Holding Creativity Together:
A Sociological Theory
of the Design Professions
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The literature on the design professions betrays a uniform assumption that a design profession, like any profession, must possess a distinct body of knowledge. Because of this default theoretical position, this literature expends much effort trying to define the putative contents of this distinct body of knowledge. But the results have been unclear, as we show below. Here we propose a different view of the ontology of a design profession: instead of an epistemological starting point, we propose a *sociological* distinctiveness to the design professions which, we argue, is really their key distinguishing signature.

The theoretical underpinnings of our argument derive from Thomas Kuhn's *The Structure of Scientific Revolutions* (1962),[1] specifically, from the postscript he added to the 1969 edition of his book. In this postscript Kuhn first propounded the concept of the disciplinary matrix,[2] which is comprised of four components: (1) symbolic generalizations; (2) commitment to models; (3) values and (4) exemplars. It is this matrix that helps us map the sociological differences between non-design professions (medicine or accounting, for example) and design professions (architecture or industrial design, for instance). We will define "design profession" more precisely as we proceed.

One might ask why look to Kuhn, since his theory deals with disciplines in the sciences and not in design? The answer is as follows. While Kuhn's 1962 theory indeed explains paradigmatic shifts in scientific knowledge, the components of his 1969 matrix describe how scientific communities *manage* such knowledge. In other words, the matrix made the implicit sociological elements embedded in Kuhn's original theory more explicit. Here we show that, while the components of the matrix in non-design disciplines manage domain-specific knowledge *internal* to a profession, in the design professions the same components of the matrix orient *externally* towards the larger culture, precisely because of the *absence* of explicit bodies of design knowledge. The result is that the components of the disciplinary matrix act as a kind of "sociological wrapping" around the design professions to, as it were, hold them together to achieve social identity and standing.

That the extant literature on the design professions assumes domain-specific bodies of knowledge is probably due to the socio-

logical literature on professions in general.[3] (Behind this, as Nigel Cross and others have suggested, exists a general appreciation for the *value* of scientific objectivity vis-à-vis definitions of design;[4] it is valuable to conceive of a design profession as an objective container of specialized knowledge). The sociologist Keith Macdonald, for instance, argues that the concept of profession itself became historically possible only when knowledge metamorphosed into an independent sociological entity.[5] Or, for Magali Sarfatti Larson, the codification of knowledge is essential to establishing market presence as well as social prestige for any profession.[6] These theories assume that, within any profession, knowledge is in fact an "independent sociological entity" which can be "codified." Lost in the fray of these models is the peculiar way the design professions relate to knowledge. Specifically, we show below that, while they certainly also traffic in knowledge, *there are no "independent knowledge entities" in the design professions.*

Consider a logical conundrum with the view that design professions do have specialized bodies of knowledge. This has to do with the recurring use of the word "interdisciplinary" and its synonyms in the literature on design knowledge. Terence Love puts it this way (italics added): "…many theories and research projects –… in the design research literature are more naturally classified under other disciplines. *This is a key point for developing a coherent and unified body of knowledge.*"[7] And Francis Duffy, in his *Architectural Knowledge*, avers that architectural inquiry, "because of its… inherent integrative and interdisciplinary nature… should be recognized as being at the frontiers of knowledge."[8] But here is the conundrum. While correctly discerning the interdisciplinary nature of knowledge useful to designers, these analysts unreflectively assume that interdisciplinary knowledge is nevertheless the "independent knowledge entity" (in Macdonald's words) residing within the domain of design. But how can inherently interdisciplinary material be at the same time a singular body of knowledge? The error lies in the conflation of a sociological question (what a discipline or profession is) with an epistemological assumption (a design discipline/profession must possess a discrete body of knowledge).[9] If freed from the epistemological assumption, the sociological factors demarking design professions become clearer. This is where Kuhn's matrix is useful in that, again, it highlights the sociological wrapping that holds a design profession together for purposes of projecting a coherent professional image to a larger public.
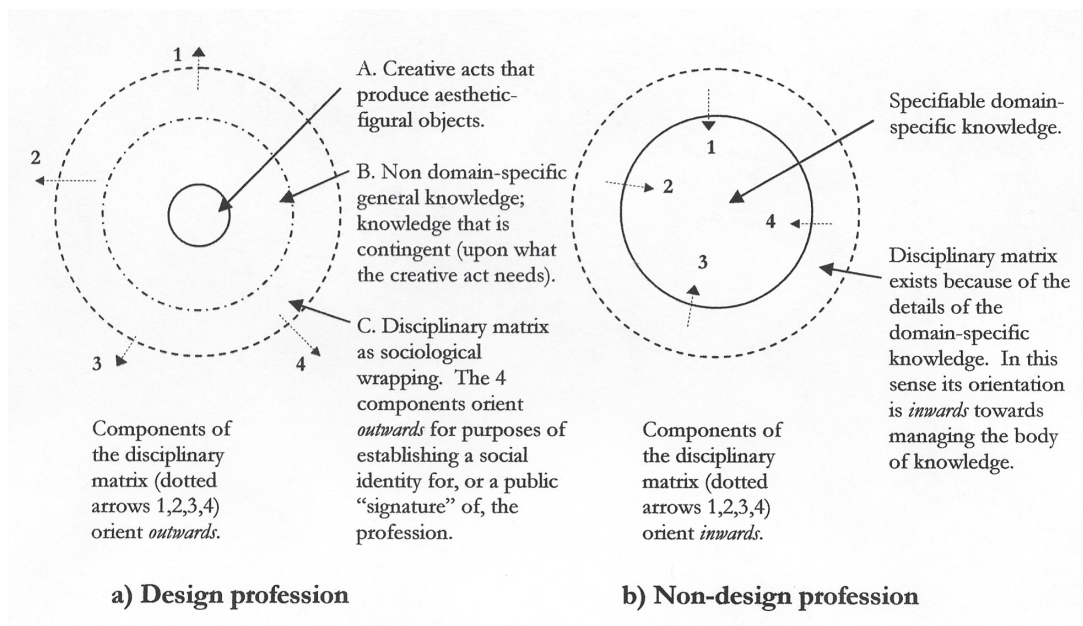
Sociological wrapping around what? Around what we call the "creative act." Now, the creative act has been addressed in the design literature—for example, by Cross,[10] along with Kees Dorst[11] (we will return to both later)—but it is remarkable that extant definitions of design professionalism tend to inadequately account for it. For our part, so central is the creative act to the design professions that we suggest that it is *it*, rather than a distinct body of knowledge, that

