CONTEXTS

SYSTEMIC DESIGN ASSOCIATION

Systemic Design as Born from the Berkeley Bubble Matrix

Harold G. Nelson
nelsongroup@cal.berkeley.edu

Abstract

From the early 1960s and continuing into the 1980s, an aggregation of exceptional scholars and professionals formed in the University of California, Berkeley environs, establishing a common bond amongst themselves and with other networks of scholars, students, and professionals globally. They were not in the same disciplines, specializations, or professional fields. They were colleagues sharing a common aspiration.

What they shared was a deep interest in, and commitment to, the utility of systems thinking and design action as a means to secure improvements and advancements in the human condition.

This common bond resulted in what I have called The Berkeley Bubble—which was internationally influential inside and outside of academia. Unfortunately, the Bubble began dissipating in the closing years of the last century, leaving generative echoes of the ideas incubated and matured in this unique crucible to influence future generations.

This essay is a narrative account of the individuals involved—starting with a doctoral committee composed of some of the key people entrained in this bubble—of their influences on one another and on the world of practitioner-scholars worldwide continuing through today.

Keywords: paradigm, inquiry, autopoiesis, phronesis, agency, desiderata

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Preliminary Notes to the Reader

The spirit of this essay is drawn from many formal presentations and informal conversations with seminal scholars and practitioners in the fields of systems and design. The work has not ended. The inquiry is ongoing, formally and informally, as a reflective conversation—a shared dialogue.

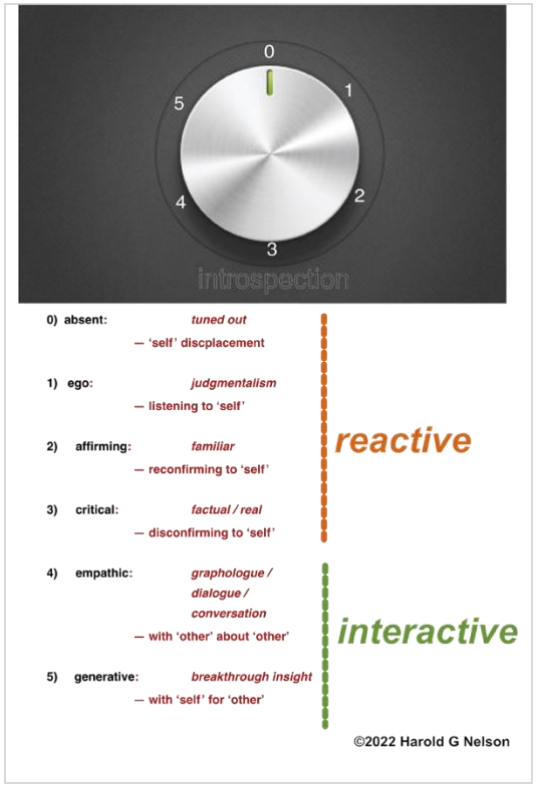

Figure 1. Quantum listening channels

To more fully access and appreciate the ideas in this essay, there is a little groundwork that needs to be laid—the reader of this narrative is an integral part of the narrative's dynamics. What is heard and understood depends as much on the listener's stance as the content of what is being said.

First, the reader needs to become aware of their paradigmatic entrainment. Is it science, art, politics, religion, or some other form or mixture of dominant paradigms? What are the things taken for granted and the habits of thought in play? What are the expectations in place? This involves a measure of introspection and awareness—mindedness as well as mindfulness.

Secondly, the reader needs to take notice of the frames and filters they have in place when receiving new ideas or entertaining unfamiliar concepts. This is not to identify personal biases but to make personal lenses and filters available for adjustment, replacement, or refinement as desired and necessary. A quantum listening—state-based—schema shows which channel can be tuned into—which state of listening the listener has selected when listening to the speaker's voice (see Figure 1).

And finally, this is an essay, not a comprehensive academic paper. This essay extends beyond the body of this text, pointing to references and expanded material on related websites. For example, more information on the people and their ideas mentioned in this essay can be found at haroldnelson.com, 'from my library.' The spirit of this essay is drawn from many formal presentations and informal conversations with seminal scholars, practitioners, and students in the fields of systems and design. The essay and The Berkeley Bubble influences do not end here—the dialogue is ongoing, formally and informally, as a reflective and shared conversation. You are welcome to join.

Bootstrapping a New Paradigm into Reality

> There are these two young fish swimming along, and they happen to meet an older fish swimming the other way, who nods at them and says:
> "Morning, boys. How's the water?"
>
> And the two young fish swim on for a bit, and then eventually one of them looks over at the other and goes:
> "What the hell is water?"
>
> –David Foster Wallace
> Kenyon College commencement address, 2005

> No one really understands water. It's embarrassing to admit it, but the stuff that covers two-thirds of our planet is still a mystery.
>
> –Philip Ball
> The mystery of water, Nature 452, 291-292 (20 March 2008)

'Water' in this essay is understood to be a metaphor for the high-level socio-cultural paradigms we are all immersed or entrained in. Many people are immersed in the 'waters of rationality,' some are immersed in the 'waters of aesthetics,' or 'politics,' or 'spirituality,' or any number of other entrainment matrixes. A few of us are attempting to become entrained in the waters of systemics and design, particularly systemic design—so the salient question is; "what the hell is systemic design?" The question focuses on how to reveal the nature of an incipient systemic design paradigm and its attendant metaphors and schema.

This brief essay is an introductory eyewitness accounting of my pursuing this question—the question I have taken seriously over the past several decades following the systemic design trajectory launched from what I experienced as the Berkeley Bubble. From the early 60s through the early 80s, an aggregation of exceptional scholars and professionals formed in and around the UC Berkeley environs establishing a common bond amongst themselves as well as with networks of other scholars, students, and professionals globally. They were not in the same disciplines, specializations, or professional fields. They were colleagues sharing a common aspiration—turning deep thinking into the right action.

An Exemplar of the Berkeley Bubble's Incipient Paradigm

This essay is a curated summary looking back at the Berkeley Bubble's inception point and the subsequent path of my professional and scholarly development since I acquired my PhD in the Design of Social Systems from the Ad Hoc Doctoral program at the University of California at Berkeley. To be accepted into this program, it was necessary to convince the Academic Senate that my area of interest did not fit into any existing field of study on campus. Once that was accomplished, I was permitted to design my curriculum and choose my faculty for this one-off area of inquiry in concert with my graduate advisor, C. West Churchman.

West Churchman suggested that my PhD program be called the 'Design of Social Systems'—a foundational systemic design program. My field research focused on 'boom towns,' which were emerging as a consequence of large-scale energy developments in the western United States. The fieldwork was supported by the US Department of Energy through the Lawrence Berkeley Research Laboratory.

