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DIALOGUE ON DESIGN
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ISSUE 31.2

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DIALOGUE ON DESIGN

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Kelly Rodriguez
kelly@arcadenw.org

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Erin Kendig
erin@arcadenw.org

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PRINTING
Consolidated Press

ARCADE
1201 Alaskan Way
Pier 56, Suite 200
Seattle WA 98101–2913
206 971 5596
info@arcadenw.org
arcadenw.org
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This list represents support as of 25 February 2013.

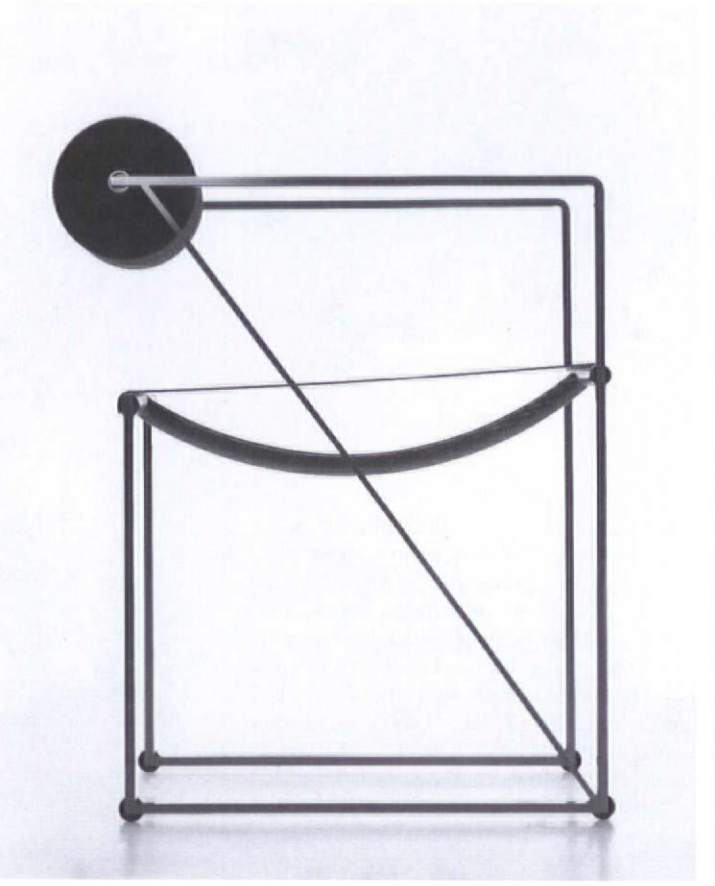
Issue 31.2 Spring 2013

Background photo: The Edna Lawrence Nature Lab at the Rhode Island School of Design, featured on page 45.

Zoom. Italian Design and the Photography of Aldo and Marirosa Ballo An Italian Point of View

Pierluigi Serraino

Photography became the centerpiece in making knowledge of Italian design ubiquitous in the public consciousness, and Aldo and Marirosa Ballo's work brings unequivocal evidence to this claim.



All images in this article from the Collection of Marirosa Toscani Ballo and courtesy of the Bellevue Arts Museum.

Opposite: Osvaldo Borsani/Techno: *D 70*, 1953 50 x 65 CM.

Above: Aldo Ballo and Marirosa Toscani Ballo in their studio in Milan, 1971-72.

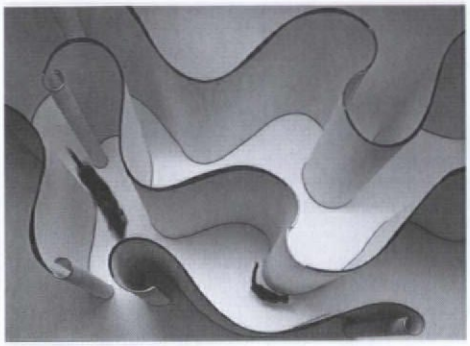
Right: Mario Botta: armchair *Seconda* for Alias, 1982. 50 x 40 CM. Studio Ballo, 1970.

Stereotypes and clichés used to identify specific cultures abound all over the globe. With its own sense of time irrespective to the impatient pace of capitalistic societies, the mythology of postwar Italian lifestyle as manifested in product and industrial design includes a powerful extension of a mindset pervasive in the *Bel Paese*, which can be handily summarized in three actions: indulge, savor, slow down. Italian design expertise, a definite source of national pride that defies times of recession, can be understood as developing from an investment in craftsmanship that began centuries ago and is at the very core of the making of Italian things. While the aesthetic revolution that the Germans brought about in the twentieth-century household and the built environment was predicated on a scientific analysis of human needs, the Italians brought to these realms a hedonistic dimension that was largely absent outside of the country's boundaries, near and far.

The sensorial and visual appeal of the everyday objects in the postwar period found a sustained presence in the consumer market thanks to the efforts of several generations of designers (many of them architects as well) located, for the most part, in Northern Italy with Milan as their headquarters. For those familiar with the geopolitics of the glorious peninsula, Milan is to Italy as New York is to the United States. The stock exchange, the fashion industry, the media empires and the pillars of the national economy were and are still there. Furthermore, the social composition of Italy is essentially a collection of families: Whether it is Fiat (the equivalent of Ford), Ferrari, Versace, Buitoni, Averna or the bakery down the street, all are family businesses. The infrastructure of the small- and medium-sized industries, sectors with strong representation in Northern Italy, constitutes the very elixir needed for the survival of craftsmanship over time beyond the market's predictions. It will come as no surprise, therefore, that both the producers and the messengers of Italian design are also settled in the financial capital of the country. From Northern Italy, designers Gio Ponti, Franco Albini, Luigi Caccia Dominoni, Achille Castiglioni and Marco Zanuso are some of the more prominent names among a staple group of prolific visionaries found in the Italian shaping of interior spaces.

Yet while so much of what speaks to this national design ethos seems indigenous, Italy also took advantage of the changes in the media affecting Western societies around the world after World War II, broadcasting its message of modernity regarding lifestyle. In the '60s, Italy gave birth to the infamous *paparazzi*, ad hoc photographers pestering celebrities to serve the popular readership's unquenchable thirst for gossip. Concurrently, Italy also crafted a highly refined photographic rendition of the stylistic details and elegant sensuality of shapes in Italian design.

Photography became the centerpiece in making knowledge of Italian design ubiquitous in the public consciousness, and Aldo and Marirosa Ballo's work brings unequivocal evidence to this claim. The Bellevue Arts Museum exhibit, *Zoom. Italian Design and the Photography of Aldo and Marirosa Ballo*, comprehensively surveys the career of this venerable couple that was so supremely influential in making (or breaking) the aura of the protagonists of Italian product design in the 40 years following World War II; they immortalized the golden days when the sweeping changes occurring in the workplace and household indeed were registered in the middle class as well. For such an imprint to take place, the Ballos leaned on media infrastructure on the rise the time. The specialized publishing industry was, and still is, a heavy



Luigi Baroli / Baleri Italia: *Cartoon*, 1992. 50 x 65 CM.

De Pas, D'Urbino, Lomazzi / Poltronova: *Joe*, 1970. 50 x 65 CM.

hitter among the players determining the highs and lows of architectural culture. The founding of magazines such as *Casabella* and *Domus* during the rise of Italian Rationalism skyrocketed the demand for photography of a genre yet to be invented. And if architectural photography has in the natural and or built environment its inevitable backdrop, the photography of product design was on its way to establishing its own rhetoric.

If a Heideggerian point of view is to be taken regarding the relationship between design and photography, then furniture, cars, lamps, typewriters, telephones and virtually all human-made objects exist in the real world in settings we can all relate to at a very factual level. These artifacts are intended to extend individual capabilities and enable flow within the prosaic obligations of users' day-to-day lives. At the same time, they also brought to these mundane and utilitarian moments an unprecedented aesthetic experience, in theory available to the masses, but by and large only truly within reach of the ruling class. The type of photography Aldo Ballo and Marirosa Toscani Ballo deliver to us sublimates the platonic suspension of such objects caught between the preciousness of their physicality and the earthliness of their function. Magnifying an object's scale by zooming in on it, as well as isolating pieces in enclosures without planes, or planes without material definition, flooded with artificial light or positioned in unlikely environments disconnected from their intended use, were standard rhetorical strategies shared in photography circles and used to memorialize postwar Italian design. Such pictorial space comes with its strictures because while abstract and elitist, it also acknowledges a critical trait of Italian national folklore: the supremacy of the domestic interior. With all the fanfare accompanying the celebration of outdoor life in The Boot, a frequent cocktail party topic while socializing in California, there exists also a collective Italian distrust in the government, in state-run programs, in everything associated with the politics of the civic realm, and in all that the public sector's care permeates, what belongs to everyone and therefore to no one. The public sector is seen as wasteful and therefore an environment in which to invest neither energy nor resources. Italian industrial design is the ultimate expression of a private sector with its own cultural standards associated with it.

In matters of design, the outcome of such an unbridgeable gap between public and private is an intense focus on the micro-scale, which can be controlled in laboratory conditions by family businesses. The artistry of the Ballos fixes in still, arresting images the countrywide Italian obsession with the small scale, where taste and social status coalesce into design items tied to a very specific class system. In that, authorship plays a monumental role in the marketing of a signature piece. It equates to quality control by manufacturing circles that is as benevolent as it is maniacal. To see Ettore Sottsass next to his creations seals authenticity and distinction to each piece, now immune from the anonymity of mass production. The Ballos' photography zooms into the hyper-reality of furniture fabrics, of keyboards, of kitchenware to aggrandize the uneventful and bring it into the stream of idealized living. All these aesthetic decisions were certainly conscious choices. However, it is the realization of the photographers' agency in the making or breaking of the legendary that is the achievement of our time. To understand why particular images and their creators have become, in time, the face of an era is a big question worthy of rigorous sociological scrutiny. For those with less scholarly but equally notable aims, the high of looking at these photographs or handling these wonderful design gems makes *Zoom* an exhibit most certainly worth remembering.

Zoom. Italian Design and the Photography of Aldo and Marirosa Ballo can be seen at the Bellevue Arts Museum from 15 March – 16 June. *bellevuearts.org*

Pierluigi Serraino is an architect, author and educator. He has lectured extensively on postwar American architecture, California modernism, architectural photography, changes in architectural practice and digital design. Pierluigi's work and writing have been widely published, and he has authored four books, among them *Donald Olsen: Architect of Habitable Abstractions, Modernism Rediscovered* with Julius Shulman, *NorCalMod: Icons of Northern California Modernism* and numerous essays.

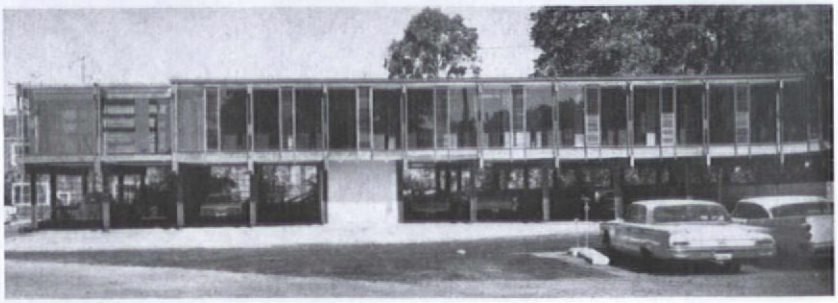
Top: The former Steinhart, Theriault and Anderson office, 1955-56. Photo: Hart Boyd

Above: George Suyama Architects office, 1982-83. Photo: Chris Eden

Above right: Architect Gene Zema's office, 1960-62. Photo: Ray Welch

Right: Kirk Wallace McKinley office, 1959-60. Photo: Western Architect & Engineer, November 1961

All photos except Steinhart courtesy of the Visual Resources Collection, College of Built Environments, University of Washington



NORTHWEST VIGNETTE

Collective Legacy: Architects in Eastlake

Jeffrey Karl Ochsner

Gene Zema was the first architect to build in Seattle's Eastlake neighborhood. In 1953, he acquired a lot at 200 E. Boston Street, at the corner of Eastlake, and constructed a small building on the alley side to house his office. Zema knew the area because he had grown up in the Cascade neighborhood, which in the 1920s and 1930s was home to many Russian immigrant families. He recalls that in the early 1950s, Eastlake was quite inexpensive. The neighborhood included many old houses and, of course, the floating homes, which at that time were often little more than shacks. Zema prospered at the Boston Street location, and in 1960-62 he designed and built a much larger multi-story building around a courtyard. This exemplary work of Northwest Regional Modernism briefly served as his home as well as his office and over time became a gallery for his emerging Japanese antiquities business. In the prologue to the book, *Gene Zema: Architect, Craftsman* (2012), Grant Hildebrand, who worked in Zema's office in the late 1960s, describes the "rich ambience" of the space and notes that his personal fascination with well-crafted building made it "difficult to get anything done."

Steinhart, Theriault and Anderson were next. They acquired the lot at 1264 Eastlake (at the corner of Galer near the intersection of Fairview) and moved into their own office in 1956. For this highly visible site, the firm designed a dramatically cantilevered, minimal glass-box floating above the landscape, reflecting the influence of Mies van der Rohe and, possibly, the example of the California "Case Study" houses (although the Seattle building predated the iconic cantilevered Stahl house in Los Angeles, designed by Pierre Koenig, by four years). The cantilever was achieved using wide-flange steel beams; the rest of the structure is wood frame and floor-to-ceiling glass. The south-facing wall is opaque, but since the building is typically seen from the north or west, the solid side is seldom noticed. A series of thin, horizontal, wood slats on the narrow west end are the one concession to the climatic effects of the western sun. The building was a striking presence when it was built; it remains so today.

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Kirk/Wallace/McKinley relocated to the Eastlake neighborhood when the I-5 freeway construction required the demolition of their rental office at 615 Lakeview. David McKinley recalls the area was quiet, convenient, affordable and had a casual atmosphere that was great for architects. Their new office building, at 2000 Fairview Avenue E., constructed in 1959-60, is a rectilinear structure elevated above parking, exemplifying the systematic application of by-pass wood construction typical of Northwest Regional Modernism. In their *Guide to Architecture in Washington State* (1982), Woodbridge and Montgomery described this building and the community psychiatric clinic to the north (dating from 1962, also by Kirk/Wallace/McKinley), as "refined expressions of the wooden post-and-beam pavilion" and added that "the matchstick quality of the structural expression" was a "hallmark" of Kirk's work. This office building received an AIA Seattle Honor Award in 1961.

In the 1970s other architects moved into the neighborhood. The Bumgardner Partnership moved into the building at 2021 Minor, dating from 1923, in December 1970. The firm remodeled the interior in 1971, cutting a large lightwell/stairway in the middle of the space to connect the two floors, replacing the windows and adding a new entry. Two years later, John Morse relocated his office to 2033 Minor, a house dating from the early twentieth century. The same year, George Suyama moved his firm to 2002 Eastlake. A decade later, Suyama moved again but stayed in the neighborhood. His new office, at 121 E. Boston Street, was a building of his own design. As Hildebrand noted in *Suyama: A Complex Serenity* (2011), the exterior of wood and brick, with a courtyard overlooking the street, "makes a strikingly sympathetic contribution to the ambience of the neighborhood."

By the 1980s, however, many of the first generation of Eastlake architects were moving on. Zema had wound down his office in the mid-1970s and thereafter concentrated on his Japanese antiquities business. He retained the Eastlake office building, which for many years housed his gallery, and he still owns it today. In 1980, Kirk/Wallace/McKinley became McKinley Architects, and by 1984 they relocated to Downtown, Seattle. Bumgardner had moved downtown a year or two earlier. Steinhart, Theriault, and Associates maintained an address on Eastlake for 30 years, but their practice slowed by the mid-1970s. Since the 1980s their building has been occupied by others. Suyama moved his firm to Belltown in 1997; his former space is now a restaurant.

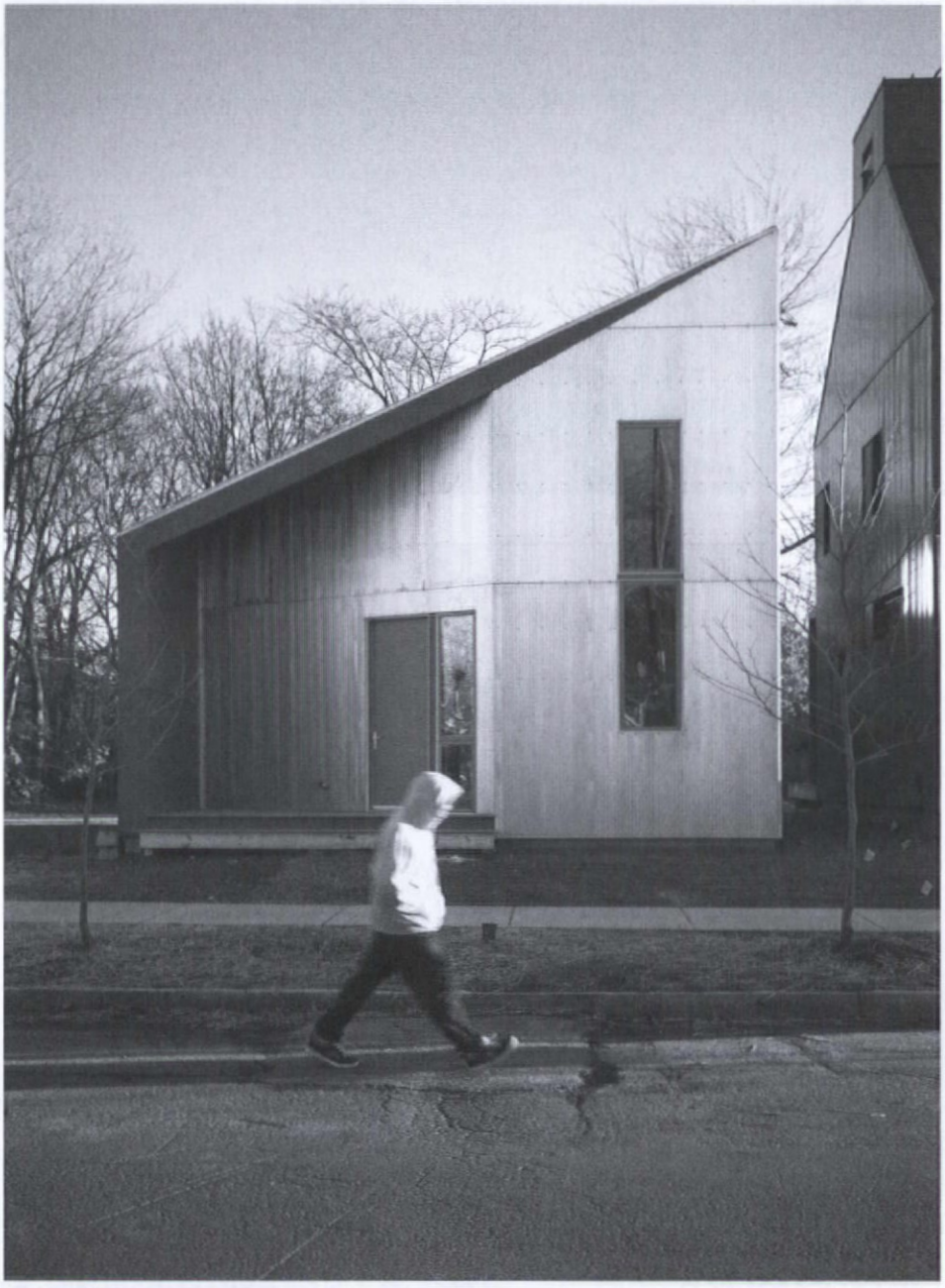
Architects still have offices in Eastlake today—too many of them to name here. Few, however, have constructed their own buildings. The built legacy of the architects from the early 1950s to the early 1980s is a remarkable one—a reminder of the emergence of Northwest Regional Modernism and of a generation of architects who contributed so much to the city.

