THE MAGIC THAT MAKES THE WHOLE:
DESIGN RESEARCH AND THE CREATION OF PREFERRED FUTURES

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INTRODUCTION

It's a special honor to participate in this important celebration of the Virginia Society's first 100 years, and to help open the door to the Society's next hundred years. At the outset I'd like to recognize the important goals of the Virginia Accord, combining job creation and environmental sustainability, and the subthemes the VSAIA has identified: Constructed Environment, Public Health, Transportation, and Land Development and Urban Infill. The Society's proactive approach to contributing to the world's future, in all its fullness, is an important next step for the environmental design professions in the Commonwealth, and I hope my remarks today will help further frame this discussion.

I'm going to speak about the value of design as a form of research and the important role that we--architects, landscape architects, planners, interior and product designers--have to play in improving the future of the world.

Designers are naturally synthetic thinkers—we see the whole, seek and solve for patterns, and tend toward action rather than reflection. We are keen to create the future, and often place less value on "learning for its own sake." We recognize that every situation is different from every other situation or that, using Heraclitus's famous metaphor, "no man ever steps in the same river twice". As a result, many of us are suspicious of, or inpatient with, methods of traditional scientific research requiring that experiments be strictly replicable, with defined variables and clearly defined experimental parameters. We know that the world does not work this way, and we tend to resist participating in, or even in some cases valuing, such research.

We recognize that, as we come to know "more and more about less and less," this research somehow allows the magic of the world to disappear.

Chemist and philosopher Michael Polanyi expressed this frustration well nearly half a century ago, saying, "We can see now how an unbridled lucidity can destroy our understanding of complex matters. Scrutinize closely the particulars of a comprehensive entity and their meaning is effaced, our conception of the entity is destroyed." (Polanyi, 18)

More recently, scientists, too, have recognized that important findings are made in the margins between fields of study, where defined disciplinary knowledge connects with the larger world. This has been called the "Humpty Dumpty problem" harkening back to the 18th century nursery rhyme that warned, "All the king's horses and all the king's men couldn't put Humpty Dumpty back together again."

Biologist Robert Dorit, writing in *American Scientist,* says "But the days when we could have blind faith in the power of reductionist deconstruction are over. Humpty lies in fragments. Fortunately for us, a new approach is taking shape…Systems biologists, complexity theorists and newly minted biologists now attend as carefully to the ways in which parts come together

as they do to the parts themselves. In the process, features of living systems that we once carelessly overlooked (or destroyed) in our haste to deconstruct now snap into focus…These features characterize systems that are simultaneously resilient and capable of evolving. They are the calling cards of life."

So it may be that designers' skepticism has been well-founded, giving us an opportunity to contribute on our own terms, as designers and design-thinkers.

But before exploring our native talents, skills, and experiences, I want to reflect briefly on the range of research frameworks we have inherited, to situate our work within this larger context.

RESEARCH FRAMEWORKS

Karl Popper, the philosopher of science, advocated for the value of research, saying simply, "we can learn from our mistakes." (Kuhn, 278)

As individuals, we learn from birth until death, always with the goal of acting in a preferred way, to achieve a preferred outcome: we try to improve, or at least not to repeat the same mistake twice. Expanding this idea, our disciplines "learn" collectively. Research provides feedback and leads to disciplinary advances, just as it does for us as individuals. I very much like the way Donald Schön describes the type of research we do naturally, when he says, "the situation talks back." (Schön, 79) This is the essence of a research mindset, and it is one we all know well.

We might linger, for a moment, on the concept of the "situation." This recognition of a situation is very much the strength of designers. We do not isolate problems to the point where the "conception of the entity is destroyed." Rather, by abstracting but not eliminating complexity, designers try to retain a sense of the whole, and to find ways forward that account for complicated interactions.

Our collective challenge is how best to listen, and how to share with others what we have learned when situations talk back.

Many of us believe that now is the time to advocate for the importance of design and design thinking in solving today's "wicked" global problems, problems often at the boundaries of defined disciplines, and in need of applied responses. Many of today's most intractable problems are tangled up in sustainability's three "Es" ecology, economy, and social equity, and responding to these wicked problems requires the thoughtful participation of the people in this room. Indeed, this is the call to action posed by the Virginia Accord. And responding will require practicing and advocating for a range of research practices.

In the book *Scholarship Reconsidered*, author Ernest Boyer defines four distinct forms of scholarship practiced in most universities. These were the scholarship of discovery, the scholarship of integration, the scholarship of application, and the scholarship of teaching. He provides a useful summary of these distinct forms of scholarly research and explains why the "scholarship of discovery" has been privileged in academia and within governmental agencies throughout most of our lifetimes. (Boyer, 15-25)

Boyer describes *discovery* as the form of research most celebrated within the academy, explaining that this is the research, often created in the basic sciences, wherein the building blocks of life are uncovered and clarified. The scholarship of *integration* connects one field to another, finding new meaning between "overlapping academic neighborhoods." The scholarship of *application* takes basic insights and uses them to address important issues of

the day. The scholarship of *teaching* extends knowledge through the act of communication.