My dissertation was a demonstration of the real-world utility of philosophy, which is too often separated from practical, pragmatic thinking and behavior (Churchman, Nelson, & Eacret, 1979). The strategic intent for my fieldwork was to demonstrate the application of Immanuel Kant's moral imperative to never treat another, even oneself, as a means only but as an end in themselves. The demonstration took place in a very complex, real-world situation—geothermal energy development in northern California. The fieldwork was a 'value distribution assessment'—that ascertains who in particular loses, and who in particular gains—rather than just being another ubiquitous socio-economic impact assessment recording the aggregate costs and benefits of resource development.

It turned out that this subject was politically dangerous to approach in this way in the 'real' world. It led to non-academic learnings about the effects and pressures from actors in political and social contexts, including academics and bureaucrats. It was a true systemic educational experience. A traditional doctoral program would not have provided this kind of opportunity for extracurricular learning. The questions that arose as a consequence remain invaluable to the maturing process of systemic designing in the real world.

My PhD was a product of the energy and reach of the Berkeley Bubble, although restricted somewhat by the traditional norms of a science-based Ph.D.—it was a research dissertation rather than a systemic design dissertation. The real value of the dissertation was the emergent unanswered questions about the nature of systemic design inquiry that have remained compelling over time.

Michael Heyman, Berkeley's chancellor at the time, was a member of my doctoral committee. When I finished my dissertation, he congratulated me, telling me that I should be proud of what I accomplished given the challenges of even getting accepted into such a carefully guarded program. He also admonished me that this was probably the worst thing I could have done for my career. He said that there would be no 'old boy (sic) system' in place to help establish and direct my future career. He was absolutely correct, as it turned out, but:

> … I shall be telling this with a sigh
> Somewhere ages and ages hence
> Two roads diverged in a wood
> And I took the one less traveled by
> And that has made all the difference
>
> –Robert Frost, "The Road not Taken"

Metaphors and Exemplars of the Emergent Paradigm

While in the Navy, I observed land birds far out at sea where they had no business to be. I was told that they were called accidental vagrants. I learned that all sorts of animals could become accidental vagrants, not just birds. By their importation of creative and innovative influences for change, they are invaluable to the continued viability of healthy (open) ecosystems. The more I learned about accidental vagrants, the more I realized that this term described those following the systemic design capacitation and praxis path—they are accidental vagrants aspiring to become scholar-practitioners of systemic design in real-world projects in real-world contexts.

Systemic design is a term applied to a variety of forms of applied science or practical arts, which is becoming mainstream. My experiences followed a third path divergent from those two—a tertium quid—the design track. Design is a third culture of inquiry—inquiry for action followed by action—distinct from science or art, with its foundational pallet of postulates, assertions, beliefs, and fundamentals. This form of inquiry—the action of a design mind—has motivated and guided human thinking from the beginning of human time.

Systemic design defines several stances and approaches that conjoin systems and design inquiry. This plurality is similar to the story of the plurality of the term design thinking. When used to denote advanced systemic designing, the term systemic design is starkly different in quality from the many other contenders. Systemics are the logics of design—inseparable from designing or explaining designs. Both 'design' and 'system' are terms that are used as nouns and verbs. The conjunction of a system perspective and a design approach results in emergent qualities of inquiry and action that are not available to either alone.

Ontological (knowing what exists) systems logic focuses on that which is in-between components or elements—the relationships, links, connections, and bonds between things—as well as the emergent qualities that materialize as a consequence of this conjunction. It also focuses on apposition—the 'fit' of a design into its context and environment.

The epistemological (how to know) systems logic is an approach that is inclusive, wholistic, and a unifying process of thinking—a different way to think in contrast to the exclusory, analytic, and reductive approaches to thinking that are routinely taught in schools or in the standard practices of administration and management in academic, business, and governmental settings.

Advanced systemic design is an emergent conjunction of poiesis and phronesis. Poiesis is an activity in which a person brings something into being that did not exist before—to make. Phronesis is wise action—a type of enacted wisdom or intelligence. It is the type of wisdom manifested by practical or prudent action—implying good judgment and excellence in skills. This conjunction is a systemic formalization of the aspirations of the participants in the Bubble.

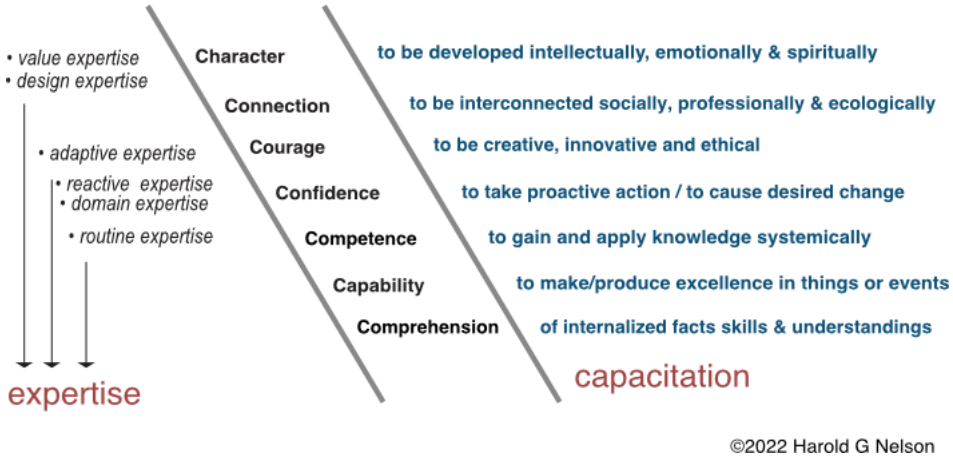

Figure 2. The 7 Cs of expertise and capacitation

Good character is just one of several essential qualities possessed by systemic designers as accidental vagrants and fully present among the Bubble scholars and practitioners. Seven qualities, including character, are of particular importance for scholar-practitioners (Figure 2).

Possession and mastery of all of these seven qualities are not as critical for academics and professionals in the same way they are for systemic designers. Academics and professionals may be quite successful in their careers with just some of the qualities in hand—however, a systemic designer needs to have all of them at hand. For example, courage is essential—not just Homeric courage (the warrior) but Aristotelean courage (the courage of the citizen) as well.

Courage in Systemic Designers

The seminal group of scholars at the center of the Berkeley Bubble demonstrated great courage in their championing of their systems thinking approaches to change—systemics—which also defined a personal commitment to enacting their own connection and interconnectedness. They contributed to the palette of systemic approaches through the lenses of natural systems, living systems, social systems, and organizational systems in the process of composing their own schemas. Courage was essential for them.