Jeffrey Karl Ochsner is a professor in the Department of Architecture at the University of Washington. He is the author of *Lionel H. Pries, Architect, Artist Educator: From Arts and Crafts to Modern Architecture* (2007) and *Furniture Studio: Materials, Craft and Architecture* (2012). **He thanks Gene Zema, David McKinley and Jennie Sue Brown for sharing their recollections.**

PRACTICE

When the Dog Catches the Bumper

An Interview with Jared Della Valle by BUILD llc



R-House, Syracuse, NY. Photo: Richard Barnes

Last year, BUILD got to know Jared Della Valle at the Reinvention 2011 event in Phoenix, Arizona. We were astounded by his bandwidth, professional diversity and architectural accomplishments. Last summer, we sat down with Jared in Manhattan, where we got caught up on the architect-as-developer model and working in the new economy.

BUILD: You have master's degrees in both architecture and construction management from Washington University, you are a licensed architect in the state of New York and also hold a real estate license. What triggered you to tackle such a wide range of professional endeavors?

Jared Della Valle: I can't say that I've had an explicit trajectory—I did carpentry and furniture building in high school, and I have always worked hard. I decided that I wanted to work for a builder, so I found this crazy guy in New York City who was like the architect's builder. I got his name from Tod Williams, and he built stuff for people like Henry Smith Miller. At the time, he was working for all the good architects.

I was there for five years, and I built some crazy stuff like Ian Schrager's apartment, a $4.5M renovation done in ten weeks. It was one of those situations where you can only work between Memorial Day and Labor Day, and you can't do construction any other time, so there's no missing it. We had a separate millworker in every single room. This was a very high-end, $1,000 per square-foot sort of renovation. It was a great exercise in learning how to build. The more high-end work I did, the more people trusted me; subsequently, I took on more important work and a greater diversity of roles on the jobsite.

What were your first projects like? How did you get off the ground?

I was so young, none of my clients had money. It was small stuff, like working for family members of my business partner at the time,

245 Tenth Avenue, New York, NY. Photo: Andrew Bernheimer

As an architect, you can't look for work—people have to find you. You don't know when someone's going to renovate. So, I decided that I wasn't going to wait, and I started spending all my nights looking for real estate.

Andy. His sister hired us to do an addition. Or it was work for myself.

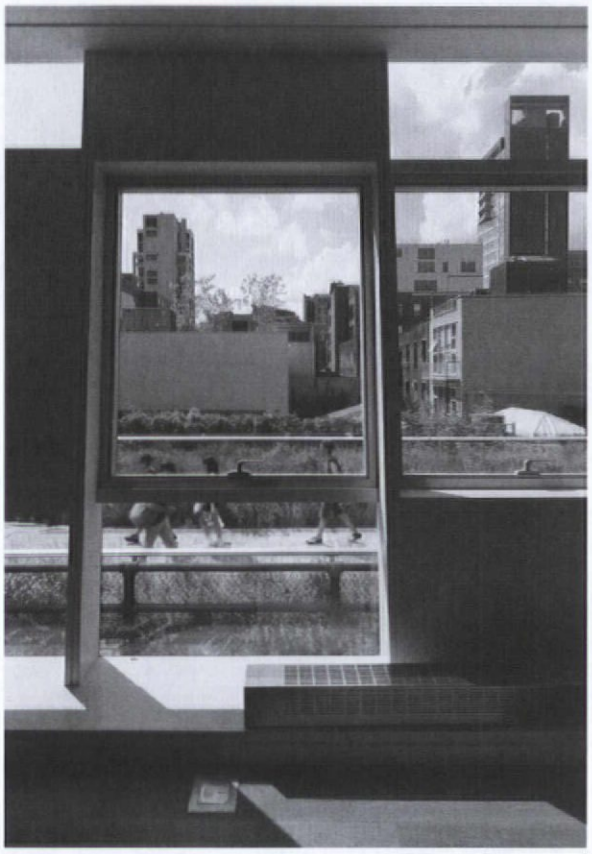
In New York City, it's so hard because everything is an interiors job. To get a new building is impossible. In construction management school, I had to take two business classes. One was just accounting, and the other was how to write a business plan. So I was working at the construction company, and we were starting our own work. We were on our third interiors project, and I was thinking to myself, *this is not what I want to do, this is stupid. I don't want to do interiors, I want to build something here in the city*—and I didn't want to wait.

As an architect, you can't look for work—people have to find you. You don't know when someone's going to renovate. So, I decided that I wasn't going to wait, and I started spending all my nights looking for real estate. It was before the internet was really prevalent, so I was literally walking around looking at buildings. Then I would have this broker of mine approach the owners. He was older and looked the part. With him being in front of me, no one ever knew how young I was. So I just started putting offers on buildings, and I would force myself to write business plans for the deals I was looking at.

When an offer would come in, I'd tell them to send it to my attorney. My attorney was a friend of mine, and I'd tell him to just sit on it while I wrote the business plan to get the cash. I'd get it all wrong because I never took any real estate classes. I was using all the wrong words; I didn't know how to do underwriting for it. I didn't know how to do any of this.

Did you get the wrinkles ironed out by the time it went through your lawyer?

No, I actually never had him look at anything because I didn't want to pay for him.



Interior at 245 Tenth Avenue, New York, NY. Photo: Andrew Bernheimer

How did you avoid getting screwed over in these deals?
I didn't get anything done for years. I spent all my time networking with people, telling them that I've got this deal and do they want to invest? I explained that I'd do the architecture, which was great—no one ever questioned that I would be the architect. I just threw it all out there, and I'd meet people I knew who worked for banks or whoever. And over time I figured out how to write a pro-forma. I'd ask for examples of projects that impressed people, and I'd work it all backwards to see what the numbers should look like. I'd reverse engineer the Excel sheets.

But you learned all that while getting paid, right?
Yes, but as the architect. I was young, and it didn't matter. I wasn't married, I didn't have any kids. Over time, I started to learn what worked and what didn't with presentations. I started to learn how to ask for a lot of money. What are the pitfalls, what are the important questions, what do you give up?

How do you ask an investor or a bank or an organization for a large sum of money?
The person that you're most likely going to get the money from you show the deal last. You learn from everybody else exactly what is wrong and what questions you should be ready to answer, so that you're ready to go in and ask somebody who is actually going to write the check. You figure out who that person is, and you go to them last. You start seeing when people are interested.

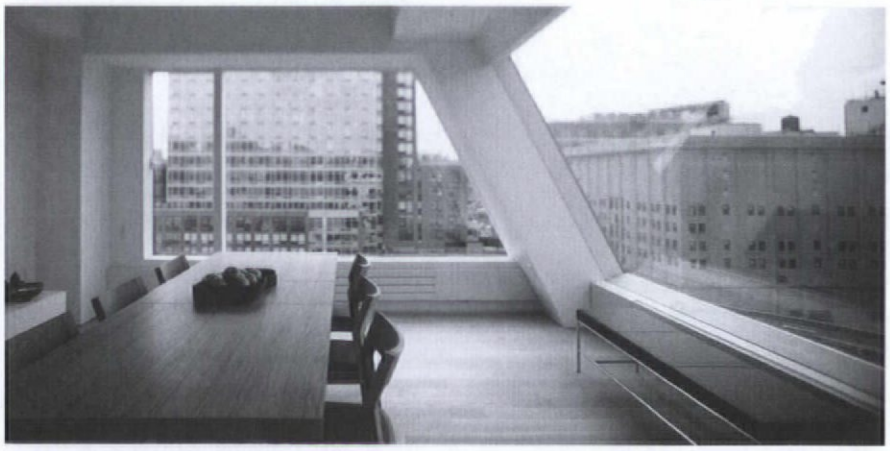
You learn that great deals are very easy to finance, and okay deals are very hard to finance.

Your current projects are measured in tens of thousands of square feet, yet you've worked with smaller scale projects like your 1,100 square-foot R-House in Syracuse. How do you effectively shift gears between large and small projects?
The smallest stuff that we would do now needs to be personal to me. It's got to be millions of dollars, or I'd rather give the work away to non-profits.

You recently released your book, *Think/Make*, published by Princeton Architecture Press. What did you most want to convey to the world with this book?
The message I wanted to get out to the world was be resourceful. It doesn't matter what you are doing. If you don't have the resources, figure it out. Ask a lot of questions. Go for it. Don't worry about failure. There's no other way but to get out there, be scrappy and get it done. Nobody is going to do it for you.

There's no other way but to get out there, be scrappy and get it done. Nobody is going to do it for you.

I'm writing my will right now for my kids. At the end of the day, I'm going to have an estate that's worth real value. But I don't want my kids to grow up feeling like it's theirs. I've got crazy stuff in my will, like dollar matching for when they save money. If they want access to the cash, they can propose a business plan to the trustees, and the trust will pay for business advisors to help them get there and review the business plan. Basically, they can't just have the money—not until they're older do they get access. Until then, I'll pay for all the education, but I'm trying to teach them that they need to have a goal and a meaningful career choice that they're passionate about and try hard



459 West 18th Street, New York, NY. Photo: Andrew Bernheimer

459 West 18th Street, New York, NY. Photo: Andrew Bernheimer

at. And if they have a great idea, I'll support that. It's impossible to teach work ethic.

If you're in your 20s or 30s and you're unmarried, my advice is to work hard. You don't have to get home early. You can balance having a social life and working really hard. You can focus on career choices and make long-term decisions.

When you first started out in New York City, you considered yourself to be an outsider. How did being an outsider benefit your career?

Going to Washington University and moving to New York, Andy and I had no network. But it made us feel like we had something to prove. It made us scrappy. We didn't know anybody anywhere in New York City, so we just started attending everything.

Your Glenmore Gardens housing project in Brooklyn was constructed for $127 per square foot. How on earth did you build good, modern design so cost-effectively in New York of all places?

It was a request for proposals from developers, and we submitted as developers with no experience, but we're architects. All the other developers just copied stuff for the RFP that they had done last time. On the other hand, we treated it like a design competition. We did a lot of work up front and a lot of drawings—most of this stuff we would normally give away anyway. And the City said, OK, let's see what happens. The City has all of these crazy design guidelines, and we broke every one of them. The buildings had to be brick, the cabinets had to have raised panel doors, and we just fought them on everything. We said *the intent of your rules is to make sure that affordable housing meets a certain quality standard, so we're going to prove to you that we have good intent and are interested in good design, and as a result, you should give us some latitude.* We showed that their rules weren't really applicable. At the end of the day, they let us do whatever we wanted because we proved our intentions.

We tried so hard, it took two years. It was a labor of love. We found one of the affordable builders who would do the work for $80 per square foot, and we convinced him to do this project for $110 per square foot. There was only about 20k of change orders on the whole job. He did a great job, but we drove him mad.

It was incredibly rewarding, and the units still look great. People take care of them.

Jared Della Valle has been a real estate professional and architect for more than 15 years. He is president of Alloy Development LLC, a real estate development company he established in 2006 with partner Katherine McConvey. He has been involved in many significant projects, including 192 Water Street in Brooklyn, 459 West 18th Street in New York City, Glenmore Gardens Homes in Brooklyn and 245 Tenth Avenue abutting the High Line. *alloyllc.com*

BUILD llc is an industrious design-build firm in Seattle run by Kevin Eckert and Andrew van Leeuwen. The firm's work focuses on permanence, sustainability and efficiency. BUILD llc maintains an architectural office and a cabinet shop and is most known for their cultural leadership on their blog. BUILD team member Charles Caldwell contributes to the ARCADE interview series. *blog.buildllc.com.*

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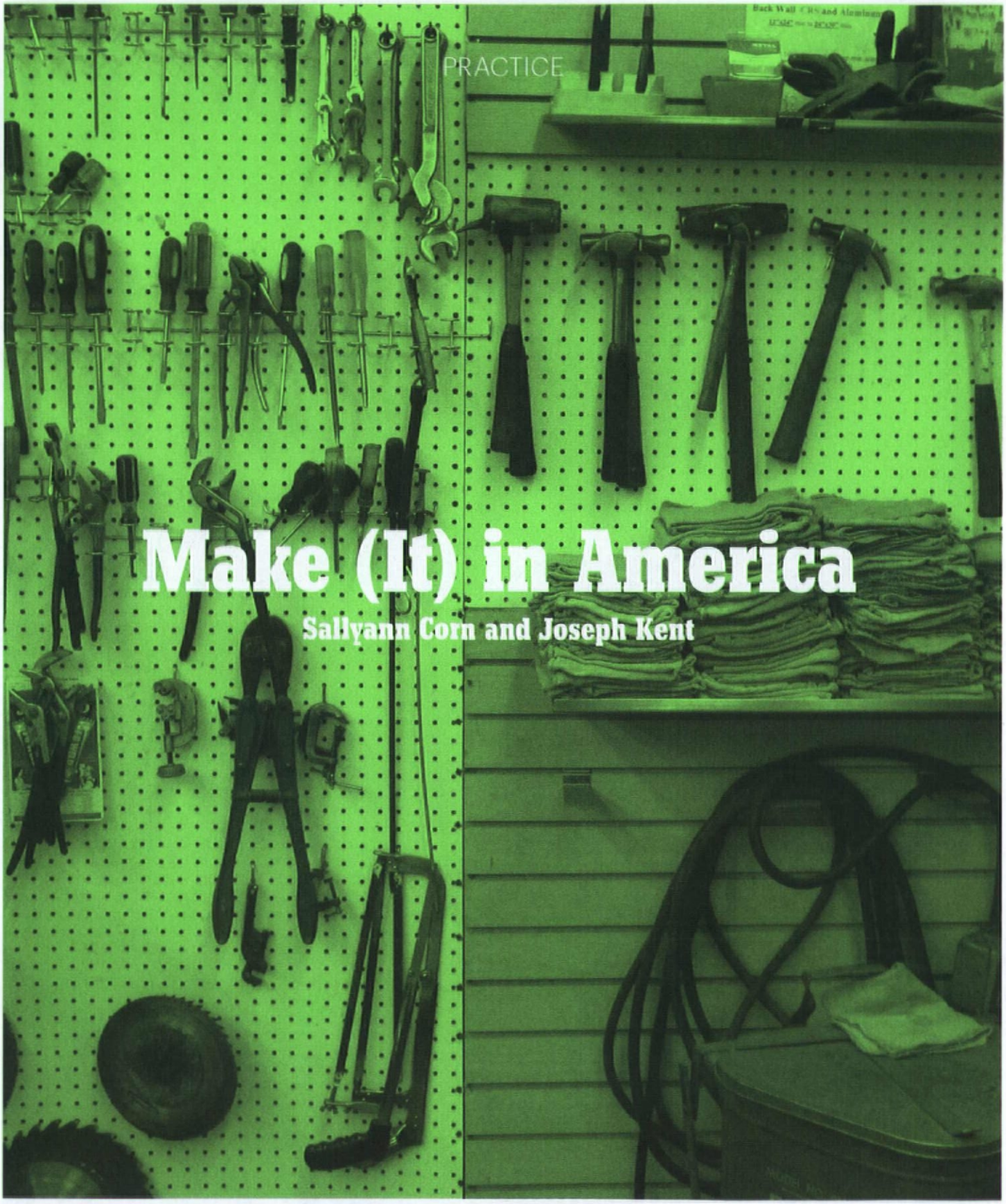
PRACTICE

Make (It) in America

Sallyann Corn and Joseph Kent



Pacer Design Metal, Seattle, WA. Photo: Sallyann Corn

It seemed like such a simple idea: design and launch a line of products made in the USA that emphasized quality and fun. We had read all of the articles about hungry American manufacturers and shaken our fists at the big box retailers pushing manufacturing off shore in search of quick profits. Our business model was fairly straightforward: design products that we would feel good about buying ourselves. Choosing to manufacture in the US meant we could actually visit the factories, save shipping time *and* help boost our local economy. *We* were going to make a difference and help start the American manufacturing revolution!

We miss being this naïve.

Wisconsin Lighting, New Richmond, WI. Photo: Sallyann Corn

A BRIEF AND ENTIRELY UNSCIENTIFIC LOOK AT THE AMERICAN MANUFACTURING LANDSCAPE

First off, the American manufacturers that exist today are survivors. These businesses have seen their peers ravaged and gutted and have been hardened. Most have found a unique niche in their field—a niche that keeps their lights on, their machines running and their staff employed. Many have been burned by entrepreneurs with the next "big idea," and are understandably wary of new ventures outside of their freshly-carved niche. Determined, they cling onto advantages they may have—things that overseas manufacturers can't yet do faster/cheaper/better. Proficiencies such as short-run, high-quality, semi-custom, high-margin, or fully-automated. Their communication can be a little jaded, a little gruff and a little nonexistent. To be fair, they have watched as clients utilize their expertise, working through a manufacturing process, only to later be dropped for a Shenzhen factory that offers higher volume production and lower pricing.

So, what's it like working with American manufacturers? In one word—frustrating. Many simply never reply to inquiries. And sometimes it's worse when they do. The process can be maddening and even illogical. We have often found ourselves ranting, "This is no way to run a business!" Some manufacturers ship inexplicably late, some send too many parts, some send the wrong parts and some go incommunicado for months at a time.

