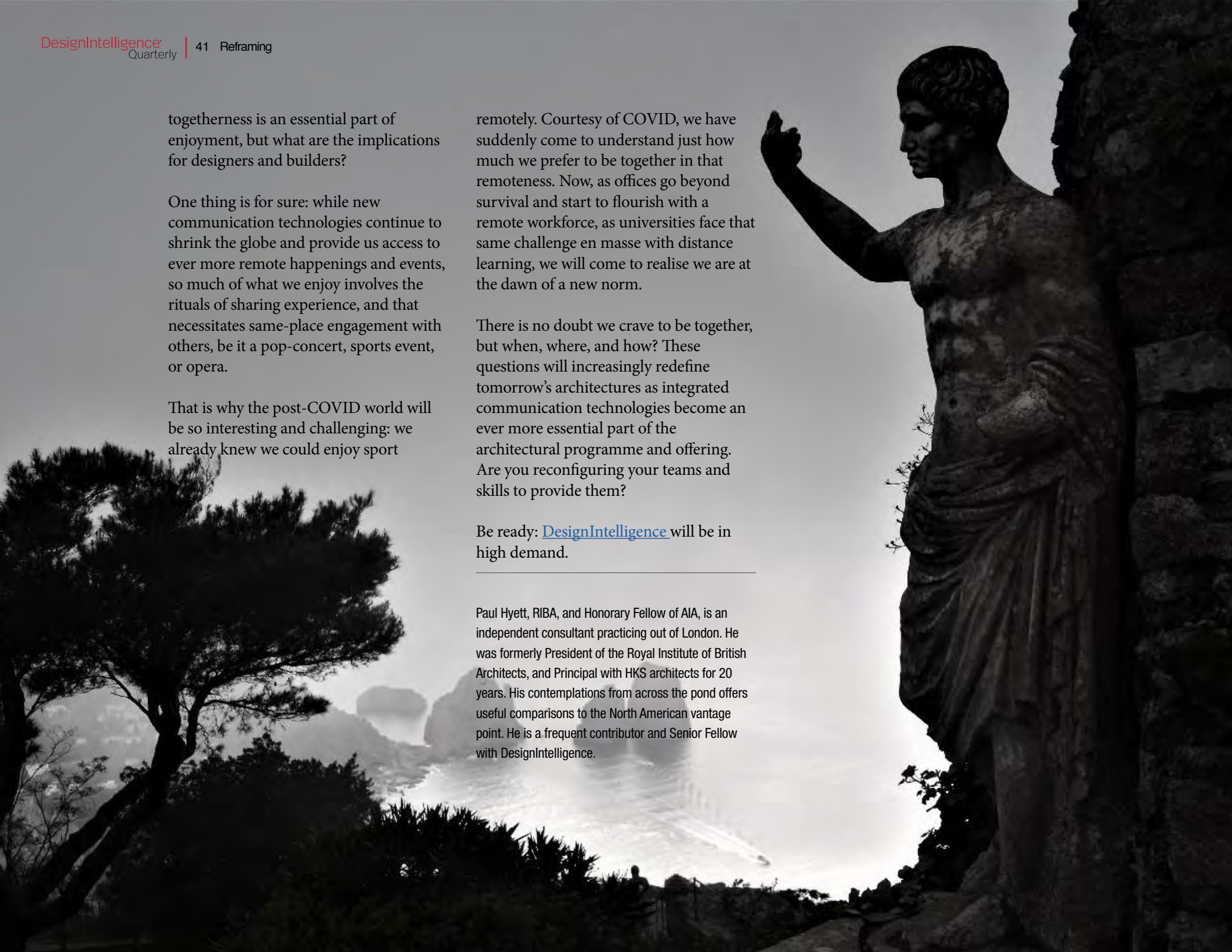
One thing is for sure: while new communication technologies continue to shrink the globe and provide us access to ever more remote happenings and events, so much of what we enjoy involves the rituals of sharing experience, and that necessitates same-place engagement with others, be it a pop-concert, sports event, or opera.

That is why the post-COVID world will be so interesting and challenging: we already knew we could enjoy sport remotely. Courtesy of COVID, we have suddenly come to understand just how much we prefer to be together in that remoteness. Now, as offices go beyond survival and start to flourish with a remote workforce, as universities face that same challenge en masse with distance learning, we will come to realise we are at the dawn of a new norm.

There is no doubt we crave to be together, but when, where, and how? These questions will increasingly redefine tomorrow's architectures as integrated communication technologies become an ever more essential part of the architectural programme and offering. Are you reconfiguring your teams and skills to provide them?

Be ready: DesignIntelligence will be in high demand.

Paul Hyett, RIBA, and Honorary Fellow of AIA, is an independent consultant practicing out of London. He was formerly President of the Royal Institute of British Architects, and Principal with HKS architects for 20 years. His contemplations from across the pond offers useful comparisons to the North American vantage point. He is a frequent contributor and Senior Fellow with DesignIntelligence.



What Won’t Change

DesignIntelligence® Quarterly

SCOTT SIMPSON

FAIA, Contributor to DesignIntelligence, Senior Fellow of the Design Futures Council

Scott Simpson shares reasons for optimism by design thinkers.

The COVID-19 pandemic has had a profound effect on the A/E/C industry as well as society at large. Many design firms are finding ways to work remotely out of necessity. Backlog is dwindling fast, and new commissions are scarce. Newly minted architecture graduates are facing vastly diminished employment opportunities, which means in a few years there will be a dearth of much-needed talent, as the Boomer generation continues to retire in record numbers. Construction activity has resumed, focused mostly on "essential" projects, and, of course, there is very limited activity in the corporate/commercial sector, as landlords contend with empty offices and retail tenants who cannot pay their rent.

It all sounds pretty dreary, but believe it or not, we've seen this movie before. The A/E/C industry has traditionally been subject to extreme economic cycles, yet always found ways to weather the storms. The big dip during the Great Recession of 2008-10 forced many firms to shed up to 40% of their staff. Tough times, indeed. Yet, what followed was the biggest economic expansion in history, as the Dow Jones average surged from about 7,000 points at the nadir to over 29,000 at the peak, ushering in a period of unprecedented prosperity.

All big dislocations invite innovation. Predictions abound about what will be different going forward. Will there be reduced demand for office space, as more people work remotely as part of a new normal? Will the recent building boom on college campuses come to a screeching halt, as schools face financial challenges which threaten their very existence? Will architects need to find entirely new ways of designing space to maximize social distancing and minimize physical contact with such mundane items as doorknobs, faucets, and elevator buttons?

The answer to these questions is certainly yes, but in varying degrees. It's said that the accuracy of a prediction is inversely proportional to the certainty with which it is rendered. About all that's certain is that the effects of the pandemic will be unevenly distributed. Urban centers will be more severely affected than rural areas. We can expect the pandemic will be a boon for some industries (internet retailers, delivery and logistics firms, and high tech) while it will do severe damage to others, likely driving many formerly healthy firms into bankruptcy. We know sooner or later vaccines and therapeutics will be available to combat the virus. Until that happens there are likely to be some fundamental changes baked into the way that buildings are designed, constructed, and occupied.

This is where architects can shine. Design thinking is the art of problem solving when we face concurrent complex variables, some of which may be entirely unknown. At its essence, it embodies "strategic optimism"—the belief that no matter how challenging a problem may be, solutions can be found. Design thinking seeks new ways of creating a "preferred future." Sometimes the solutions are just process tweaks (like the invention of microwave popcorn), and sometimes they are game changers (such

> *…this is not the first (nor will it be the last) challenge society will have to face.*

as BIM technology and IPD). Design thinking operates at both levels.

As difficult as things may appear to be at the moment, this is not the first (nor will it be the last) challenge society will have to face. Pandemics generally last for a year or two at most, whereas the normal lifespan of a building is measured in decades. Thus, designers must think both short-term and long-term at the same time. Short term thinking focuses on the bugs on the windshield; it deals with things that demand immediate attention. However, long term thinking is where design's real value plays out. When the true cost of a well-conceived and well-constructed building is amortized over its useful life, it turns out to be very inexpensive indeed. Durable value never goes out of style. Thus, while some things may change as the result of the pandemic, the fundamentals will always remain. That's why they're called fundamentals. For example:

CREATIVITY & INNOVATION

These are core values for architects. Clients will always seek designers who can bring fresh ideas to the table and solve problems in new and unexpected ways. Difficult challenges will attract the best talent, and the tougher the problems, the more interesting the solutions will be. Thus, the effects of the pandemic are fertile ground for design thinkers.

PREDICTABILITY

At the same time, clients need to rely on their design professionals to deliver results as promised. This includes paying close attention to budget and schedule. Time is money, and money is a key denominator in the value equation. The pandemic will force firms to unlock new ways of eliminating waste and inefficiency. Productivity will always be a critical success factor.

PEOPLE

Great design is always personal. It touches people. It inspires an emotional reaction. It has the power to influence behavior. Contrary to popular myth, great design is rarely the work of a single inspired individual. Instead, it is rooted in teamwork. To be effective, designers need to be leaders—able to harness the energy of a diverse group of contributors and inspire them to collaborate in achieving common goals. Teamwork is the ultimate trump card.

OBJECTS AND PROCESSES

An object is the "what" that gets designed, and process is the "how". Objects are static; they exist in three-dimensional space and are defined by measurable attributes (length, width, height, weight,

materiality, color, texture, etc.) Processes are dynamic. Process design focuses on cause and effect. How something is done is often more important than what is done. For example, when building a house, using a nail gun rather than a hammer makes a huge difference, even if the resulting object is the same.

FINANCIAL SAVVY

In good times or bad, design firms need to pay attention to the bottom line. Sound financial management provides the fuel that allows the design engine to function in the first place. Rent must be paid, equipment must be acquired, and talent—the most expensive budget item—must be well compensated. In any economy, the two most important financial metrics are backlog and accounts receivable. If both are in good shape, the firm will thrive.

TALENT

Hiring the best possible people is the single most important challenge for design firm leaders. The pandemic has made it especially difficult for new graduates to find their footing in the profession and to begin acquiring the experience they will need to forge successful careers long term. Still, past recessions have shown despite some very challenging circumstances, the cream will find a way to rise to the top. Finding, hiring, and training top talent never goes out of style.

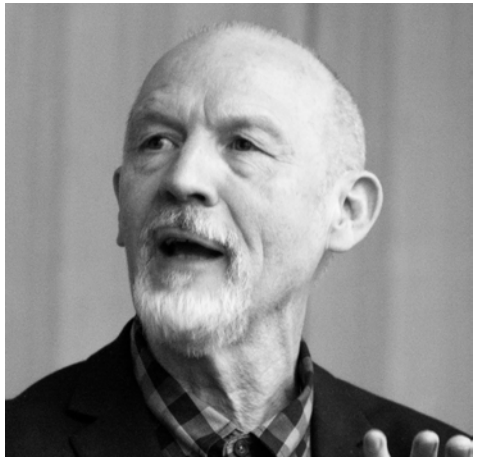
CLIENT SERVICE

This is especially important in challenging times as clients are faced with a multitude of problems and uncertainties. They need to rely on people they can trust, people who bring energy and ideas to the table. In good times or bad, client service paves the road to future work.

To paraphrase Winston Churchill, we are not nearly at the end of the pandemic, but we may be approaching the end of the beginning. Protocols have slowed the rate of contagion. Vital equipment and supplies are becoming more available. Hospital beds are less crowded, and the economy is (slowly) beginning to find its footing again. The road to a full recovery is likely to be a long and bumpy one, fraught with difficulties we cannot yet foresee. Nonetheless, we know eventually this pandemic will pass. Things may never fully return to the "normal" of the recent past, but those who stay focused on the long term and keep their eye on the ball will emerge stronger than ever. Design thinking can lead the way. That much, at least, will not change.

Scott Simpson, FAIA, is frequent contributor to DesignIntelligence and a Senior Fellow of the Design Futures Council.


Redefining
the Profession
DesignIntelligence
Quarterly



GEORGE JOHNSTON

Professor of Architecture
at Georgia Tech and
Principal of Johnston+Dumais

In his new book, "Assembling the Architect", author, historian, and professor George Johnston draws from the past to suggest future directions. An interview.

DesignIntelligence (DI): George, your new book focuses on defining the history and development of the profession, the journey to its present state. In light of recent events, and consistent with DI's future-focused mission and current theme, what do you consider some of the changing conditions that are compelling us to redefine the profession?

George Johnston (GJ): The acceleration and confluence of recent events demonstrate how intertwined the profession is with the world – economically, environmentally, socially, technologically. As if architectural practices didn't already face enough challenges from ever-tightening constraints and expanding expectations, now they must add the urgency of a global health pandemic and the lingering wounds of social injustice to the weight of existential concerns the profession must bear.

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Like so many institutions, the profession of architecture and architectural education are being challenged to account for their past, for their parts in perpetuating inequitable and exploitative systems and approaches.

for their parts in perpetuating inequitable and exploitative systems and approaches. But, it' s difficult to soberly reflect on such matters in the midst of a crisis; to chart a path ahead when the next payroll is in jeopardy, when livelihoods and even lives may be at stake.

DI: How would you suggest the profession go about addressing these challenges?

GJ: The role and responsibility of the historian is to help put current challenges into some framework with respect to the accumulated concerns and preoccupations of the past. That won't necessarily give us a precise roadmap for future action, but it can be helpful for understanding some of the precipitating causes of the crises at hand. This in-turn may help us be more circumspect about the unintended consequences our best-meaning actions might entail. And being so informed can keep us alert to any future possibilities suggested by the patterns of the past. That's some of what I hope my work contributes in charting the history of architectural practice.

DI: What historical patterns should we be more aware of today as we think about the future of the profession?

GJ: My recent book, "Assembling the Architect", and an earlier book "Drafting Culture", deal with what I consider to be some of the perennial structural paradoxes of US architectural practice, ones I trace back a century-and-a-half to the period of national recovery and expansion following the Civil War. That period was when the profession of architecture in the US was being defined as a distinct vocation separate from either its dilettante-designer or artisan-builder beginnings.