For example, West Churchman's imperative challenge to business schools and professional managers to act ethically was not well received even at Berkeley. He expanded his imperative to include all types of professionals and practitioners, including systems scientists, which was also not well received by many of his colleagues. Yet he continued to remain committed to establishing ethics in business and professional praxis.

Another example of professional courage is Russell Ackoff's pronouncement at an international conference and in a professional journal article that "the future of operations research (OR) was past"—a field that he had helped found and grow into a major academic

field and consulting venue. Needless to say, his proclamation was not embraced by the field of OR practitioners.

Arnold Schultz's determination to establish ecosystemology as a legitimate academic field of study and domain of research elicited strong pushback from established researchers on campus and field stations, but he persevered.

Each example represents a call for fundamental change to established norms, and courage was essential. Courage is seminal in systemic design, in part because of the dominance of indeterminacy, necessitating judgment-based choice such as when enacting the concomitant freedoms of human inquiry (Figure 3).

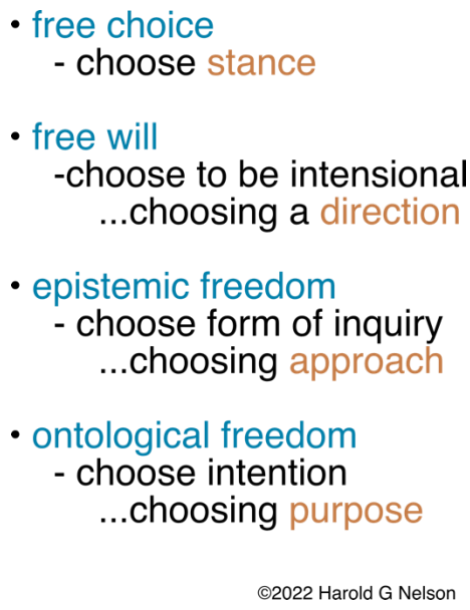

Figure 3. Design freedoms

Schemas for Measurement — Examples

Courage is also essential for creating schemas that provide utility for navigating complex, indeterminate environments. Theories are a special class of schema that are reinforced with rational certitude in distinction to more unbound generalized design schemas. The architect-builders—master builders—of Gothic cathedrals did not use standardized scales or instruments of measurement—examples of scalar bounding schemas. At the beginning of a cathedral's construction, the master builder would lay down a great mark from which everything would be scaled and proportioned. Each cathedral was distinct in size and appearance because of its great mark—an ultimately particular schema.

Today's young designers, including but not limited to architectural designers, are not taught how to define and lay down their own great mark—how to bound a system. Their mentors do not train them how to create and use a great mark or even explain why it is a necessary skill to have. They are taught how to access the multitude of standards-of-measure at their fingertips—computerized fingertips nowadays. No need for courage in that.

But what about the design of social systems? Who lays down the standards of measurement—a great mark—for those designers? What should those great marks measure? Who should be served by the innovation of a great mark? Those were the kinds of questions implicit in the ongoing conversations in the Bubble, especially for West Churchman. There were strong ethical connotations for him in each question.

Self-Organization of The Berkeley Bubble

As in any complex developmental process, such as with systemic design's genesis, the trajectories and branching of threads of development are highly influenced by the initial conditions at an inception point. In my case, the inception point for systemic design was the Berkeley Bubble—the aggregation of students, scholars, and professionals formed on UC Berkeley's campus and its surrounds in response to the attractors of systems and design.

I now realize that they were consummate polymaths and that any systemic designer is a nascent polymath by nature, including myself. What they shared was a deep aspirational interest in, and commitment to, the utility of systems thinking and design action as a means—in the words of Churchman—to "secure improvement and progress in the human condition." All done while engaged in respectful, collegial discourse without cutting their shared conversations off with deterministic definitions

The conversations were understood to be unending. The binding focus for all was on how to best turn deep thought into prudent action. This is a considerable reach beyond today's popular aspirations, such as the economic aspiration of high-tech firms—"to put a ding in the universe"—in the words of Steve Jobs. The commonly shared aspiration for improving the human condition resulted in the autopoiesis of the Berkeley Bubble—which was internationally influential both inside and outside of academia.

Realism and Idealism

Unfortunately, the Bubble began dissipating in the closing years of the last century, leaving self-reinforcing echoes of the germinal ideas incubated and matured in this unique crucible. Its influences continue to stretch beyond their originating time and place. Humanistic idealism was slowly dying away, along with interest in new forms of thinking. Opportunities to further develop advanced system design were missed or never considered.

At this point, idealism was losing ground to economic realism in general. On May 18, 1986, Ivan Boesky gave the commencement address at UC Berkeley's School of Business Administration. One of the things he told the students in that speech became a famous (and infamous) quotation: "Greed is all right, by the way," he said to applause. "I want you to know that. I think greed is healthy. You can be greedy and still feel good about yourself."

The late industrial age was giving way to the emerging information age with its focus on computer technologies and services that led to unimagined wealth and influence for a new generation of technicians. Humanistic idealism was being replaced with the digital age—often referred to as the 'revenge of the nerds.' Improvement in the human condition was replaced by technological progress.

Systemic design approaches were absorbed by traditional disciplines and professional fields. Reductionism, problem-solving, and planning remained dominant strategies for any change projects. Systems and design became encoded terms. 'Systems' became another label for systems science. 'Design' became another label for creative problem-solving. Silos of specialization were reinforced around traditional disciplines and fields. New silos were erected around emergent new and primarily technical, areas of research and development. Porous boundaries were erected around marriages of convenience or arranged marriages between existing academic and research domains resulting in interdisciplinary and multidisciplinary programs and projects.

System thinking often gave rise to animus in established disciplines and traditional professions. Academic pressure increased to reinforce traditional silos of knowledge. Disciplinary approaches tried to remain adaptive, while interdisciplinary and multidisciplinary approaches tried to approximate the intent of systemic approaches.

Inheriting The Berkeley Bubble

After the founders of the Berkeley Bubble retired or passed away, there were few places—valances—for the heirs of the Berkeley Bubble in traditional academic, business, or governmental programs. There were few career-friendly environments or spaces for systemic polymaths—only weak attempts to accommodate people who were both specialists and generalists—'T-shaped people' in business jargon. The Dean of Environmental Design at Berkeley told me while I was still a graduate student that "There is only room for one Churchman in the world." It dawned on me then that there would probably be no valance on campus for any systemic designers.