MAKING IT HAPPEN

Only now, after two years, have we gained a bit of insight into the nuances of working with American manufacturers. We now know that these survivors are indeed still hungry, while also understandably hesitant. The good news is we're much smarter now than when we started, and it *is* getting easier. We are by no means experts, but in the hopes of helping others down this path, we'd love to share a few lessons we've learned along the way.

Do your research. It seems like a simple thing, but knowing a manufacturer's capabilities will save everyone a lot of time. Having even a minimal knowledge base of their particular niche will show that you're committed and appreciative of their time.

Build a relationship. Factory owners are people, too. Be clear and upfront about what your expectations are. Pay invoices on time, respond quickly and clearly, and do not assume anything. Ask questions and know when to pick your battles.

Get a recommendation. If you know others who work with US manufacturers, ask their advice. We constantly share the names of manufacturers with whom we've worked (well). New opportunities help ensure a factory stays in business—while building upon now-established relationships.

Know your scale. If you can describe yourself as any of the following – new, unproven, or small-scale – you don't have a lot of clout. This is hard to hear, but it's true. This doesn't mean you're not important to manufacturers, it just means that only as you continually build your relationships with them will this change.

Pick the right process. If you tailor your product idea to fit within a manufacturer's current capabilities, you will have much more initial success. For example, if they are currently compression molding rubber gaskets, asking them to make silicone jewelry might be a stretch. In most cases, if they aren't already set up to make something very similar to what you're looking for, you won't even get your foot in the door. At the very least, you will be setting yourself up for a communication nightmare. Only once you build a relationship can you start pushing their processes.

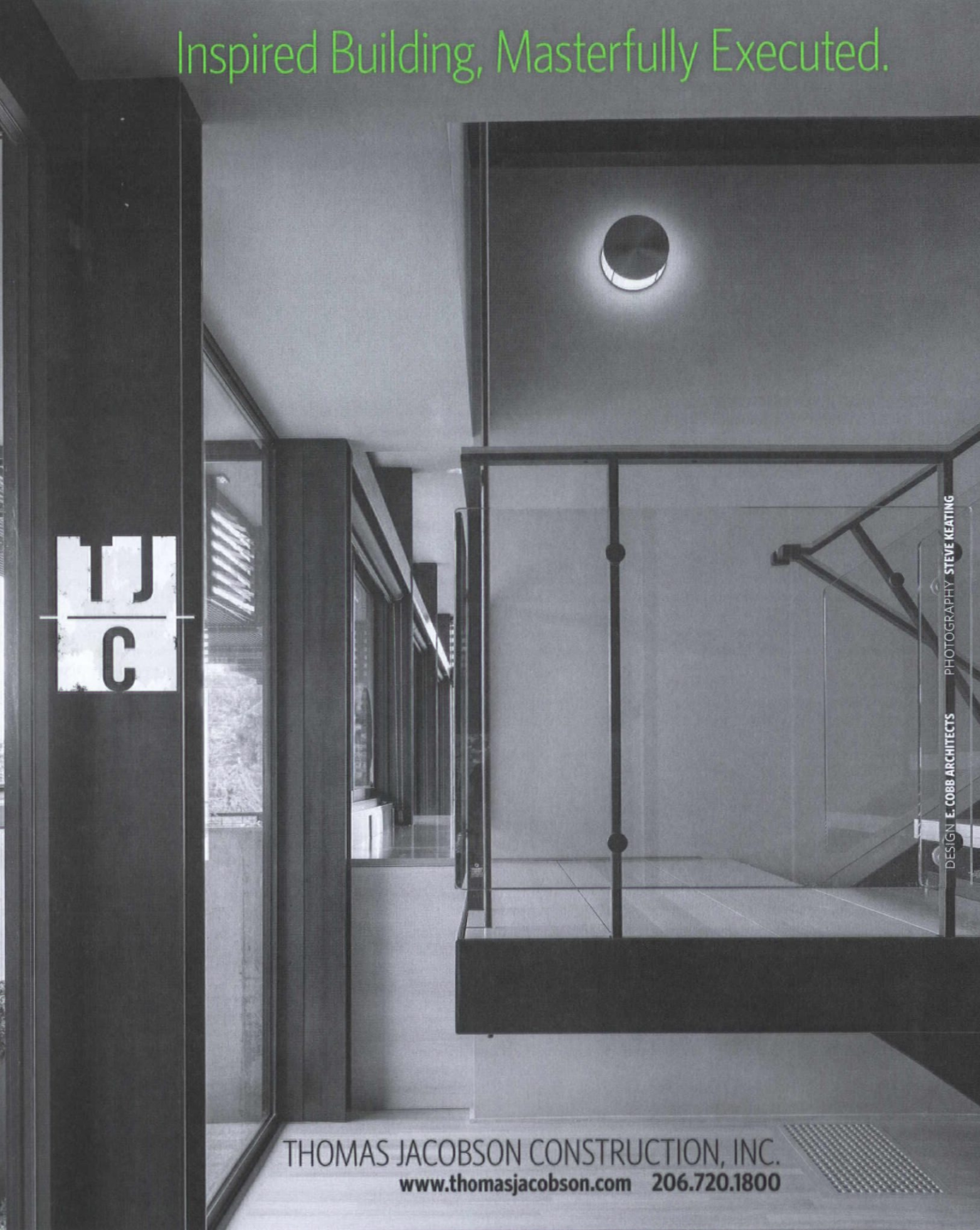
Recognize their time and investment. When you begin working with a new manufacturer, understand that they are taking time for you that could be spent elsewhere. And remember, there is no such thing as a free lunch. Be ready and willing to pay for prototyping services, samples and their time.

SILVER LINING

Making (it) in America? Aside from being somewhat stubborn and really wanting our path to work, the moment when we find a manufacturer that actually *gets it* is incredibly rewarding. Working with a manufacturer that is willing to learn and grow with us is the best part of the bringing-a-product-to-market process. Together, we're helping maintain jobs in the USA, stimulate the local economy *and* we're very proud of the quality products we're creating.

Right now, we're lucky to be working with a small group of manufacturers who understand our goals. It's a very short list, but we're working on it.

fruitsuper design is a Seattle-based design duo run by Sallyann Corn and Joseph Kent. One-part design consultancy, one-part product development and three-parts "serious fun," you'll usually find them buried in the design section at the local bookstore. To share manufacturing horror stories or revel in small manufacturing victories, contact them at info@fruitsuperdesign.com.
fruitsuperdesign.com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STEM + A =

STEAM

We are trained at a young age to separate art from the core subjects of our studies. Students are unknowingly squeezed through a series of tightly fitted molds on their way from elementary school into adulthood, fully accepting an assumed fact that we spend less time teaching art because it is frivolous in the shadows of science and math. The truth of the matter is that these basic topics of art and science are more closely related than not, and the overlap is more relevant now than ever. The STEM subjects (Science, Technology, Engineering, Mathematics) are no longer adequate to describe the needs of our society. Our contemporary world craves empathy and understanding in the face of an intensified onset of technological advances and a decline in direct interpersonal communication. Art and design can offer just that. The equation is simple:

STEM + A (Art and Design thinking) = STEAM

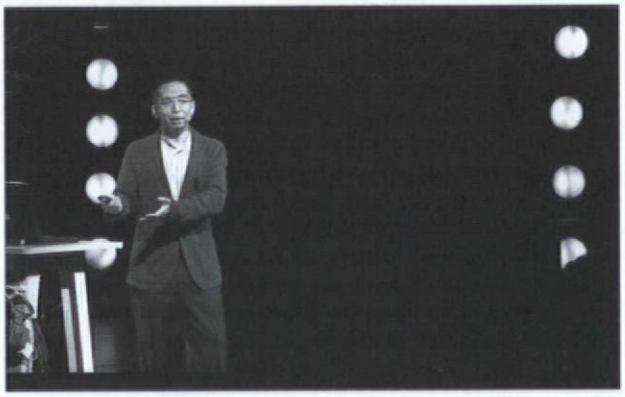
This ARCADE feature section brings together the perspectives of experienced educators, design and scientific professionals and current students, to paint, if you will, a compelling landscape of STEAM at work today. The following pages affirm the value of creativity in the twenty-first century, highlighting efforts in classrooms, laboratories and studios to challenge the way we traditionally consider learning and creating.

The contributors to this issue of ARCADE represent only a fraction of the individuals and organizations committed to turning STEM into STEAM. Whether you are an artist, designer, technologist or student, the shift toward STEAM is vital; creativity is essential to American progress. We can no longer deny the importance of an arts education, for the artists' and designers' pursuit of expression – to make an impact – gives new life to innovation and our future. ▲

Sarah Pease is a student designer, maker and researcher at the Rhode Island School of Design (RISD). She is the founder and president of the RISD STEAM club and a research assistant for the STEM to STEAM initiative at RISD. Sarah has explored the principals of STEAM in her own work as a visiting student at the MIT Media Lab and continues to do so in her senior year in the Department of Furniture Design.

John Maeda

STEAM: Adding Art and Design to STEM



John Maeda speaking at TED, June 2012.
Source: http://youtu.be/WAuDCOI9qrk

When I was young, my teachers praised me for being good at math and art, but my father would always tell people, "John is good at math." I felt I had to choose between the two, and with my parents' influence winning over my own, I went to MIT. After many years there, I saw technology succeeding in making everything cheaper, faster and smaller—but failing to make things any more emotionally rich. Something else was needed to transform our experience and inspire true innovation. I believe what was missing was design and art, and it was this belief that propelled me into leading the Rhode Island School of Design (RISD).

Here in the US, the White House reminds us that science, technology, engineering and mathematics are "... essential to virtually every goal we have as a nation—whether it's broadly shared economic prosperity, international competitiveness, a strong national defense, a clean energy future, or longer, healthier lives." Around the world, even small countries such as Estonia are focusing on teaching coding, positing that technological literacy will be key to future innovation. As a lifelong STEM (Science, Technology, Engineering, Math) student myself, I've seen firsthand the innovation that STEM practice can produce. But I've also witnessed STEM's limits. The challenges the next generation is going to face will demand creative solutions, and I would argue that these subjects alone will not get us there. Innovation happens when convergent thinkers, those who march straight ahead toward their goals, combine forces with divergent thinkers, those who professionally wander, who are comfortable being uncomfortable.

With global competition rising, America is at a critical juncture in defining its economic future. I believe that art and design are poised to transform our economy in the twenty-first century, like science and technology did in the last century, and the STEAM movement – *adding Art to STEM* – is an opportunity for America to sustain its role as a world innovator.

John Maeda is a leader who integrates technology, design and leadership into a twenty-first century synthesis of creativity and innovation. An artist, graphic designer, computer scientist and president of RISD, he is leading the movement to transform STEM (Science, Technology, Engineering and Math) to STEAM by adding Art.
stemtosteam.org

MAKING THE REAL

In our heavily digital age, we're seeing renewed curiosity about materials and all things physical, simply because much of the world has lost sight of them. You see this in the obsession with placing faux woodgrain veneers on software apps, for example. My experience at RISD has reawakened me to this world of physical creation. Here, there is no greater manifestation of integrity, no greater goal achieved, than an idea articulately expressed through something made with your hands. We call this constant dialogue between eye, mind and hand "critical thinking – critical making." It's an education in getting your hands dirty, in understanding why you made what you made and owning the impact of that work in the world. It's what artists and designers do.

PRODUCTS WITH ARTISTIC VISION

Artists are not as interested in fitting in or feeling comfortable as in getting to the *truth* at the core of an enigma. In the late Steve Jobs's case, he painstakingly pursued the question of what a digital ecosystem that transcends mere relevance and basic needs could mean for contemporary culture. We buy Apple products not just because they function, not just because they're well designed, but out of respect for his vision and what it brought us. We buy into the vision of the world he was trying to create and the values they represent. And for this, we are happy to pay a little extra.

Art and science – once inextricably linked, both dedicated to finding truth and beauty – are better together than apart.

Art speaks to us as humans, not as "human capital." It shows us that human beings still matter in a world where money speaks loudest, machines make our meals and computers know everything about us. In a world in which new breaches of integrity are revealed every day, it's important for us to hold on to clear values. We want the products we buy to be made responsibly, presented honestly and come from the mind of a human being, not an algorithm.

ART + SCIENCE REUNITE

So how do we have more of these successes? I'm not talking about commercializing or debasing art but reminding people that innovation and cultural advancement stem from an artistic sensibility. After a life spent traversing the fields of technology, art and design, my conclusion is that there is great power in both fields taken separately and more in both fields put together.

Art and science – once inextricably linked, both dedicated to finding truth and beauty – are better together than apart. In da Vinci's time of naturalist observation, the two cohabitated. "Art is the queen of all sciences, communicating knowledge to all the generations of the world," he said. Today, many artists and designers are making headway in visualizing much more complex scientific concepts in forms that make sense to people, and what's more, emotionally compel them to act. Just recently at RISD, we had a studio course dedicated to the concept of communicating medical risk, so that patients could make truly informed decisions. Similarly, there is a body of work being conducted here that pairs artists with oceanographers to address the global crisis of climate change. The work of the artist and designer in this context is not just to package the results of the scientists but to enrich the questions that are being asked.

With all that we have to address in the world – warming climates, fluctuating economies, growing cities – finding a solution driven by art and design may not be our leaders' first inclination. But artists and designers – in partnership with those developing scientific and technical solutions – can ask deep questions, bring humanity to the problem, make us care and create answers that resonate with our values. And that's what will propel us forward. ▲

Background image: Inside the RISD Museum of Art.

Babette Allina

The Evolution of a Game-Changing Acronym: Why Government Recognition of STEAM is Critical

Babette Allina is an artist and research policy expert at RISD where she serves as director of government relations. Previously, Allina worked to develop funding for large-scale life-sciences research at the University of Rhode Island, spanning agencies that include the NSF, DoD and DoE. In her artwork, Allina explores the intersection of art and science, most recently visualizing the efficacy of pharmaceutical inhibitors to arrest bacterial growth.

Back in the 1990s, federal investments in Science, Math, Technology and Engineering were conveniently bundled to make SMET. The National Science Foundation (NSF) led the charge, mandated to provide access and support for an increasingly diverse population in the "...attainment of SMET degrees, workforce entry and research participation." An advisory committee to NSF, the Committee on Equal Opportunities in Science and Engineering (CEOSE), put it this way: "In order to maintain its global leadership, America must ensure [all] our citizens can meet the demands of a more scientifically – and technologically – centered world," including "... fostering the national science and engineering workforce more broadly."

Then some smart person at the NSF decided on "STEM"—same concept but a less "smutty" sounding alternative. Like SMET, STEM refers to the fields of Science, Technology, Engineering and Math. It does not necessarily imply cross-disciplinary interaction, although there is a push for "integrative STEM education" that looks to a broader application of technology in education. Generally, STEM education exists to support our nation's readiness in STEM fields, and it all comes down to US competitiveness and maintaining a position of global leadership. A follow-up report issued by the National Science and Technology Council in 2011 showed 2010 federal agency investments in STEM totaling $3.4 billion. CEOSE has called for even greater support for equal access to STEM education opportunities, citing among other findings that in 2010, only 10% of both the African American and Asian and Pacific Islander populations were conferred advanced STEM degrees.

Enter STEAM – adding Art and Design to STEM – an integrative approach to education and research that industry support and arts education research is beginning to show will advance US capabilities in innovation and export-

A research assistant works on organizing the STEMtoSTEAM network.
Photo: David O'Connor

Government agencies are also acknowledging that collaboration between art and science can result in innovation that may not otherwise be possible without the thinking that happens when both disciplines come together.

able knowledge. Programs at the NSF such as the Informal Science Education (ISE) program have seen an increase in funding – in the case of ISE, from $4.6 million to $34.6 million between 1984 and 1994 – and are now making exploratory investments in STEAM. A recent study issued by the National Endowment for the Arts (NEA), "The Arts and Achievement in At-Risk Youth: Findings from Four Longitudinal Studies," found a correlation between arts engagement and high performance on science and writing tests.

STEAM is unquestionably gaining traction as a movement in governmental and research circles. House Resolution 319, introduced by Representative Jim Langevin (D-RI), "expresses the sense of the House of Representatives that adding art and design into federal programs that target Science, Technology, Engineering and Math (STEM) fields encourages innovation and economic growth in the United States."

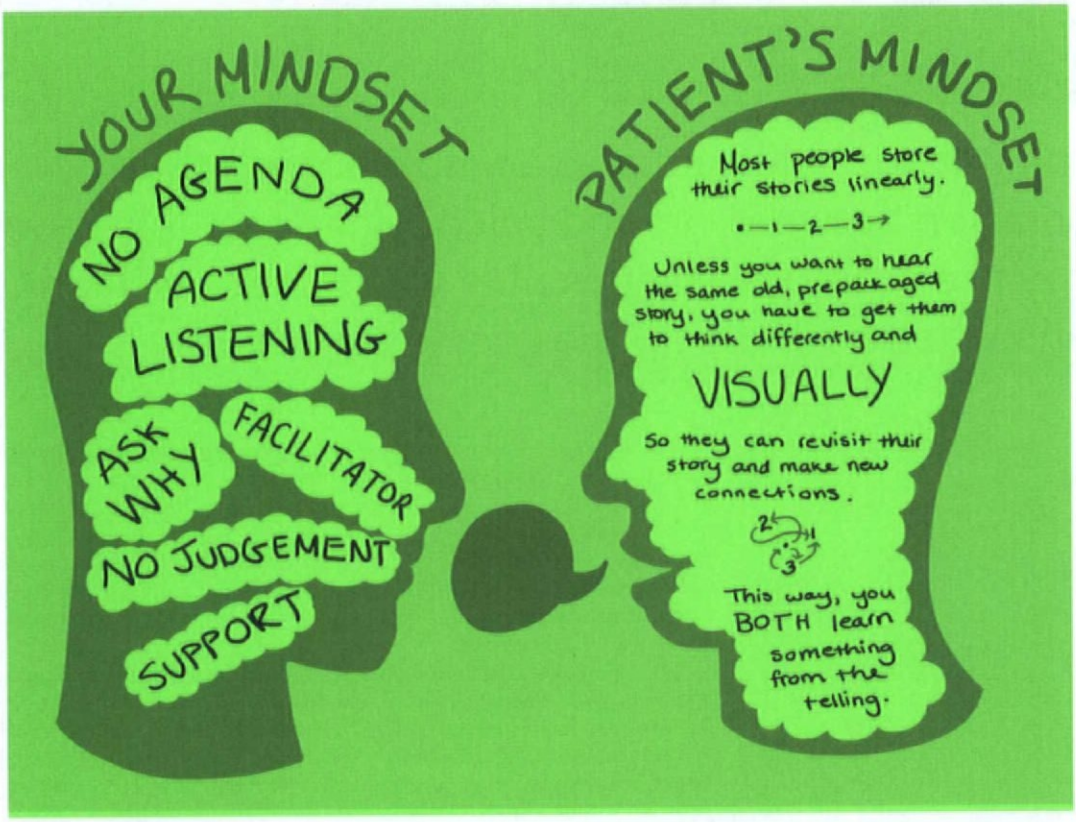
Government agencies are also acknowledging that collaboration between art and science – two areas that have, over time, become divided – can result in innovation that may not otherwise be possible without the thinking that happens when both disciplines come together. In a sense, the whole becomes greater than the sum of its parts. Among recent investments in exploring the idea of STEAM, the NSF funded a series of workshops, one of which took place at RISD, that sought to develop new frameworks for Art/Science pedagogy. From the other side of the spectrum, The NEA has made a major push around what they call ArtScience initiatives, including hosting an event this June about the intersection of art, science and technology.