resides at the cores of these professions. And this in turn leads to a different ontology for these professions—on sociological grounds. Consider Figure 1. We propose that a design profession (1-a) consists of three regions: (A) creative acts—to be defined; (B) non domain-specific general knowledge; and (C) the disciplinary matrix as sociological wrapping. In design professions, the four elements of the disciplinary matrix (dotted arrows) orient outwards towards the general culture for purposes of establishing professional identity. In contrast, in non-design professions (1-b), the elements of the disciplinary matrix orient inwards in response to the demands of domain-specific bodies of knowledge.[12]

Figure 1 implies that design knowledge is not so much a "third area" of knowledge distinct from knowledge in the sciences and humanities—as proposed by Cross.[13] Instead, the onus of the problem in defining a design profession lies not in isolating the content of what it knows, but rather in discerning what it does (with any general knowledge that assists in the creative act) in a sociological process of defining itself to the larger culture.

In what follows, we first define a "creative act" and illustrate how it relates to knowledge in three design communities: architecture, interior design, and industrial design. We show that, even though each is at a different stage of establishing a professional identity, all are at the same stage vis-à-vis the absence of a domain-specific body of knowledge. This is one way to demonstrate that knowledge used in the design professions is general rather than domain-specific, and we cite examples of how this general nature of knowledge in the design professions is handled in the extant literature. We then consider in more detail how the four components

Figure 1
Dotted arrows indicate the components of Kuhn's disciplinary matrix; they are: (1) symbolic generalizations; (2) shared commitments to models; (3) values; (4) exemplars. Inward versus outward orientation is the key.

A. Creative acts that produce aesthetic-figural objects.

B. Non domain-specific general knowledge; knowledge that is contingent (upon what the creative act needs).

C. Disciplinary matrix as sociological wrapping. The 4 components orient *outwards* for purposes of establishing a social identity for, or a public "signature" of, the profession.

Components of the disciplinary matrix (dotted arrows 1,2,3,4) orient *outwards*.

Specifiable domain-specific knowledge.

Disciplinary matrix exists because of the details of the domain-specific knowledge. In this sense its orientation is *inwards* towards managing the body of knowledge.

Components of the disciplinary matrix (dotted arrows 1,2,3,4) orient *inwards*.

a) Design profession

b) Non-design profession

of Kuhn's matrix orient outwards, as sociological wrapping, in the design professions. We conclude by addressing several limitations of our argument.

Defining "Creative Act" and "Design Profession"
We define a creative act as follows:

> A creative act is characterized by the imaginative and original generation—with aesthetic value as a high priority—of utilitarian objects, usually first expressed in figural representations such as sketches, working drawings, physical or computer models, and the like, but ultimately produced (i.e., fabricated, assembled, constructed) because they have cultural value. The provenance of a creative act is essentially unpredictable in nature, if by prediction is meant the ability to reproduce the moment of creation, or the empirical attributes of what is created, by pre-determined formulations or frameworks.

An illustration of a creative act comes from Le Corbusier, the modernist architect of the *Ronchamps* chapel in eastern France. Long before receiving the commission for the project, Le Corbusier was strolling along a beach and found a shell he kept as a memento. Years later, while designing the chapel… that curvy shell was still on his drawing board. The curvilinear roof of the now-famous *Ronchamps* has been traced to this happenstance connection.[14] Such is the unpredictable provenance of creative acts.

Cross and others, looking to methods such as protocol analysis, have attempted to map these creative processes—and Le Corbusier's shell-to-roof solution may be viewed in this literature as an analogical one.[15] But documenting the minute stages of creative processes—what Bryan Lawson calls "events"[16]—is not equal to understanding their origins, much less to predicting their outcomes. Cross himself terms it "the creative leap."[17] And Lawson cryptically calls it "some higher quality… of knowledge lying outside and beyond the problem… "[18] The same challenge is also present in Peter Rowe's *Design Thinking*, which provides a broad overview of theories of design generation, at least as applied to architecture.[19] From creativity keyed to mental acts and/or mental pictures, to behaviorist theories, to creativity as information processing, to formulaic design generators (analogy, empirical relations, typologies, formal languages)… behind all of this remains the mystery of creation itself, as distinguished from creative *process.* Concludes Rowe:

> In spite of the very real contributions that were made… in almost all cases the step beyond description into a normative realm in which process became pursued as an end in itself resulted in abject failure.[20]

But by the "creative act" and its unpredictability, we are not championing the idea of design solely as the activity of the romantic artist. Yes, creative acts are mysterious, but by this we do not mean that design communities ought not to professionalize. Our point is this: assuming by default that design professions must have domain-specific bodies of knowledge actually *delays* the process of demarking design professionalism as a distinct domain in its own right. That distinction is the unpredictable creative process and how design professions "hold themselves together" with sociological wrapping to nurture and to safeguard that process.