Within a relatively short span of decades, the field of architecture was transformed by an increasingly activist and protectionist professional organization, the adoption of university-based architectural education, the rise of general contracting, the embrace of the design-bid-build delivery system, and state licensure of architects. One of the unanticipated effects of all

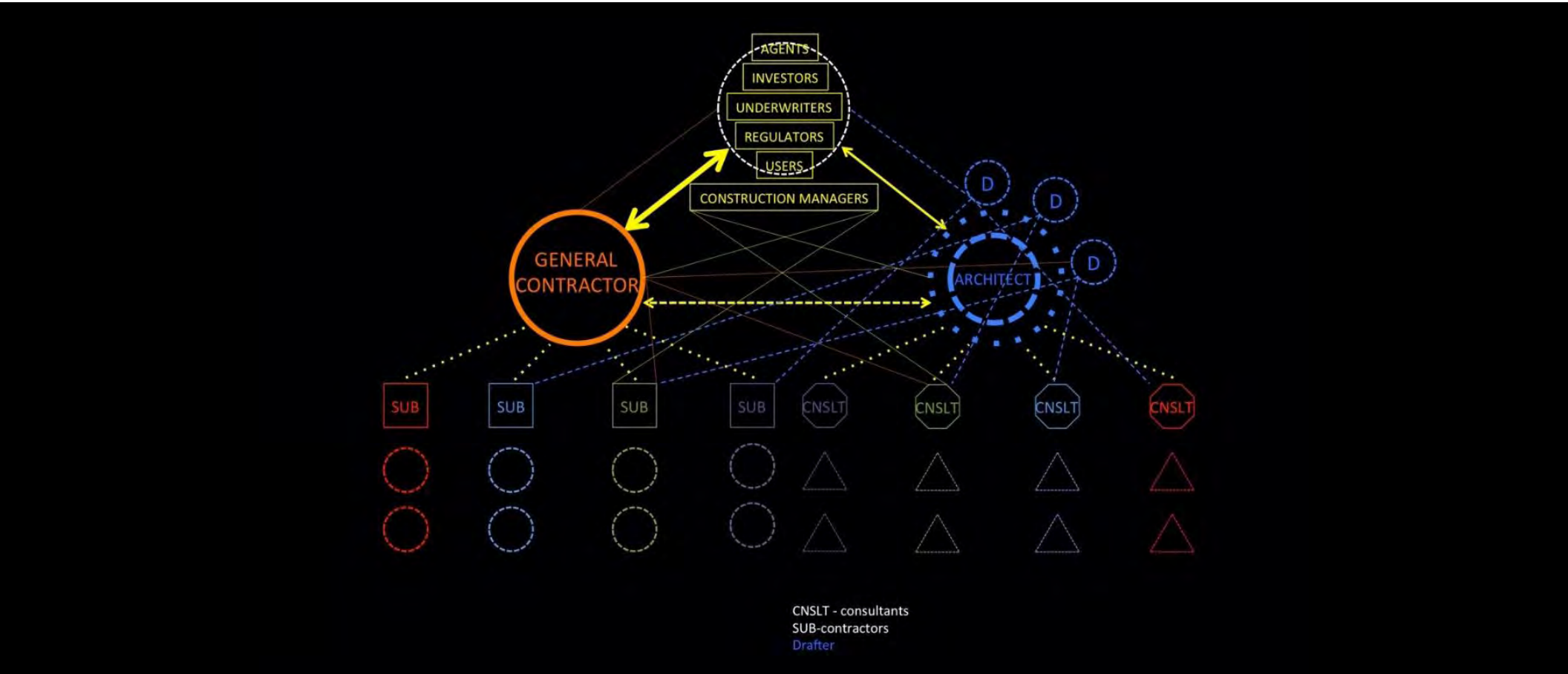
The ironic result of the architect's elevated status as owner's agent was a gradual distancing from the construction site, from the interplay of capital and labor.

these profession-building efforts was the narrowing scope of the architect's role as compared to earlier times when neither the title nor the functions of architect had been so strictly fixed. The ironic result of the architect's elevated status as owner's agent was a gradual distancing from the construction site, from the interplay of capital and labor.

DI: You write about the A-O-C trinity we first learn about in school, the relationship between and among the architect, owner, and contractor. Is this simple three-party division at the root of the issues we face as a "profession"?

GJ: I do think there is a disconnect between the elegance of that triangular diagram and the potential complexity of the actual organization of a project. Each one of those three entities is really a multitude of actors, each with competing aims and interests even within their own respective "silos." Historically, there was a greater fluidity among the different players than we came to assume over the course of the 20th century.

The essential relationship, however, is still the one that pertains between an owner who needs a building and a builder with the requisite skills and a crew. An architect could emerge from either side of that equation, as an



owner providing their own designs or as a masonry or carpentry contractor employing a drafter to produce drawings in-house for planning and estimating purposes. Hybrid formations were always a possibility.

Indeed, before the emergence of general contractors in the late 19th century, architects themselves were likely to perform many aspects of that integral role as part of their standard services. It is ironic to recognize in taking on that role, general contractors were compensated for a service for which architects had never been able to command an adequate fee. That's a longer story, but one that holds many lessons with regard to the financial structure of the profession.

DI: As the profession evolved with society, an infinite number of roles and blurred relationships took form. Just within the role of architect there are thousands of variations, interests, and practice areas. We could list the designer, spec writer, production architect, manager, BIM leader, and so on, but the public simply says "architect."

GJ: Exactly! What I see today in the proliferation of project delivery methods – the developer-architect, the design-builder, specialized design assistants, various construction management approaches, integrated project delivery and the like - is not so much a direct challenge to dominant design-bid-build modalities as a return to pre-modern norms, a more generous, inclusive tradition that embraced a multitude of alternative possibilities and blurred roles. The digital tools we have at our disposal today can perhaps empower many more diverse approaches than current regulatory and professional strictures can comfortably fathom or allow.

DI: Has the broad range and plurality of architectural duties contributed to a slowed maturation or a diminished stature of the profession? Is the profession of architecture misunderstood or maladapted because it's in fact, dozens of professions?

GJ: There is a vexing paradox in all this. To raise the stature of the profession from what was admittedly a rather suspect vocation - one subject to all manners of financial and material malfeasance - a relatively small cadre of paternalist practitioners successfully advocated for state-sanctioned restrictions on the use of the title "architect." While one might agree that such profession-building efforts succeeded in securing a market and in establishing a strong public profile of ethics-bound service, we must also recognize that such restrictive claims to the title excluded many whose work was architecture in-effect, even if not sanctioned by a title. If we look more closely, we are likely to find cases where such protectionism was also a mechanism of privilege and systemic exclusion based in unacknowledged gender-, race-, and class-based biases.

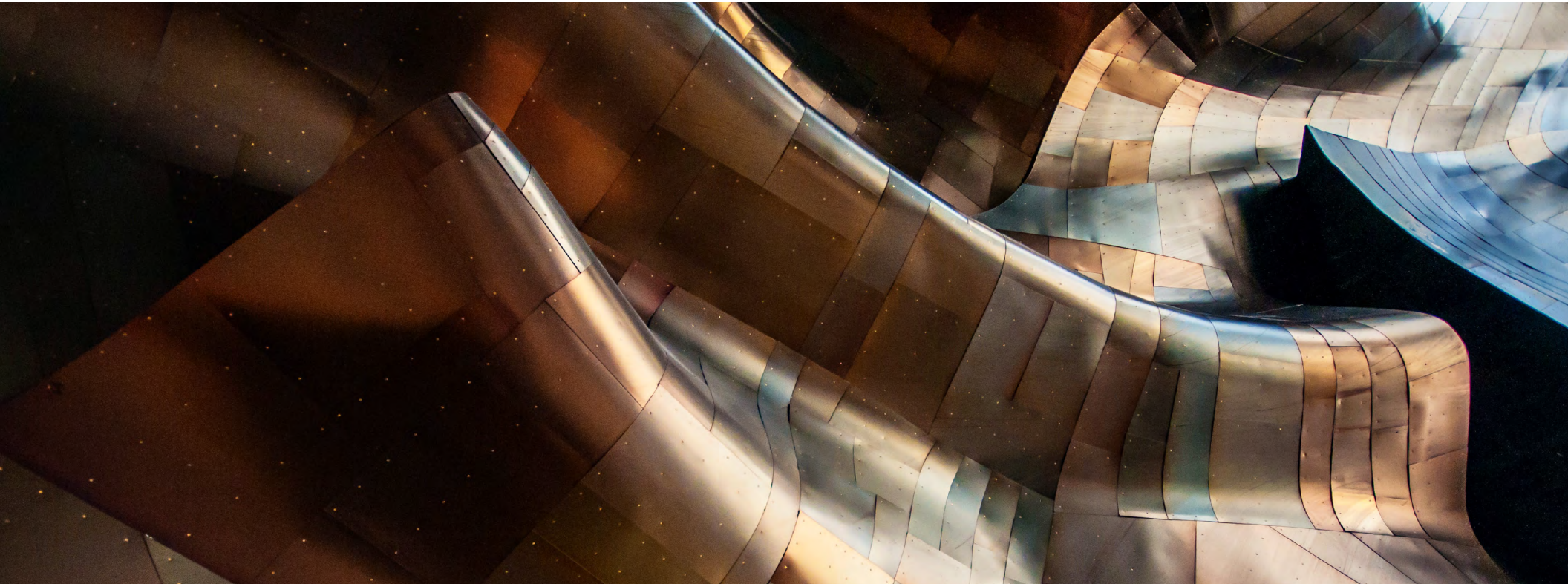
The profession really spent the last century and a half defending claims to a narrowing title rather than expanding its inventory of applicable expertise; by limiting access rather than redefining the field's social purpose. In laying claim to a very small subset of edifying purposes, the profession of architecture has necessarily ceded authority to other fields – city planning, civil

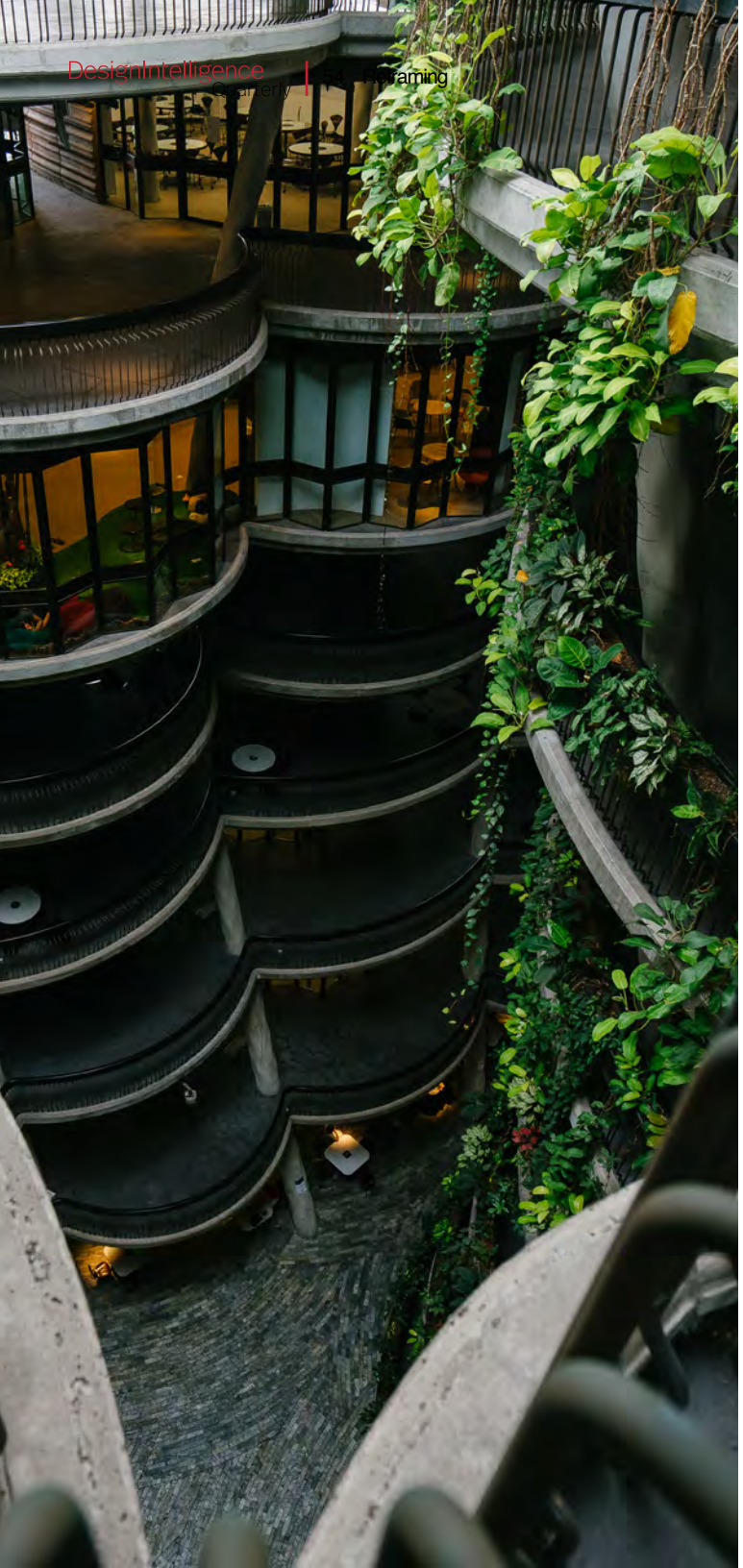
engineering, landscape architecture, urban design, interior design – for the constitution of the architecture of the public domain. Firms may gather several of those disciplines under their umbrella, but this only confirms that as it is practiced today, architecture is a specialization within the larger design and construction continuum, one within which even more sub-specialties pertain.

At the same time, unfettered use of the term "architecture" has absolutely exploded in non-building fields such as computer science, electrical engineering, bioengineering, and many others. It's in this sense that I think that the concept of "architecture" has become a pervasive social and technological concept, the signifier of a complex, locally situated, globally integrated system of structured and virtual relations with both discernable and undiscernible effects. Obviously, no state-issued architect's seal can exert dominion over all of that!

DI: Are you suggesting the profession be de-regulated? That claims to the title "architect" be opened-up? In "The Future of the Professions", the Susskinds pose a future in which routinized tasks will be outsourced. They speculate the end of architectural practitioners as we know them. What's your take?

GJ: We are talking about the future, right? We have to question whether the current professional regulatory system, born out of 19th century motives, is still adequate to meet demands likely to emerge in the next decades of the 21st century. Professional licensure was only one mecha-





nism among many others intended to safeguard the health, safety, and welfare of the public. Even then, only a small proportion of our designed and built environment ever saw the shadow of a licensed architect's hand.

Over the course of the 20th century, the design and construction enterprise became highly integrated through adoption of state and municipal zoning ordinances, public planning processes, uniform building codes, energy codes, accessibility and egress requirements, stormwater management and other environmental requirements, and so on. For each of these, established procedures of submittal and review were initiated by a variety of parties, to ensure conformance and enforcement, and to petition for variances and exceptions. These rules of the road are constantly being refined to reflect adjustments in public policy and a general ratcheting of standards as we get more precise in specifying desirable performance outcomes. It is easy to see the contractual centrality of the architect as a mediating agent, and the disproportionate liability that conceit has historically entailed, are anachronistic propositions!

In addition to the public regulation of design and building, consider the multi-disciplinary expertise needed to address any complex problem, the increasing integration of digital design and fabrication technologies, the contingencies of material production processes, and the pressures of supply-chain logistics and cost control. Perhaps less easy to model are the intertwined nature of public and private interest, the dignity of labor, or the vicissitudes of human desire. But each of these rule sets is potentially translatable into so many algorithmic descriptions and manipulable parametric scripts for computing variable combinations and design alternatives.