Whether today's generation goes on to become lawyers, doctors, artists or politicians, we know that the many challenges they will face will require unconventional solutions.

The public's growing recognition of the great power of creative thinking to produce positive outcomes with economic impact, and government's acknowledgement and support of this, is critical. Collaborative efforts in STEAM areas in research, education, policy and beyond will sustain America's foothold as a global leader in innovation. ▲

Samantha Dempsey

Radical Collaborations



Illustrations courtesy Samantha Dempsey

The summer I spent as an experimental illustrator at the Mayo Clinic Center for Innovation (CFI) in Rochester, Minnesota, followed none of the predictions I'd made about how a Rhode Island School of Design (RISD) student, science enthusiast and born-and-bred New Englander would spend her summer. First of all, I never expected to spend so much time around so much corn. Second, I never knew that the radical collaborations happening at the CFI could exist beyond my daydreams. The CFI is a multidisciplinary team of designers and healthcare providers who collaborate and ask difficult questions to revolutionize healthcare. For one summer, I had the opportunity to join this brilliant team and revolutionize my own understanding of design.

My Minnesotan adventure began when I was awarded a Maharam STEAM fellowship, which supports RISD students who propose a unique internship with a government agency or nonprofit organization to explore how art and design can effect change in policy and practice. As a senior in illustration at RISD, this fellowship was my key into a strange new world of social innovation.

Samantha Dempsey is a senior in illustration at RISD and the daughter of two engineers. She is always on the lookout for the fuzzy areas where art and science combine. *grouchycow.com*

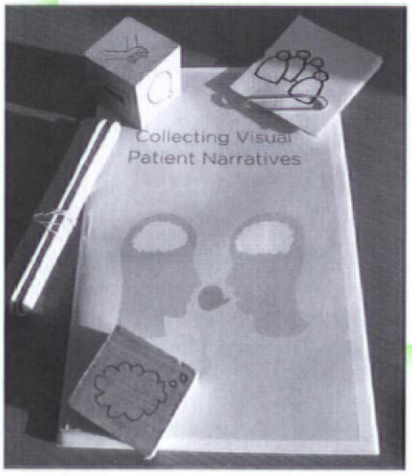
With the support of my fellowship, I arrived at the CFI and began exploring. I started collaborating with the Practice Redesign team, in which I created medical illustrations embedded in experimental education videos. I next worked with the Community Health Transformation team to develop a method of real-time doctor/patient conversation capture to facilitate shared understanding of primary care visits. In my third project, I completed a series of wordless comics illustrating patient stories that communicated an experimental Care Team approach. Next, I created an animation for the Center for Individualized Medicine to visually explain the complexity of exome sequencing, while still keeping the patient experience at the forefront of the conversation.

These collaborations altered my understanding of what it means to be a "designer," but my final project allowed me to explore the unique value of an illustrator within a design community. Working closely with Lorna Ross, the inspirational design manager of the CFI, I proposed, designed and executed my own experiment based on two assumptions: 1) patient stories have value and 2) in order to reveal that value, we must collect these stories. I wanted to discover the aspects of patient life that normal methods of collecting data failed to reveal. Designers working in a data-driven environment like the Clinic are encouraged to present their findings in measurable terms. However, there are parts of the patient experience that can't be quantified. How do you measure the difference between when a patient trusts her surgeon and when she doesn't? I wanted to reveal the untapped, non-metric wealth of information within patient stories and give others a way to record it.

There are parts of the patient experience that can't be quantified. How do you measure the difference between when a patient trusts her surgeon and when she doesn't? I wanted to reveal the untapped, non-metric wealth of information within patient stories and give others a way to record it.

I began interviewing patients without an agenda, listening to whatever stories they wanted to tell. Once patients understood that there was someone who wanted to listen, their stories came pouring out. This free exploration revealed things which I would never have known to ask about.

The process involved patients thinking, talking and drawing about their experiences in a new way. Most people store stories linearly and verbally. I needed to get them to think differently so we could avoid the same old, prepackaged narratives, which wouldn't provide us with any new information. When patients began telling their narratives visually, they began to make new connections within old stories. Using visuals allowed one woman to reveal how her doctor's judgment of her religious beliefs affected her ability to seek care. Both the patient and I learned something from this kind of retelling.



My colleagues on the design team asked me to create kits that would allow other groups at Mayo to collect visual patient narratives. The kits combine placemat-like maps of the human body, concentric circles describing influence and word association charts on which patients draw directly. They also contain image dice, symbol cards, stickers and a how-to workbook. The CFI currently uses the kit to introduce design thinking to providers and allow resident designers to gather new kinds of patient data, and Mayo medical students also use the kit to comprehend the larger context of patient care. The Center for the Humanities in Medicine uses the kit to engage patients in therapeutic visual storytelling and create a library of patient stories to benefit future members of the clinic.

The Mayo Clinic Center for Innovation is something far bigger than any single designer, provider or illustrator. It's a tangled web of active thinkers who ask questions that may not have answers. I've learned from them that design isn't just part of the solution. Design changes how we see the problem. ▲

Lizzie Kripke

Scientific Artistry: Unlocking the Biology of Pure White

With technology as a vehicle, we fused artistic and scientific methods, exposing not only some of the inner workings of nature but also a fertile common ground between science and art.

Linen-swept summer-ites sporting fresh tans and bleached Top Siders drift along the only main street in town. The road is lined with sailboats and sea shops. It's not a bad place to kill time before catching the ferry to Martha's Vineyard, docked just a few yards down. No, Woods Hole, on the southwestern tip of Cape Cod, is not a bad place to be at all...it's just not exactly how one might envision the world's foremost scientific community for cutting-edge marine research. But no one's complaining. Science is simply encountered differently here, and seeing beyond the apparent is a recurring theme.

I arrived in Woods Hole seeking to integrate artistic and scientific methods of problem solving in the realm of neuroscience. Fortunately, senior scientist Roger Hanlon at the Marine Biological Laboratory had been applying similar thinking to his studies of dynamic camouflage in cephalopods (octopuses, squid and cuttlefish), so he invited me to serve as artist-in-residence in his lab. We narrowed in on a problem requiring multidisciplinary attention: how to visualize a leucophore. A leucophore is a specialized cell-type discovered in the fin of cuttlefish that passively emits one of the purest whites found in nature—more uniformly "white" than any material built by man. Even under the most sophisticated microscope techniques, the cell structure is so small and complex that it evades visual comprehension.

We sought to overcome this, devising a plan to convert thousands of microscope images into a visually discernible, three-dimensional computer model. I worked with scientists who developed computer programs capable of analyzing the complex microscope imagery and converting it into quantitative data. This was a great analytical step, but it still looked a lot like numbers and not a lot like a leucophore, so we turned to Blender, an open-source animation software. "Open source" software enables you to directly customize its coding. We did just this by inputting our quantitative data as code, thus repurposing Blender for science. Doing so, I was able to render our data with appropriate material and reflective properties, aligning the leucophore's physical morphology with its functional characteristics.

And the result? An unprecedented glimpse into one of the biological underpinnings of extreme coloration. Furthermore, with technology as a vehicle, we fused artistic and scientific methods, exposing not only some of the inner workings of nature but also a fertile common ground between science and art—and *that*, I believe, demands further investigation. ▲

Lizzie Kripke is currently enrolled in the Brown/RISD Dual Degree Program, studying neuroscience at Brown University and painting at RISD. Kripke was an artist-in-residence in the Roger T. Hanlon Laboratory in Woods Hole, Massachusetts, during the summer of 2012.

A Q&A with Roger Hanlon by Lizzie Kripke

Camouflage and Conspicuousness: Integrating Art and Research Science

Roger Hanlon is a senior scientist at the Marine Biological Laboratory in Woods Hole, Massachusetts, where he is also director of the program for sensory physiology and behavior as well as professor of ecology and evolutionary biology in affiliation with Brown University.

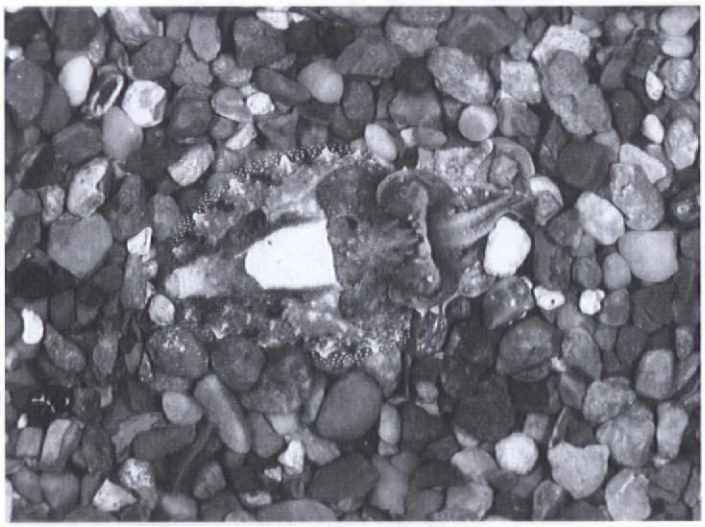
Lizzie Kripke: What do you study?
Roger Hanlon: Our studies on camouflage have to do with visual perception. We study color, contrast and pattern as a means of animal communication or camouflage, looking at the animals that change the most: cuttlefish, octopuses and squid.

How is this pertinent to art and design?
There is a continuum between camouflage and conspicuousness that can be exploited artistically, design-wise and biologically to make something blend in or stand out. We're learning a lot from artists about this, and that's what modern science is going towards—collaboration with different disciplines to solve the hardest problems. You need more tools, more information, a more sophisticated way to take complicated concepts and chisel them down to the meat.

How did you begin collaborating with artists/designers?
It started when I was invited by Mark Milloff at the Rhode Island School of Design to challenge his freshman design students with a camouflage assignment, and their work was critiqued from both an artistic and scientific direction. Students were amazingly inventive. This will culminate in a course offered to both biology and art/design students, co-taught by myself and Professor Milloff.

Has this influenced your research practice?
Yes, we've invited student artists-in-residence into our lab for an extended period, engaging our scientific personnel with an artistic view of how to show some of our complex principles and, vice versa, challenging the artists to look at that information and make their own products to help answer scientific questions.

So artists in your lab act as both researchers and communicators. Can you see this happening elsewhere in science?
We study color, contrast and pattern in biology, so maybe our type of science is a little more amenable to the artistic side of things, but I think that once demonstrations are made, folks in different fields will also see its value. Microscopy is a particularly good example. The more sophisticated the microscope, the harder the interpretation of the image. How do you visualize these tiny, complex structures and illustrate them within your own field, much less to the general public? We're also interested in applied biology, taking elaborate skin patterning and coloration and working with engineers and material scientists to create products that emulate those capabilities. The problem is that we're talking the lingo of biology to engineers, and it's hard to find a common language. I think there's a growing awareness of scientists working on things that need to be visualized or the design of which needs to be explained more clearly to collaborators of wildly different disciplines. ▲



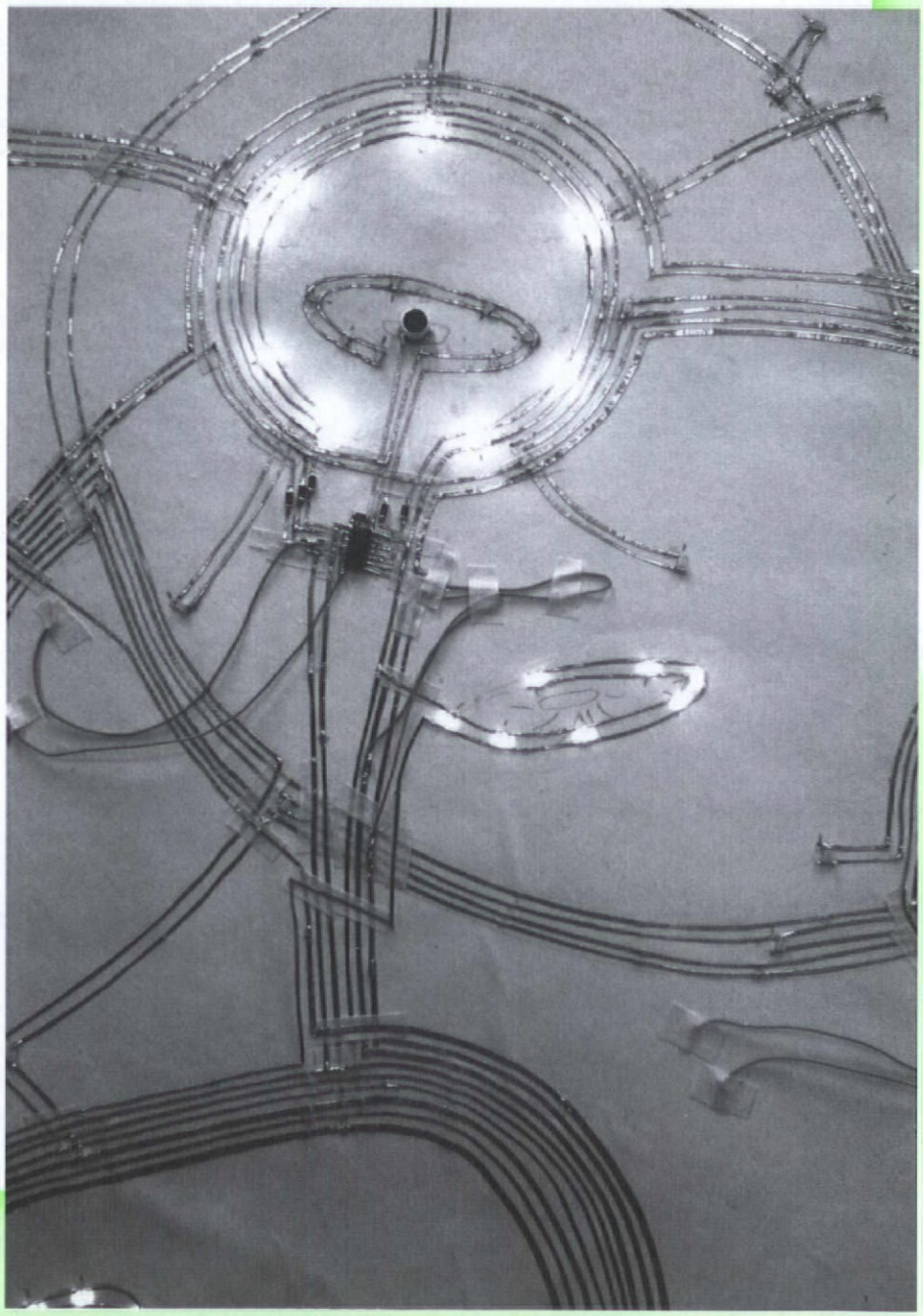
Sepia officinalis cuttlefish displaying extreme white.
Photo: Roger T. Hanlon Laboratory

How do you visualize these tiny, complex structures and illustrate them within your own field, much less to the general public?

Background photo of waves. Source: National Oceanic and Atmospheric Administration/Department of Commerce

An Interview with Jie Qi by Carly Ayres

The Fine Art of Electronics



A detail of Qi's interactive painting *Pu Gong Ying Tu (Dandelion Painting)*. All photos in this article courtesy of Jie Qi.

Jie Qi is a doctoral student in the High-Low Tech group at the MIT Media Lab. Her research investigates materials and techniques for blending electronics with traditional arts and crafts media to create personally meaningful technology.

Carly Ayres is a member of the team behind the CreativeMornings lecture series, a contributor to the Core77 design blog and a senior in the department of Industrial Design at the Rhode Island School of Design (RISD). At RISD she is a research assistant for the STEM to STEAM initiative.

Student of industrial design, Carly Ayres, picks the brain of Jie Qi, a PhD candidate at the MIT Media Lab, on her experience working at the intersection of art and technology. The premed dropout turned sculptor's intern finally found a home in the High-Low Tech group, where she has been finishing up her Master of Science degree. In her thesis, Qi explores blending electronics with paper and has created a toolkit to teach others to work with the materials.

Carly Ayres: I think the best way to start off is by asking you about life prior to the Media Lab. What were you studying that eventually led you to become a student at High-Low Tech?
Jie Qi: I started out studying biomedical engineering as a premed student at Columbia. I had this dream to become a surgeon because you get to work with your hands and help people.

For the first two years, I was working in a lab for tissue engineering research, but it drove me nuts. Every so often I would have a "make breakdown," in which I would spend a whole night making flowers or something for no reason. It was a sign.

With the support of friends, I decided to try something new. I ended up getting an internship with a sculptor. I had so much fun that I changed my major to mechanical engineering so I could keep building in the machine shop.

Jie Qi instructing RISD students on the basics of electronics during a RISD STEAM club workshop.

I'm trying to create useful tools, create project examples as inspiration, and then, through workshops, share them and see what works and what doesn't. I'm trying to universalize electronics and technology as an expressive medium.

A bit later, I found out about Eyebeam, an art and technology center in New York, and an artist named Ayah Bdeir, who was combining engineering and art in this project called LittleBits. Having little experience in actually building electronics, I came to work for Ayah and essentially spent a month tinkering with, and breaking, things.

After I got the hang of working with LittleBits, which are magnetic circuit boards that snap together, I started understanding, intuitively, the electronic side. I also learned about the Media Lab, where she had graduated from, and of a new professor there, Leah Buechley, who was integrating craft and technology in a research group called High-Low Tech.