Now, by design profession we mean the social entity that gives a community of designers a group identity in the larger culture. This group identity is instrumental for purposes of social status, economic gain, legal definition of a designer's actions, as well as legal delimitation of who can engage in those actions, usually by means of state sanction.

Defined thus, "creative act" and "design profession" are both inclusive as well as exclusive in such a way that serviceably describes a range of design communities currently in the throes of achieving professional identities in the larger culture. The scope is inclusive in that it encompasses everything from the design of pens and pencils to complete city plans. But the scope also excludes certain endeavors that are undeniably creative acts—for example: composing music or writing poetry. These endeavors are often categorized under "fine arts." Objects of fine art are, first, not necessarily preceded by representative figural schemes and, second, it is arguable whether they have utilitarian value. As a matter of fact, since the eighteenth century when the notion of "fine arts" first emerged in Western ideas, one trait of the category—at least one trait of the appreciation of these sorts of objects—is disinterest, which is to say, a kind of appreciation devoid of any utilitarian considerations.[21]We elaborate further about this distinction in this endnote.[22]

Moreover, our coupling of creative act with design profession cuts sectionally across Richard Buchanan's theory of general design activity as an emerging "liberal art of technological culture."[23] Buchanan posits that all design activity involves "signs, things, actions, and thoughts." This, like other examples cited below, suffers from broad generality. To his credit Buchanan further divides his framework into four areas: symbolic and visual communication (such as book or magazine production, or graphic design); material objects (such as clothing or tools); organized services (such as scheduling human resources); and complex systems (such as architecture or urban planning). Our technical terms clarify these four areas by culling out from them cases of communities which are not only engaged in creative activity, but are also in process of striving for professional identity.

Three Cases: Architecture, Interior Design, Industrial Design

These three cases are instructive when considered side-by-side because, despite being at different stages of establishing their social (read: "professional") boundaries, all three are at a similar stage in debating the meets and bounds of their knowledge boundaries: What knowledge is in? What knowledge is out? This quandary underlines our view that design communities simply do not have domain-specific bodies of knowledge—no matter what stages they find themselves in vis-à-vis establishing professional identity. It is significant evidence that the role knowledge plays in design professions may just be quite different than the role it plays in non-design ones.

For sake of a clear (but sufficiently large) sample size, we consider our three case communities limited to the United States. Of the three, architecture is the most developed as a profession because all the standard sociological measures for a profession are in place: a professional organization (the American Institute of Architects, AIA); state-enforced licensure by examination; a code of conduct self-enforced by the AIA but recognized by law; and a network of accredited schools offering professional degrees. But despite all of these professional trappings, there is only the illusion of a coherent body of "architectural knowledge." Recently the AIA fostered this illusion by: (a) establishing an elaborate network of twenty-four "knowledge communities" for its membership; (b) disseminating new knowledge via print and electronic media formats;[24] and (c) mandating continuing education as a requirement for ongoing membership. Below is Wang's map of these knowledge communities as they were configured at the time of the 2003 AIA National Knowledge Conference in Berkeley, California. Each tab is one knowledge community (Figure 2). The foci range from medical to legal, religious to environmental, private to public buildings, and from small to large projects.[25] In sum, the tabs illustrate Love's point, that much of the material: "…are more naturally classified under other disciplines."[26] These tabs underline the fact that, when a project of a certain kind needs knowledge relating to that kind, then that kind of knowledge enters the domain of "architectural knowledge."

For architecture, then, a well-defined professional identity by sociological measures does little to delineate a well-bounded epistemological domain—because those boundaries are porous to all kinds of knowledge rooted in human experience in general, and not in some definable domain specifically recognizable as architectural knowledge.

Interior design is more in-process than architecture vis-à-vis professional identity. The National Council of Interior Design Qualification (NCIDQ) administers a "regularly updated" professional examination.[27] But as of this writing, only twenty-four states "regulate the profession of interior design; many of these states are
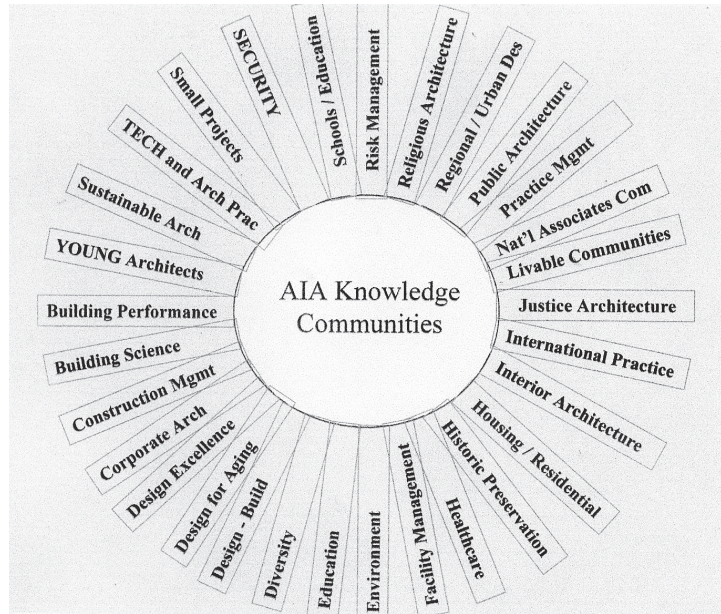
NCIDQ members."[28] It is not clear what "regulate" means, nor clear why "many" (but not all) of these states have NCIDQ membership. In any event, the linkage between licensure and government restrictions on professional practice is in flux much more than in architecture. As a matter of fact, in a recent paper, Denise Guerin and Caren Martin suggest that without a succinct "body of knowledge" for interior design—one which they aver "had not been comprehensively defined or even partially defined"—legislative progress in support of interior design as a profession would prove difficult.[29]