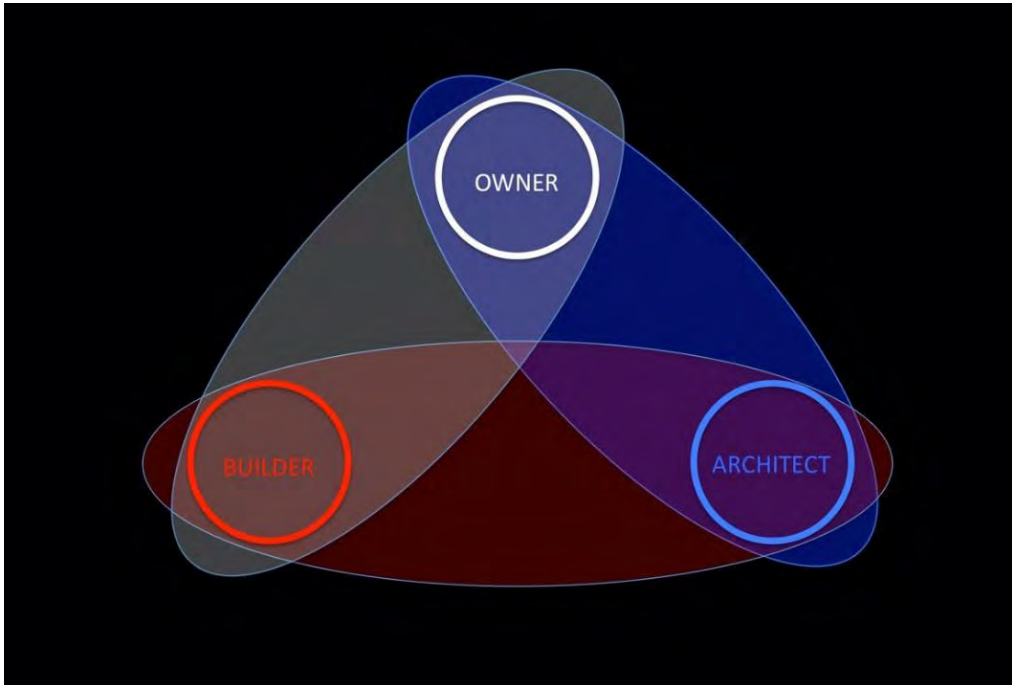
Some would like to imagine machine learning will enable the rise of a new breed of "master builder," architects re-empowered by an all-encompassing system of digital command-and-control. I think that is a fantasy founded upon dreams of the Middle Ages. Rather than a

romantic return to some mythologized past or the fiction of creative autonomy, I'd rather anticipate an expanding field of many coordinated actors, all interacting with empathy as agents of their own expertise, enabled by a retinue of tools and applications that automate and facilitate their tasks and link their work to the work of others. This is the sort of disaggregation and democratization of professional roles that I think the Susskinds have in mind.

I don't suppose the need for an architect's design authorship would simply disappear or be absorbed into an all-encompassing automated building factory. Rather, the demand for bespoke architectural services we courted and depended upon in the past, in service to wealth and power, would be only one possibility among a host of hybrid models. The roles of architect, owner, and builder may become more fluid again, able to variably recombine the functions of project initiation, design negotiation, and construction realization necessary to accommodate the myriad designing-and-building purposes for which only architecture – in that broadened sense suggested earlier – can meet the demand. One question this raises, however, is whether all individuals will need to be educated in the mold of the generalist, licensable architect that we have assumed for just over a century as the operative default.

DI: I'm glad you mentioned the role of education. As a scholar of the history of the profession - and an educator - you're in a unique position to affect the course of things. Are you doing anything to catalyze change in the next generation of practitioners?

GJ: Well, I hope I am having an impact, pressing at disciplinary boundaries even while working within the system we already have. I recognize I'm probably a part of the very problems I'm trying to describe. The research I undertake is a means of questioning my own assumptions. I try to challenge uncritical



acceptance of the paradoxes of practice as if they were laws set in stone – and to help remedy any historical amnesia about how those paradoxes were formed. I try to suggest that any challenge to received or conventional wisdom requires engagement with the broader culture, and the political economy of building, rather than just focusing upon narrow disciplinary domains. As much as I love design practice and the art of architecture, I am increasingly convinced the real challenge is redesigning practice itself. We need to move beyond overly simplified models of how architecture is practiced.

If you look at schools of architecture right now, it would be wise to question the long-term implications of the large institutional investments being made in software licenses and industrial-scale CNC fabrication equipment. Architecture students are being steeped in a collaborative culture as digitally enabled makers. The particular stylistic fixations of the 19th and 20th centuries are only a vague background for exercises in modeling and performance simulation. Students are questioning how our cities get made as well as how buildings get fabricated, how public policies interact with private investment, how their labor is valued,

“…I am increasingly convinced the real challenge is redesigning practice itself.”

whose interests are being served. In coming decades, I think these emphases will result in the emergence of a variety of practice formats that broaden the definition of the architect's role. They are likely to yield new overlaps and blurred distinctions among developer/designers and contractor/builders as has been so richly precedented in the past. This will necessitate the development of new mediating tools and open-sourced apps to facilitate the re-bundled social relations of practice. That was the kind of impetus that spawned, say, shop drawings and change orders a century ago.

For the immediate future, I think we are all challenged to make access to the profession more open to those historically excluded, to find ways to re-distribute the cost of education, and to share responsibility among all the stakeholders for this ongoing social and technological conversion. This is not the first time we've been challenged to redefine the profession. I'm pretty sure it will not be the last.

DI: Thanks for this history lesson, George, and for speculating about what may be over the horizon.

GJ: My pleasure.

George B. Johnston is Professor of Architecture at Georgia Tech and principal of Johnston+Dumais [architects]. He has over 40 years of experience as an architect, educator, academic leader, and cultural historian. He teaches courses in architectural and urban design, cultural theory, and social history of architectural practice; and his research interrogates the social, historical, and cultural implications of making architecture in the American context. He is author of the award-winning book from The MIT Press,"Drafting Culture: A Social History of Architectural Graphic Standards", which has been lauded for its insights into the ongoing technological transformation of the profession.

George holds a Ph.D., from Emory University, 2006; an M. Arch. from Rice University, 1984; and a B.Arch. from Mississippi State University in 1979.

His most recent book, "Assembling the Architect: The History and Theory of Professional Practice" (Bloomsbury, 2020) traces the formation and standardization of fundamental relationships among architects, owners, and builders and cultivates a deeper understanding of the contemporary profession. As both practicing architect and cultural historian, George is open to and supports research and design projects that involve themes of memory and modernity; institutions of cultural exhibition and display; changing design technologies and representational practices, approaches to American vernacular architecture and cultural landscape; and the critique of the everyday. Propelling his inquiries is this central concern: What recuperative role can architects' practices play in this age of social and technological upheaval?

Redefining Sustainability
Through the Triple Bottom Line

DesignIntelligence
Quarterly

LIZ YORK

Senior Architect and Design Strategist for Healthy Design Collaborative, LLC a healthy design consultancy

Can we find a new word for Sustainability? Do we need to? Liz York, FAIA shares three case studies that achieve balance using a three-part outlook: People, Planet, and Prosperity

When was the first time you heard the word sustainability used to describe the notion of protecting our environment with the choices we make? The term is founded on the idea that a good design or a well-considered decision will help sustain our world for future generations. My own recollection was from the late 1980s in design school at Georgia Tech. Since then, many conversations point out someone's dislike of the word. Not all of us seem to like the term "sustainability." We talk about it often. Can we find a better, more embraceable, actionable word? After all, understanding, commitment, and action are the point.

Few other terms offer such meaning or convey as many qualities: long lasting, enduring, transcending, climate protecting, carbon reducing, equitable, efficient, sublime, regenerative, natural, and systematic. But

> *If there is no struggle there is no progress. Those who profess to favor freedom and yet deprecate agitation are men who want crops without plowing up the ground; they want rain without thunder and lightning. They want the ocean without the awful roar of its many waters.*
>
> FREDERICK DOUGLASS

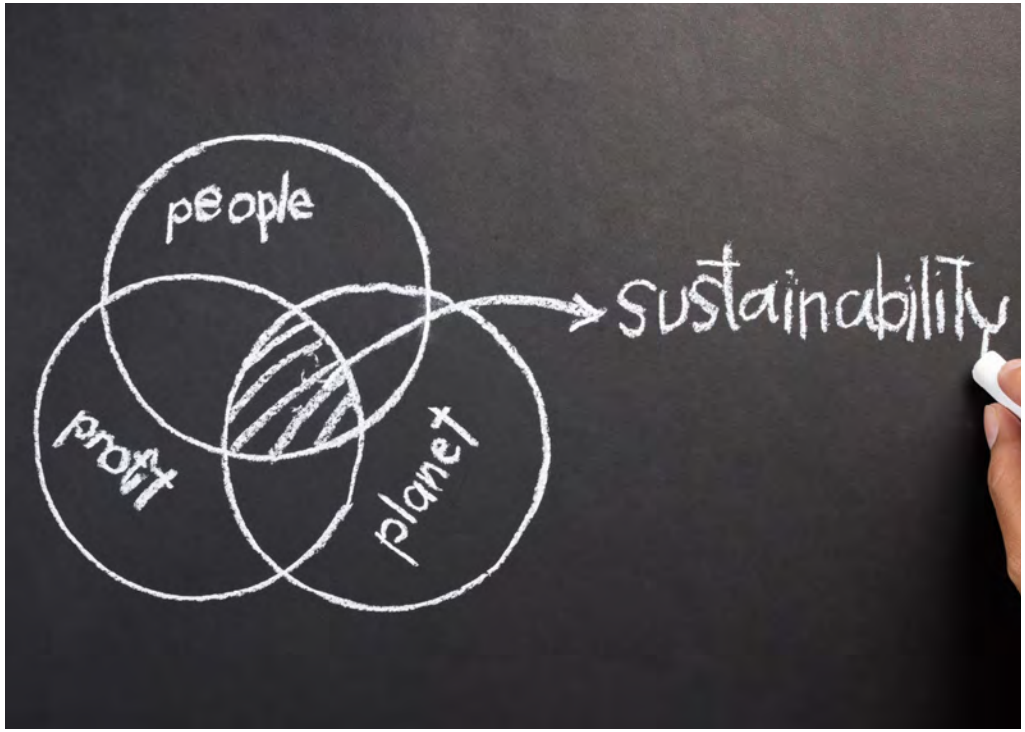
the term is no one of these aspects in a vacuum. The essence of the word is best described in the metaphor of the triple bottom line - a three-legged stool: People, Planet, and Prosperity. Each leg stands for a different priority, yet all support the overarching goal.

The beauty of this triad is that it displays how the whole fails when any one part – any of the stool's legs - is ignored or underrepresented in a design solution. Sustainability is about balance.

WITH RAIN COMES THUNDER AND LIGHTNING

Why is this distinction important? When we think about sustainability as being beyond an object it gives us a framework to work within, opening the conversation to all points of view. Such a framework implies an openness and creativity to account for many factors and make choices that positively affect the whole system, not just one outcome. In truth, sustainability requires defining values in advance and working toward a Venn diagram that includes those values. Too often, societal progress creates unintended consequences for those who aren't paying attention to all three values. On occasion, bad actors intend negative consequences. More often, this failing is the result of people interested in simply making "progress." Their plans don't fully account for the negative byproducts of their proposed solutions. These unintended consequences could be merely annoying or harmful and catastrophic.

The industrialized cities of the 1800s demonstrated many of these unintended consequences. Progress was the zeitgeist. Concurrent change was the norm. It was difficult to predict the consequences of such progress. As industrialization and mass production fueled civilization's boom, urban population densities increased, cities became crowded, and factories created dark clouds of thick, hard-to-breathe air. Poor water quality,



polluted air, and unhealthy living conditions caused the quality of life for many to decrease during a time of rapid growth and progress. Even the transportation of goods by horse and cart went from an annoyance to a public health issue as the manure of hundreds of thousands of horses accumulated daily on narrow city streets.

In response to these challenges, architects, engineers, planners, public health experts, and public officials worked together to establish new systems, codes and strategies to address these externalities of industrial progress. The public parks movement, and later, the City Beautiful movement resulted. Both movements influenced cities to become more green, open, and healthier for residents. Zoning laws, site setbacks and other water and sewage improvements shaped urban development to be healthier, increasing the quality of life broadly for city occupants. The unintended negative consequences of progress were felt for years until a holistic look at industry and the surrounding systems for worker living, transportation and public health were understood and addressed through design.

Sustainability demands intentional consequences.

Sustainability demands intentional consequences. Beyond a no waste paradigm, this mindset needs a no harm paradigm. Case studies of two exemplar urban redevelopment projects and a personal tale demonstrate what can be achieved in more current times when we intentionally seek balanced consequences.

CASE STUDY: OLD FOURTH WARD PARK

The site was an old Excelsior mill, two miles from Atlanta's downtown. The area was a forgotten wasteland of broken-down warehouses, parking lots and deserted streets that invited crime and neglect. The city's hundred-year-old water system had been plagued with collapses, and the area was a catch basin for combined sewer overflows during typical summer rainstorms. A consent decree forced the city to act, but the price tag for a traditional tunnel sewer system was $70 million. The result would have been a largely invisible, uninspired design that would address the environmental concerns of the site while neglecting community needs.

Residents, neighbors and designers envisioned a way to adapt the water management project into an amenity. A 17-acre park was designed around an open stormwater detention pond. This pond, sized to detain a 100-year flood, is designed as a water feature instead of the typical "hole in the ground surrounded by chain link." Pathways, playgrounds, waterfalls, and a skate park were included to activate this recreational heart for the neighborhood. The amenities have drawn residents together and created a vibrant community where there was blight. And the price tag for the stormwater pond, brownfield cleanup and the land purchase? $25 million — a significant savings compared to original estimates. The project team addressed all three components of the triple bottom line simultaneously.

This project prepared the city for major weather events and created a beacon of vitality for the community. It demonstrates the rebirth of an industrial area into a regenerative center for recreation, gathering and civic community. It stands is a symbol of resilience and sustainability that can be enjoyed by residents and visitors alike.

CASE STUDY 2: AMANI PLACE

A few miles away, Edgewood Court apartments were another area crying out for rebirth. In 2015-2017, this Section 8 housing development was cited over 170 times by 911 callers to report shootings. The residents of the complex expressed concerns about their safety and one mother said that she would not let her children go out to play for fear of them being hurt by gunfire. Local blog posts called for demolishing the apartments while grandmothers lamented the fall of the neighborhood and the blight of crime.