A bit later, I was told by another dean at a very large midwestern university that he "would never hire anyone from Berkeley," which I took to mean anyone influenced by Berkeley's openness to new ideas, particularly as displayed by the Berkeley Bubble. Opportunities were rare for systemic design acolytes who had studied with the founders of the Berkeley Bubble or those who were heavily influenced by the founders and their ideas. There were no support systems for the offspring of the bubble, as forewarned by Mike Heyman, Chancellor of UC Berkeley.

Despite that, there continues to be an intrepid sustaining development of the seminal ideas and concepts incubated in the nutritive mix of the Bubble dialogue. Germinal insights from the Bubble were in the form of seeds, protocols, and combinations-permutations. Seeds were ideas that germinated and grew into something richer and more complex while remaining true to their parental genetic concepts. Protocols were ideas that focused on elucidating the relationships in-between seminal ideas that formed patterns and networks of systemic

understanding. Combinations-permutations took elements of key insights from the Bubble and iterated them into prototypes of advanced inquiry, creating new models and schemas of systems thinking. The seeds, protocols, and combination/permutations were born from the influences of a core of academic and professional scholars working on the Berkeley campus in the middle of the last century who formed the Berkeley Bubble.

Founding Members of the Berkeley Bubble

The members of my dissertation committee at the University of California at Berkeley were some of the seminal founding members of the Berkeley Bubble:

C. West Churchman	1957* (UCB)	systems approaches & ethics
Leonard Duhl	1968* (UCB)	holistic health & healthy cities
Joseph Esherick	1959* (UCB)	environmental design & architecture
Michael Heyman	1959* (UCB)	environmental and land use law
Arnold Schultz	1966* (UCB)	ecosystemology

**date of arrival at UCB*

These individuals were from diverse departments on campus who had identified a common shared interest in systems and design. Their highly respected professional reputations—founded on substantial knowledge, fundamental skills, abilities, and competencies leading to confidence in their leadership roles in traditional disciplines or practices—secured them their place at Berkeley. But the primary connecting interrelationships among them were based on mutual scholarly interests, influences, and respect. They were not a group of interdisciplinary, multidisciplinary, or transdisciplinary academics— they were systemic scholar-practitioners engaged in shared inquiry. Their shared idealism—to improve the human condition through scholarship and wise action—gave them a common cause. These founding individuals demonstrated expertise and capacitation in full. Their integrity and professional abilities were held to full measure while under constant renewal.

Influences and Influencers of The Berkeley Bubble

Bubble influencers extended beyond my dissertation committee to include people on the Berkeley campus, including Horst Rittel, Erich Jantsch, and those off campus, Russell Ackoff, Herbert Simon, Bela Banathy, Ilya Prigogine, Geoffrey Vickers, and James Hillman, all of whom were intimate contributors to the Bubble. Systems pioneers such as Margaret Mead, Ludwig von Bertalanffy, Anatol Rappaport, Kenneth Boulding, and Stafford Beer influenced and were influenced by the Bubble, particularly through the work of C. West Churchman. This listing is inclusive and not exclusive, of course. The pioneers and practitioners of cybernetics, such as Heinz von Foerster and Gregory Bateson, were part of the mix as well.

The Macy conferences on cybernetics—a systems-related domain—occurred between 1946 and 1953, presaging an era of increased interest in systems science in general. The participants in these conferences influenced and were influenced by the Berkeley scholars who began to gather on the Berkeley campus in the late 1950s and early 60s. Between 1965

and 1981, the Gaither Lecture Series in Systems Science was convened at UC Berkeley under the sponsorship of the Graduate School of Business and the Center for Research in Management Science. They marked a milestone in focal activities related to the Berkeley Bubble influencers and influences. Between the Macy conferences and the Gaither lecture series, the Design Methods movement took shape concomitantly at UC Berkeley and at various UK universities from 1944 through the late 1960s.

Those who were influenced by, or were influencers of, the Bubble came from a broad community of esteemed scholars and accomplished practitioners. There were no edges or boundaries to the Berkeley Bubble—only magnitudes of influence and proximities to core influencers.

Others from my Bubble experience in the Berkeley environs included philosophers, professionals, and artists such as Hubert Dreyfuss, Paul Feyerabend, Christopher Alexander, David Lance Goins, and Peter Voulkos. In addition, the Bubble network's provenance included a multitude of intellectual ancestors who influenced key members of the Bubble (Churchman, 1982), such as William James' student Edgar Singer. Singer was Tom Cowan's mentor, who in turn mentored and taught C. West Churchman and Russell Ackoff at the University of Pennsylvania. Going further back, the intellectual ancestors included seminal thinkers from antiquity, such as the authors of the I Ching and Bhagavad Gita and Greek scholars from classical and pre-classical periods. It included rational scholars from the Enlightenment—Leibniz, Spinoza, Hume, and Kant. The ancestors were not important because what they had said was 'immutable truth,' but rather, what they had said was relevant, provocative, and valuable to the aspirations of the Bubble community.

Professional organizations and associations were essential parts of the Berkeley Bubble as well:

- Design Methods Group—DMG
- Society for General Systems Research, since 1988 named the ISSS, International Society for Systems Science
- International Systems Institute — ISI

Systems to Systemics

Part of the academic attraction holding the Bubble together was the continued development and application of systems thinking. Interest in systems theories had developed in many places across the globe over time, but this new way of thinking gained considerable traction during and after World War II. From technologies such as radar and sonar to process management methods like operations research (OR), systems thinking led to breakthrough applications and success stories, greatly helping the war effort and giving considerable credence to the 'systems approach.'

There are a wide variety of stances and approaches for taking on world issues that use some combination of the root term 'system.' Charles Francois insightfully used the term systemics as a categorical label for a broad aggregation of systems-related approaches to inquiry (Francois, 1999). I expanded his aggregation to include but not remain limited to:

- systems
- systems thinking
- systems approach
- whole systems
- critical systems thinking
- soft/hard systems thinking
- cybernetics
- dynamic systems
- general systems
- systems science
- systems design
- social systems
- living systems
- ecosystem

Problems and Wicked Problems

Practical philosophy was a guiding theme in the ongoing exploration for ways to turn thought into prudent action (wisdom), edging away from the dominating justification for action (problem-solving) found among academics, professionals, activists, and politicians. There was a problem with problems—although problems of some kind certainly existed and needed attention. However, these problems were not seminal to serious efforts to improve the human condition. Simple or tame problems were considered to be trivial by Horst Rittel. Problematic issues of consequence were more advantageously approached as *ill-structured problems* (Simon, 1973), *messes* (Ackoff et al., 2010), or, even better, treated as *wicked problems* (Rittel,1972).