But the lack of a specialized body of knowledge may again be because, like architecture, interior design also draws from general knowledge on an as-needed basis. An example of this can be seen in the chapter headings of Stanley Abercrombie's *The Philosophy of Interior Design.*[30] These include: Being Outside; Coming Inside; Color and Light; Art; and Plants. To say no more, these are very general categories of knowledge. The point is clear: even as architecture's well-defined professional identity continues to grapple with an ill-defined (because general) "body" of knowledge, the less-defined profession of interior design nevertheless shares the same ill-defined (because general) "body" of knowledge. Indeed, the title of Guerin and Martin's article, "The Career Cycle Approach to Defining the Interior Design Profession's Body of Knowledge," implicitly embraces the general nature of this "body" of knowledge. Put another way, to suggest that the body of interior design knowledge more or less equals the totality of the experiences of a life in interior design is an innovative (and certainly more academically attractive) way of saying that a specific body of knowledge may not exist for interior design at all; that instead, all knowledge is contingently relevant for interior design practice.

Of our three cases, industrial design is the least professionalized by sociological standards. Even though the Industrial Designers Society of America (IDSA) is a nationwide organization, its membership of 3,300 pales in comparison to the 48,000 industrial and commercial designers active in the United States (in 2006).[31] IDSA is not a professional organization backed by government support and enforced by laws. And at present in the U.S., there is no state or government-enforced licensure mechanism for industrial design which can secure for it a monopoly in the labor market.

But again, even as its professional status is different from architecture or interior design, the status of the "body of knowledge" in industrial design is roughly as ill-defined as the "bodies" of knowledge in the other two. Jacques Giard illustrates the state of knowledge in the industrial design community as follows: Unlike members of other professions (who) regularly share their knowledge through conferences and journals, participants at industrial design conferences take back "a collection of color brochures and pamphlets, peruse them, and eventually discard the lot."[32] But following the typical default assumption, Giard asserts that a well defined body of knowledge is essential for industrial design. He calls for a "descriptive knowledge" that "will lead to a better understanding of our context." And what is descriptive knowledge? Well, Giard has in mind *general* knowledge: "…given the broad spectrum of knowledge areas, the diversity offered by most interdisciplinary universities will make them the most likely venues for professional design education."[33]

All of this suggests that knowledge in relation to design is, by its nature, not domain-specific. Again, this goes largely counter to the view in the extant literature.

The Hint of the Generality of Design Knowledge in the Literature

One symptom of the default assumption that domain-specific bodies of design knowledge exist is the need to call design a "science," the objections of Cross and others to this tendency notwithstanding.[34] Until such a core can be identified, design is merely in a pre-scientific stage. For example, Kees Dorst—who actually models his argument after Kuhn in referring to design research as "a revolution waiting to happen"—puts it this way (italics added):

> …our explanatory framework about the "why" of design activity is still weak, *making it hard to build up a core of scientific knowledge in our field*. Another criticism that can be leveled at design research is that it is still in a "pre-scientific" stage, because design researchers seem to be happy to develop methods without rigorously testing them, thus again imperiling the knowledge build-up in the field…[35]

The need to be scientific (at least taxonomic) may be one reason for the many complicated charts in the relevant literature; these all assume that if there are explicit bodies of design knowledge, they can be mapped graphically. Love provides several such charts,[36] as do Guerin and Martin,[37] as does Wang (Figure 2). The problem, again, is that these "bodies" of knowledge encompass just about everything. Love's table, for instance, amounts to a table of contents of a university course catalogue: Engineering, all of the Natural Sciences, Geography, Psychology, all of the Social Sciences… all of these, interspersed by curious categories called "research into designing."[38]

This feature of generality in models of explicit design knowledge is quite common in the relevant literature. Here is an example from Ken Friedman:

> Even though design knowledge arises in part from practice, however, it is not practice but systematic and method-ological inquiry into practice—and other issues—that constitute design research, as distinct from practice itself. The elements of design knowledge begin in many sources, and practice is only one of them.[39]

What are these "other issues" and, specifically, what are these "many (other) sources"? One concludes that Friedman must have quite a general domain in view. Nigel Cross himself also discerns the general nature of design knowledge:

> Some of it [design knowledge] is knowledge inherent in the activity of designing. Some of it is knowledge inherent in the artifacts of the artificial world… Some of it is knowledge inherent in the processes of manufacturing the artifacts, gained through making and reflecting upon the making of those artifacts. And some of each of these forms of knowledge also can be gained through instruction in them.[40]

So design knowledge is some of this and some of that from many other domains (which in a way works against Cross's own view of design as a distinct "third area" of knowledge). Our assessment of this state of affairs is not so much that analysts are failing to define design knowledge. Our assessment is that, actually, there is nothing to define—or, put another way, there is *everything* to define. And everything is hard to define.