Then entered a dream team of innovators, financiers, designers, standards groups, health experts, local government leaders and community members. The developer and operator led a process of inclusion around the concepts of people, planet, and prosperity. The project team asked questions that showed they valued the people and wanted to create a built environment that prioritized health, wellness and general prosperity. Residents were consulted about the issues they faced as the apartments were being renovated, and the

project found them places to live during the process. ADA units were created to serve residents with disabilities. Jobs were created and residents were employed by the new Amani Place property. The buildings themselves were renovated to improve energy efficiency and storm-water management. Roads, walkways, playgrounds, and gardens were repaired and created to increase resident fitness opportunities. A community center with a communal kitchen, garden and rec room helped residents connect with each other and build a sense of neighborhood. Through sustainable funder incentives all the 222 units were affordable, serving residents below the 60% of area median income.

The residents themselves named the new community – Amani means "peace" in Swahili. This collaboration has created a place for people to live and thrive. It has not been torn down and replaced with luxury townhouses. It has been redeveloped for people, for their health, with improvements that protect the earth and reduce utility costs while keeping rents affordable. At the grand opening, one resident shared that she finally felt comfortable letting her son go out and play.

CASE STUDY 3: A PERSONAL STRUGGLE - AND PROGRESS

How can we build personal resilience? In 2001, I was a new mother, returning to work, wanting to "do it all." After 12 weeks with my newborn, I wanted to reconnect with coworkers, take on my share of work, and contribute by returning to my job. I was ready for adult conversations and real-world discussions, but I also wanted to provide for my son by pumping breastmilk at work for his next day at preschool. I had a supportive employer and boss. I had access to a lactation consultant, a medical grade pump, and lactation rooms across several campuses. But I still faced challenges. I scheduled meetings around my pumping times – a regular schedule helped maintain a steady milk supply – but meetings sometimes ran long. Compounding my challenges, the lactation room was a ten-minute walk across campus. These hurried trips were made twice daily and after reaching the destination, I was supposed to relax. I searched for a place to pump closer to my office and settled on a wire-closet in my building. I set up shop there until an IT tech walked in one afternoon, not seeing the sign I had posted on the door. My personal realization of the need for more lactation rooms made me wonder why they weren't designed into every office building from the start.

For many years, building types such as office buildings, convention centers, airports, and universities had few women gracing their halls. But things have been changing. Occupant mixes are decidedly more feminine. The influx of women in the workplace that began in the 1960s was supported by the development of infant formula because it gave mothers of newborns the freedom to return to work after childbirth without worrying about milk.

Since then, public health research has shown that breastmilk is healthier for babies, mothers, families and communities. Breastfed babies are sick less often, which also keeps family

members well and allows them to be more productive. Mothers who breastfeed have lower incidences of breast cancer and ovarian cancer. Whole communities benefit as the increase in IQ for children who are breastfed for 12 months or more translates into increased productivity over their lifetimes. In short, this is a resilience issue. And architecture plays a part.

Do returning mothers have the physical resources they need to be productive in the workplace? How about as they travel for business or attend a meeting or conference?

In canvassing my colleagues, I found universally, that women returning to work lacked the full support of the workplace to keep breastfeeding until the 12-month mark. Some workplaces do not provide time for women to take breaks. Others make it challenging for mothers to stay on a regular schedule, which is crucial when collecting milk. Teachers and childcare workers, the women who dedicate their lives to our children, often have the greatest challenges with no time or place to take needed breaks for pumping milk. As an architect, I decided I would try to tackle the "place" problem by helping our industry understand what women needed in a lactation room. This issue touched my life, so I gave my expertise to it and did what I could to make it better for others — an act of balance, sustainability and resiliency.

Each of us has the power to give our skills and experience to causes greater than our own needs. Through generosity, we can improve situations for others and be part of building a more resilient society. I wrote a best practice article and talked to others in the field. Since those actions, legislation has been passed, rooms have been built, women have returned to work, and babies have been fed. Maybe it all would have happened anyway, but maybe my singular, personal actions helped in some small way.

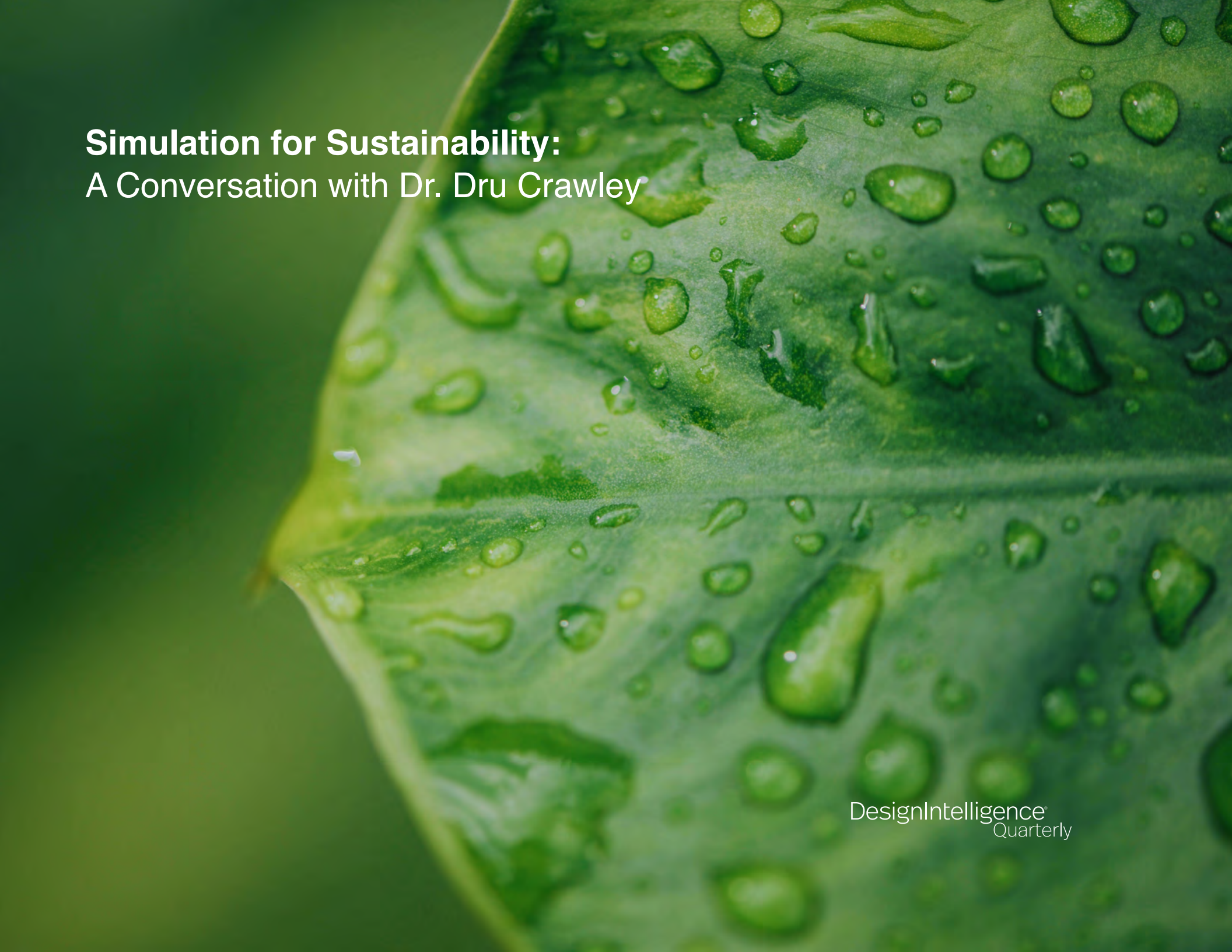
Each of us has an opportunity to improve the resilience of our communities. We can serve on local planning boards, work to help develop codes and standards, speak to owners about the way their buildings can change the surrounding community through simple site engagement strategies or improve health for occupants with light, views, and active design concepts. We can use the triple bottom line framework to help remind us of all that is at stake.

APPRECIATING THE OCEAN'S ROAR

When we make decisions, we must visualize the future with an eye toward people, planet and prosperity. Appreciating all possible consequences guides us to the most resilient decisions. Such a three-sided framework allows for creativity within its structure. It sets up a value system that encourages evolution of ideas and design over time without losing the overarching goals.

As you think about how to engage with resilience, commit to personally evolving the way you think about what you build. Think - and act - in ways that support our communal ability to be nimble and bounce back. No matter what you call it, sustainability is an expression of balance, empathy, and action.

Liz York, FAIA serves as a senior architect and strategist for a federal public health organization. She earned a Masters of Architecture and a Bachelors of Science in Architecture from the Georgia Institute of Technology.



Simulation for Sustainability:
A Conversation with Dr. Dru Crawley

DesignIntelligence® Quarterly

DR. DRU CRAWLEY

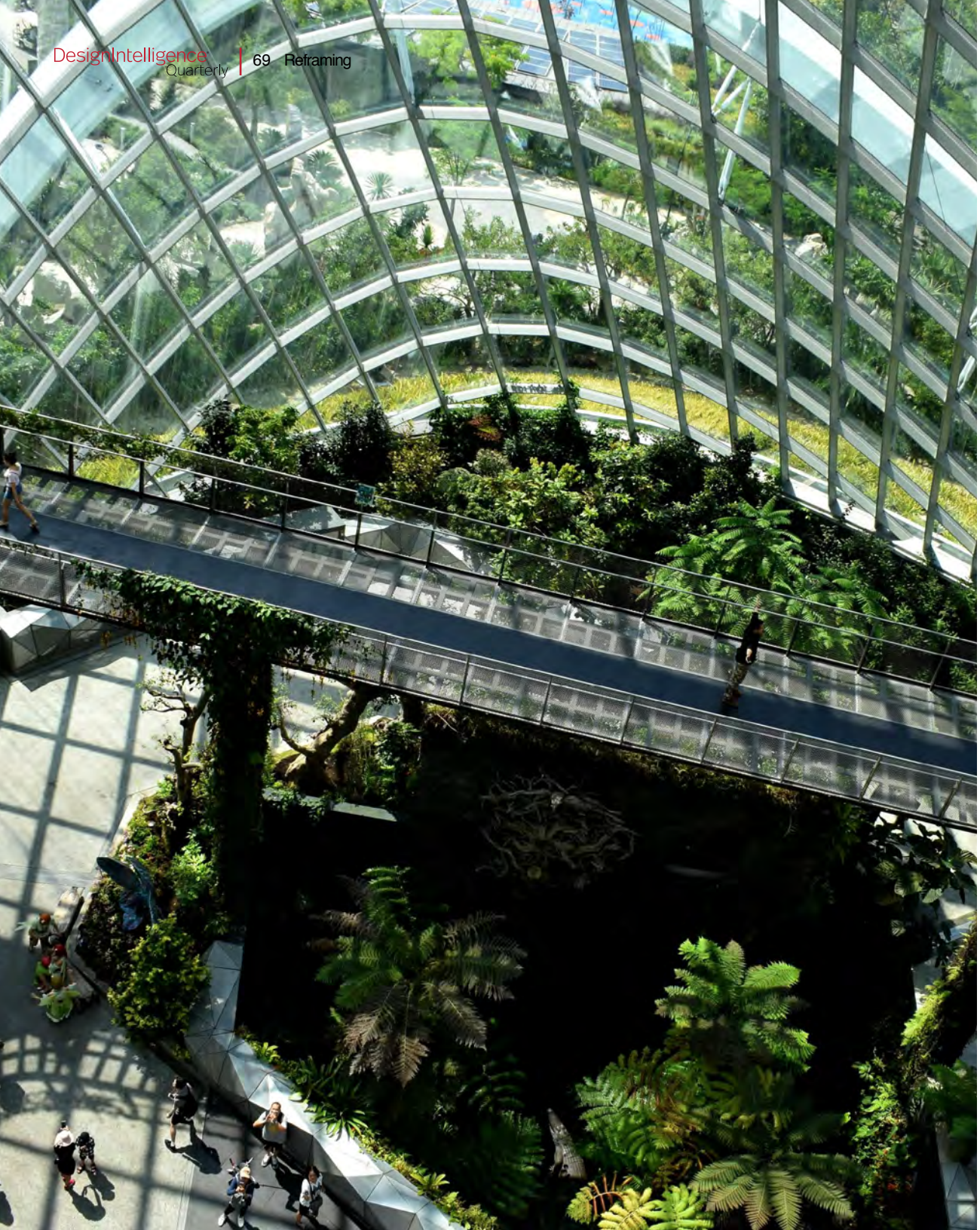
Ph.d., FASHRAE, BEMP, FIBPSA, AIA is Bentley Fellow and Director, Building Performance at Bentley Systems Inc. Vice-president of IBPSA, President of IBPSA-USA, AIA and ASHRAE, and recipient of the President's Volunteer Service Award

Data modeling can change behavior. In this discussion, Bentley Fellow Dr. Dru Crawley discusses simulation, digital twins, and 5G — and revives an old idea for higher performing, sustainable buildings, infrastructures, and cities: designing for flexibility and adaptability.

DesignIntelligence (DI): Thank you for joining us. It's wonderful to reconnect after all these years. I remember working together when you were with the Heery Energy Company in 1981. That's 40 years ago, before the PC and the Internet. That was a pioneering role. What was the vision for that group, and what drew you there?

Dru Crawley (DC): I was working for AIA Research right out of college. The opportunity at Heery Energy appealed to me because it was a small, growing group doing interesting work. They were doing simulations, something I had done in college. After a year and a half in Washington dealing with the politics, I didn't want to deal with it anymore, so Atlanta seemed like a good idea.

DI: The theme of this issue is redefining. Your foresight and early work in the energy industry shows an inclination to do that as a scholar and practitioner. I remember collaborating on what we called "energy conservation opportunities." For example, does this option affect the building orientation? Should the project have an atrium for passive ventilation or not, and options analyses for HVAC and electrical systems? While those things may not have redefined those projects, they shaped them.



But we didn't have the kind of interactive visualization and simulation tools you have been developing. We were using dot matrix printers. In your experience, has the shift to things like generative components, machine learning, and simulation had an impact on how we design, or use data to inform design?

DC: It has. We see more interesting buildings now. Generative components have made that possible. You can use algorithms to define shapes and create new ways of doing things. Similarly, the computational powers now exist to let you do multi-disciplinary evaluation and optimization of shapes, systems, and other design aspects.

The data itself is becoming transformative. We've rarely had enough data to understand how our buildings use data or understand how cities are using it. Now, there are 25 U.S. cities that have benchmarking. If your building is over a certain floor area, say 50,000 square feet, you're required to publish utility bills for electricity, natural gas,

water, and everything related. That data is publicly available, and we've seen cities where this has had an informative and transformative affect.

In Chicago, where they've been doing it for seven years, the energy use of the buildings in the data set is coming down. That's partly because the measurement challenges, informs, and begs questions. They can look at a building next to them they had no idea about and ask "Why is that building using half the energy of my building? What's different?" So, having that data is transformative.

DI: You're able to observe and measure that the data is changing behavior?