Wicked problems, as asserted by Horst Rittel, were not problems as such but a different challenge altogether. The term' wicked problem' has taken on a life of its own now and is used in a variety of ways to frame a multitude of different approaches to problematic or challenging situations—but without the understanding and insight that Rittel might have hoped for. Wicked problems are not merely complicated, difficult, or large-scale forms of determinate problems.

The essence of a wicked problem is that it is incomprehensible, inexplicable, perplexing, unfathomable, indeterminate—and the list goes on. Nothing was implied by Rittel that wicked problems are determinate, have solutions, or are rational. Wicked problems are not simple, tame, ill-formed problems or just complicated messes. The choice to treat wicked problems as just another form of a problem means that the 'simple but wrong answers' path—as in the case with science—is most often chosen over the 'complex but right answers' path (see Figure 4).

Because the path less taken is left unexplored, serious scholarship into systemic design has been somewhat neglected. Such scholarship could and should focus on developing stances and approaches to dissolve wicked problems rather than solving them.

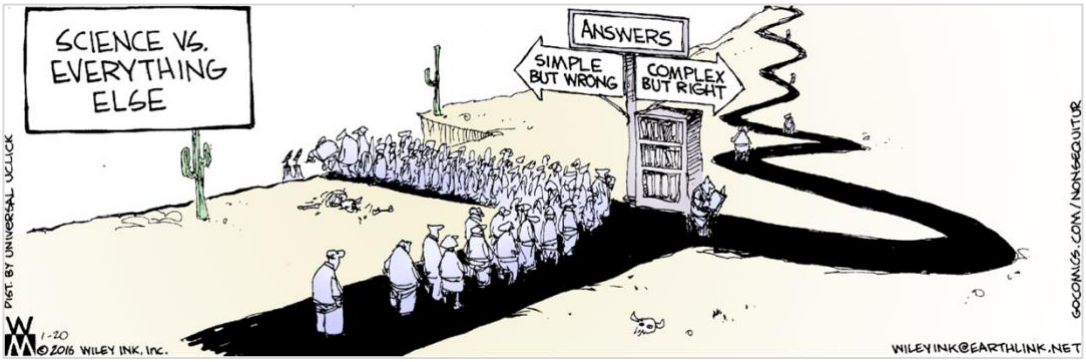

Figure 4. Answers

For West Churchman, there was the challenge of agency and ethics concerning whose interests were being served by the way a 'problem' is framed or bounded. What should be the scale of measurement evaluating the success of interventions? What resources should be used, under whose direction, and for whose benefit? Who were the clients, and did that include future generations and the disenfranchised? Who should be given agency as planners and decision makers? As a result of Churchman's challenging questions, the post-Berkeley Bubble epiphany for me was that even impeccable descriptions and explanations do not and could not prescribe action, nor did accurate predictions and absolute control justify action. An action could only be derived from service to the 'other' through systemic agency.

Churchman's activist default for action was moral outrage at injustices and irrational policies: "Kids are starving dammit!" (Churchman's typical phrasing)—the trigger for action used by activists from the '60s till today. Once action was triggered, he championed the use of a rational systems approach to optimize interventions through ethical agency.

Systems and Designers

The systems approach is made more capable of confronting the challenges of understanding and intervening in wicked problems but remains limited by being reactive. The intent of systemic inquiry is to describe and explain a social system discerning its essence (quiddity) and uniqueness (haecceity) in addition to what is true (universal and general) about it. Adding to the challenge is the fact that a social system is a particular or ultimate particular entity and not merely a representative sample from a category of social systems.

But his was not just angry problem solving—Churchman's moral outrage was transformed into a serious systems approach for intervening in significant issues in the right way. As an example, he pointed out the dangers of the environmental fallacy—a potent seed idea—common to planning and problem-solving approaches inherited from the research traditions of bounded systems—systems that are isolated from their environments and contexts. The environment of a system must be taken into account as part of any assessment or analysis,

including the influence of what Churchman described as the 'enemies of the systems approach': politics, morality, religion, and aesthetics.

Traditional research depends on isolating key variables from their environment. This was a typical tactic of traditional research, which is focused on describing and explaining social systems. Churchman asserted that social systems could not be separated from their environments or the effects of peer systems. This made social systems research, analysis, and assessment more complex and more challenging. The limits to reason quickly become apparent when making a systemic inquiry without accounting for environments and contexts—including provenance.

Related to Churchman's environmental fallacy was his assertion that designers, in any particular project, decide what is to be considered a system—another potent seed idea. Systems are not already existing, waiting just to be discovered. Systems are the constructs of designers who decide what the nature and character of a system are, where a system's boundary extends, and what is included and what is excluded from its makeup—they are a schema. This increases the requirements for design competency considerably and adds to the designer's responsibilities and accountabilities.

Exemplars

One of Churchman's students was Werner Ulrich. Ulrich developed a combination-permutation schema of these assertions, following the tracks of systems science and practical philosophy to develop his influential conceptualization of Critical System Heuristics (Ulrich, 1996) for social systems planning. This approach has had far-reaching influences in systems science and engineering fields and is one example of the reach of the Berkeley Bubble.

Churchman's default to ethical outrage for triggering action was not attractive to everyone. Horst Rittel chose another path (Kunz & Rittel, 1970). He created the Issue-Based Information System (IBIS) approach for dealing with wicked problems—another seminal seed. He chose dialectics for dealing with wicked problems for his foundational framework, which was a carefully managed process for debating issues.

Rittel's IBIS allowed differences to be resolved and common agreement on actions to emerge. He pointed out that the normative scientific process of collecting more data to address the challenge of determining action had a German term attached to it called Sachzwang—coercion by facts. This worked politically but was unsatisfactory for dealing with complex human issues and wicked problems. He believed that the chasm between 'is' and 'ought' or 'desired' outcomes cannot be bridged by data alone but should be bridged dialectically.

Another exemplar is Edgar Singer—a seminal influence on both Churchman and Ackoff—who proposed four ideals for ensuring progress in securing improvements in the human condition (Singer, 1948). A particular ramification for the integration of design and systems thinking was his fourth ideal—*dissatisfaction*—a foundational seed concept for future development of protocols interrelating systems and design. This was not dissatisfaction with a particular situation, such as would be the case in a problem-solving frame, but a general dissatisfaction with the status quo. This dissatisfaction was not simply reactive because it impelled humans to

improve their condition continuously. This, of course, is an early indicator that a different direction or path was desired as an alternative to the habitual path taken for action, or more accurately, reaction—problem-solving.