In your master's thesis, you focus on combining paper with electronics. What led you to explore these mediums together?
I love paper. I'm a total paper nerd. At High-Low Tech, Leah showed me how you could combine paper with things like circuits. I ran with paper because it was something I knew and had used so much.

Paper is a material that is relatively familiar to most people, and at the same time, it holds structures and forms, allowing you to construct and build. When you see something that's made of paper, it seems more accessible, less expensive. You don't feel as bad screwing up, which is important when learning something new.

What is the main goal of your thesis?
I'm trying to create useful tools, create project examples as inspiration, and then, through workshops, share them and see what works and what doesn't. I'm trying to universalize electronics and technology as an expressive medium.

Do you think your tools will be able to bridge the gap between artists, engineers and technologists?
I'm optimistic. My bigger objective is to help people think of technology as a tool or as a means of realizing ideas. It's somewhat cheesy, but that is my personal, pie in the sky goal. I think paper technology is accessible as a tool to accomplish this.

In your thesis, you talk about the expressive possibilities of technology in conjunction with art. What does it mean to put those two together?
My title, "The Fine Art of Electronics," is a play on this book called *The Art of Electronics*, which is like the Bible of electronics. Electronics and circuitry are already very creative, hence the title of the original book, but my idea is to also add personal stories on top of the physical layer of circuit interaction. I am trying to inject an expressive aspect into it.

It gets to the big question of *what is art?* My feeling is that if electronics is a medium, the result *can* be art, *can* be craft, *can* be a prototype. It is what the person does with the material that defines the outcome, not the means or the techniques themselves. Paper-based electronics give people the freedom to make that sort of creative statement, if they so desire.

How do you see these resources existing beyond these workshops?
I'm currently working on what is essentially a circuit-craft workbook. I have this vision for a book with templates that you craft right into, and, in the process of creating the book, you learn skills and electronics theory. By the time you are done, you have this encyclopedia of different interaction options that can be used as inspiration later.

I have seen so many electronics and craft books and view mine as a very happy intersection of both. I'm excited to make it and get it into people's hands. I want to show that you don't have to throw an entire computer or touchscreen at something to make it intelligent and interactive in an interesting way. ▲

You can view Jie's work at technolojie.com and the High-Low Tech group at hlt.media.mit.edu.

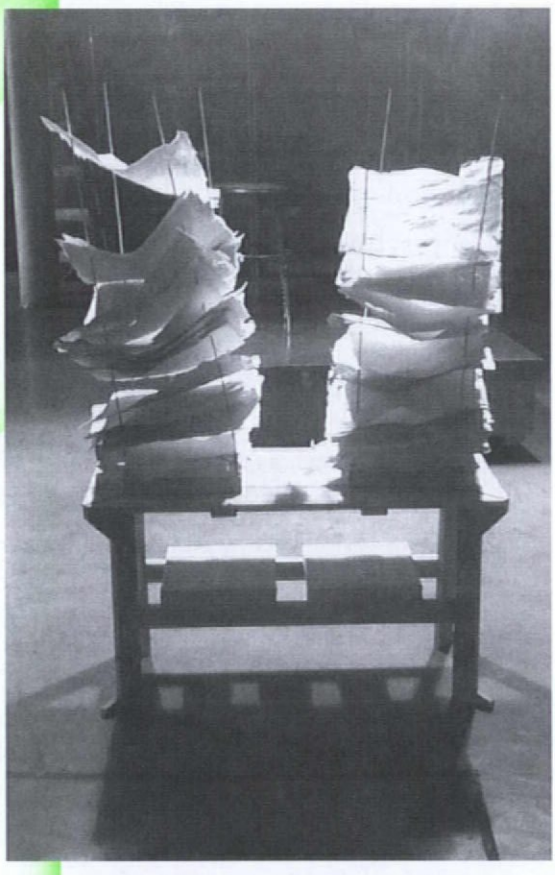
Ryan Mather

On Paper

Paper can glide, float or stand still. It can hold messages, start fires and polymorph into any number of animal shapes. During my foundation year at the Rhode Island School of Design (RISD), Lee Dejasu told me that my first four-week assignment was "paper."

In Lee's classroom there were two industrial-grade blenders, a few clothes irons, several screens and newspapers covering everything. Our papermaking process was a rudimentary one: Put everything into a blender and then squeeze the water out through a screen. I hadn't the slightest idea where to go, so I just started making.

My first instinct was to make the biggest screen possible, so I built a large wooden frame. Lee approached me and said something along the lines of, "You sure do like to plan things out, don't you?" The way he lingered on *plan* made me feel like it was a bad thing. So I started mixing in soap, candy canes and anything else I could get my hands on. I learned that I was more interested in the delicacy and translucency of the paper than the size of the pages.



Sculptural work comprised of cast paper, wood and found bricks by Ryan Mather. Photo: Ryan Mather

> Neither of these processes is better than the other, but to be constantly working in concert with the two is what works best for me.

Six months later, I was introduced to another papermaking project, this time in a laboratory at the Syracuse Biomaterials Institute, where I worked on incorporating shape-memory polymer into paper. The lab was a huge room, about the size of a tennis court, populated by white coats, machines that made unexpected clicking noises and glassware with magnets whirring inside to stir their contents.

My advisor described to me how we would systematically vary concentrations of a shape-memory polymer within a paper to increase its water-soaking properties. The first step was to make samples of the paper and measure if we were successfully incorporating the polymer. I asked, what if we do successfully get the polymer into the paper? How will this increase the water uptake?

The focus of the lab seemed to be about discovering what we were capable of making. In Lee's studio, the focus was more on why one would want to do something without much emphasis on what the final product would be.

Neither of these processes is better than the other, but to be constantly working in concert with the two is what works best for me. As a designer, I do not always have the answers, but the real value I gain is the ability to ask the right questions, and being in a scientific role has helped me constantly edit my process. What am I doing right now, and how will it lead to the next step? ▲

Ryan Mather is a member of the RISD class of 2015, where he is studying industrial design. Ryan's extracurricular interests include polymer science, community building, RISD's role as a research institution and playing the accordion.

Paul Sproll

STEM to STEAM: Consequences, Challenges and Opportunities for K-12 Art and Design Education

Paul Sproll, Head of RISD's Department of Teaching + Learning in Art + Design, is actively involved in reform efforts in urban public high schools. He has received grants in support of arts learning initiatives totaling over $1 million from organizations ranging from the US Department of Education, the Surdna Foundation, the Angell Foundation and the National Endowment for the Arts to the Rhode Island State Council on the Arts. Paul's consultancy work has involved travels to the Middle East as an adviser to the Qatar Museums Authority on its establishment of a high school for visual arts and design in Doha, Qatar.

The ongoing debate about K-12 education in the United States is replete with concerns for levels of student performance in its schools and most particularly in the areas of reading literacy, mathematics and science. The Organization for Economic Cooperation and Development's (OECD's) 2009 "Program for International Student Assessment" (PISA) report provides all involved, in one way or another, with the education of America's children and youth with sobering evidence for such concern, for in its league table comparison of the performance of fifteen-year-olds around the world, as reported by the *Huffington Post*, "the United States [ranked] 14th out of 34 OECD countries for reading skills, 17th for science and a below-average 25th for mathematics." The US Education Secretary Arne Duncan responded at the time to America's rankings, stating, "Being average in science is a mantle of mediocrity—and especially in a knowledge economy where scientific literacy is so central to sustaining innovation and international competitiveness."

In light of the PISA data, combined with the associated concerns for global and economic competitiveness, it is not too surprising that a laser focus is fast being directed at *what* is being taught in this nation's public schools, *how* subjects are being taught and, indeed, the beam expands to include an investigation of the *quality* of its teachers. The adoption by states of Common Core Standards is an example of one educational policy strategy designed to address American students' poor performance in the areas of mathematics and English language arts in relationship to their global peers. The prioritization currently being given in schools both here in the United States and, not coincidently, in the United Kingdom to the quartet of STEM subjects – Science, Technology, Engineering and Mathematics – is another example.

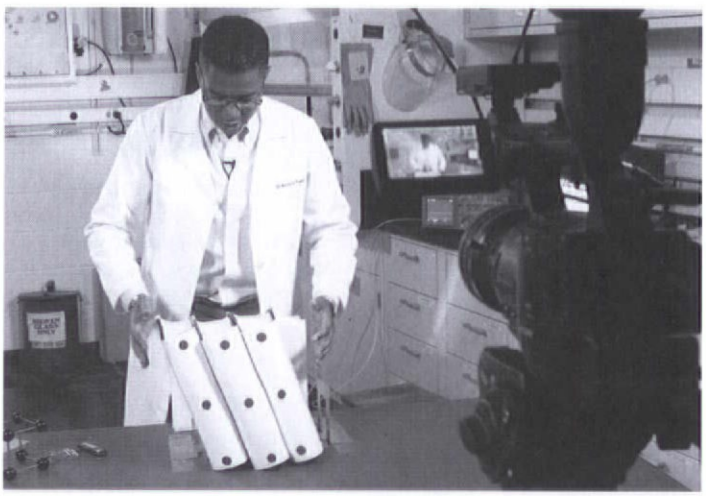
While I certainly understand the economic drivers that have elevated STEM subjects to prominence in schools across the country, it would be unwise to believe that an emphasis on these subjects alone can be solely responsible for reversals of the nation's fortune and for improving its competiveness. Further, a consequence of the subsequent reductionist approach to the education of American students, which preferences STEM subjects, will inevitably and regrettably come at the expense of the provision of a broad educational experience for our young people, one that is inclusive of the humanities and, most particularly of course, the creative subjects, which all too often find themselves on the margins of school curricula—this in spite of declarations in reports, such as "Reinvesting in Arts Education: Winning America's Future Through Creative Schools," that "education in the arts is more important than ever. In the global economy, creativity is essential."

Engagement with art and design is far from just a physical or therapeutic act; as an area of study, it has the capacity to engender in students the skills of *critical thinking and problem solving, communication and collaboration,* and *creativity and innovation* that the Partnership for 21st Century Skills has identified as being so essential "as the United States continues to compete in a global economy that demands innovation."

It is against this background of the narrowing of school curriculum that John Maeda, the Rhode Island School of Design's (RISD's) President, is positioned at the vanguard of advocacy, which challenges the exclusivity of STEM fields as the sole incubators of innovation, by inserting Art *and* Design to produce STEAM. What President Maeda and others recognize is that engagement with art and design is far from just a physical or therapeutic act and that as an area of study, it has the capacity to engender in students the kinds of skills of *critical thinking and problem solving, communication and collaboration,* and *creativity and innovation* that the Partnership for 21st Century Skills has identified as being so essential "as the United States continues to compete in a global economy that demands innovation." The highlighting in STEAM of the significance of art and design presents the field of K-12 art and design education with challenges and opportunities. It will in my view, for instance, require visual arts educators to scrutinize their curricula and pedagogical practices to ensure that any claims of parity with STEM subjects in terms of rigor are indeed justified. I am not arguing here, however, that art [and design's] position alongside Science, Technology, Engineering and Mathematics is warranted by its equivalence to those modes of disciplinary inquiry; rather, I am advocating that once the distinctive features of art and design as a serious area of study for elementary and secondary students is made more transparent and the coherency and quality of student learning outcomes are made more visible, then Art [and Design's] case not only for a partnership with STEM but also for a role in its own right at the core of all students' schooling will be irrefutable. I am not, though, naïve enough to not fully recognize the magnitude of the cultural shift required to move art and design education in the nation's schools to a more central role in students' learning; however, I firmly believe that if art education in elementary and secondary schools were re-framed and re-presented as an *inquiry-based* and *discovery-orientated* subject, and if instruction were designed to truly cultivate and develop in young people dispositions of creativity and innovation, then STEAM could, indeed, hold opportunity as a school subject whose true value in education is largely misunderstood. ▲

Ainissa Ramirez

Cultivating Creativity and Curiosity with STEM



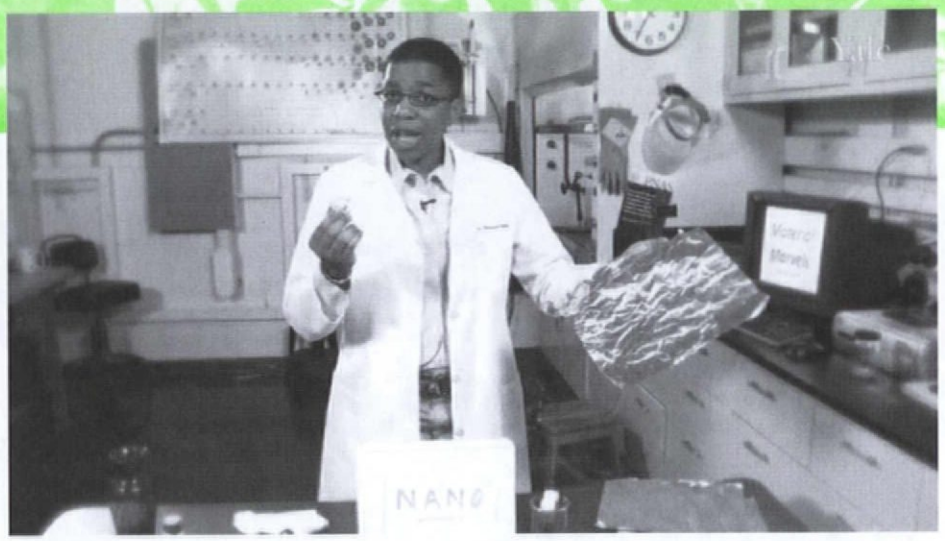
Scientist Anissa Ramirez in her lab demonstrating the arrangement of atoms using blue dots on the back of books, and showing how a small shift in the books changes this arrangement. This demo can be found in her video for *Material Marvels* (http://youtu.be/WREwKxOqFTo). Photo: Wes Choi

When it comes to learning in the twenty-first century, many schools have it upside-down; many want you to memorize the correct answers. World-class learners of the twenty-first century, however, need to know how to figure things out, and this requires using the skills of artists and scientists.

Artists and scientists are not too different from each other. Both groups use trial-and-error, need patience, apply imagination, are friends with failure, possess curiosity and draw on creativity. These elements are part of the artist's palette and the scientist's toolkit. Artists and scientists both know that the human endeavor is about discovery, which is often accompanied by revising and improving upon an idea. Having the right answer does not have the premium it once had now that Google exists. The mantra that knowledge is power is now dead. Information is everywhere and cheap.

In an age of Google and Big Data, we need thinkers—those who know what to do with all of this information. Humans still have the market on thinking; there isn't an algorithm for it yet. Important twenty-first century skills are creativity/curiosity, critical thinking/problem solving and collaborative/communication skills—the 5Cs. These are skills that artists and scientists use all the time.

Ainissa Ramirez (@blkgrlphd) is a science evangelist who is passionate about getting kids of all ages excited about the subject. Before taking on this call, she was an associate professor of mechanical engineering at Yale University. She has spoken at TED on the importance of STEM education and authored an accompanying book called *Flip this Class* (TED Books). Currently, she is writing a book on the science behind football with sportswriter and *New York Times* best-selling author Allen St. John entitled *Newton's Football* (Ballantine Books). *ainissa.com*



Ainissa Ramirez, *Material Marvels — Nanomaterials.* (http://youtu.be/jXwkO9AcXSA)

Keeping kids creative is not just a moral imperative but an economic one. We do not have a crystal ball, but we do know that the careers, opportunities and challenges of the future will require creative problem solvers.

These twenty-first century skills are innate to children, but they are often "educated" out. Every school year, millions of five-year-olds enter kindergarten armed with creativity and curiosity, but somewhere along the way, they are lost. Picasso once said, "Every child is an artist. The problem is how to remain an artist once we grow up." We need to bring these skills back. Artists and scientists could take a leadership role in showing how to present these skills to children. If schools cannot show them these skills, then the rest of us must.

A PERSONAL JOURNEY

Keeping kids creative is not just a moral imperative but an economic one. We do not have a crystal ball, but we do know that the careers, opportunities and challenges of the future will require creative problem solvers. And, from my vantage as a scientist, one of the best ways to encourage creativity and curiosity is by improving Science, Technology, Engineering and Math (STEM) education. STEM requires creativity to discover new things and stokes the fires of curiosity with one question leading to another.

In the tradition of Isaac Asimov, Carl Sagan, Neil deGrasse Tyson and Bill Nye, there need to be scientists to inspire our youth and the next generation with STEM. After a decade of working in academia, I took a leap and traded in my science-professor hat for a science-popularizer one. I became a science evangelist to get kids excited.

STEM is inherently fun, but schools are too constrained or unable to show that. In response, I developed a short video series called *Material Marvels* to showcase cool materials at work, like solar cells, nanomaterials and space shuttle tiles. In these videos, I try to hook audiences with big demonstrations (often with a blowtorch) and then teach the science concepts once they are drawn in. In the series *Science Xplained*, I make videos about general science topics, such as the physics of football. I've learned from this exercise that kids (and adults) want to understand; they just need information to be presented in an approachable and engaging way.

NEXT STEPS?

To improve schools, both artists and scientists must take part in the conversation. We need all hands on deck to get children excited about learning. One way we can all get involved is to show the importance of creativity and curiosity in our work. Creative parents beget creative children. If children see that creativity is valued, they will try to emulate it. Being surrounded by creative activities makes creativity seem less foreign and less onerous. If you are creative, expose children to your creative endeavors. Invite them to your tinker space or studio. Get their hands dirty doing something fun (while teaching them along the way). Make kid-friendly descriptions of what you do. If you are creative and have STEM leanings, consider writing a children's book on science, create engaging posters, images or videos or put science in your performance or piece. We must give children ways to nurture their curiosity and creativity at every opportunity possible. Supporting children who think and create is our best legacy. ▲

Neal Overstrom

More Than a Cabinet of Curiosities: Innovations in Biophilia

For more than 75 years, the Rhode Island School of Design's (RISD) Edna Lawrence Nature Lab's teaching collection of natural history specimens has been used as inspiration in myriad studio projects. Somewhat reminiscent of a Victorian "cabinet of curiosities," the Nature Lab is a memorable space, and many alumnae write that it was one of their favorite places on campus. In my time at RISD I, too, have become appreciative of its uniqueness and an ever more ardent advocate for the value of biology in an art and design education.

Part of the reason is that inspiration from nature is timeless and taps into our innate affinity for the living world, what biologist E. O. Wilson termed "biophilia." Through careful observation, comparison and composition, students examine the fundamentals of pattern, form, texture and color found in nature. In addition, the collection provides opportunities for studying the relationship between physical structure and function—essentially, how individual organisms have created design solutions for survival through evolution and how these might be applied in new areas of bio-inspired design such as biomimicry.