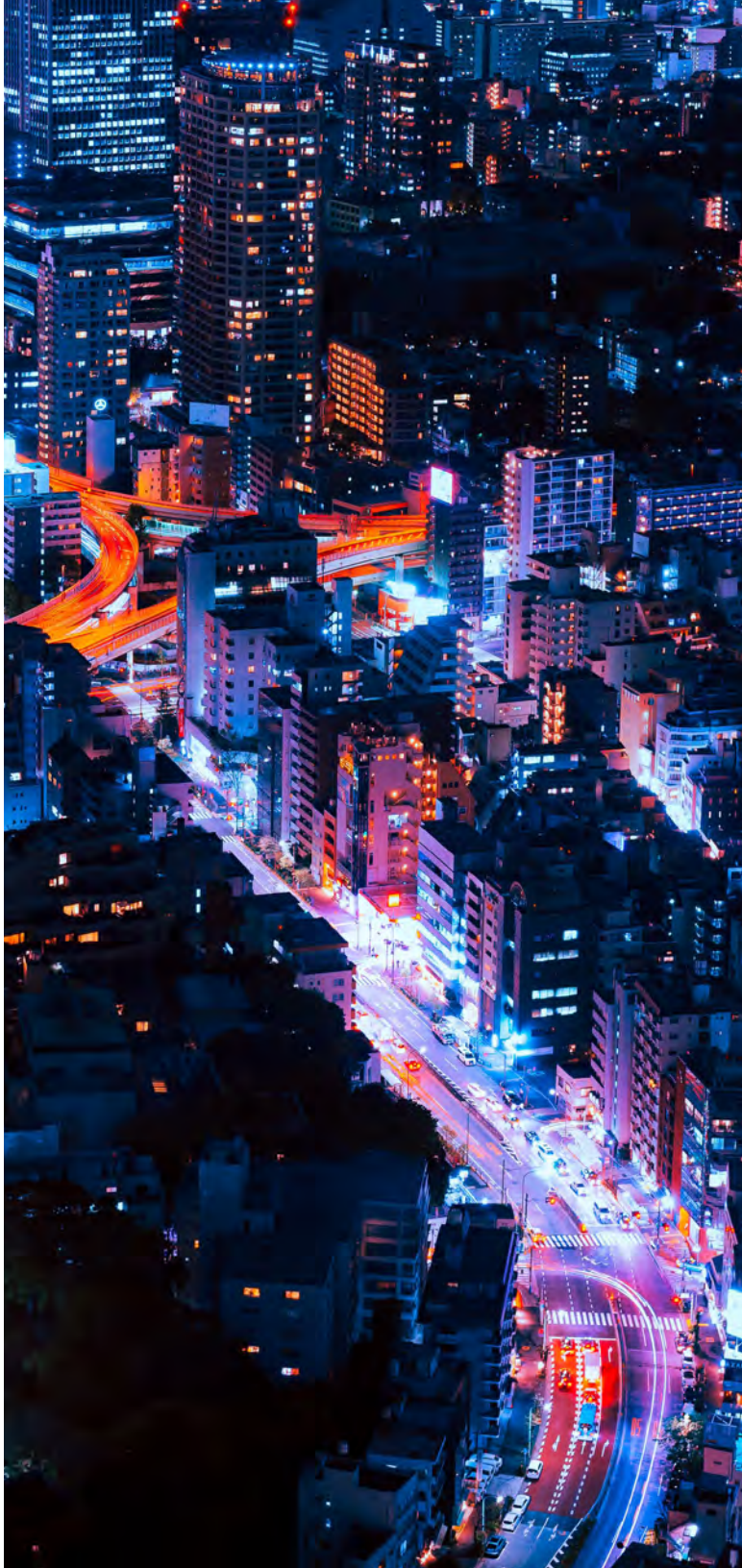
DC: Absolutely. The most interesting data transformation is going to be is the real time data we'll get because of new network technologies like 5G and beyond. Their lack of latency is going to provide instantaneous access to data. That allows us to have more mobile connections collecting data from a lot more places. The Internet of things, Smart cities, all of that is going to be enabled by having access to that data. That's going to move us forward quickly.

DI: Beyond my cell phone or wireless network, for the lay person, what does this mean? Is it just faster, with less latency?

DC: It will be faster, but the benefit is instantaneous response. Now, if you do a speed check on your Internet connection, there's a millisecond response delay from a web page or device. In the future that access should be instantaneous. That allows you to control things that require very quick response. It's going to revolutionize controls – and lots of other things.

Cities are looking to collect data about transportation. Trying to make streets and transportation easier during commutes, and being able to redirect traffic in certain ways, and be able to make decisions in real time. That's going to be a game changer in the industry.

How that does in buildings, we'll see, but I could imagine where you no longer have to wire a controls device. It could be a wireless device instead.



One of the problems we've always had with controls, is that the little devices, like thermostats sensing or controlling, are not that expensive. It used to cost $20.00 for the controller, and then $100.00 to wire it back to the central processing unit. If we can eliminate that part, we can have more ability to control and make our buildings more comfortable and safer.

DI: We know buildings are a big contributor to energy consumption. It's one thing to improve one building's performance, drive an electric vehicle, recycle your waste, or make some small improvement. But now that you're talking on the scale of cities, that broader scale systematic infrastructure potential is where the impact is. Let talk about what Bentley is doing in that regard.

30 years ago, Bentley was the robust software system of choice for most architects. Over three decades I've seen you migrate from the mass market in architectural design to the engineering and infrastructure community. I'm astounded at the number of software solutions your company has. What are some new things your software is doing now that the average person might not know about?

DC: Bentley's tag line is, "Advancing Infrastructure," so we see our software as an enabler for not only design and construction, but operation and asset management. We have a whole suite of products. We're not just BIM. BIM is a relatively small part of our revenue stream. We're doing massive infrastructure projects. The new Elizabeth Line through the center of London is 40 miles of new tunnel built within 18 inches of other existing, operating tunnels. We can do that with precision. All the design documentation was Cloud based, using Bentley Software. Structural, bridge, rail, and large infrastructure projects are a focus for us these days.

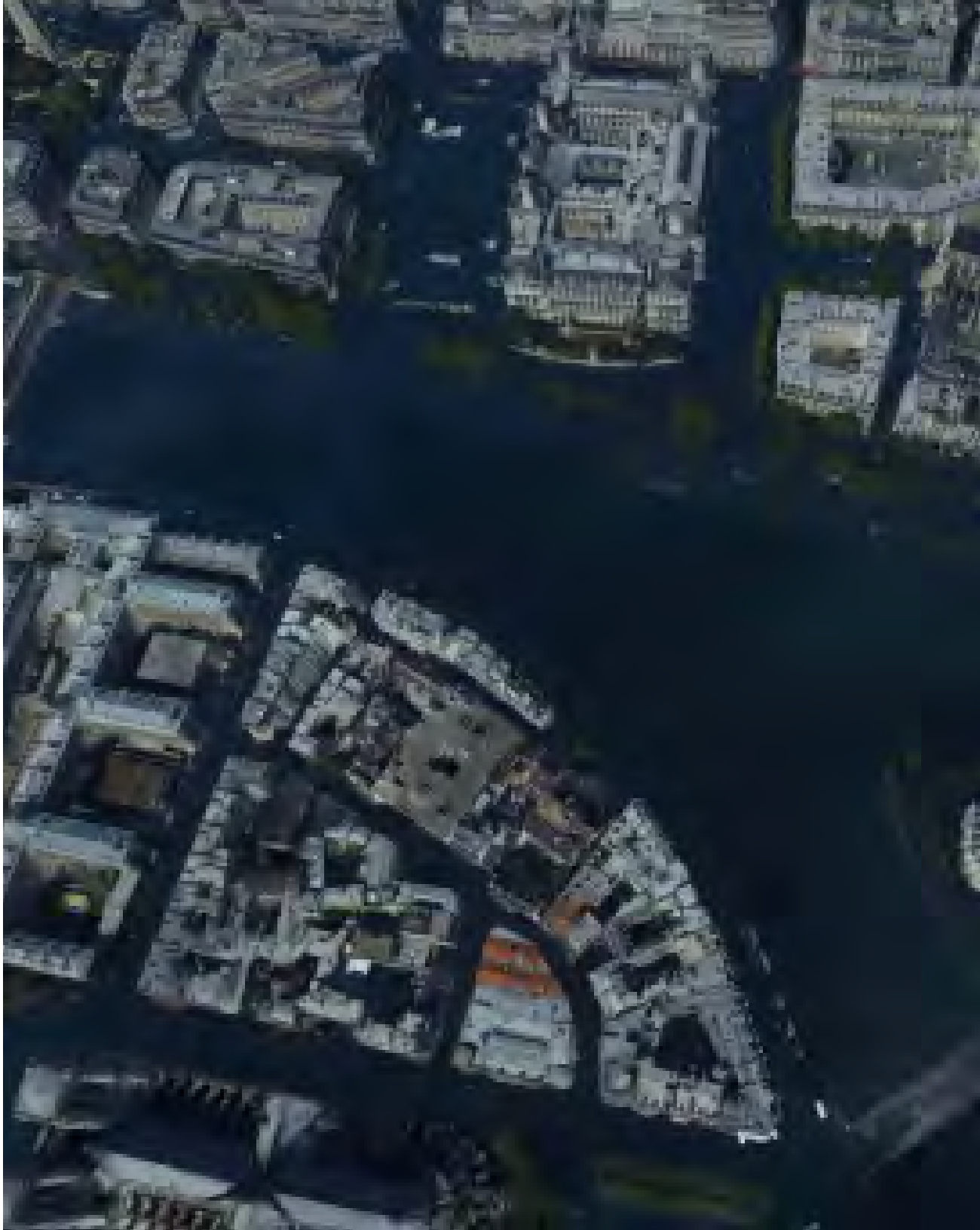
That doesn't mean we don't have BIM. We do, and we have, as you said, a very robust product, but it's evolving. Our BIM platform works throughout all built infrastructure, so you can be with the same platform designing a building, a bridge, a subway station, or anything. They're separate products for specific purposes but it's the same platform.

Our focus of late is digital twins. The idea is we have not only the design and the as-builts, but data that represents the building. It could be a way to operate it. It could be a way to do analysis, all sorts of aspects, so there's essentially a digitized version of the infrastructure or element. We are looking at ways of collecting data. Our platform can do traditional 3D objects, but we also can take in mesh and point cloud data, so you can go to the field and collect data using Lidar, and that can be part of your model. Or you can collect a few thousand photographs and create a 3D model of it using photogrammetry. We have lots of ways of getting data. It's not just a design tool anymore. We have 4D, 5D, 6D, and even 7D at this point. Cost, operation, FM assets data, and all the aspects beyond geometry and time.

DI: Those are great examples. I saw one when I spoke at one of your

annual conferences in Baltimore years ago. Up on the screen was a 3D digital model of an entire municipal water system. It showed the geometry, layout, flow rates, problems, leaks, data, controls, and operation. That was mind blowing to think somebody could model all that data at an infrastructure level. Has Bentley has ever aspired to take infrastructure down to an individual, residential, or commercial level?

DC: Our software is used widely for doing infrastructure at the building scale as well. We can model the mechanical, electrical, water, or any system. We had an acquisition about three years ago, where they modeled the drainage system. The company was founded in Lisbon, and they had a model of the city showing, if they had a 100-year flood or rainfall, or a 500-year event, what's going to happen to the drainage? Where are they going to have problems? Where is it going to be backed up? You can simulate that because you have a 3D model of the city, and the underlying infrastructure.



I saw a recent 3D model of Paris built from photogrammetry. The ability to model that and see exactly at what level, if the city floods, are certain banks going to go underwater? How far is it going to reach back into the city? They can study and learn that to an accuracy of 100 centimeters or less to influence retaining wall and bank top design to prevent flooding. That becomes obvious once you have a way to simulate and visualize it.

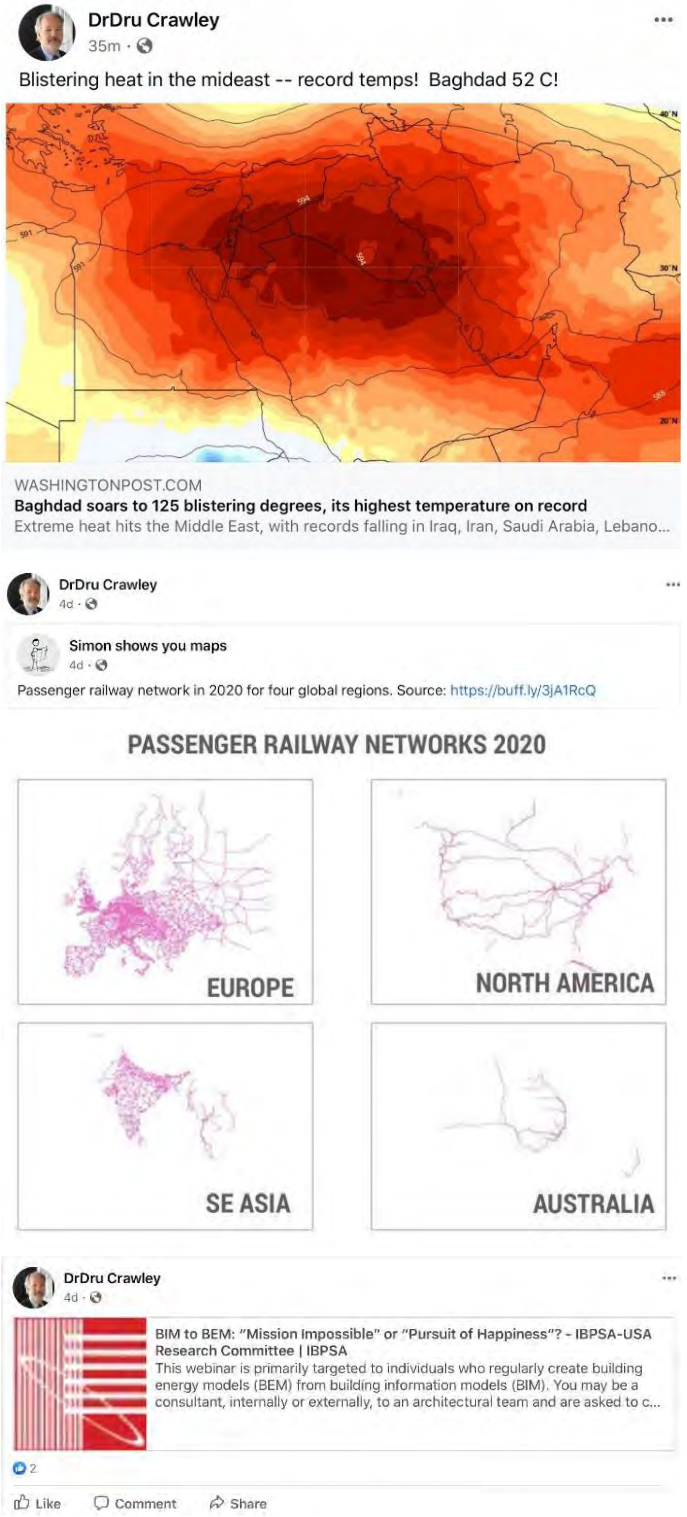
DI: In significant ways, the ability to see and access simulations changes how we see, think, and design. When you go down to the level of an individual looking at who's dropping an Amazon package at their doorstep, or controlling their thermostat remotely, that kind of access is powerful.