Singer's concept of dissatisfaction encouraged Russell Ackoff to further evolve the standard design approach he had been introduced to as an architect student into a combination-permutation of older and newer understandings of design. He developed a more comprehensive systemic approach to designing which led to the development of his schemas for idealized design and interactive planning. Systems and design became more integral to one another, both as subject and object—an exemplar of systemic designing.

Ackoff chose to develop idealized design and interactive planning as strategies for dissolving problems through design rather than by solving, resolving, or absolving them:

> "... to dissolve a problem is to redesign the entity that has the problem or its environment in such a way as eliminates the problem so that it cannot arise again despite changes in either the environment or the entity that has the problem." (Ackoff, 2006)

He carefully made distinctions between terms used to denote different activities, such as planning (operational and tactical) and designing (strategic and normative) in clearly articulated combination permutations, for example (see Figure 5):

Types	*means*	*goals*	*objectives*	*ideals*	**assoc. w/**
Operational	choose	given	given	given	***inactivism***
Tactical	choose	choose	given	given	***reactivism***
Strategic	choose	choose	choose	given	***preactivism***
Normative	choose	choose	choose	choose	***interactivism***

Figure 5. Ackoff's approaches to planning and designing

He was well known for forming user-friendly statements to explain profound insights, such as: "The righter you do the wrong thing the wronger you get," in reaction to the popularized habit of optimizing organizational behavior without a clear purpose for the organization.

One of the key people in the Bubble matrix, also a member of my dissertation committee, was Leonard Duhl, who was a medical doctor and psychiatrist. Len pushed the meaning of health well beyond just doctors, medicine, and hospitals. His understanding of the potential for health from a systemic perspective led to the development of one of the largest programs in the United Nations—Healthy Cities (Duhl & Sanchez, 1999). The Healthy Cities program has expanded to include hundreds of cities in both the northern and southern hemispheres.

His approach to design, in this case, was to design a 'seed concept' that would grow and adapt to totally different social and cultural environments and settings. No two Healthy Cities programs were the same in character or detail. The many expressions of health from

an expanded understanding of what it means to be healthy were diverse but congruent. They represented true diversity. Duhl demonstrated that systems design did not need to be at the level of prescriptions.

Influences of The Berkeley Bubble

Churchman, Rittel, and Ackoff all used the terms planning and design somewhat interchangeably. However, the seedbed for a deeper and broader appreciation for what design could be, as distinct from planning, was more fully formed and refined following the dissipation of the Berkeley Bubble. The foundations and fundamentals for advanced systemic design are still incipient but well-developed enough to be used to guide professional practice and formal education programs.

Design and Systems Integrated

My subsequent pivot from reactive problem solving was to attempt to transform the traditions of normative design, which were being adapted to take on more complex social design challenges. This required sweeping in combination-permutations of systemic stances and approaches to inquiry to replace the traditional intuitive approaches to creative design used in architecture, urban design, environmental design, and other manifestations of physical design that I had been trained in and taught. Key questions were what is the relationship between systems or systemics and design, *what ought it to be,* and **what do we want it to be?**

The terms' system' and 'design' can both be used as either nouns or verbs. One can design (verb) a system (noun) or take a systems perspective (verb) of a design (noun). This leads to a diversity of adoptions and adaptions of systems and design terms and methods. When asked to redesign the design program at UC Berkeley, Churchman and Rittel discovered that design, in a variety of forms, was widely distributed across campus and was owned by a range of disciplines and professions. Churchman hosted a series of lectures on design from the perspectives of academics from across campus that was startling in its broad appeal to diverse populations.

Within the mix of candidate strategies for moving thought into action, design was well represented in the Bubble as an alternative to just planning, management, and research. The Design Methods movement (Upitas, 2008) was strong on campus and represented by proponents such as Donald Grant, founder and director of the Design Methods Group, and Christopher Alexander, who brought mathematical logic and order to the processes of designing.

Traditional design professions were well represented in the Bubble by professionals like another member of my committee, Joseph Esherick. As a co-founder of the College of Environmental Design at UC Berkeley (and recipient of the American Institute of Architects' Gold Medal), Joe was well known for his approach to environmental design and his focus on the appropriate fit between designed artifacts and their environments. His values in practice are exemplified by his leadership as an architect for the famous Sea Ranch development in Northern California (Fletcher & Becker, 2018).

Design was being seriously accepted as much more than style, fashion, or appearance towards the end of the tenure of the Berkeley Bubble. It became clear that the concept of 'method' as in 'design method' did not capture the breadth and depth of design as inquiry-for-action, which is what is required to design or redesign complex social systems. Design praxis had to be inclusive of much more than method—particularly when limited to scientized design method. Design, when taken as a resolute approach to serious social change, needed to be systemic with a greater depth and breadth of understanding conducted by highly competent professionals—scholar-practitioners.

It also became apparent that systemics were the logics of designing. Creating relationships, links, connections, and bonds were at the heart of traditional design praxis and the descriptive explanations of systems. Systemic designing resulted in emergent qualities being brought into existence as a consequence of the catalyzing nature of systemic designing. Systems and design were inseparable when dealing with the complexity and diversity of living systems—of whole systems.

By the mid-20th century, as exemplified in the Design Methods movement, design professions were being tamed and disciplined (siloed) by the introduction of scientific forms of inquiry (research) and rational methods for taking design action. Design science was animated by a form of objective inquiry (design research) that threatened to eclipse nascent systemic design inquiry altogether and truncate any future development of broader and deeper systemic design inquiry. Still today, design is being declared as becoming a research discipline in select academic quarters to the concern of scholar-practitioners of systemic design.

Design Inquiry

As mentioned earlier, the hard-won insight from exposure to the scholars and practitioners in the Bubble was that good scientific description and explanation do not prescribe action for designers, stakeholders, and clients for any design project—and applied science does not justify action on its own. These are two vital seed ideas for advanced systemic design. This does not mean that "anything goes" becomes the default alternative to scientized design. It also does not mean that objective scientific reasoning was excluded. Using a Singerian approach, objective reasoning was 'swept in' and interrelated with other stances and approaches to serious inquiry.

What this meant was that human destiny—social and cultural evolution—is not predetermined by scientific necessity or perverse chance. Ways of life, qualities of life, and values in life, which are measures of life, are subject to human desiderata and preference. Humans have the freedom to determine what direction they want their lives to go in and what outcomes they hope will appear along the way—even though they may not always take advantage of or successfully manage such freedoms. Systemic design aims desire through intension (direction)—and manifests purpose through intention (outcome)—strategies for dealing with indeterminacy.