Note that non-design professions do not spill much ink wondering what *their* bodies of knowledge are; their professional journals simply document refinements and additions to those bodies of knowledge. Readers can easily refer to the *New England Journal of Medicine,* or *Physical Therapy,* or *CPA Journal,* or *Journal of Electrical Engineering Education,* and so on, to see examples of this phenomenon. By comparison, in an edition of the *Journal of Architectural Education*

focusing on the question of what research in architecture means, one contributor—who taught at the Massachusetts Institute of Technology no less—averred that, essentially, walking around and looking at things constituted research.[41]

This kind of generality typifies the disconnect between a designer's intuitive openness in allowing all phenomena to spur creativity, on the one hand, with a certain motivation—perhaps a social need, whether that be in the marketplace, or in academia, or simply in one's neighborhood—to legitimize design creativity as some kind of "mode of inquiry" that has both social as well as economic value, on the other. It is this pressure to be socially relevant and economically viable that motivates design communities to attain professional status. We now turn to Kuhn's disciplinary matrix and explain how it is unreflectively used in the design professions for sociological wrapping to achieve such viability, in the absence of definitive bodies of knowledge.

Kuhn's Disciplinary Matrix as Sociological Wrapping for the Design Disciplines

Again, Kuhn's disciplinary matrix is comprised of four components: (1) symbolic generalizations, (2) shared commitments, (3) values, and (4) exemplars. Even a casual reading of his definitions of these components makes clear that each operates because of the quantifiable knowledge bases that exist at the core of scientific communities. We show here that this is not the case for the design professions.

1. Symbolic generalizations. Kuhn's examples of symbolic generalizations for scientific communities are either quantitative nomenclature such as found in equations (e.g., f=ma) or propositional rules (e.g., "action equal reaction").[42] But in a design profession, there are no such propositional rules rooted in the domain. Certainly an industrial designer may deal in algebraic formulas, or an architect may occasionally use formulas for sizing structural framing. But these formulas are rooted in other domains (mathematics, engineering); architecture long ago ceded structural design to engineers. As for propositional rules, normative practices—such as spacing framing studs at sixteen-inch centers (in the U.S.)—do exist. But again, this practice is rooted in construction practice, a body of knowledge that architecture also has largely ceded to non-architects.

Now, symbolic generalizations do exist in the design professions, but not as propositional formulations of epistemological content, *but rather in the material-aesthetic expressions of style.* The key is the word "symbol," which the dictionary defines as: "An object or name that stands for something else, especially a material thing that stands for something that is not material."[43] In scientific communities abstract markings are the material symbols of immaterial but quantifiable principles of knowledge residing within the domain. However, in design communities, material-aesthetic expressions of

style, evidenced not only in the material objects designers create, but across-the-board in the material accouterments designers surround themselves with, coalesce to form symbolic generalizations that connote to a larger culture that designers possess an esoteric and economically valuable expertise available to society. Style as symbolic generalization in the design professions, then, acts as an immaterial meta-narrative expressed in material forms, one that conveys to the outside world the totality of the cultural relevance of design. Understood in this way, style informs not only the created objects designers make, but also what designers wear, what cars they drive, and what their apartment interiors look like. And so style includes both the created object and also the creator of the object, and everything in between, acting in their totality as a symbol of the value of design. This is why, for example, a Pierre Cardin jacket is more than just the jacket. The designer, Pierre Cardin, and by association all of the culture and lifestyle the name symbolizes, is necessarily part of the worth of the jacket. The same is true with the Apple "iPod." It is not only the industry standard MP3 player; it also has become a general symbol of a mode of lifestyle prized all over the world.

2. Shared commitments. The second element of the disciplinary matrix is what Kuhn calls "shared commitments to theoretical models" such as "Heat is the kinetic energy of the constituent parts of bodies," or "The molecules of a gas behave like tiny elastic billiard balls…" etc.[44] Again, these are propositional models that scientific communities commit themselves to—indeed, Kuhn uses the word "belief."[45] The models are based on quantifiable knowledge, and demand conceptual commitment on that basis not only from members within the community, but also from those outside of the community.

Now, the lack of such quantifiable models in the design professions raises an observation made by the architect Peter Eisenman, as quoted and commented upon by Sarfatti Larson:

> "When the government wants a legal opinion it goes to the Harvard Law School or the Stanford Law School for advice. When there is a question of development or environ-mental concern, nobody goes to the architecture schools for advice." … Eisenman's point is that [architects] are not taken seriously because their expertise does not rest on autonomous theory.[46]

What Larson means by autonomous theory are the propositional models (theories) that reside within non-design professions. These quantifiable models (e.g., "…molecules of a gas behave like tiny elastic billiard balls…") demand the respect of outside persons. Design professions do not have such models, and so their membership does not have shared commitments looking inward towards such models. Design professions must have some way of

having the public come to them other than for (non-existent) quantifiable models of knowledge. Again, the key lies with the creative acts design professions *do* have at their cores. And creative acts, although unpredictable, draw from material that general experience furnishes. In architecture, for example, Vitruvius called for the education of the architect to include geometry, history, philosophy, music, medicine, in short, "all departments of learning."[47] Thus, an architect is often called a generalist—one who, because of a liberal arts training, is able to draw generally from the domains of knowledge and combine that material with creative powers to produce the objects of his or her domain: a design. In this way, Love's tables are apropos: a designer must engage with knowledge from all fields represented by a university curriculum; Love is just incorrect to designate all of this interdisciplinary content as a single "body of knowledge" within a design discipline. In actuality, this is general knowledge residing outside of the design professions.

Thus, the design professions position themselves for shared commitments to external inputs of knowledge. The AIA knowledge communities (see again Figure 2 for the 2003 configuration of these communities) form one such framework: each of the communities commit to a domain of knowledge residing outside of the profession, for the purpose of providing that outside domain with architectural services.