DC: Exactly. It is amazing what's possible now, and what's happened in the last few years. I give talks about future building and market trends. One of the examples I use is my cell phone. I hold it up and say, "This is more powerful than the mainframe computer it was talking to 40 years ago. This has more capability — and I can use it as a phone too."

DI: That's a good example. Having reflected on your career evolution, now we face this astounding year of concurrent crises. So, let's shift to a future view. I know from your prolific social media output that you keep your finger on the pulse of countless environmental issues. Where should designers, builders, and owners direct their attention to improve building performance and sustainability? Is that a tough question?

DC: It is, and it isn't. I think about this a lot. One of my roles as a fellow is to keep my finger on the pulse of what's going on and look for new, interesting things happening — or ones that aren't and should be. I've concluded that one of the things we can best do as designers, to support what may happen in the future, is to design flexibility into our buildings. To have the ability to consider changing them later.

Stewart Brand wrote a great book called How Buildings Learn. He has a wonderful quote: "Every building is a prediction. Every prediction is wrong." His thesis is that we start changing our buildings to match our



needs the moment we occupy them. They'll change. They'll need to change – in reasonably easy ways. Ways that can support us for energy efficiency, going to net zero, sustainability, resilience, all the buzz words. There's a powerful need for buildings that can accommodate such flexibility.

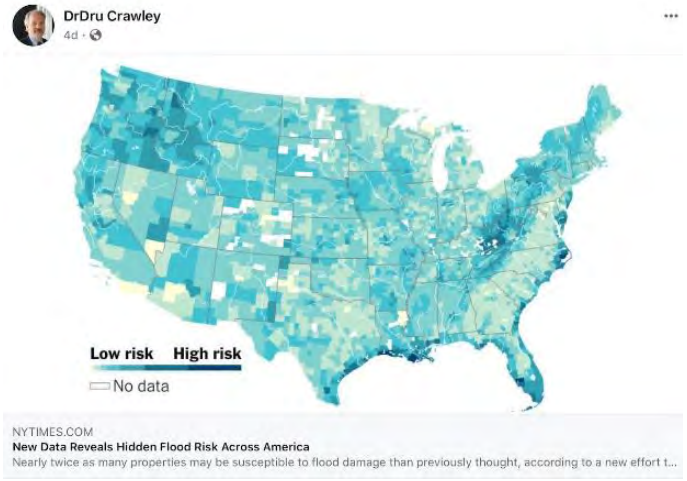
The cover of the book has a picture of twin buildings built in the 1800's. They look identical. Then, looking at them 150 years later, you couldn't tell they were related, much less identical twins, because one's got a new floor and it's got wrought iron on it. The other one had gone classical. They're still right next to each other, but you would never have known they were the same floor plan, layout, and structure.

We forget that sometimes our buildings need to change. They don't meet our needs. How we use them will change, and flexibility is something we leave out. We over-design, make things overly specific and don't give future use a consideration. Is that sustainable? No.

DI: That's a fascinating observation, particularly in 2020. I've dabbled in what you're suggesting in past lives as a designer. We were trying to design structures that might last 50 or 100 years, HVAC systems that might last 20 or 30 years then need upgrading, and interiors that would need refreshing or to accommodate changing programs every 2 to 5 years. Flexibility and adaptability are such underappreciated values for owners, because they're too often myopically focused on, "I have to meet a first cost budget," or, "I'm a developer, I just want to flip this building in a year. It's not my problem."

Well, I hope they're learning some lessons. At DesignIntelligence, we're focused on capturing the opportunity for transformation this crisis is giving us. Colleague Bob Fisher says, "in a crisis the first thing that's lost is perspective." Perspective is what you're talking about.

Our responsibility should be to give program and design decisions a longer time horizon. That's obvious



in this time of COVID and other crises, because everything we "knew" seems to be wrong, or at least uncertain. Do we still have a job? Do we still need our office space? Can we re-purpose it? Can we modify the HVAC system to prevent spread of the virus? Designing for adaptability, uncertainty, and change is THE key strategy for sustainability. I love that observation, and I think Charles Darwin would agree.

DC: Right. Back in May people were saying, "I like working from home. This is really good," but by July, people are saying, "I really need to go back. Somewhere else that's not home, that's a separate place." I think we'll eventually make it back. We've struggled with epidemics in the past. Fortunately, we have always come back. This happened 100 years ago, with the Spanish Flu. It shut large chunks of the country down. Today we're still functioning, because we're able to do what you and I are doing right now, have calls and still function. Even 10 years ago this would have been more devastating, because there just wasn't the

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> *Every building is a prediction. Every prediction is wrong."*
>
> *Stewart Brand, "How Buildings Learn"*

capability that we have now. Electronics have evolved to support us.

DI: Our CEO, Dave Gilmore, just recommended a book by Steven Pinker called Enlightenment Now. The book tracks data, science, and trends to show we have many reasons for optimism. People who aren't data-driven wrongly say, "Everything's horrible. It's worse than ever. It's declining and we're failing." Pinker demonstrates in every category that the data say otherwise.

You cover a lot of similar ground in your role, a whole host of issues from buildings to infrastructure. In your role as a fellow doing research and education, is there a parallel for the rest of us as we evolve to be smarter about these things we're talking about. Can you talk about your role?

DC: Sure. My role as a fellow is partly thought leadership and sharing through presentations. Despite COVID, I've done 25 presentations so far this year, both live and virtual. Bentley encourages me to speak. One aspect is sharing vision and information I'm learning. Also, keeping my finger on the pulse to see where things are headed. The third aspect is research. I'm not doing a lot of research personally. I'm doing some work on climate, but more working with universities where we are sponsoring or co-sponsoring research projects. We also sponsor PhDs in a number of universities. We are broadening that and looking for people interested in digital twins. That's the focus: what's a new way we can do this?

I'm working with the University of Texas right now. They have made a proposal to create a digital twin of their whole campus to look at energy

flows. The professors are trying to de-carbonize their campus. They have a problem: they're going to add another 2 million square feet and they're going to need an additional power plant. They're looking to see if they can use the model to optimize what they have and identify areas where — through storage, energy efficiency, and renewables — they can reduce the need for that central plant.

We're also working with a university in India. They are capturing some 450 square kilometers to create a digital twin of the whole city. From there, they'll create energy simulation models of every building. Using machine learning, they can identify elements and automatically tell if it's a roof, a door, or a window. What are the parts of the building, so they can start breaking them apart? Not just a mesh model, but a 3D model with metadata. We have other projects going on, but those are the two biggest right now.

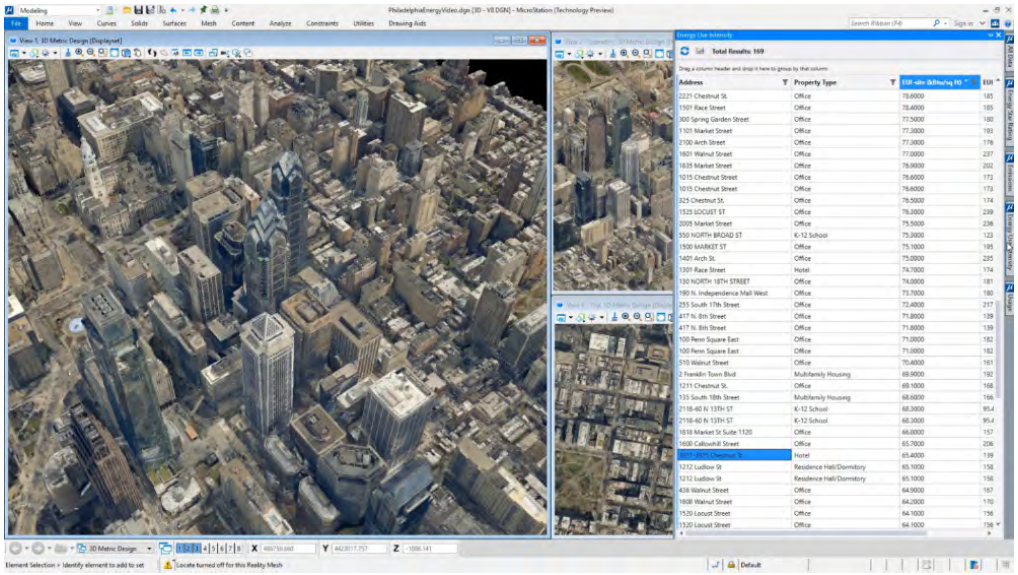
DI: You're doing those as commissioned, purposed, applied research support services for those customers?

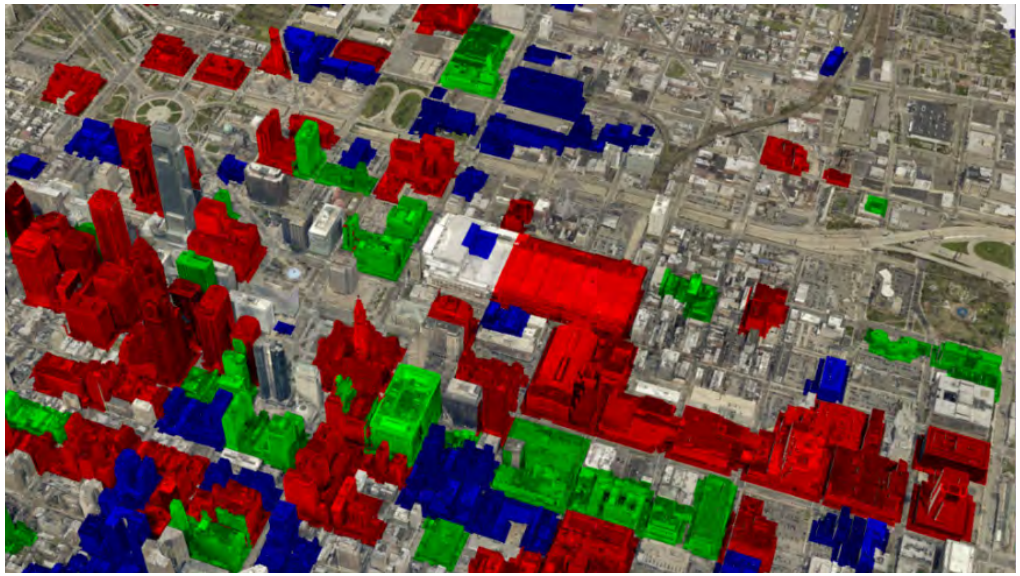
DC: In those cases, we're a partner. Their researchers perform most of the work. We provide software and access to our experts, particularly in the AI side of things.

DI: More of a mutual sharing?

DC: Right. For cases where we're working with PhD students, we are not paying their expenses, but we're a partner. They often have pooled resources from governmental access as well. The opportunities I'm looking for are all related to building performance and looking at how smart cities and anything related to performance in the built environment. I'm trying to direct the universities and professors I'm working with toward that.

DI: Let's explore that. Most of the business world is transactional. You sell me some services, and I pay you. I might not care about the





future or responsibilities to society. In your work as a fellow doing research, do you feel pressured — as you make these discoveries or encounter cutting edge things — to productize and monetize them? You're shaking your head no, so that confirms what I thought. That's an interesting model that's emerged over the past few decades of open sharing, and collaboration. Things like freeware, shareware, and Wikipedia where people have an idea and put it out there for the common good, in the hopes they might get something back in the future.

I'm assuming a company like Bentley makes their money in other areas. You're being funded somehow, as an R&D guy in a different sector. I was lucky enough late in my career to have a similar role, where part of my charge was to look ahead, be a change agent and give back. The average Joe, working week to week doesn't have the luxury of thinking that way.

DC: It's unique, I haven't run into anybody with a similar role. Normally, my research is for something at least two years out, to get the research done in time to have a product offer.

The conference you mentioned, the one you talked at in Baltimore, has now been converted to a C-Suite event. It's now called "A Year in Infrastructure." Last October, it was in Singapore. They've been rotating the location. It was in Philly for a while, then about seven years ago, they started doing it in London, and three years ago, in London and Singapore. This year it was supposed to be in Vancouver, but it's going virtual. That is an event where our users get to show the world what they've done with our software, and so we're promoting the users. They get to come to a big party, and all that, but they're also able to make presentations about their innovations. We share amazing work from around the world.

Bentley doesn't expect any direct immediate payback from the work I do, because it's five to seven years out for a lot of it. But if we can use some of it to empower software or customers, that gives our product managers ideas about where they can take their software in the future and what they might need to support it. I think the pure research is a win for the company, but as my boss reminds me, sometimes we have to show what we do that makes it worthwhile for us to keep doing it and show the outcomes of the research. I still can't believe they let me do whatever I want to do. It feels that way some days.

DI: You earned the privilege, and I'm sure there are plenty of other, more challenging things that offset that freedom. It can be tough setting priorities when you have no direction or product deadlines given to you. To bring this full circle, let's close with a two-part question.

First, there's so much discussion in our industry about what's wrong with our fragmented processes. I have a bias – and supporting experience – that most owners I've worked with have been misdirected. They're working on first cost budgets and their process and

project delivery approach are flawed. We're still designing projects where the designer has an idea, then we bring on some engineers to force the HVAC systems into the project, and maybe we'll apply some sustainability and energy analysis. A rare handful of projects are doing that together, in an integrated way at the start, and changing how they work. That's my experience over 40 years of practice with multiple firms. Does that match your experience?

DC: It does.

DI: OK, if so, how would you go about it in an ideal scenario? Who's in the room? What do we do? How do we refocus the goals?

DC: The most interesting projects I've had were the ones with an engaged owner. Owner-occupied projects. If it was a building they were going to occupy, they started to think beyond pure first cost. In owner-occupied projects they have self-interest. Sure, there are probably separate budgets for capital and ongoing operations, but the line blurs

> *…that's when we started asking if we could go to zero. We realized we better do some analysis to see whether it's even technically possible, knowing what we know. We were surprised. It was. And now I'm seeing large buildings operating at zero energy successfully."*

when you can say, "If you want to save money in the long term, it will keep getting more expensive. If we do this now, we can make this building as efficient as possible, maybe even get to zero energy."

It's funny, 15 years ago I was talking to my boss at the Department of Energy. I said, "You're all about measurement. You really want to measure progress, but I don't know how to measure 'high performance.' I don't know what 'high' means." He said, "Well then, come up with another metric," and that's when we started asking if we could go to zero. We realized we better do some analysis to see whether it's even technically possible, knowing what we know. We were surprised. It was. And now I'm seeing large buildings operating at zero energy successfully. They're going to pay those owners back forever. Their costs are substantially lower. The total cost of ownership is going to be much better for them.