The challenge is to learn the nature of what Churchman called the guarantor of destiny (G.O.D.). Concomitantly, the challenge for systemic designers is to determine their guarantor of design (g.o.d.) as well. Not having direct knowledge of design's guarantors means that designers must precede to design without the certitude of deterministic processes of inquiry. Design inquiry must be expanded to include the process of search—inquiry for indeterminate outcomes. Good systemic design search strategies can be used, with courage and confidence, to choose indeterminate directions and outcomes. Systemic designers need to be navigators and guides in complex contexts and environments—polymathic scholar-practitioners in search of desired directions and outcomes.

The tether to a problem-solving approach as the primary justification for taking action was strained and frayed during the Bubble, but there was no clean break. While popular problem-solving was reactive—backing into the future away from undesirable present conditions—design remained incipient as an approach to serious design or redesign of social systems, but that began to change as it matured. Design, as it was being reconceived, was treated as proactive—advancing into the future—and holistic. The realization came that design inquiry needs to be treated as its own unique form of inquiry—a cognitive paradigm—separate from other traditional forms of inquiry such as science or the arts and humanities.

In the 1959 Rede Lecture, C. P. Snow gave an influential lecture followed by a published essay titled *The Two Cultures* (Snow, 1959). He made the distinction between the two dominant cultures-of-inquiry or cognitive paradigms—science and the humanities—that are so fundamentally different that, he claimed, they would never be able to communicate with one another in the future. It makes sense to treat design as a third culture of inquiry with its own postulates, assumptions, assertions, and beliefs. Design may be rational and aesthetic, but it remains distinct from either science or art.

If contained within the bounds of scientific or humanistic cultures of inquiry, the struggle to develop a deeper and broader understanding of what design—particularly systemic design—has been, is now, and has the potential to be, remains too contrived. Similar to the challenge to describe and explain the orbital patterns of planets, which get overly complicated from a geocentric approach versus the more orderly and coherent patterns that appear from a heliocentric approach (see Figure 6).

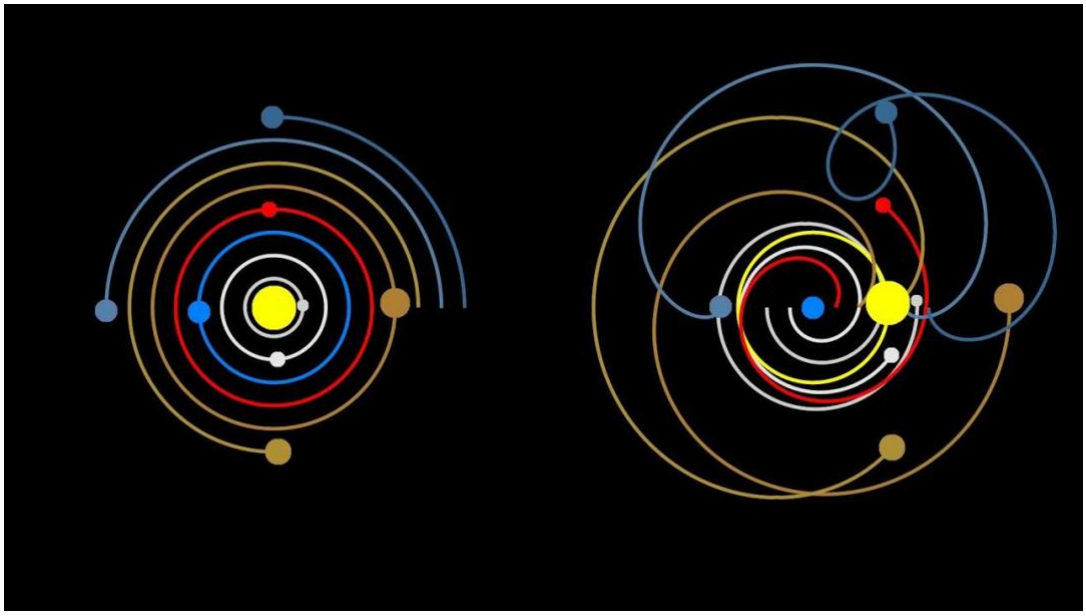

Figure 6. Heliocentric vs. geocentric approach. Design inquiry and action make more sense from a design stance than either a science or humanities and arts approach.

Churchman's seminal book, *The Design of Inquiring Systems* (Churchman, 1971), demonstrated how distinct strategies of inquiry could be designed to uncover diverse kinds of 'truth.' Interestingly, Churchman never explored the mode of inquiry—design—that his selected philosophers used to 'design' their own forms of inquiry, nor was he self-reflective on the nature of his own 'design inquiry' process for creating his systems approaches. However, design for him was obviously a cogent and practical form of serious scholarly inquiry needing more elucidation itself.

An emergent design challenge now is to determine how to design design-based inquiry systems that are 'search' based as well as research-based. Search-based inquiry determines outcomes in indeterminate settings—the kind of settings that the members of the Bubble struggled with constantly.

Design projects are indeterminate in a similar way that wicked problems are indeterminate. This means that judgment— in lieu of just rational decision-making—becomes a necessary means for making design choices in complex contexts. A design judgment is not right or wrong, only good or bad with concomitant consequences—good or bad design determinations. Design judgment makers do not assume that there is a true or right solution to be discovered or calculated—good solutions are the result of courage and competence in creating relationships or making links, connections, and bonds—creating design compositions. Design judgment and design inquiry, in general, are based on approaches and stances that are different in kind and not just in character from the other two dominating cultures of inquiry. It is a different way of thinking and not just a way of thinking about different things.

The cue from Einstein, who is often quoted as saying: "we cannot solve our problems with the same thinking we used when we created them," implies we need to *think* differently, not just differently about different things. This is not the same as the creative imperative to gain a 'new mind,' 'beginners mind,' or 'liquid mind' at the start of a creative process, but it is an equally essential imperative. To think differently means to form a cognitive frame conducive to systemic designing. It turns out that systemic designing is an apposite way to think differently, to 'secure improvement in the human condition.'

The ability to 'see' a different way of thinking requires that the inquirer is open to seeing and hearing ideas that do not confirm their habits of thinking and knowing (see Figure 1). It is the case that we often cannot cognitively think differently because it would be so alien to how we have learned and been trained to think. We are cognitively blind to other forms of seeing, hearing, and feeling.

The Thin Red Line, Terence Malick's (1998) antiwar epic, has a scene where a seasoned indigenous hunter passes a foreign soldier without seeing him or recognizing his existence. The hunter cognitively cannot see the soldier because the soldier's appearance is so alien to the hunter's experienced reality (Figure 7).

Figure 7. Cognitive blindness. Image from the trailer for The Thin Red Line (1998, 20th Century Fox) from YouTube.