RESEARCH INFORMED PRACTICES

I'd like to spend a few moments bringing some of Boyer's descriptions of research to life through three examples that are specific to architecture. The first is what Popper described as "not making mistakes." A second has to do with research leading to innovation. The third is what we might describe as a paradigm shift.

To reduce mistakes

I'll begin by talking about simply "not making mistakes" by using research in a timely fashion. Philip Mead, in his wonderful essay "Unhealthy Energy Conservation Practices," begins with a quote by systems thinker Peter Senge: "Today's problems come from yesterday's solutions." (Mead, 153)

Mead's essay focuses on the 1970s energy crisis, and one widespread result of that crisis, which was that architects began to make much tighter building envelopes to reduce energy usage. This meant buildings were designed with more compact perimeters, more airtight building envelopes, fewer openings, and as a result, less natural ventilation. Our well-intended collective response was to design windows that did not open, or to incorporate fewer windows altogether.

While this had the effect of reducing energy usage, which was important at that time, there were unintended consequences, and these became the subject of Mead's essay. He describes two kinds of unintended consequences—the quality and quantity of air and of daylight.

It is only recently that studies have been done by researchers in healthcare and education--many times working in concert with architects and other environmental designers--demonstrating the importance of windows that are operable, that provide views and abundant daylight. Had we undertaken research as these buildings were built, considered the consequences collectively, and shared our findings systematically, perhaps we could have avoided a generation of buildings with this significant shortcoming. By focusing on one aspect of the building we mistakenly overlooked the magic of the whole.

Looking at Boyer's descriptions of types of scholarship we might say that to avoid this decade-long collective mistake we would have *integrated knowledge* across different disciplines, including environmental psychology, mechanical engineering, epidemiology, and design, and *applied this new knowledge* across disciplines. We would have sought to understand the performance of buildings holistically rather than looking simply at one element, a tight thermal envelope, in isolation.

To innovate

A second more optimistic example of the use of research comes from the work of Arthur Troutner, a relatively unknown architect working for about fifty years, beginning in the 1950s. He was a native of Idaho, one of five children born into a family of modest means, reported to be an inventive child from an early age. (Reich, 199-211)

He designed and built many buildings, from private houses to the football stadium at the University of Idaho. He naturally employed wood in his designs, an important natural resource in Idaho. He invented new ways to extend the structural capacity of wood at the same time he worked to conserve this resource.

He invented first what was called a “trus deck” a product integrating floor decking and a structural member, and then “trus joists”, and finally and “micro lam” beams. Those of you who have designed in wood have probably specified products that he invented across the course of his career. By the time he died, he had more than 50 patents to his name. He also developed a business out of the “trus joist” suite of products, and for this he had a business partner, Harold Thomas. Together they invented a system for manufacturing the trus joist line of products and for distributing and selling them. Due to his inventions and his ability to take them to market, Troutner became a wealthy man. He ultimately sold the business to Weyerhouser, the manufacturer that today provides these products, which many of you have specified in your practices.

To innovate as they did, Troutner and Thomas *integrated knowledge* from different disciplines such structural and materials engineering, construction, and business along with architecture. They *applied this knowledge* to conserve the Idaho environment Troutner loved, but also, of course, to make money. An important part of the success of their enterprise had to do with *teaching* their customers how to use these new products, so one might say they used three of Boyer’s four modes of scholarship--integration, application, and teaching.

To stimulate paradigm shifts

The third example of design research led to a true paradigm shift. Filippo Brunelleschi is described as the inventor of perspective, a story some of you may remember from your architectural history classes.

In the early 15th century Brunelleschi painted a small representation of the Baptistery in Florence and its surroundings, reported to be correctly proportion and positioned, geometrically and mathematically “accurate.” The building and piazza appeared to recede in space because Brunelleschi used a grid system to measure distance.

He shared his invention, which he called a demonstration, with his friend and fellow architect Leon Battista Alberti. Alberti wrote about the demonstration using geometric terms and provided instructions for constructing perspectives. Alberti’s instructions to construct perspectives were very similar to the ones many of you use when drawing even today if you have a sketchbook in your hand.

This might be seen as a *discovery-driven* paradigm shift, because Brunelleschi and Alerti “invented” the rules of visual perspective. They provided a way to “accurately” represent three-dimensional space in two dimensions.