Another barrier we traditionally face is, "Oh, we can't really do anything more than a three year pay back." If you start to look at, "Let's go as far as we can and see what that's going to cost." A lot of zero energy buildings don't cost any more than a traditional building, because we've downsized the systems and operating equipment so the total cost is lower. We have better envelopes, better integration, natural flows, maybe natural ventilation and daylighting, that take advantage of all those opportunities at the same time.

DI: That is clear incentive — an ideal situation where an owner occupies their building because they care. It's theirs, and they have a long-term perspective. I've had the good fortune to work for a few clients who aspired to and achieved that. Like the folks at Apple at their new Apple Park campus, and the Mercedes-Benz Stadium in Atlanta. It's one of the most sustainable sports facilities in North America. For the sake of devil's advocacy, I'll go back to your earlier statement about flexibility. In a world with as much uncertainty as we're facing, might there be fewer owners who can afford the risk of owning their own facility? Developers and landlords have always borne that risk. How do we challenge those of us who need the flexibility you suggest – of non-ownership – to stay liquid and nimble? Because I can certainly see a scenario of less ownership. How do we change the mindsets of the people who aren't those ideal owners?

DC: It's tough. One of the things I learned at the Department of Energy was to understand the client's business model to be able to effectively work with them. If we always talk about "per square foot," they're not going to listen. That's not how a lot of businesses work. If it's a hotel, they're interested in revenue per occupied room. That's their metric. If it's a school, "per square foot" doesn't mean a thing. It's "how many students can I get in there," and "what is it going to cost me to build and operate that building per student?" That's a much better metric for them.

DI: Maybe one answer, now that we're measuring more and have data, is that hotel metric — as offset or penalized by carbon emissions,

carbon tax, or societal penalties — now has a different outcome. If we can share that data, maybe your work and others' doing measurement and analysis will pay off. But as you say, knowing your business and putting things in their language are a must.

DC: It takes some leading-edge people to take the risk and do the documentation. The National Renewable Energy Lab has been in operation for 10 years. Their research support facility is a 330,000 square foot, zero-energy building. It has a data center and all sorts of other things. They've operated that building successfully for the last 10 years. The worst capital cost scenario is working for the federal government. You have a fixed budget appropriated by Congress and that's all the money there is. They were able to accomplish those things within that budget.

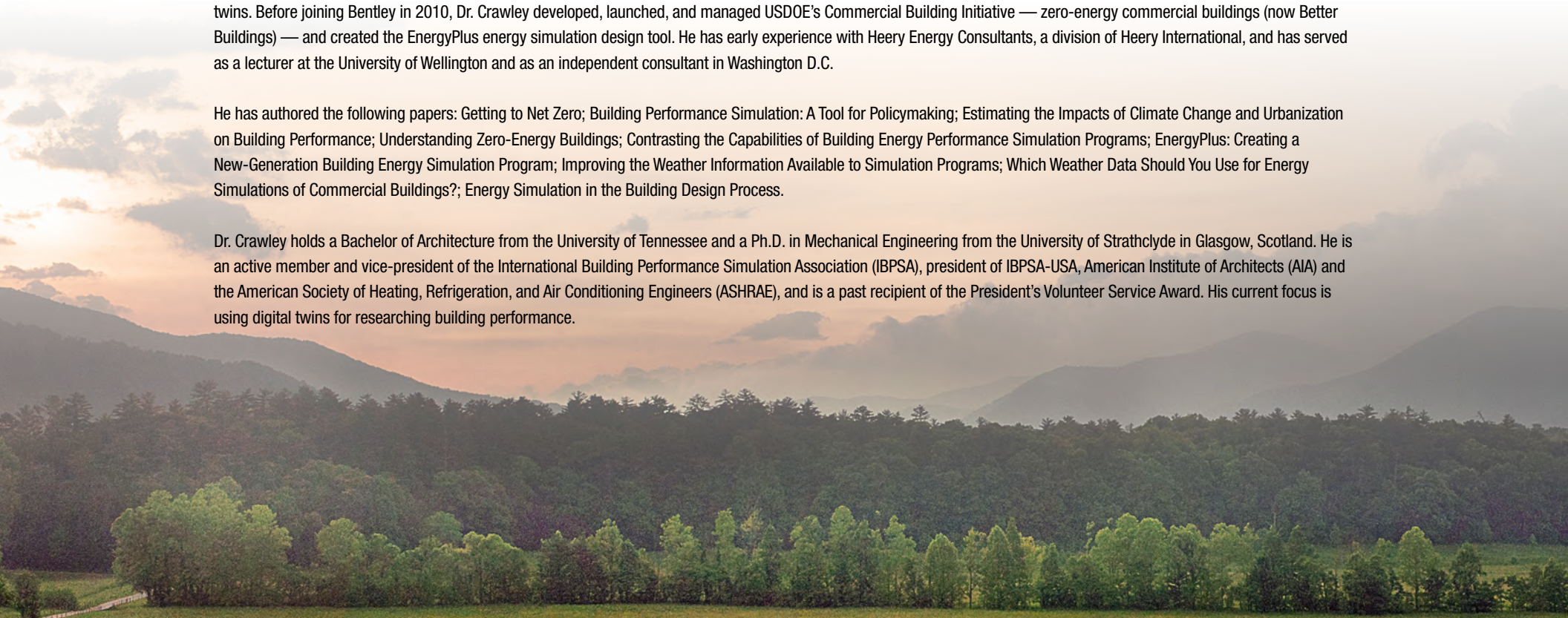
DI: Those case studies give the rest of us hope. Thank you for being one of those leading-edge people — and for being willing to share it with us. I think this is going to be a valuable discussion. Hopefully we can keep the conversation going.

DC: Happy to do it. Thank you, Michael.

Dru Crawley, Ph.d., FASHRAE, BEMP, FIBPSA, AIA is Bentley Fellow and Director, Building Performance at Bentley Systems Inc., where he is a thought leader focusing on building performance, BIM, zero-energy buildings, interoperability, smart cities, and sustainability, responsible for Bentley-sponsored research relating to decarbonization using digital twins. Before joining Bentley in 2010, Dr. Crawley developed, launched, and managed USDOE's Commercial Building Initiative — zero-energy commercial buildings (now Better Buildings) — and created the EnergyPlus energy simulation design tool. He has early experience with Heery Energy Consultants, a division of Heery International, and has served as a lecturer at the University of Wellington and as an independent consultant in Washington D.C.

He has authored the following papers: Getting to Net Zero; Building Performance Simulation: A Tool for Policymaking; Estimating the Impacts of Climate Change and Urbanization on Building Performance; Understanding Zero-Energy Buildings; Contrasting the Capabilities of Building Energy Performance Simulation Programs; EnergyPlus: Creating a New-Generation Building Energy Simulation Program; Improving the Weather Information Available to Simulation Programs; Which Weather Data Should You Use for Energy Simulations of Commercial Buildings?; Energy Simulation in the Building Design Process.

Dr. Crawley holds a Bachelor of Architecture from the University of Tennessee and a Ph.D. in Mechanical Engineering from the University of Strathclyde in Glasgow, Scotland. He is an active member and vice-president of the International Building Performance Simulation Association (IBPSA), president of IBPSA-USA, American Institute of Architects (AIA) and the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE), and is a past recipient of the President's Volunteer Service Award. His current focus is using digital twins for researching building performance.



DesignIntelligence®
Quarterly

Redefining Professional Practice Education: Speculations and Challenges

IRENE HWANG

Assistant Chair of Architecture at the University of Michigan's Taubman College of Architecture and Urban Planning

University of Michigan's Taubman College Assistant Chair of Architecture Irene Hwang shares anecdotes that provoke speculation and challenges educators and practitioners of architecture to move in new directions.

As the practice of architecture has radically changed over the past decade, our teaching of professional practice in the academy has remained largely static for decades. To better prepare future practitioners, I share three new directions, instituted through changes to the core, professional practice curriculum at the University of Michigan's Taubman College of Architecture and Urban Planning. Consider these challenges with urgency and responsibility to the discipline and to the new generations of graduates entering the field.

A LEGACY OF GAPS

McKim would indicate to the draftsman where to draw lines and correct them: 'He looked at them for a long time and then said, "Just take out that middle line and move it up a little…No, put it back where it was—perhaps a little lower"… it was quite a job to erase and remake the lines smeared in the process, and to repeat that sort of thing for hours on end was hard on the nerves of anyone.
—H. Van Buren Magonigle, Pencil Points, 1934[1]

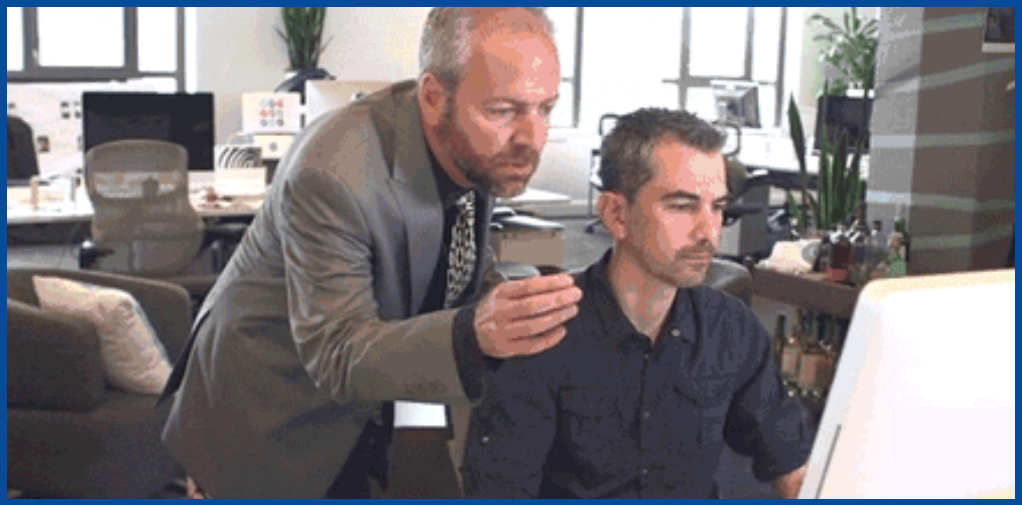
Though H. Van Buren's experience in the office of McKim, Mead and White is near a century old, such over-the-shoulder interactions remain commonplace today. In our primary, core professional practice course, ARCH 583, we show a GIF[2] to our students on the first day. In the GIF, a young professional sits at his computer while his boss stands and directs from behind. As the

[1] *Pencil Points. East Stroudsburg, Pa.: Reinhold, vol. 15, 1934.*
[2] *GIF link: https://media.giphy.com/media/CbSGut2wzWKZy/giphy.gif*

GIF cuts to the CAD drawing on the monitor, we see a toilet slide to the left. Cut back to the boss, who gestures to the right, and we see the toilet slide back to the right. The GIF refreshes, and the sequence begins again. This interaction is so familiar and ubiquitous, that one only need Google "architect" + "GIF" to find the image; no further descriptors are needed or click here. Nicknamed "Robot Arms" by us, the GIF gets a laugh from our students and is the introduction to Practice, our first course module.

As the discipline and profession diversify through globalization and technological advances, educators face a critical demand for a new mindset in architectural education, one that looks to revise and update inherited leadership and working structures. Increasingly, the primary challenge for design professionals is figuring out how to collaborate on projects over larger and larger distances. Managing these distances is complex and demanding. We find ourselves having to bridge huge gaps in language, time, culture, traditions, preferences, climates, supply chains, technology, and building methods, among many others.

The behavior and mindset embodied in the Robot Arms GIF continues to be a legacy of Beaux-Arts[3] teaching. For generations, the rigidly hierarchical atelier provided an effective model to nurture the best work from groups composed of individuals with the same training and from the same backgrounds. In these more homogenous, less diverse contexts, the best solution was also the right solution—for everyone.



[3] This autocratic, master-led structure has its origins in the widespread emulation and adoption of the French École des Beaux-Arts teaching model throughout American architectural education. Of the ten original programs of architecture in American universities founded in the 19th century, nine were led by American alumni or teachers from the École.

Above: University of Michigan, Taubman College, Student cohorts in 1914 courtesy of Taubman College and University of Michigan Bentley Historical Library

Above: University of Michigan, Taubman College, Student cohorts 2019 courtesy of Taubman College and University of Michigan Bentley Historical Library

The Beaux-Arts atelier model still shapes our discipline, even while culture and society have drastically changed. Just as 19th-century students were indoctrinated to be unquestioning of their master academicians, architecture students today still refer to their teachers as "critics" and have their schoolwork reviewed by a "final jury" at the close of each project. This master-led mentality, first instituted in school, persists in the workplace. Why? We continue to celebrate starchitects and endorse top-down leadership models. We continue to elevate "leadership" as a distinct group held above the rest of the organization. We continue to treat our young colleagues as fungible, interchangeable units of labor. The unanticipated outcome is another gap: one in which our working and organizational structures are falling short. We have much to lose if we continue such practices. By failing to embrace and implement advancements in organizational thinking, which prioritize inclusive leadership through new managerial styles, we remain tethered to the status quo and forgo the benefits of diversity.

We have a long way to go to achieve representative levels of diversity in the field[4]:

- 91% percent of registered (licensed) architects in the US are white (2015, NCARB statistics);
- 2% are Black American (2015 NCARB); 0.4% are Black-American women, or only 477 of ~115,00 total US licensed architects;
- 81% percent of registered (licensed) architects in the US are men (AIA, 2020)[5];
- Until 2020, 95% of Pritzker Prize winners (i.e., architecture's highest, global prize) were men; With their most recent win, Shelley McNamara and Yvonne Farrell nearly doubled the number of women prize winners in forty-one years, from three (3) to five (5).
- Of the top 100 architecture firms in the world (2018), only three (3) are headed by women[6];
- Of graduates who initially begin the path to licensure, the attrition rate (those who never attain licensure) remains highest among women and non-white candidates. (NCARB, 2018)

Like medicine and law, architecture is a learned profession (not a trade): our education is both extensive and expensive. Unlike medicine and law, the architectural profession has significantly lower compensation models across the board. With the continuance of low salaries, long working hours, and repetitive, production-based tasks in autocratic working environments, our young graduates continue to become disillusioned, fatigued, and frustrated with architecture. While some bear it for a few years, many talented and motivated graduates end up leaving the profession altogether.

THE CHALLENGE:

To stem such loss, in our professional practice teaching at Michigan, we asked: what next generation of skills, expertise, and intellectual frameworks are necessary to help graduates stay and thrive in our industry? How do we counteract the "invisible" curriculum of outdated values, biases, and assumptions that stand to regress the discipline?

For us, we believe our primary responsibility is to help increase diversity in the field and in our profession. We've learned from studies that show how diverse teams outperform homogenous teams.[7] Social psychologists discovered that in homogenous team dynamics, individual team members conform more easily: they are quicker to accept their teammates have the right answer—even when wrong—leading to poorer group decision-making and mistakes. On the other hand, diverse teams with individuals from a mix of race, cultures, and genders, tended to be more objective and rigorous, with more accurate solutions and better decisions overall. Increasing diversity is not just a matter of race or gender. It's also a matter of increasing cognitive diversity.