3. Values. The third element of Kuhn's matrix is values, and again Kuhn has internal propositional knowledge in mind: "…the most deeply held values concern predictions: they should be accurate," and "Quantitative predictions are preferable to qualitative ones…"[48] Communities in possession of quantifiable models of knowledge with predictive power develop a value system by which competing explanatory frameworks are evaluated: Are they equally predictive? Or are they as elegantly framed?

Again, design communities do not possess these internal models; hence designers' values form in other ways. It is not difficult to note the external orientation towards social values in design communities. In fact, design communities usually take the lead in clarifying social values for the larger culture. For instance, the recent green building standards developed by LEED (Leadership in Energy and Environmental Design) promote the values of environmental awareness in the larger culture. Architects thus are motivated to obtain LEED certification for themselves as well as for their buildings. Now, it is noteworthy that empirical data comparing LEED-certified buildings with non-LEED buildings—for instance, between quality of life or occupant productivity in LEED versus non-LEED buildings—is surprisingly sparse in the literature. Why? Because "green design" is currently such a well-received social value that certification brings automatic professional credibility—never mind the limited empirical data. Put another way, despite the lack of measurable data based upon specifiable knowledge within

the profession, much effort is expended to wrap the profession externally with the social value of green awareness and environmental responsibility—for purposes of external professional identity and promotion.

> **4. Exemplars.** Kuhn defines exemplars in the following way:
> By [exemplars] I mean, initially, the concrete problem-solutions that students encounter from the start of their scientific education, whether in laboratories, on examinations, or at the ends of chapters in science texts. To these shared examples should, however, be added at least some of the technical problem-solutions found in the periodical literature that scientists encounter during their post-educational research careers and that also show them by example how their job is to be done.[49]

The similarities with design disciplines are striking. Larson asserts that the architectural discourse is "ultimately based on practice"[50] and the "canon of architecture consists of beautiful or innovative built exemplars."[51] Although Larson specifically talks about architecture, her concept of "discourse" can be understood as sociological wrapping that can be extended easily over other design disciplines.

In this context, built or produced exemplars, such as Apple's iPod or Frank Gehry's buildings, become shared examples for concrete problem solutions in design discourse. Disseminated through professional publications and honored by awards granted by professional institutions such as IDSA or AIA, such exemplars are promoted in design offices in the marketplace as well as in design studios in academia. Ultimately, these exemplars become iconic in the mind of the general public.

Larson does not note that, in the design fields, the creators of iconic exemplars also themselves become exemplars—in a way arguably more pronounced, as a matter of course, than the esteem awarded significant leaders in non-design disciplines. For example, if John Smith is the best accountant in the world, it is still much more important that a handbag be a *Gucci* handbag than it is for a tax report to be a *Smith* tax report. In design, exemplars as objects conceptually become one with their exemplar-creators. So, again, a Gehry building is a *Gehry* building; an Eames chair is an *Eames* chair. Even the iPod is an *Apple* iPod; the others have the whiff of being imitations of the original. There is a growing body of work in design studies which seeks to analyze the thinking styles of the "great designers." This underlines the prominence of exemplar-creators in the design disciplines.[52]The underlying assumption is that, by analyzing the design processes of those exemplars (exemplar-creators and exemplar-objects), some generalizations about innovative "design thinking" processes can be reached which, then, can be useful in design education.

At any rate, creator-object exemplars in the design fields differ from the "problem solution" exemplars of Kuhn's original definition. Yes, there is no doubt that both kinds of exemplars regulate subsequent action by instilling normative expectations even while they set idealized standards. But the difference, again, is that exemplars reside internally for communities with domain-specific bodies of knowledge. For design communities, creator-object exemplars orient outwards, to give the larger society a professional "face" for the creative activities that reside within design professions.

Conclusion

We have argued that the four elements of Kuhn's disciplinary matrix behave differently in non-design versus design professions, and that this is the key ontological difference between the one and the other. The outward orientation of the components of the disciplinary matrix—what we have called the sociological wrapping of the design professions—is due to the lack of domain-specific bodies of knowledge in these professions. The wrapping transmits relevant general knowledge external to a design profession into its inner domain for the purpose of motivating and inspiring creative acts. The wrapping also serves to give a design profession a professional identity in the larger culture.

By way of conclusion, here are some limitations to our proposal, or areas for further inquiry it raises. We first emphasize that we mean nothing pejorative by "sociological wrapping"; it is simply a technical term denoting a key ontological trait of the design professions, as we have shown. But precisely because it is a key, more inquiry is needed regarding the specifics of sociological wrapping. For example, how would each component of Kuhn's matrix work—as sociological wrapping—more *specifically* for architecture, interior design or industrial design?

Second, critics will no doubt question our definition of the creative act: is it as central as we claim it to be for design professionalism? This critique will probably coalesce in two forms. One would be to demand further clarification in light of the work of researchers such as Howard Gardner[53] or Mahaly Csikszentmihalyi[54] on this topic. The other would be concern that we might be returning to an outmoded way of theorizing about design in general. In an age of cybernetic technology, is the creative act indebted to inspiration or to information? We look forward to such future dialogue, but feel that our task here was to offer a clear definition of the creative act (and its importance to the design professions) so that such future exchanges may indeed take place.

Third, there also is the obvious need for clarifying subtler distinctions between design versus non-design professions. We realize we have not identified two silos hermetically sealed one from the other; there are gradations of difference. Consider civil

engineering for example. It would be difficult for anyone to claim civil engineering does not have domain-specific knowledge. And yet civil engineers have designed some of the most aesthetically striking objects we have (bridges, for instance).