We owe a great deal to Brunelleschi and Alberti, along with important others, who have given us the tools with which to conceived of architecture in Cartesian space. One might argue that today’s vector-based digital representation uses Cartesian coordinates that are based on the way Brunelleschi and Alberti presented them to us six centuries ago. Their discovery significantly changed the built form of the western world.

I hope these three examples--one where we simply hope to make fewer mistakes, one leading to innovation, and one leading to a paradigm shift in how we conceive of space--bring to life the Boyer’s concepts.

Now I would like to take a few moments to flesh out what we designers do that is special, to make this framework more tangible. We can then think together about how to more effectively use our talents, our experience, and our disciplinary frameworks to create preferred futures.

DESIGN RESEARCH
As we enter the Society's second hundred years, I believe we have an extraordinary opportunity to contribute by doing what we do best--thinking and acting as designers.

Put simply, designers are very good at considering complex situations, without losing their complexity. We embrace and try to enhance the "magic that makes the whole." We are not afraid to act, to propose futures, to conceive of what *might be*, not just what *has been*.

Think through similarities
We do this in part by thinking through similarities. This is sometimes called "abductive thinking," the kind of problem solving Sherlock Holmes engaged in when he looked for clues, patterns, and curious similarities. Designers often do this explicitly through the case study method of preparation, but we also do it intuitively, when we identify formal patterns, or when we use metaphors to describe our thinking or our design proposals. We take relevant and related features and apply them to a new situation, reshaping them to fit new circumstances.

Employ different kinds of intelligence
We also employ what Howard Gardner describes as multiple intelligences. We think through words, pictures, sound, motion, mathematics, spatial logics, and with great interpersonal sensitivity. Many of us have the ability to "cross these circuits," to translate a mathematical logic into a visual rhythm, or a prevailing breeze pattern into a verbal description. Anthropologist Margaret Mead described this as multi-modal thinking.

Sometimes these translations happen so quickly we are barely aware of them ourselves. One of our challenges for the next hundred years might be to recognize our own creative processes and to externalize them more fully for others, because these moments of lightening-fast thought are the beginning of new knowledge, or knowledge applied in new circumstances.

Draw to think
"Drawing is thinking," asserted graphic designer Milton Glaser. I suspect we all know this to be true. When we draw, we combine intense concentration with an almost lazy peripheral awareness. When we draw from life we observe relationships that we might otherwise overlook. When we draw to design, we literally draw connections never before made quite that way.

See patterns easily
Because we are so fluent visually, we see visual and spatial patterns easily. This helps us understand how water flows down hill, where traffic pools, why certain passages must be wider than others. We both recognize patterns and communicate them to others more easily than professionals in any other discipline I know.

Visual data
And, as big data has come to define our era, it seems we are also especially good at visualizing data. We can see patterns in numbers, and find ways to represent data so that we learn from it. We can coax big data to "talk back" to us, allowing us access to its patterns, providing a means to make sense of it, and to propose action using it.

Using the skills I've just described, our disciplines have developed several research methods that account for complex wholes. Three are the post occupancy evaluation, the natural experiment, and ethnography.

Method: the post occupancy evaluation

Many of us resist participating in post-occupancy evaluations, perhaps because we don't want to learn of failures but also because, frankly, they can be uninspiring. I believe we have not yet found ways for evaluation to capture our imaginations.

Let me share two promising models: The Belgian architecture firm Rotor participated in the 2010 Venice Biennale by contributing a radically literal form of post-occupancy evaluation. They removed worn carpets from buildings in the Brussels, demonstrating patterns of occupation, and reinstalled them on the walls of the Arsenale in Venice. They also photographed wear patterns on stairs and in hallways—beautiful evidence of human action—and exhibited them as art. Here we learned facts without diminishing their poetic power.

A second example is a series of "drawn walks" by MIT professor Paloma Gonzalez. The project, called "WALKACROSS" traces moving bodies, uses GPS tracks set within floor plans to see humans in action. Both of these design projects trace actual human behavior rigorously, beautifully, and instructively. How might we learn from their examples?

Method: the natural experiment
Natural experiments provide a credible alternative to laboratory-based scientific experiments. Following the well-known example of the 1858 London cholera outbreak, during which Dr. John Snow traced the paths of those who became ill back to one shared drinking well, we can work with epidemiologists, statisticians, public health officials and others to draw conclusions from complex lived situations.

Method: ethnography
In the last decade or so, design thinking has become an important element in business education, in part due to the work of the design firm IDEO. One of the methods they have advocated successfully, and one that we use far too infrequently, is described as ethnographic research. They closely observe the way people use products, how they move through space, how they behave on a daily basis. These observations, often done by trained anthropologists, are then brought back to the design process, so that designers can incorporate end-users' real behaviors into the design of new products and processes. I just completed a project with anthropologist and industrial designer Jacob Simon, the Director of Experience Design from NBBJ-Seattle, a firm that has embraced this form of design research.