How do we counteract the "invisible" curriculum of outdated values, biases, and assumptions that stand to regress the discipline?

[4] *Statistics drawn from AIA, NCARB, and ACSA: Visit website here*
[5] *https://www.aia.org/articles/6252982-women-in-architecture*
[6] *Dezeen, https://www.dezeen.com/2017/11/16/survey-leading-architecture-firms-reveals-shocking-lack-gender-diversity-senior-levels/*
[7] *Mangelsdorf, Martha E. "The Trouble With Homogeneous Teams." MIT Sloan Management Review 59, no. 2 (1/1/2018): 43–47.*

THE CHANGE:

Our first step was to rethink the timing and structure of the course. Instead of taking it for granted that professional practice is the last required course that students must complete to graduate, we made ARCH 583 an introductory course at Taubman College. By moving the course earlier in the curriculum, students now start to think about professional practice from the outset, rather than as an afterthought a few months before graduation. The very nature of professional practice—and how to reshape it for the better—becomes one of the first things students think about when they start architecture school.

The course is now designed to introduce new concepts, changing values, and future directions for professional development. We discuss and explore these over three modules: Practice, Service, and Entrepreneurship.

MODULE 1 - PRACTICE:

From day one, we address the historical professional practice curriculum as a baseline and as a point of departure. For us, it's imperative that students understand architectural practice within the US, by first learning the fundamental principles for the delivery of building design through construction. Students gain a working knowledge of professionalism, ethics, contracts, and business practices. Concurrently, we get to know the students and learn about their unique priorities and ambitions. The heart of their learning is the pivot toward understanding and reshaping what architects do and how they do it.

The course starts with an invitation to students to imagine new means and methods for the discipline and for the profession. The Practice module is capped with the completion and presentation of the Firm Audit project. In the Firm Audit, student teams identify a practice that they admire and then study in depth—a familiar approach based on the case-study method. Where the project departs from tradition, is in the nature of the study. Students look beyond firm anatomy (e.g., number of partners, ownership structure, yearly revenue, types of projects, market sectors, fee structure, etc.) to seek insights on:

- **Decision-Making:** Which partner owns the majority stake? Is the stake evenly split, or do some partners have larger shares with larger influence?
- **Office Culture:** Are there strong relationships running vertically through the firm, or just horizontally at the top and at the bottom?
- **Office Operations:** How are projects staffed? Are junior employees considered for their individual strengths and professional development, or are they interchangeable?
- **Values:** Does the firm support adaptive, on-the-job learning and innovative experimental thinking? Or, do they prefer routine and rote execution?[8]
- **Communication:** Is there smooth and easy communication at and between all levels of firm personnel? Do colleagues feel comfortable asking or help and speaking up? Or, are they made to feel embarrassed if they don't know the answer and discouraged from sharing a different view? [9]

[8] *Edmondson, Amy C., Teaming How Organizations Learn, Innovate, and Compete in the Knowledge Economy. 1st ed., Jossey-Bass, 2012.*
[9] *Baker, Wayne E., All You Have to Do Is Ask: How to Master the Most Important Skill for Success. First edition., Currency, 2020.*

- **Diversity:** Are different backgrounds and perspectives welcome at the firm? Or, is there an adherence to the status quo and an emphasis on: "This is the way we do things here?"

While it's rare for students to find all the answers, in working through the Firm Audit project, they learn to consider aspects of professional practice that would otherwise remain out of their view. In so doing, students are empowered to reassess their assumptions about practice: they realize that it's possible to move beyond the standard path. For many, this realization brings new meaning to their professional journeys by instilling confidence to forge new professional directions for themselves and for architectural practice. At the close of the Firm Audit, students present their findings to each other, in a horizontal review format, exchanging new visions and new insights into contemporary practice.

PUBLIC ENGAGEMENT AND ARCHITECTURAL SERVICE

Have you ever caught yourself watching the Home and Garden Television Channel (HGTV) and found it rather enjoyable? Last year, when I suffered a sports injury, I visited many waiting rooms during my recovery. In every single one there was a DIY, home improvement show playing in the background. To satisfy my curiosity, on one visit I asked the receptionist about the programming choice. Relieved I hadn't come over to complain, she lit up, and replied, "Oh! HGTV! Everyone loves it. Before, with anything else, we'd see complete strangers come nearly to blows about something that had flashed on the screen, especially when it had to do with football or politics. No one argues when HGTV is on!"
With the rise of the internet, social

media, and streaming content, the public's exposure to design of our built environment is now more plentiful and accessible than ever. Programs like Property Brothers or Good Bones, along with their hosts (twin brothers Jonathan and Drew and mother-daughter team Mina and Karen) draw millions of weekly viewers, elevating HGTV to the fourth-highest-rated cable network in the United States.[10] By many estimates, the global home décor industry accounted for between $600-700 billion USD in 2019, with the North America representing one of the largest segments, of nearly 40 percent of the worldwide market in 2018.[11] With such a large audience, home improvement media hosts are now the primary role models that most people look to for guidance and instruction about the built environment. Not architects.

Even as the massive rise of interest and participation in design and the built environment takes hold of the American imagination, we continue to see flat attendance in architecture degree programs. Starting in 2008, new-student enrollment steadily declined, only to rebound by a few hundred students annually during the last five years. (Fewer than 7000 new students enrolled nationally in 2014.[12]) If we compare that to other learned professions such as law or medicine, where yearly enrollment is in the tens of thousands, the cumulative impact to the number of professionals in each discipline is staggering: in 2020 there are approximately 100,000 registered architects in the United States; 1.33 million licensed lawyers; and 1 million licensed physicians.[13] It could be argued that our capacity to serve society through the built environment (architecture) is one-twelfth our capacity through social justice (law) or one-tenth of our capacity to serve its physical health (medicine).

What does this mean for architecture's position within society? What does this say about architects' contribution to a just and healthy world?

THE CHALLENGE:

If we take the cause of promoting equity as a primary mission of the 21st century, then what is the role of architecture in informing the public's priorities and conduct towards the built environment: what we build; how we build; why we build? How will architects seize the opportunity to bring the benefits of their work to the general public? In the face of dwindling resources, population growth, wealth inequality, and overcrowding, how can we increase our ability to make better, more intelligent, societal-level decisions about the built environment?

MODULE 2 - SERVICE:

There is little doubt that home improvement media is highly entertaining. Millions are tuning in. Why then has the enrollment rate of new students at architecture schools not risen? My speculation is this: the general public doesn't know about architecture because the majority of people have had little—if any—exposure to its benefits and value. Returning to our previous

[10] https://www.multichannel.com/news/weekly-cable-ratings-fox-news-cable-news-networks-continue-to-sizzle
[11] https://www.grandviewresearch.com/industry-analysis/home-decor-market
[12] NCARB, https://www.ncarb.org/nbtn2019/education
[13] Law: https://data.lawschooltransparency.com/enrollment/all/, https://www.americanbar.org/news/abanews/aba-news-archives/2018/05/new_aba_data_reveals/

For us, the Public Engagement project is the means for students to start shifting the public's impression of architecture as rarefied and inappreciable into a necessary and ubiquitous aspect of daily life.

comparison: with 100,000 architects serving 320 million Americans, some simple arithmetic yields one architect per every 3,200 citizens; one doctor for every 320; one lawyer for every 240; one engineer for every 190. The average person's exposure to architecture is a small fraction of that in other learned professions. Conversely, one's exposure to the construction industry (with 7 million employees[14]) is much higher; wit h one member of the trade for every 45 citizens. For ARCH 583's second module, Service, we begin by asking our students how they increase stewardship and advocacy for the built environment. We propose to them an expanded understanding of "service," one in which architecture connects with people in the everyday, and not only in special instances.

THE CHANGE:

After our students learn about existing standards and methods of professional service in the architecture industry, we ask them to redefine "service" through a public engagement lens. They complete a four-week assignment where they research, design, structure, and present a public-engagement project for their hometowns. They begin by reflecting on their home communities. They identify a place where they can use architecture (e.g., spatial and systems thinking, visual representation, plus generative and analytical problem-solving) to create sustained benefit for their communities. For the final presentation of a two-minute video, which shares their inspirations, ideas, and approach, we invite community activists and public engagement experts to share a discussion of the work. The resultant conversation is filled with insights into how architecture can serve a larger constituency of people and purposes. For us, the Public Engagement project is the means for students to start shifting the public's impression of architecture as rarefied and inappreciable into a necessary and ubiquitous aspect of daily life.

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[14] https://www.agc.org/learn/construction-data

A BUILDING IS NOT ARCHITECTURE

Two years out of architecture school, my father excitedly pulled me aside one night after dinner. I had just flown home to New Jersey for a week-long visit. At the time, I was an intern designer in a well-known architecture firm located in Madrid, Spain. My dad is low key, but he excitedly shared a proposal with me that night. Dad wanted to invest in the design and construction of a new addition to our house. In the previous ten years of living in our 1967, split-level house my parents, who are avid karaoke enthusiasts, had grown frustrated with the layout, particularly on nights their friends were over. Dad was frustrated that the whole group couldn't sing, snack, and socialize together. "The space was too small," he told me. Without the addition, the group would continue to be splintered: people moving from the over-crowded family room, through the narrow half-stair, up to the kitchen to grab a snack, and back down again.

My dad had it all figured out: I would create a bigger family room and wider stair, reposition the deck, and add on more space to the garage. After considering his proposal, I asked, "Why don't you test-move the karaoke machine, upstairs to the formal living room? You will have an open singing space directly adjacent to the kitchen and the snacks, which you guys can set up, buffet style, in the adjoining dining room."

My response wasn't what Dad hoped to hear. He was confused. Why hadn't I jumped at the chance to work on my first commission? Moreover, in our house, the formal living room

was off limits to parties and fun. It was the place for the nice stuff, where family heirlooms and expensive furniture stood safe from spills and accidents.

Pretty quickly Dad started to see the benefits of my suggestion. By only moving the karaoke machine (i.e., reprogramming the "living room"), he would have the ideal party spot and save himself from an extensive, costly, and time-intensive renovation. Months later, after a few parties in the new configuration, Dad, a biostatistician, shared that he finally understood the value of what I had learned in architecture school.

THE CHALLENGE:

The architecture industry is extraordinarily undersized in the face of potential demand and utility. Taking a cue from the new business models that emerged in the Dot-Com Revolution, how can our discipline devise new ways of becoming scalable enterprises? Not just in the case where we inject our business models with "tech" and "data," but where architecture itself can sustain scalar growth and impact?

There is a difference between buildings and architecture. While a building is a built structure that provides shelter for the basic activities of daily life, architecture is more layered, performative, and enduring. Think of a window: in my single-family house (a building), a window need only do two things: allow the passage of light and air. Conversely, in a structure designed and delivered by an architect (architecture), a window is the result of a multitude of layered considerations, far more performative in that the architect will have thought through how that window lets in light and air (circulation, passive or active HVAC, east, north, south, or west facing); its materiality, finish, and detail (culture, craft, and history); its proportion and position (spatial efficiency, composition, and symbolism), as well as its technical and material construction (smart window, low-e glass), among so many others. Simply put: while buildings and the built environment are an integral and ubiquitous component of the human experience, architecture is not. In our current models, where the majority of architecture firms are small businesses, focused on the design and delivery of buildings, we may have reached a saturation point. How then, can we redeploy architectural expertise (a superior built environment) as a scalable business?

MODULE 3 - ENTREPRENEURSHIP:

Most people understand a business to be the selling of goods or services for profit. Yet, most students arrive to our class without ever considering that the practice of architecture is actually a business enterprise. Like any business, architecture practice involves profit, loss, risk, management, customers, sales, planning, strategy, and a concept/value proposition. For Entrepreneurship, the course's third module, we challenge the students to rethink the term "successful architecture."

THE CHANGE:

During most of their studio education, our students are not thinking about the business of architecture. Even if their design work involves large-scale issues, their ideas get drilled down and end up

hyper-localized in the design of a single building. While some large buildings can serve up to 30,000 people a day, that pales to the impact of large business enterprises like Google, where a single change to the user experience can affect upwards of one billion people.

To expand their view, our students' third project is to devise a startup idea for the AEC industry. During this process, students put together a basic business plan, devise a marketing pitch, and learn about the AEC industry's capacities and structures. They also explore how to apply their architectural expertise to the creation of new value propositions. These value propositions are assessed not solely for their intellectual merit, but also for their market viability, profitability, and potential to transform the industry, at scale.

After five weeks of brainstorming, research, and conceptual prototyping, the students deliver their ideas in a Shark-Tank-style pitch to entrepreneurship experts and real-world investors. Some projects are advancements on existing business ideas. Others create new services that fill in gaps or take advantages of voids in the industry. In a good number of projects, our invited experts have said, "I can imagine this as a new business idea that would secure a first round of seed funding." At the end of the presentation day, top pitches are recognized, and students, faculty, and guests have exchanged ideas and suggestions.

As they move forward, our students no longer think of their architectural practices as isolated creative endeavors. Rather, they have begun to view their work as interwoven with society—through the multiple lenses of practice, service, and entrepreneurship.

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OPTIMISM AND SHARED INSIGHTS

In the two years we have worked to revamp the professional practice curriculum at Taubman College, I have become ever more optimistic about the near and far future of the discipline. Working with co-teacher Daniel Jacobs on the curriculum, and collaborating with graduate research assistants Akima Brackeen and Olivia Raisanen on the supporting research into public understanding of architecture and design-specific leadership, has helped us to create new pedagogy that builds upon the enthusiasm and passion that we all have for architectural education and practice. As we continue forward, my hope is for our colleagues outside of the academy to reach out to us with ideas and suggestions that will further enrich the work of redefining professional practice education.

Irene Hwang is the Assistant Chair of Architecture at the University of Michigan's Taubman College of Architecture and Urban Planning. She holds a degree in International Relations from the University of Pennsylvania and received her M.Arch from the Harvard University Graduate School of Design. Her ongoing focus is in examining and understanding the impact of architectural thinking and making upon society.

"An adaptable company is one that captures more than its fair share of new opportunities. It's always redefining its 'core business' in ways that open up new avenues for growth."

Gary Hamel

"Simple, clear purpose and principles give rise to complex intelligent behavior. Complex rules and regulations give rise to simple, stupid behavior."

Dee Hock

Every great architect is—necessarily—a great poet. He must be a great original interpreter of his time, his day, his age.

Frank Lloyd Wright

"Innovation demands risk-taking—which, in turn, entails redefining failure, stripping away its power to inhibit."

Lynne Doughtie

"We are called to be architects of the future, not its victims."

Charles Wright

There's always hurdles. So I just keep moving, just constantly redefining myself. That's how you stay in the race.

Isaac Hayes



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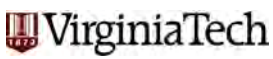

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