Beyond being a source of inspiration and natural history, however, the Nature Lab is playing an emerging role as a forum for broader conversations about human inquiry, the biological influences on art and design and their relevance in addressing the environmental, economic and social problems we face today.

Through a grant from the National Science Foundation to the Rhode Island EPSCoR network (Experimental Program to Stimulate Competitive Research), RISD, the University of Rhode Island, Brown University and six other institutions of higher education in the Ocean State are working to broaden their research capacities and advance innovation in science and engineering, particularly with regard to climate change and its impact on marine ecosystems.

RISD's niche focuses on creating collaborative studios and workshops bringing together artists, designers, scientists and students to explore topics around data visualization and science communication. To date, five semester-long studios have been completed with varied themes such as

Neal Overstrom, director of the Edna Lawrence Nature Lab at RISD, is an environmental educator and designer interested in the ways pattern, form and living elements in the built environment can reinforce the human-nature connection.

RISD's Edna W. Lawrence Nature Lab. Photo: Michael Benson

designing oyster habitats that also raise public awareness of coastal ecosystems, presenting climate-science issues through e-books and apps for mobile devices and developing interactive graphics for analyzing large data-sets related to the genetics and disease resistance in shellfish.

As diverse as these projects have been, the confluence of both art and science has required all students, regardless of their academic backgrounds, to deal with technical considerations, develop some understanding of biological systems and generate narratives that would create greater meaning around environmental information for either scientists or the public. In addition, it encourages them to consider what happens when we bring together the type of qualitative, subjective inquiry we typically associate with art and the quantitative, objective inquiry we associate with science in a studio setting to explore complex problems. Many would point out that art and science are fundamentally different processes—notably that science typically wants to answer its questions with the fewest possible outcomes and arrive at a solid conclusion. Artistic inquiry has no such constraints. Yet increasingly, we see evidence that these seemingly disparate ways of thinking are actually linked. For example, Albert Einstein famously relied on mental imaging as a tool in problem solving, something that recent studies have shown can be enhanced by artistic training.

Can encouraging students to work in both modes – gliding back and forth along an art-science continuum unfettered at one end and constrained at the other – indeed help them tackle complex issues or design problems?

Can encouraging students to work in both modes – gliding back and forth along an art-science continuum unfettered at one end and constrained at the other – indeed help them tackle complex issues or design problems?

In her recent book *The Watchman's Rattle*, sociobiologist Rebecca Costa argues that our ability to address increasingly complex challenges is inhibited by widely held cultural beliefs and the relatively slow pace at which the human brain can evolve. She proposes that we foster new modes of investigation whereby both right and left sides of the brain work in conjunction, something Costa believes leads to the type of spontaneous, intuitive insight that has previously led to great discoveries.

The EPSCoR initiative has more than two years of studios still remaining, and the wider lessons of such collaborations remain to be assessed. However, it's already become clear that this type of integrated thinking around technology, biology and our human-nature connection can only help us meet the future in more insightful and sustainable ways. ▲

Matt Goldman

Blue Man to Blue School: Encouraging Innovation

Photos: Andrea LaBarge Mills

Innovation does not happen in a vacuum. It typically requires people who have extraordinary skills, knowledge of the rules of diverse disciplines and an added desire to integrate and break those rules. It is from this rule-breaking, "trickster" energy that I believe true innovation grows.

My entire career, and life, has been devoted to tapping into my own creativity and that of those around me to create innovation. I am a founder of Blue Man Group, an organization that started as an outrageous idea: inspire creativity in both our audiences and ourselves and speak "up" to the intelligence of those at our shows while reaching "in" to their childlike innocence. We wanted to create a special kind of organization to benefit both our audiences and ourselves—a place where people continually learn and grow. We wanted to recombine influences to make something new.

The basic mission and values of Blue Man Group have transferred remarkably well to an educational setting. At Blue School in New York, we have created a pre-primary and primary educational program where creativity is cherished and encouraged and children fall in love with the joy of learning. Our approach is to weigh creativity, innovation, self and social learning and collaboration as heavily as all the academic subjects in order to be responsive to the whole child. In short, we absolutely believe that we can create the conditions in which innovation flourishes by giving our young inquirers the tools to navigate and integrate the skills of scientists and artists, heroes and innocents, group members and "tricksters."

At Blue School, students learn to be more flexible thinkers, collaborators and responsive to different situations. For example, kindergartners' studies focus on the world within their classroom and outside the school as they become inquisitive researchers, scientists and group members, working artists and explorers; in one assignment, the kindergarten class

Matt Goldman is the board vice chair and co-founder of Blue School. He co-founded Blue Man Group, which opened Off-Broadway at the Astor Place Theatre in 1991. Throughout their long association, the founders of Blue Man Group have been fascinated by the interconnections between learning, creativity and community and how, combined with new teaching techniques and breakthroughs in neuroscience, the educational experience can be enhanced. It is these interests that led them and their life partners to start Blue School. Matt also sits on the Clark University LEEP Advisory Board working to re-imagine liberal arts undergraduate education, and on the Advisory Board of BlinkNow/Kopila Valley School in Surkhet, Nepal.

broke into three research groups to study how people cross the East River, compiling their research through visual representation and dramatic play to learn experientially. In other lessons, our 4th and 5th graders learn through their studies of literature, analyzing the specific traits and roles that various characters assume. Our 2nd graders are currently engaged in an activity that melds math, science and art, studying the Brooklyn Bridge to understand its construction and making their own reconstructions of it in several study groups. In all cases, this way of working allows students to practice the skill of metacognition; lessons provide them with opportunities to understand the choices they have in life and in group dynamics.

In Blue Man Group, there is no separating art from science from technology from math from engineering. It is the integration and recombination of all these disciplines that leads to our show on stages worldwide. One scene from a past Blue Man performance went as far as explaining and demonstrating the phenomenon of synesthesia—hearing colors or seeing sound. We also give our audiences a tour through the human brain. In all cases, we try to combine science and art in a way that is informative, accurate, funny, accessible and entertaining.

I had a recent email exchange with my friend and Blue School Advisory Board Member Dr. Dan Siegel about the movement of STEM to STEAM (adding Art and Design to STEM education and practice), and he replied with an interesting scientific perspective:

> The mind integrates both internal and external perceptual streams to create the experience of reality and life. When education provides only the externally organized domain of knowledge – as with science, technology, engineering and math – the internal contribution to living and making sense of lived reality is under-involved. The risk of such externally constrained didactic emphasis and structure is that the freedom of new possibilities, the open space of imagination, the new ways of combining old things, each central to innovation, may be not only undervalued, but also under-developed. The freedom to create new approaches is fostered with internal perception—the way we focus attention on our internal experience.
>
> Art is a human expression that brings the inside out. In diverse ways, art is a skill and communication that requires internal perception for both its expression and for deeply appreciating its meaning within perception. We inquire how art makes us feel, the bodily sensations it evokes, the emotions that arise, the associations with other experiences. Art expands how we think, too, as it challenges our previously existing models of reality and invites us to imagine alternate approaches to life. Art inspires us to SIFT the mind as we experience our internal world of Sensations, Images, Feelings and Thoughts. SIFTing our internal experience sets the stage for the art of STEAM to empower the mind to move beyond what externally exists and imagine new ways at the heart of the innovation we need for living and thriving in our ever-changing world.

Dr. Siegel hit the nail on the head. I don't just believe that the integration of Science, Technology, Engineering, Art and Math – STEAM – is a good thing—I believe that it is absolutely essential for creating the innovation required to change the trajectory of our world toward a sustainable and harmonious future in the limited timeframe we have in which to work. ▲

We absolutely believe that we can create the conditions in which innovation flourishes by giving our young inquirers the tools to navigate and integrate the skills of scientists and artists, heroes and innocents, group members and "tricksters."

Photos: Andrea LaBarge Mills

Jon Perera

Creativity – A Critical Skill for Success

71%

Believe that creative thinking should be taught as a course, like math and science.

85%

Agree creative thinking is critical for problem solving in their career.

32%

Don't feel comfortable thinking creatively in their career.

78%

Wish they had more creative ability.

Source: Adobe "Creativity and Education: Why it Matters" survey. Study based on interviews with 1,000 college-educated and full-time, salaried employees ages 25+.

Our economic growth and health as a nation rely on our collective ability to innovate. The most successful innovations – across healthcare, education, R&D, manufacturing and the environment – result from the combination of creative thinking, world-class technology and cutting-edge design. Going beyond the core competencies associated with STEM (Science, Technology, Engineering and Math) to embrace the concept of STEAM (championing art and creativity in education) is imperative to drive the economy forward.

Today's professionals agree. Consider the results of "Adobe Creativity and Education: Why It Matters," a recent Adobe-sponsored study of 1,000 college-educated professionals in the United States over age 25, all with at least a four-year degree. Of those surveyed, 71% believe that creative thinking should be taught as a course, like math and science. Further, 91% agree that there is more to success in school than focusing only on course material. 85% agree creative thinking is *critical* for problem solving in their career.

To better prepare our students for the challenges of today's global workplace, creativity can no longer be treated as an elective in education; it must be core to the way we teach and learn and promoted across the fields of STEM. We think this will also benefit education: For example, students are more engaged when a complex theory is explained through a movie or a simple animation and display better understanding of material when asked to create a visual presentation on a given subject. Through project-based collaborative learning, educators can link core concepts, technology and creativity to further challenge and encourage students to look for new ways to solve problems, express their ideas and communicate with peers.

There is still much to be done. A separate "Adobe State of Create" study found that only 39% of those surveyed believe that they have creative skills, yet more than 60%, including hiring managers of tomorrow, view creativity as important. Students, educators and employers in all industries are demanding creative skill-sets that are critical to solving tomorrow's challenges. By embracing STEAM and integrating Science, Technology, Engineering, Art and Math, educators can help bridge the creativity gap within the global economy and help ensure the success of the next generation. ▲

78%

57%

78% say that creativity is very important to their career, but only 57% thought so when they were in college.

82%

wish they had more exposure to creative thinking as students.

91%

agree there is more to success in school than focusing on course material.

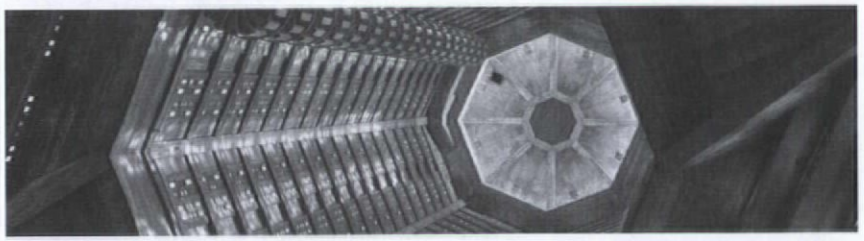
Of education majors, **68%** say creativity is something you are born with and also something you can learn; **75%** view creativity as important in school; **86%** say creativity is important in their career; but only **48%** believe creative thinking currently has a place in their career.

79% – ART
76% – MUSIC
69% – SCIENCE
65% – DRAMA
59% – MATH

Interestingly, math and science ranked nearly as high as traditional creative subjects in contributing to creative thinking.

Jon Perera is vice president of Adobe's education organization and is responsible for the company's strategy across K–12 and higher education. Adobe's objective is to unleash the creativity of all students, educators and schools around the world, and Perera believes creativity is key to the re-invention of education, student success and economic growth.

BUILT WORLD



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PERSPECTIVE

Restaurant Service as Non-linear Rhythm

Peter Lewis

In my career as a restaurateur – first as a manager and later as an owner – I have trained hundreds of employees on how to wait table. So much of what I have to impart "turns," as they say, on movement: how to stand, how to place plates or flatware or stemware on the plane of a table, how to move fluidly through a section and around colleagues and customers—rituals I learned and performed over many years of waiting table myself.

I was once asked, very early in my days as a waiter, if I was a dancer. This was, as I was given to understand by the customer, intended as a compliment. He had noted that I moved gracefully.

This is hilarious to anyone who has suffered the punishment of having to watch me dance. My sole experience with ballet – other than having the privilege of seeing great dance companies perform in the Chicago of my youth – occurred one day when I was asked by my mother to pick up my little sister at ballet class. Her teacher, a man, saw me standing in the wings (I was "pretty" in those days) and suggested I would be perfect as my sister's classmate. He insisted that I execute a few steps, upon which he threw me a disparaging look and told me to wait until class was over.

I'm no dancer, as my wife will attest. This usually comes in the form of an admonition: "Don't you go Greek on me!" referring to my inimitable style, a perverse mélange of the *horah*, a few moves I picked up while traveling through Sub-Saharan West Africa in the early '70s and Greek folk dancing I was forced to participate in while living on Crete later that decade.

To appear graceful as a waiter has little to do with formal dance training. It has everything to do with knowing how to bend, swivel, reach and pull, all the while stacking or releasing plates from an outstretched arm, hoisting a tray laden with the entrées of a six-top, or carrying a disk with four or five mart' or highball glasses and a couple of wine stems.

I have worked with individuals – hosts, servers, managers – who don't have a clue how to move in the space. They walk in straight lines: from the reservation desk to a table and back again; from the pick-up line to the bar, thence to a table; from the office to the host stand, only to peer at what used to be the reservation book and is now a computer screen, and back to the office, perhaps checking with the expediter to see how the evening's going.

The overall effect is haphazard, static, linear. Compare this to one of my favorite pastimes of the summer—now that I'm able to enjoy a summer, having sold my restaurants some years ago: watching bumblebees careen from flowering plant to flowering plant, gathering pollen and then returning to the hive—a vacant birdhouse suspended from a wall of our home. Their journey happens in reverse order to that executed by a wait staff: while bees gather foodstuffs and fly back to the table of the queen, waiters pick up plates on the line, delivering them to a multitude of guests in a dining room.

But if you examine each of these performances as inverse images of each other, what you witness is an improvisational geometry that is regulated – determined by the specific locations of plants or tables, the hive or kitchen – and the regiment of honey bees or servers who must navigate the space and each other in a finite series of equilibrated trips and gestures which are, in the end, supremely functional rather than aesthetic.

But here's a cardinal difference: It's not as if bees converse with stamens; they do their busy work silently. A waiter executes his or her moves, all the while engaging customers verbally, describing the dish he or she is serving or asking how the guest liked this or that plate. Try it sometime at home. You'll immediately perceive how tough it is, especially if you're gathering four or six plates with their attendant silverware.

Is there an instrument waiters, or bees, for that matter, could wear that would record how they move in a restaurant or garden? I doubt it. If there were, it would show a diagram of small loops endlessly circling and swerving in ever tighter or expanding oblongs and switchbacks, pivoting at acute or obtuse angles with punctuated pauses that define points of service.

Understanding how we move in a restaurant encompasses the fields of human body dynamics, classical mechanics and human movement—what is sometimes referred to as human motion kinetics, wherein a body's movements can be charted on a series of anatomical planes: the frontal plane, lateral plane and transverse plane. And this move-

The rhythms of this movement are various: at times sweeping, at times syncopated, the whole performance constituting an improvised riff whose duration commences at the beginning of service and doesn't conclude until the end of the shift.

The dexterity of an employee's performance in a restaurant depends on a sense of rhythm, at once internally registered and externally expressed. And the individual instrument "plays," so to speak, with every other person in an ensemble of varying scale.

ment occurs in a public space (the restaurant) that, in its functional reality, is transformed into performative space (service).

To experience space as an organic whole, be that space your section or the entire restaurant, is to begin the process of deciphering not merely the nature of space but the mystery of form and movement through it.

The rhythms of this movement are various, at times sweeping, at times syncopated, the whole performance constituting an improvised riff whose duration commences at the beginning of service and doesn't conclude until the end of the shift. And, in fact, as I think about it, the whole conforms to a quasi-symphonic set of "movements":

The Overture: Pre-shift (*Lento*)

The First Movement: The calm before the storm of the first rush (*Adagio*)

The Second Movement: The first rush (*Allegro*)

The Third Movement: The onslaught of a full restaurant (*Presto*)

The Fourth Movement: The night winding down (*Moderato*)

Often this structure concludes with a Coda: The denouement of performing side-work, doing the night's books, sitting and talking with colleagues.

While the score underlying a restaurant's performance may serve as a backdrop, the physicality of the work suggests dance, and the various combinations are familiar: solo, *pas de deux* (*ou de trois, de quatre*, etc.), and *la grande spectacle* of the entire staff – a *corps de restaurant*, as it were – moving synchronously.

But equally important, if often overlooked or taken for granted, is the silence that, at its best, informs the execution of service. The only ambient noise you ought to hear in a restaurant is the clink of glassware, the diminuendo of forks and knives on china, the hushed or raucous tones of conversation. You understand the importance of background silence when a waiter drops a tray, when a cook lets a stack of plates fall on the line or when a bartender shatters a glass. The noise grates on our experience as diners, and suddenly, the room is hushed.

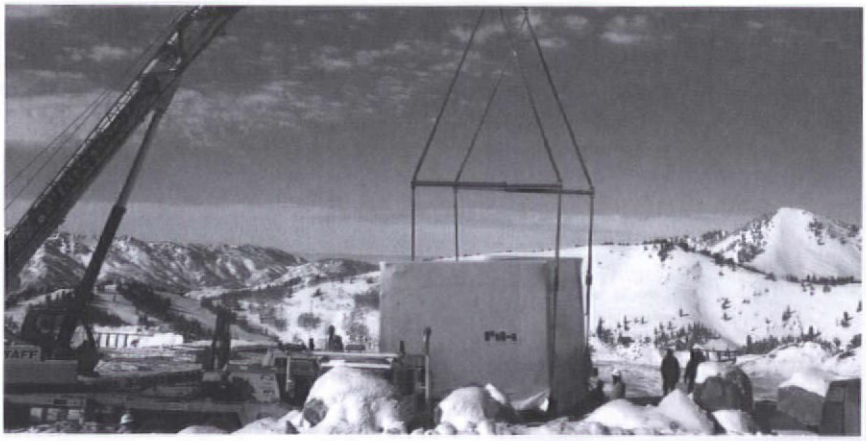
On the other hand, there's what one friend calls "noisy movement": the erratic, staccato stop-and-start of a server (or host or bus person) who's clearly lost, or "in the weeds," as we say in the trade. The effect on diners is utterly disconcerting. Being "visibly noisy" is white noise of a wholly different order, a subliminal disturbance that, in calling attention to itself, can grind conversation to a halt.