I've described some research methods that we might consider native to designers, or at least a natural fit for designers. I'd like to end this brief inventory of opportunities by suggesting two "repositories" for designers' research, both of which hold knowledge within its context.

A complex whole: the case study
The first is the case study. Through case studies we might investigate common building types, common site circumstances, or common tectonic solutions. A good case study is clear enough to be instructive, but complex enough to be understood as part of the real world. While we use case studies in teaching and in practice, we do not yet embrace them to the extent that, for instance, business schools use the "case study" method of instruction, or physicians rely on "grand rounds" to present classic medical conditions. Among our disciplines, landscape architecture has systemized this synthetic repository of knowledge most effectively.

A complex whole: place-based knowledge
An even more comprehensive repository might be the use of a specific location as a form of living encyclopedia. This is sometimes described as place-based knowledge or local knowledge. Taking the idea several steps further, my colleague Tom Fisher has advocated

reorganizing libraries so that knowledge is classified not according to an abstract taxonomy but rather as it is *literally* organized in place. For example, Abby Suckle's "CultureNOW" project, described as a museum without walls, maps history, art, and architecture in the public realm. It allows people with smart phones to walk down a street and learn about its history in place. CultureNOW originated in New York City and has expanded to eight cities and the state of Florida.

As a second example, University of Idaho professor of landscape architecture Lil Alessa, and planner and a cultural geographer Andrew Kliskey, are cataloguing tribal knowledge using data sets embedded in interactive GIS-based maps.

How can we more fully capitalize on the potential of these digital technologies, and integrate them into our design efforts? How can we contribute our knowledge of locations to the larger world?

DEPENDABLE FEEDBACK—ORIGINALITY, IMPORTANCE, INTEREST

When scientists consider the value of research to others they identify three necessary criteria: originality, importance, and interest. They ask the questions, "Is what I have found new? Is it important enough to others that it will make a difference? And, does anybody care about this knowledge?"

In order to answer these questions, designers must first recognize that we have found out something we did not know, something that perhaps no one knew. This self-reflection can be surprisingly difficult.

Recognizing new knowledge

Michael Polanyi used the phrase "we know more than we can tell" to explain that, in practice-based disciplines like architecture, we do things but don't necessarily understand the value they might have for others, or even for us. Some of our knowledge takes the form of actions or experiences that reside beneath our conscious awareness. This knowledge is held in our drawing hand, or embedded in years of unspoken experience.

So the first challenge for architects is to be alert to our own professional experiences, recognizing when we're learning something that is important for others to know, something important for us to communicate to others, then documenting it appropriately. As simple as this sounds, it is surprisingly difficult.

Peer review

Once we have recognized that we hold knowledge that is potentially original, important and of interest to others, we need to test our assumption. This testing process is called peer review, a process in which many of you have participated. Design juries--for built or unbuilt projects--and editorial boards for research journals are a few forms of peer review we have available to us.

Dissemination

The final important component of disciplinary feedback is generally known as "dissemination of results." Through publications, websites, public presentations and debates, this might happen between design disciplines and also, importantly between professionals and academics.

In summary, to make good on the promise of design thinking we need to recognize when we are learning something and record it. We need to confirm its relevance through a peer review

process. Finally we need to disseminate knowledge within our disciplines, between disciplines, and also, importantly, across the boundary that all too often divides professionals from the academy.

THE DESIGN OF PREFERRED FUTURES

Thomas Jefferson said, "I like the dreams of the future better than the history of the past."

Designers, too, like the dreams of the future. In fact, as Herbert Simon describes it, design is just that--the creation of preferred futures. Today I've provided some conceptual tools to more precisely consider design thinking and research, with the goal of helping us imagine preferred futures inventively and responsibly.

I've shared with you Boyer's four types of scholarship—discovery, integration, application, and teaching—and suggested that we are especially good at design research through integration, application, and teaching. I gave examples of design research to help us make fewer mistakes, to lead us toward innovations, and to contribute to a rare world-changing paradigm shift.

I've highlighted some special talents designers possess, fine-tuned through our education and experience. These include our ability to think through similarities, to employ different modes of intelligence, to draw in order to think, to see patterns easily, and to visualize data. I've argued that we have experience with research methods helpful in design research, including poetic post-occupancy evaluations, natural experiments, and ethnography. I've reminded you that we have unique ways of holding knowledge in complex wholes, through case studies and by building place-based knowledge. And I've posited that we can do more—recognizing and documenting what we have learned, seeking peer evaluation, and finding new means of dissemination.

The Virginia Accord lays out important goals for the next century. Today we can dream together, applying the opportunities we have as designers, mindful of the magic that makes the whole, to create preferred futures.

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