Fourth, the distinction between profession and discipline also needs further clarification. For our purposes, we have implicitly understood this difference as framed by Friedman, to wit, that discipline refers to the academic subject of the area that becomes a profession.[55] But in the design communities, if the elements of the matrix orient outwardly because of the lack of domain-specific bodies of knowledge to draw inward theoretical focus, this raises more fundamental questions about the role of design curricula.

Finally, we return to Cross's proposal of design knowledge as a "third" category of knowledge distinct from scientific and humanities/artistic knowledge.[56] The proposal is attractive if for nothing else than the putative clarity it promises—if you can't join them, separate from them. But our solution has not been to be segregative, but to be integrative. In other words, rather than (again) isolate design knowledge as a specific epistemological domain all its own, we have suggested that design knowledge actually draws from the general pool of cultural knowledge for purposes of informing creativity. But of course, Cross's consistent contributions to this discourse over the years require that his proposal be systematically considered, and so we urge more in-depth comparison between his theory and ours.

Aware of all these limitations, our view remains that the contribution of this article—an application of the components of Kuhn's disciplinary matrix in a *sociological* appraisal of the design professions—opens new theoretical ground for discerning a unique ontology for these professions, in a way that integrates design with knowledge from all walks of life.

1   Thomas Kuhn, *Structure of Scientific Revolutions* (Chicago: University of Chicago Press, 1962).

2   Ibid., 181–187.

3   In this view, modern professionalism is basically a "set of institutions which permit the members of an occupation to make a living while controlling their own work." Eliot Freidson, *Professionalism, The Third Logic* (Chicago: The University of Chicago Press, 2001), 17. Such a prominent privilege—the right of self-regulation/control—can only be granted by the society if certain occupational groups are believed to posses an esoteric body of knowledge that is directly associated with some major "needs and values of the social system." See Magali Sarfatti Larson, *The Rise of Professionalism* (Berkeley and Los Angeles: University of California Press, 1977), x.

4   Nigel Cross, John Naughton and David Walker, "Design Method and Scientific Method" in *Design: Science: Method: Proceedings of the 1980 Design Research Society Conference,* Robin Jacques and James A. Powell, eds. (Great Britain: Westbury House, 1981), 18–29.

5   Keith Macdonald, *The Sociology of the Professions* (London: Sage Publications, 1995), 9.

6   Larson, *The Rise of Professionalism*, 40–53.

7   Terence Love, "Constructing a Coherent Cross-disciplinary Body of Theory about Designing and Designs: Some Philosophical Issues," in *Design Studies* 23 (2002); 349.

8   Francis Duffy with Les Hutton, *Architectural Knowledge: The Idea of a Profession* (London and New York: E & FN Spon, 1998), 168.

9   There are reasons for this conflation. Historically, the emergence of the professions was prompted by the need to define marketable specializations in service to industrializing societies. These specializations were special because not everyone possessed the requisite knowledge. It is therefore not surprising that sociological assessments of the professions have taken for granted that knowledge is a fundamental starting point for profession-making. And design analyses of disciplinary/professional domains follow suit in assuming the centrality of a coherent body of knowledge within those domains. Take, for example, again, the citations from Love and Duffy above. Our argument is not with this logic per se—although we underline one obvious limitation to this approach: After many attempts at defining a body of "design knowledge," the boundaries of that domain (as well as its contents) remain tellingly vague. For our part, we suggest that considering where "knowledge" *fits* into the constellation of factors that define a profession (as opposed to simply assuming it is the key identifying ingredient of any profession) can go a long way toward achieving clarity on the ontological status of design professions.

10   Nigel Cross, "Descriptive Models of Creative Design: Application to an Example," in *Design Studies* 18 (1997): 427–455.

11   Kees Dorst and Nigel Cross, "Creativity in the Design Process: Co-evolution of Problem-Solution," in *Design Studies* 22 (2001): 425–437.

12   This does not negate the need for creativity in general in non-design professions. However, in a non-design profession (1-b), success entails handling its domain-specific body of knowledge creatively, and the elements of the disciplinary matrix orient inwards towards this body of knowledge in part for this purpose. But in a design profession (1-a), the elements of the matrix orient outwardly so as to constantly update knowledge generated outside the profession to inform and inspire the creative acts within.

13   Nigel Cross, "Designerly Ways of Knowing" in *Design Studies* 4:3 (1982): 221–227.

14   Le Corbusier, *Texts and Sketches for Ronchamp*. First published by Jean Petit, 1965. Association oeuvre de N.D. du Haut, Ronchamp. No pagination. This particular fact can be found on page 20 if pagination starts at the first page.

15   Cross, "Descriptive Models," 433, 436–437. Here Cross is citing the work of Rossman and Gero, "Creativity in Design Using a Design Prototype Approach" in *Modeling Creativity and Knowledge-based Creative Design* J. Gero and M. Maher, eds. (New Jersey: Lawrence Erlbaum, 1993).

16   Bryan Lawson, *What Designers Know* (Oxford: Elsevier, 2004), 17–19.

17   Nigel Cross, "The Creative Leap" in *Designerly Ways of Knowing* (London: Spring-Verlag, 2006), 43–61.

18   Ibid., 10. Lawson's statement in full is even more cryptic (italics added): "Our purpose is to show that there is some higher quality depending on some *identifiable body of knowledge* lying outside and beyond the problem that distinguishes architecture from building. Translating this into more generic language requires us to see that design as opposed to mere problem solving requires the application of *a body of knowledge not stated or necessarily even referred to in the brief."* The tension between Lawson's insistence that there indeed is an identifiable body of knowledge, on the one hand, and that this body is necessarily unstated, on the other, is unresolved.