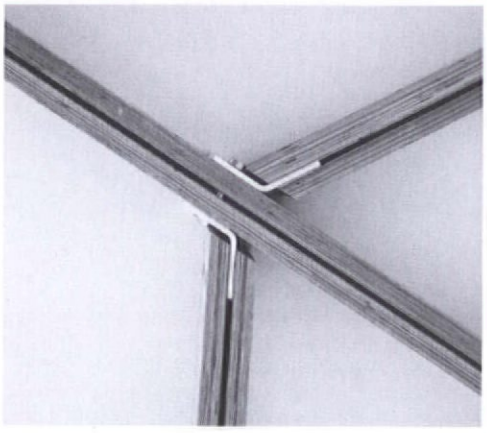
It's been suggested that the earliest "concepts," discrete sensations experienced and objectified by humans, were breath, movement and heat. I don't remember whether I first read this in Volume 2 of *The Eternal Present: The Beginnings of Art* by Sigfried Giedion, the Bohemian-born, Swiss historian and critic of architecture, or somewhere else. It may have been in a volume about paleolithic Yang-shao pottery in China. It doesn't matter. What interests me personally is that every time I step onto the floor of a restaurant, these are the three realities I experience most immediately, most viscerally.

The dexterity of an employee's performance in a restaurant depends on a sense of rhythm at once internally registered and externally expressed. And the individual instrument "plays," so to speak, with every other person in an ensemble of varying scale. To watch a waiter move with delicacy, gliding through space, conversing with parties discretely, is to witness a real pro at the top of his or her game.

At the end of the day, I can no sooner teach a waiter to dance in the space, to move with intrinsic grace, than I can teach a bartender to hear and mix cocktails to the International Call Order. You either have it, or you don't. But when we see it – as guests, as managers or as owners – we know it immediately. I don't necessarily want to define this as "beauty," but when we discern it occurring around us, it certainly is beautiful.

Peter Lewis owned Campagne and Café Campagne in Seattle for 20 years, was a contributing editor for *Virtuoso Travel & Life* and has written articles for *Pacific Northwest* and ARCADE. In 2010, he published a novel, *Blind Tasting*, based on the wine trade. Lewis currently works as a consultant to the restaurant industry.





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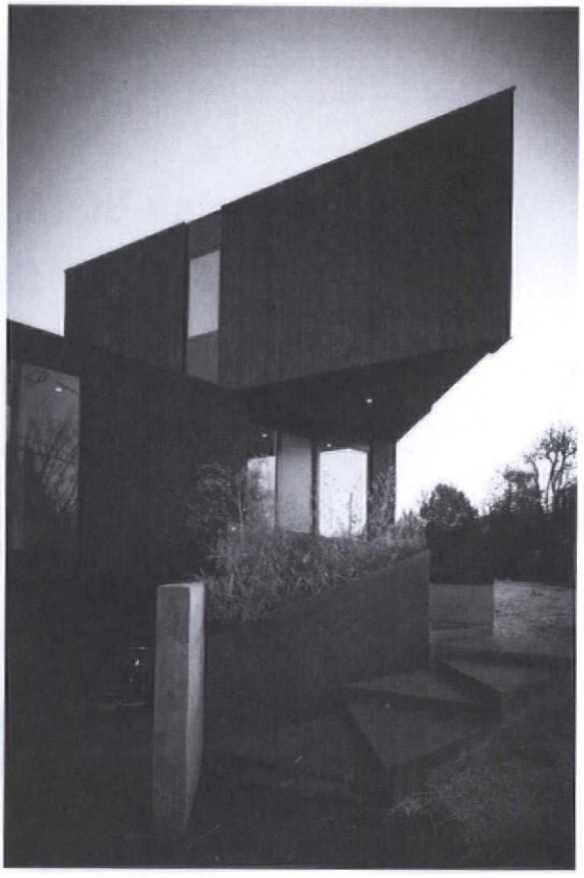

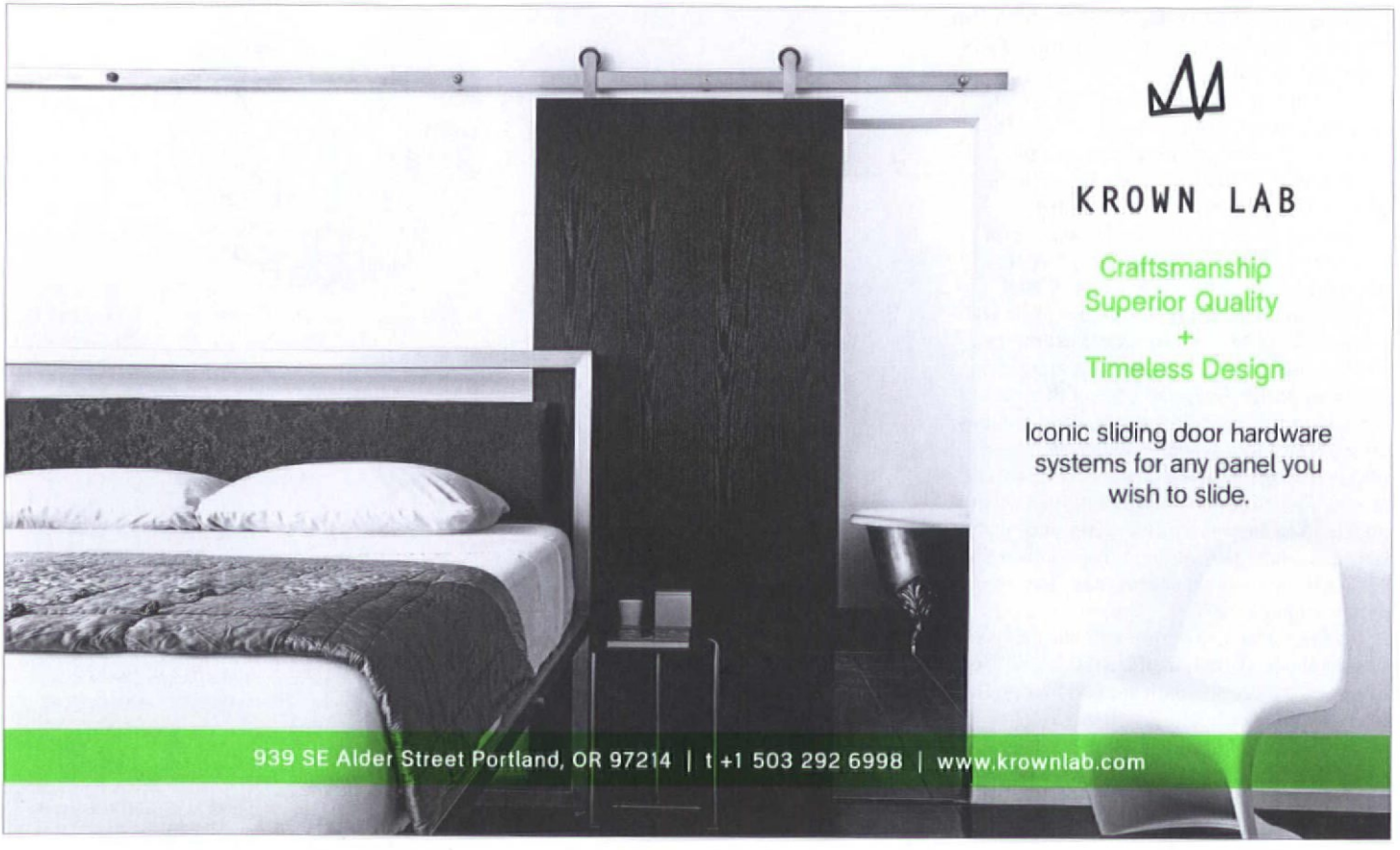

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PERSPECTIVE

Make Way for the Carbon Accountants

Seeing Building Materials in a New Light

Hans-Erik Blomgren

I can remember a short 15 years ago, nearly at the start of my career as a structural engineer, when "sustainability" and "green design" were just becoming household terms in the building industry. Although it seems a bit laughable now, to many at the time, the idea that the environmental impact of a building's design and construction would be a mandated consideration for future projects was truly a foreign concept.

Today, my perspective is that we are really only at the end of the beginning when it comes to building sustainably. Sustainable building design, or at least its most commonly used metric, the LEED Credit System, is still in its nascent stages; it is a growing, changing organism that has yet to reach a real state of maturation and begin to attain its aim of making a measurable impact in reducing, and even turning back, the building industry's detrimental environmental effects at the global scale.

For those unfamiliar, the LEED system assigns "credits" to a building that contribute to an overall score representing the building project's environmental impact with the goal of calling attention to and rewarding sustainable design decisions. The portion of the current LEED credit system score that structural engineers have the most direct ability to influence is under the Materials and Resources Credit Category. Current metrics for those resource credits are generally limited to specifying recycled content in structural materials and determining whether they were sourced locally and responsibly. These are good steps—steps which have caused the industry to react and change, but in practice, they tend to be prescriptive. They encourage very little engagement and innovation on the part of the structural engineer to shape more dynamic change.

On the horizon, however, and possibly as soon as the next version of LEED is released this year, a more sophisticated and powerful tool, *lifecycle accounting*, will begin to be at the disposal of designers and engineers within the LEED system, allowing us to directly measure and compare the environmental impact of common building materials

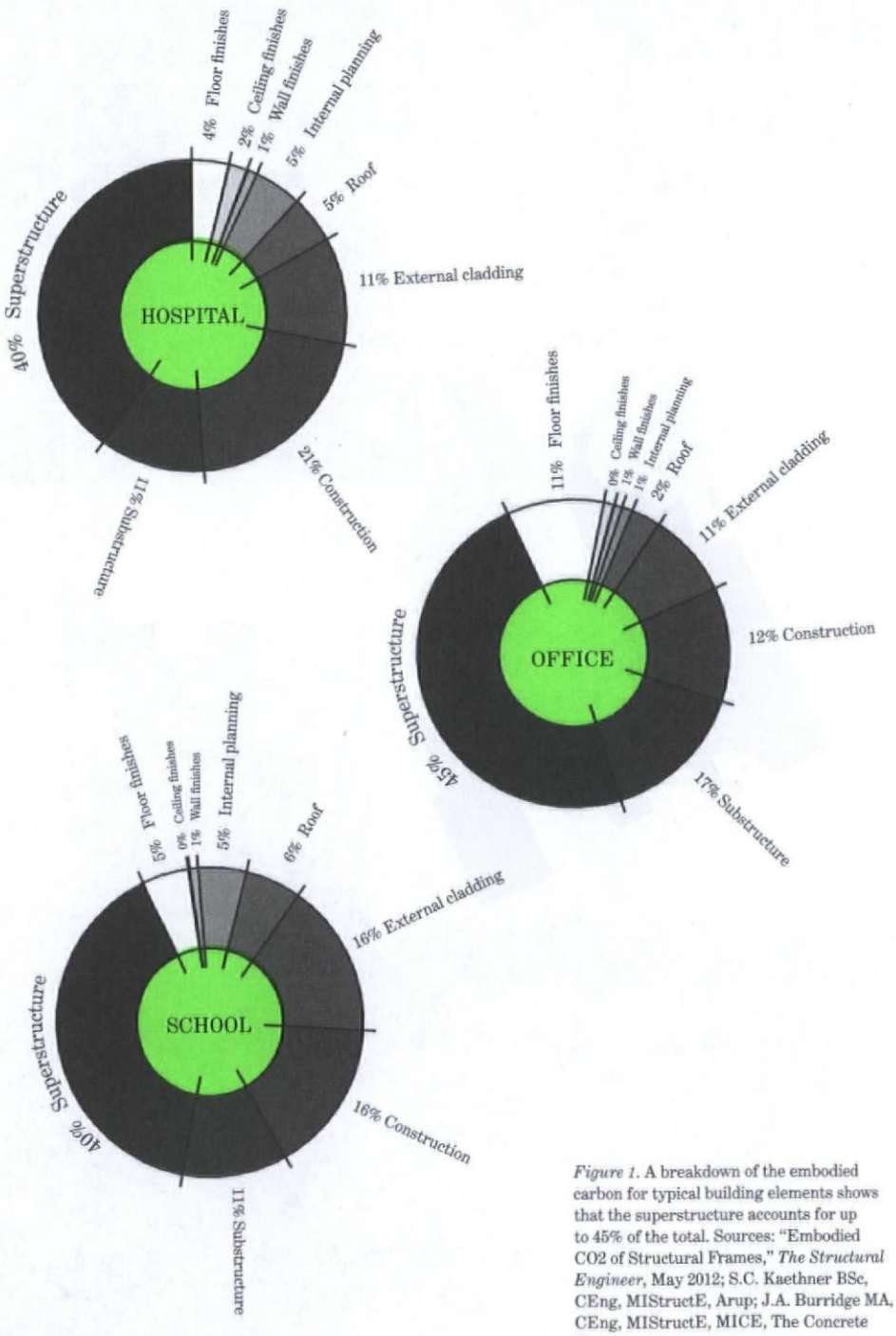


Figure 1. A breakdown of the embodied carbon for typical building elements shows that the superstructure accounts for up to 45% of the total. Sources: "Embodied CO2 of Structural Frames," *The Structural Engineer*, May 2012; S.C. Kaethner BSc, CEng, MIStructE, Arup; J.A. Burridge MA, CEng, MIStructE, MICE, The Concrete Centre.

through analysis of their production, usage and disposal.

Coca-Cola is credited as the first company to formulate a business decision about its product based on lifecycle accounting. In 1969, they were confronted with the decision to continue using glass bottles or change to plastic. Instead of using the simple metric of material "first-cost" – the cost of the materials in manufacturing – they pioneered a holistic study of the complete lifecycle cost of their soda containers. Even though plastic bottles were a more expensive petroleum-based material, they were the favored choice because they were made at the same plant as the soda; lighter weight, reducing overall transportation costs; less breakable; and at the time, easier to recycle.

Today, when you walk into a Tesco supermarket in London, you will find that labels on many of the products include a summary statement of their embodied carbon (the universal metric for measuring global warming potential), determined via lifecycle accounting methods. This is not a measure of the carbon contained within the product but rather, the total equivalent carbon released into the atmosphere during the extraction of the product's raw materials and then through manufacturing, packaging and transporting it to store shelves. Tesco's intent in labeling products this way is to encourage manufacturers to work toward reducing the environmental impacts of their products by giving the consumer the power of information and the choice to make the most environmentally responsible purchase.

Similarly, and unbeknownst to many, nearly two decades of global academic research has been occurring to collect an accurate inventory of data and develop the standards by which we can measure and declare a building product's environmental impact. Locally here in Seattle, it is encouraging to note that groups such as the Carbon Leadership Forum, Consortium on Research for Renewable Industrial Materials (CORRIM), Architecture 2030, Preservation Green Lab and The International Living Future Institute have all been playing a part in the research, advocacy and application of carbon accounting in designing the built environment. The complexity and magnitude of the task can't be underestimated. Thankfully, there are many dedicated hands laying the groundwork.

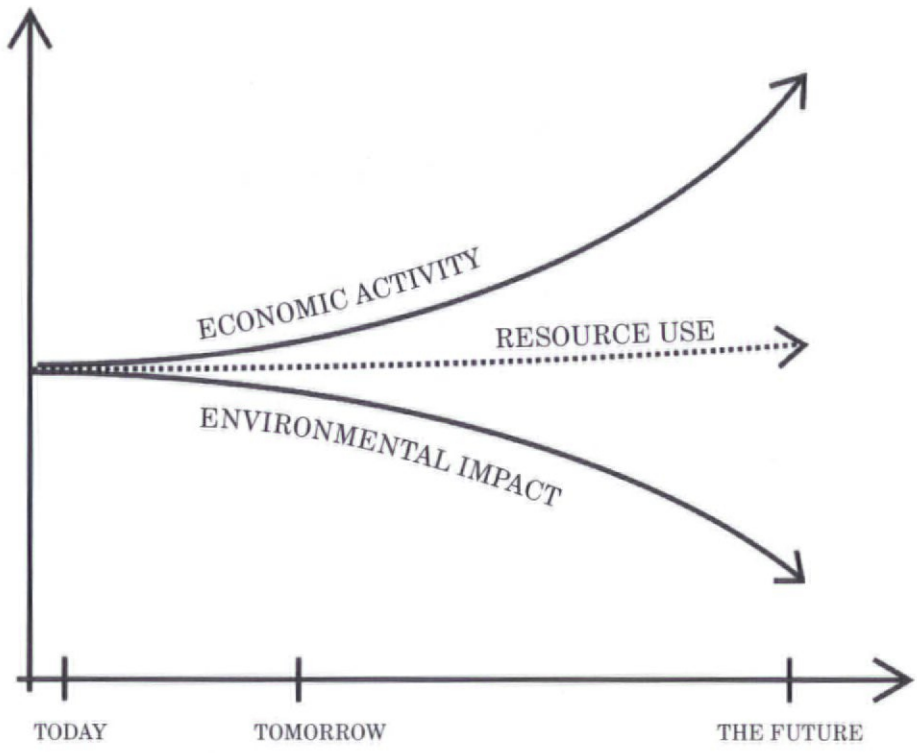


Figure 2. The objective of forthcoming sustainability requirements for building materials is to decouple resource use from economic growth while reducing the overall environmental impact. Source: CEN/TC 350—Sustainability of Construction Works

Studies show that the lion's share of a typical, new commercial building's embodied carbon is contained within its superstructure (see Figure 1). With lifecycle accounting tools made available, it is the structural engineer who should be prepared to find him or herself thrust into the sustainability limelight. Structural engineers will be invaluable players at the design table, well-suited to play the role of carbon accountants. As the field advances in the coming years, on a project specific basis, engineers will be able to utilize in their work the structural materials (wood, steel, concrete, etc.) and systems (truss, moment frame, arch, etc.) which play the best roles in minimizing the building's total embodied carbon and other environmental impacts.

The highest-level aim of developing carbon accounting standards is to achieve resource efficiency in the built environment at a national scale. Structural engineers need to invest in and embrace the possibility of their important role. By use of their skills, imagination and influence at the design table, engineers can play an essential part in society's future by ensuring that our resource use doesn't continue to increase with our economic growth, while also decreasing the overall environmental impact of building. Isn't it fantastic to imagine what sustainable design will look like in another 15 years?