The soldier has similar challenges of his own, of course. But this cognitive challenge can be diminished. Bubble member Harold Linstone, an emeritus professor of systems science at Portland State University (and former editor-in-chief of the leading journal Technological Forecasting and Social Change), demonstrated how people could think differently in a very straightforward and pragmatic way (Linstone, 1984). His TOP schema of 'multiple perspectives' (technical, organizational, personal) was based on Churchman's (1971) design of inquiring systems. This schema was used with success, for example, in assessing what was 'real' in the cases of particular major industrial disasters.

Linstone's schema has been further expanded by others to become even more inclusive systemically (Figure 8). It is a good example of how to 'think differently' by adjusting or changing the cognitive lenses and filters used in any form of inquiry—not just systemic design inquiry. This is not a focus on determining one's bias—it concerns paying attention to how one thinks differently from different 'viewpoints.'

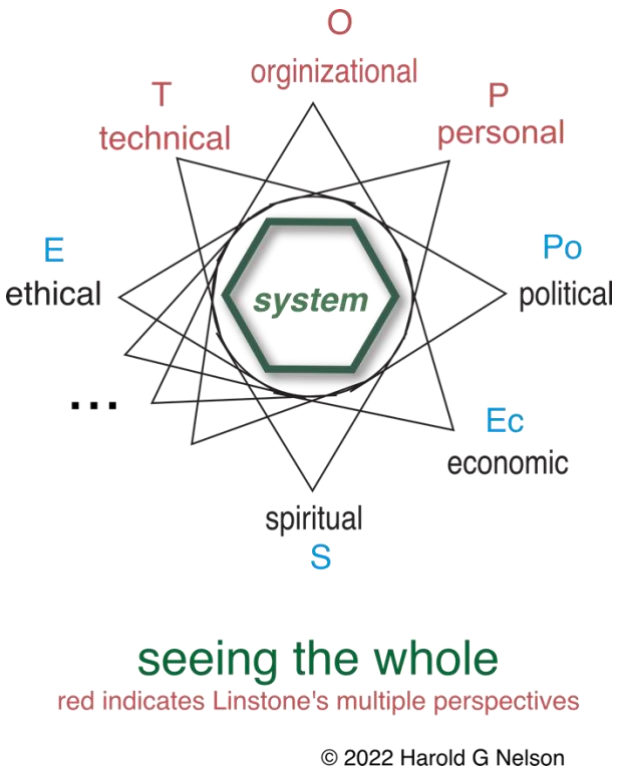

Figure 8. Multiple perspectives schema expanded.

Systemic Design Scholarship and Praxis

The overview effect is a sudden and dramatic change in perspective that was reported by astronauts and cosmonauts when they first viewed the earth from space. It is an example of how to think differently involuntarily—to gain access immediately to a new cognitive paradigm. Sadly, this particular experience is inaccessible to the majority of us. However, it points to a class of experiences that dramatically change the filters and lenses of the experiencers such that they think differently because of disruptive interventions of outside influences of new paradigms. The term 'sublime' is used to denote these experiences that change how people think at their very core. Typically, these transformative experiences are not incremental or aggregative, as most education or training programs are, but this does not mean that deliberate, reflective, and intentional actions cannot reach similar transformative ends.

For example, some deliberate approaches to scholarship in relationship to professional preparation can expedite learning to think differently. Systemic design scholarship is a particularly adept strategy. In 1990 the Carnegie Foundation proposed a different approach to scholarship than the normative academic model used in the West based on research, teaching, and service. Their report (*Scholarship Reconsidered: Priorities of the Professoriate*, Boyer, 1990) had profound implications for the academy but was followed by limited innovation of its key proposals in higher education. A combination permutation of systemic design scholarship can be formed from the Carnegie model of redefined scholarship (Figure 9).

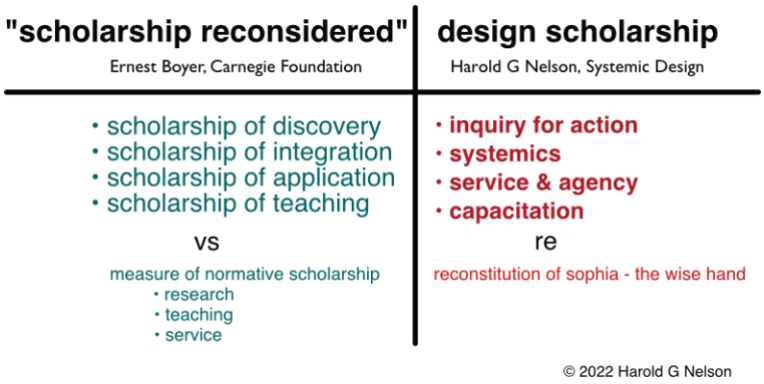

Figure 9. Systemic design scholarship

To help innovate new systemic design scholarship that better fits the needs of scholar-practitioners of systemic design, new educational designs for systemic designing were needed. I played a major leadership role in designing the graduate programs in Whole Systems Design at Antioch University, as the Director from 1987-1999 (Nelson, 2005). They were very successful exemplars of the Berkeley Bubble's paradigm. The educational andragogy (adult teaching curriculum) of the programs was itself formed as a systemic design process[1].

The Design Way: Intentional Change in an Unpredictable World was published in 2003, followed by a second edition (Nelson & Stolterman, 2012). It is an exemplar of the continued integration of systemics and designing influenced by the earlier thinking from the Berkeley Bubble and subsequent systemic design scholarship. This book introduces facets of design as a third culture of inquiry at the same level of intention as the science and humanities cultures of inquiry. The book has gained the attention of a wide spectrum of disciplines, professions, and academic backgrounds from around the world.

[1] The graduate programs were dissolved shortly after my tenure when Antioch University restructured.

The full potential of the systemic design paradigm remains to be further disclosed through the work of scholar-practitioners and their cohorts. The times have dramatically changed, and new norms are being sought because the old norms are inadequate for today's challenges. The time is ripe for a new systemic design matrix to assemble around a new generation of scholar-practitioners.

In Summary

This essay provides a brief overview of some selected examples of thinking from the inception point of the Berkeley Bubble's 'matrix' and subsequent developments in systemic designing as a consequence. The actual effects of relationships and interactions between and among the many members and influencers of the Bubble, including their conjunctive emergent insights, are much too complex to capture in a brief exposition. However, what this essay does offer is a glance at the breadth and depth of the genesis and development of the systemic design paradigm and exemplars as born of the Berkeley Bubble matrix—a development that continues through today.

Efforts to further reify the systemic design paradigm continue. Presently design efforts are underway to create more advanced systemic design programs in diverse settings:

- Center for Systemic Design draft prospectus
- A new school for systemic design

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