19   Peter Rowe, *Design Thinking* (Cambridge, MA: MIT Press, 1987 [1992]), 39–113.

20   Ibid., 111.

21   Kant's aesthetics, of course, is the source for this point of view. See Immanuel Kant, *Critique of Judgment* (1790), Sections 1–5. Translated by Werner S. Pluhar (Indianapolis, IN: Hackett Publishing Company, 1987), 44–53.

22   Some might still take issue with the boundaries we have set for a design profession. For instance, one can point to "professional" organizations that seek to define and defend the rights of artists engaged in producing fine art. One example is ASCAP (The American Society of Composers, Authors, and Publishers), which defends copyright interests for their constituents. But the litmus test of everyday language helps us here: there is no problem in referring to an architect as a member of a profession, but calling a poet a member of a profession, while not unimaginable, would probably not be an everyday description of that person. And it is doubtful whether the poetry writing community would wish to become a profession, even if it could.

23   Richard Buchanan, "Wicked Problems in Design Thinking," in *Design Issues* 8:2 (Spring, 1992): 5–21.

24   See, for example, AIA Soloso, a new website for the dissemination of architectural knowledge: http://soloso.aia.org/eknowledge/index.htm (accessed: July 15, 2008).

25   A list of all twenty-four AIA Knowledge Communities can be found at http://www.aia.org/nav_kc (accessed July 15, 2008).

26   Terence Love, "Constructing a Coherent Cross-disciplinary body of Theory About Designing and Designs: Some Philosophical Issues" in *Design Studies* 23 (2002), 349.

27   http://www.accredit-id.org/associations.html (accessed July 15, 2008).

28   http://www.ncidq.org/who/agencies.asp (accessed July 15, 2008).

29   Denis Guerin and Caren Martin, "The Career Cycle Approach to Defining the Interior Design Profession's Body of Knowledge," in *Journal of Interior Design* 30:2 (2004): 8.

30   Stanley Abercrombie, *A Philosophy of Interior Design* (New York: Harper & Row, 1990).

31   http://www.bls.gov/oco/ocos290.htm (accessed July 22, 2008).

32   Jacques Giard, "Design Education in Crisis: The Transition from Skills to Knowledge" in *Design Issues* VII:1 (Fall 1990): 26–27.

33   Ibid., 26

34   "Attempts to equate 'design' with 'science' must logically be predicated upon a concept of science that is epistemologically coherent and historically valid. This history of the twentieth-century debate in the philosophy of science suggests that such a concept does not yet exist. It would therefore seem prudent for writers on design method to back away from this particular line of argument, at least for the time being…" From Cross, Naughton and Walker, "Design Method and Scientific Method," 23.

35   Kees Dorst, "Viewpoint: Design Research: A Revolution-waiting-to-happen," in *Design Studies* 29:6 (2008).

36   Love, "Constructing a Coherent Cross-disciplinary Body of Theory about Designing and Designs: Some Philosophical Issues," 350.

37   Guerin and Martin, "The Career Cycle Approach to Defining the Interior Design Profession's Body of Knowledge," 9, 11–13.

38   Love, "Constructing a Coherent Cross-disciplinary Body of Theory about Designing and Designs: Some Philosophical Issues," 350.

39   Ken Friedman, "Theory Construction in Design Research: Criteria: Approaches, and Methods" *Design Studies* 24:6 (November, 2003): 512.

40   Nigel Cross, "Designerly Ways of Knowing: Design Discipline versus Design Knowledge" in *Design Issues* 17:17 (Summer, 2001): 54–55.

41   Jan Wampler, "Watching," in *Journal of Architectural Education* XXXII:4 (May, 1979): 20–21.

42   Kuhn, *Structure of Scientific Revolutions* 182–183.

43   Random House, Inc. http://dictionary.reference.com/browse/symbol (accessed: April 17, 2008).

44   Kuhn, *Structure of Scientific Revolutions* 184.

45   Ibid., 184.

46   Magali Sarfatti Larson, *Behind the Postmodern Façade: Architectural Change in Late Twentieth-Century America* (Berkeley and Los Angeles: University of California Press, 1993). She cites from "Interview: Gerald Hines and Peter Eisenman," *Skyline* (October, 1982): 21.

47   Vitruvius, *The Ten Books on Architecture,* Book I, Sections 5, 7, 8, 10, and 17.

48   Kuhn, *Structure of Scientific Revolutions* 185.

49   Ibid., 187.

50   Larson, *Behind the Postmodern Façade*, 5.

51   Ibid., 5.

52   Nigel Cross, 2003. "The Expertise of Exceptional Designers," in *Expertise in Design: Design Thinking Research Symposium 6*, N. Cross and E. Edmonds, eds. (Sydney: Creativity and Cognition Studio Press): 23–36. Also, Bryan Lawson provides many examples of designer-exemplars in his book *What Designers Know* (Oxford Architectural Press, 2004).

53   Howard Gardner, *Creating Minds: An Anatomy of Creativity as Seen through the Lives of Freud, Einstein, Picasso, Stravinsky, Eliot, Graham, and Gandhi* (New York: Basic Books, 1993).

54   Mihaly Csikszentmihalyi, *Creativity: Flow and the Psychology of Discovery and Invention* (New York: Harper Collins, 1996).

55   "That is, one studies the disciplines that lead to professional practice—design, law, medicine, etc. Once embarked in professional practice, one is not engaged in a discipline but in a profession or a field. If one goes back for advanced study or to teach, one returns to the discipline." Ken Friedman, "Disciplines, Fuss…" in PHD-DESIGN@JISCMAIL.AC.UK. (Last accessed September 29, 2007).

56   Cross, "Designerly Ways of Knowing," 221–227.