Hans-Erik Blomgren PE, P.Eng, SE, is an associate at Arup, a global multidisciplinary consulting firm and a lead structural engineer in their Seattle office. He has worked in the Pacific Northwest region over his 15-year career and most recently contributed to the design and construction phases of the Bill & Melinda Gates Foundation Campus in Seattle.

PERSPECTIVE

Dodging Industrial Decay

The Virtues of Isolation

Michael Luis

All over Seattle, there is a tension between the preservation of land and buildings for industrial and craft uses and the conversion of that land to housing and commercial uses that promise greater revenue. That tension has become quite visible in SODO, the industrial district south of Downtown, Seattle, where an investor wants to build a new basketball arena, and advocates for port and manufacturing activities want to hold the line on conversion of that area. The same fight was played out in South Lake Union where the old industrial users lost—and in the Ballard and Interbay neighborhoods, where industrial users have held on.

Seattle has a constrained supply of industrial land close to the city center at a time when exciting, new kinds of industry are rapidly developing: artisanal foods and beverages, custom clothing and furnishing and a general renaissance of "urban manufacturing." While heavy industry has mostly moved to distant suburbs and small towns, these new manufacturers are closely tied to urban life and need to be near their customers and partners.

When compared to cities across the country, however, Seattle's competition for industrial land is a nice problem to have. A look at aerial photos of cities in the Midwest and Northeast will reveal large tracts of vacant land close to older downtowns, where abandoned industrial operations have been demolished. Why does Seattle have so few of these vacant tracts? The answer goes back 150 years to the forces that shaped the economy of the city and the role that geography played in its growth.

To begin with, Seattle evolved more as a commercial than a manufacturing center. By actively recruiting businessmen, craftsmen and professionals, and by starting businesses of their own, pioneers like Doc Maynard and David Denny made sure that Seattle became more than just another timber and fishing town. They wanted to create a city of merchants and service providers who would meet the needs of growing communities around Puget Sound. At its height, the Mosquito Fleet served over 300 settlements from its base in Seattle, bringing people to town for shopping and services and sending goods to far flung communities.

When compared to cities across the country, Seattle's competition for industrial land is a nice problem to have.

These pioneers also wanted to create a place where families and middle class culture would thrive. Sure, all manner of entertainment took root south of Yesler Street, but to the north and on Capitol Hill, respectable citizens built fine homes and a territorial university. Seattle had some mills and canneries, but the economic action really took place in the substantial brick and terra cotta buildings that rose up in the downtown core after the fire and the Klondike Gold Rush.

The arrival of the railroads in 1893 and the development of Seattle into the largest West Coast port meant even more trade and commercial activity. By 1910 Seattle had 240,000 residents, but unlike most cities of that size elsewhere in the country, it had no dominant heavy industry. Seattle had grown into the business center of Puget Sound and, increasingly, the Northwest, and a major transportation hub. But aside from shipbuilding and other industries associated with timber, fishing and trade, not much was made in the city.

Seattle's lack of heavy industry is simply a product of its location. It makes no sense at all to locate production facilities in the upper left-hand corner of the map. As the nation moved from shacks on farms to well-appointed homes in cities and suburbs, and from horses and oxen to railroads and automobiles, factories sprung up to make products for an increasingly affluent country. Seattle, however, had little share of this industrial action since it was too far from most of the nation's consumers. Only when technology-laden products came along – first airplanes and then software and instruments – for which distance from the customer did not matter did Seattle break out of its 100-year-old pattern.

This industrial isolation did, however, have an upside. Because Seattle did not have many traditional industrial operations, it did not suffer as much when manufacturers across the country faced debilitating foreign competition in the 1970s and 1980s. On the contrary, Seattle's unique industrial profile – aerospace, information technologies, life sciences, trade – has been consistent with the new global economic order.

While other cities saw factories shut down and faced acres of vacant land surrounded by chain link fence, Seattle's industrial neighborhoods remained largely intact. And as land prices rise in the core, and areas like South Lake Union and Rainier Valley become less available, pressure mounts on districts like SODO.

This will be a challenging time for planners in Seattle as they try to balance the desires of sports fans, longshoremen, craft distillers, nightclub owners and all the other users competing for limited space. It is a challenge we are lucky to have, however, as anyone touring other great American cities will attest.

Michael Luis is a consultant and writer based in the Seattle area. His book, *Century 21 City: Seattle's Fifty Year Journey from World's Fair to World Stage*, came out in 2012. *centurytwentyonecity.com*

Above: The fate of the Millworks Supply building, a typical SODO light industrial structure, will tell us a lot about the future direction of the neighborhood.

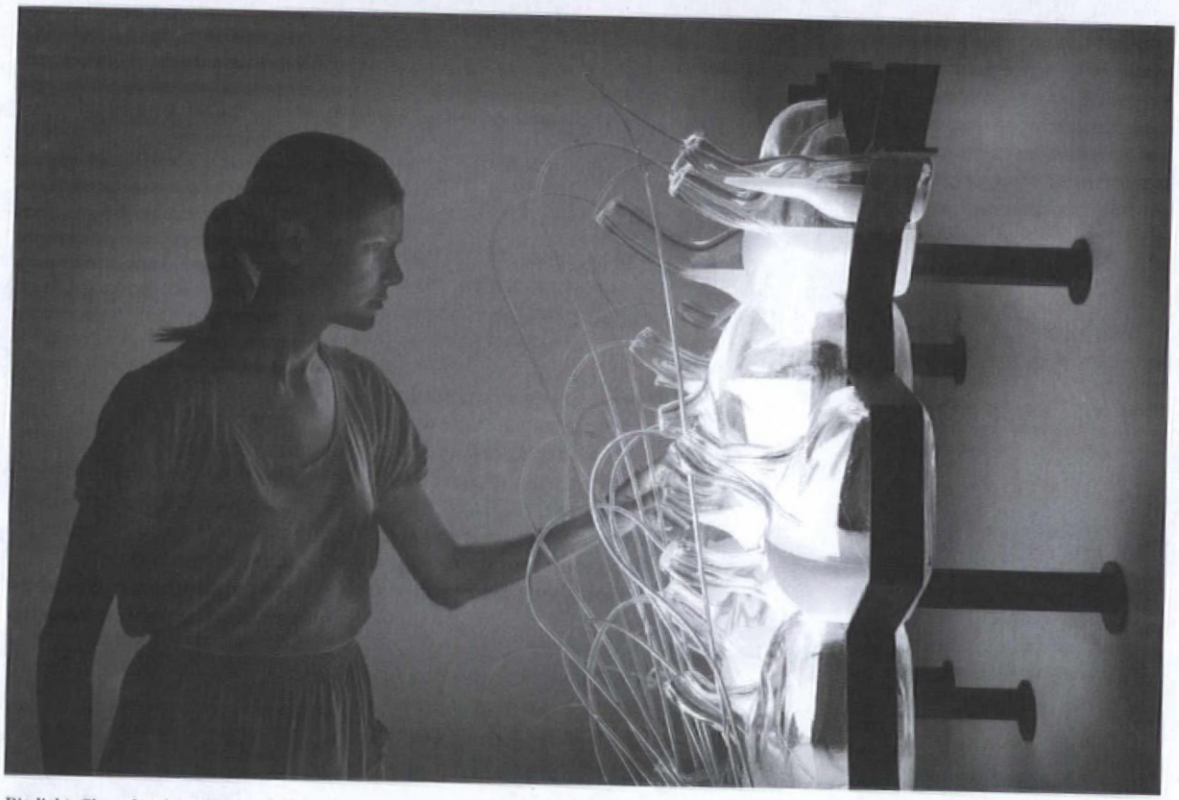
Below: Tired buildings like this SODO warehouse have been successfully repurposed, allowing the neighborhood to retain its character.

Photos: Michael Luis

PERSPECTIVE

The Evolution of Biomimicry

An Interview with William Myers by Allison Kudla



Bio-light. Glass chambers filled with bioluminescent bacteria. Part of Microbial Home—a prototype design project by Jack Mama, Clive van Heerdan and Phillips Design, Netherlands. The design concept is for a series of biodevices for the home aimed at creating an ecosystem for filtering, processing and recycling wastewater, sewage and garbage. Image courtesy of Philips Design

Bio Design by William Meyers surveys recent design and art projects that harness living materials and processes, presenting bio-integrated approaches to achieving sustainability, innovations enabled by biotechnology, and provocative experiments that deliberately illustrate the dangers and opportunities of manipulating life for human ends. As the first publication to focus on this new phenomenon and closely examine how it fits into the history of architecture, art and industrial design, this volume surveys this shift and contextualizes it through comparisons to previous historic transitions in art and design practices, clarifying its implications for the future.

What inspired you to write *Bio Design: Art + Science + Creativity*?
I was inspired through studying the history of architecture and design at the School of Visual Arts in the master's program in design criticism. My thesis project, which I developed with the help of the faculty and with the input of fellow students, became the basis for the book. Also, I was inspired by my own discoveries while becoming an amateur brewer and baker, in learning how to utilize yeast to make my own bread and mead.

One could say that human beings have been altering nature for centuries. However, biodesign brings to the forefront the idea that now is a unique time in human history for these types of interactions. What reasons might there be for a paradigm shift in this direction at this moment in time?
I think there are two factors driving this shift that are most important: The first is that frequent and fundamental advancements are occurring in the field of biology. Just to give a few quick examples: Information about extremophiles, or microorganisms that thrive in places previously thought uninhabitable, has recently led to additions to the branch of Archea on the tree of life. These organisms can survive in frozen, dark, toxic, radioactive places—even in the vacuum of space, which makes them very interesting for potential industrial and medical applications. It also suggests possibilities or, at least, new thinking about how life might live on other worlds. The field of genetics is also a rapidly moving target—the discovery of innumerable, complex gene switches in human DNA was only announced months ago. This upturns the conventional thinking that something like 98% of human DNA was thought to be "junk" leftover from our evolutionary legacy. It turns out that much of it is essential.

The second factor prompting this shift, particularly for design and architecture, is

climate change. There is no longer any question that systems of building and manufacturing must change dramatically if we are to preserve the environment and still fuel economic growth and support social stability around the world. Our conventional methods, which exploit and deplete ecosystems, must evolve so that economic growth instead integrates with and enhances these systems. This is where I think biodesign can offer an approach that can be effective: finding ways to partner with living processes.

Bio-digester: a kitchen waste-disposal system that houses bacteria that consume unwanted organic matter and produces methane to power the cooking range and water heater. Part of Microbial Home—a prototype design project by Jack Mama, Clive van Heerdan and Phillips Design, Netherlands. Image courtesy of Philips Design

I love this quotation in Paola Antonelli's foreword: "In Designers' ability to build scenarios and prototypes of behavior lies a power that they should protect and cherish and that will become even more important in the future." Designers who study and manipulate behavior have a power and also a great challenge at hand. What are some examples of projects from the book that eloquently encapsulate this prophecy already beginning?

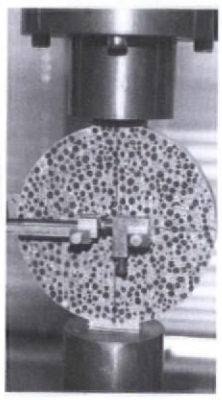
You remind me of the project Microbial Home by Philips—one of their "Future Probes" that delves into what is possible or probable in the future based on emerging technologies and cultural shifts. This project presents a

Double Decker Root Bridge. A dramatic two-storey structure that spans the Umshiang River in India. Image courtesy of Lambert Shadap

series of appliances and home furnishings that all use biology, like a garbage disposal that uses bacteria to digest organic waste, which in turn creates methane for use by the stove. Although I do not foresee such technology becoming widely used anytime soon, I think it accurately predicts how we will become more in tune with such microbial-level processes and find ways to integrate them into our daily lives. Going much further, the artist Liam Young has undertaken a project called *Under Tomorrow's Sky* in which he has assembled a futurist think-tank of scientists, writers, designers and others to help create a portrait of the city many years in the future.

A few times you mention how practices in the book move beyond "emulation." Could you go into more detail about what you mean when you say that?

As I define it, biodesign is a step beyond the strategy of biomimicry, which is the conscious emulation of nature's processes. Biomimicry is, of course, a valuable and important approach, beautifully articulated by Janine Benyus in her book on the subject first published in 1997. However, I worry that the term has been overused and too often stuck onto works of design that simply bear



BioConcrete. Experimental new concrete that's embedded with bacterial and nutrient spheres alongside traditional aggregate that once exposed to distress or cracks in the concrete expand to fill it up with calcium carbonate, much like the way bones constantly self-heal. By Henk Jonkers and CITG Microlab, Delft University of Technology, Netherlands. Image courtesy of Henk Jonkers

resemblance to natural forms or colors, for example. If you think about it, a gas-guzzling Toyota "Sequoia" SUV that is painted a forest-green color copied from a tree leaf might be called biomimicry, but it has nothing whatsoever to do with honoring or protecting the environment, as Benyus had intended. Biodesign, since it integrates living matter, goes beyond replicating a particular feature or observable attribute of biology and instead uses it with an interest in maintaining conditions conducive to life, including an abundance of clean water, soil and air.

BioCouture by Suzanne Lee. This denim jacket is hand stitched from grown bacterial cellulose and then treated with indigo dye. Image courtesy of ©BioCouture

Can you share any anecdotes or noteworthy experiences that happened during the making of the book?

Upon completion, I threw a party that included a bioluminescent water-gun fight in the dark. It was all very jolly until the next morning when I surveyed the mess, including stained walls.

William Myers teaches and writes about the history of architecture and design. He has written for *Domus, Metropolis, The Architect's Newspaper, Next American City* and Pentagram design consultancy. William has also worked for the Solomon R. Guggenheim Museum, The Museum of Modern Art, the Smithsonian Cooper-Hewitt National Design Museum, Hunter College and Genspace, the first community biotech lab in the United States.

Allison Kudla is currently living in Seattle, where she works at the Institute for Systems Biology. She has a PhD from the University of Washington's DXARTS program, where she focused on patterns, fabrication technologies and plant tissue culturing to make living installations. Her work *Growth Pattern* was recently featured in the book *Bio Design: Nature + Science + Creativity*.

SIDE YARD

Bad Ass with a Mustache...

I Grew One This Winter

Ron van der Veen

This winter, I decided to shake things up and do the very un-architectural thing of jumping into a style trend while it was still in its weird and edgy stage. I grew a mustache! A great, big, long one that slides down past the sides of my mouth. This is a '70s porn-star mustache!

My brother Rouke is a real jazz cat. As a guitarist, he not only plays the hell out of his axe, he looks and acts and dresses and eats and talks like a jazz cat. His guitars look jazz-catty. He drives a vintage "Cattylac." He has always been my hero of "the cool."

By now, most of our faithful Side Yard followers are well aware of my protracted quest for this sense of hip legitimacy as an architect. Along the way, I've written about looking cool, acting cool, talking cool, living cool, cool houses, cool kids with cool toys, cool music and even cool glasses. And as long and hard as I have labored at it, I always seem to be a half-step short of this urban ideal.

One thing I have realized along the way is that architects are inherently prudish. Deep down we've all wanted to be artists, musicians and urban activists, but we didn't have the emotional *cajones*. In some ways, we are all trapped in our psychological cardigan sweaters and pleated khaki Dockers. We may be one step ahead of the general culture in taste, but it's not in our nature to be setting the pace. We think we're so cool wearing blue jeans with suit jackets, but software designers set this trend in the '90s.

So this winter, I decided to shake things up and do the very un-architectural thing and jump into a style trend while it was still in its weird and edgy stage. I grew a mustache! A great, big, long one that slides down past the sides of my mouth. This is a '70s porn-star mustache!

Over my career, I feel like I have manifested my profession's ambivalent relationship to hairstyles in my own facial constructs. Two things have been constant for me: 1. I have a restless face, so I am constantly changing up what gets shaved and what stays and 2. I don't want to go too far out on a limb. Yeah, in the '70s I had the same mustache, plus long hair, sideburns and oversized plastic glasses. But as much as I might have wanted to, I just couldn't do anything as far-out as Ziggy Stardust.

In the '80s, I went a bit wild and grew a rat tail but often kept it hidden under my pastel-colored shirt collar for fear I was just way too un-yuppie. I eventually cut it off and mailed it to my sister. I also took many cues from Don Johnson and Miami Vice, continually experimenting with maintaining that perfect three-day growth...everyday. With the technology we had in those days, it was harder than it looked.

I'm pretty sure I was the first architect in Seattle to grow the ever-so-popular-in-our-profession goatee beard in the early '90s, but this was only after I saw Brad Pitt with one. (Rick Zieve *might* have beaten me, but he's stuck in a beard rut.) In this decade, I also made the worst hair decision of my life and grew a fairly large and unmanageable mullet. What was I thinking?! Again, all of this was within the confines of the approval of my style-sheepish architect peers.

As the twenty-first century arrived, I remember how proud I was to enter it with a soul patch, but again, Brad Pitt already had one, so it was still pretty safe. However, as with my goatee, I believe I was the one who introduced the Seattle design community to this peculiar swatch of facial hair; now, half the architecture community over 40 has one. It should really be called the muzak patch.

(On a side note, how does a designer determine how big his soul patch should be? Does the bigger the patch mean the bigger the soul? Or is it a compensation thing? You don't want to go too big because it may appear like an oversized truck, gold chain or crotch rocket. And if you go too small, is it because you are really into detail and precision? Or is it because you are indecisive?)

I've often wondered why many of the established architects in Seattle haven't experimented more with their beards. Take Tom Kundig for instance (he does have that characteristic longish hair). Come on, Tom, I challenge you to a sideburn competition!

Like so many architects I know, I want to be relevant and progressive, but I don't want to be loud-mouthed about it. I would rather mail my soul patch to my mother than find out people think I look too eccentric. When it comes to my facial-hair style, I have relied on everyone from Tom Selleck and Johnny Depp to Dirk Nowitzki, Bruce Springsteen and Pat Morita for direction. All pretty edgy mainstream.

But this time is different. I'm not waiting for some celebrity or graphic artist to affirm me—I'm going to lead. I don't care if people think I'm having a mid-life crisis or if one of our commercial real estate clients thinks I'm Dale Chihuly. Heck, maybe I'll be the Ron Jeremy of architects! Now that's badass.

By the time this article is published, Ron will have been growing his mustache for close to three months. If you see him around town, please tell him he looks cool. It will help his self-esteem. For comments, ideas and questions about Side Yard, please contact Ron at rvanderveen@dlrgroup.com.

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Northwest Architectural League dba ARCADE
1201 Alaskan Way, Suite 200, Pier 56
Seattle WA 98101–2913

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