Introduction

Each article in this issue is a foray into a different aspect of design. The reader will find fresh insight into a familiar chapter in the history of type design in Kay Amert's contribution and be reminded by Gay McDonald of the role of cultural institutions in the Cold War. Mohammad Ali Yaghan's discussion of "Arabizi," a contemporary form of written slang, prompts us to think about the impact of modern communication technologies on ancient scripts. An article by Geke Ludden, Hendrick Schifferstein, and Paul Hekkert probing the nature of innovation and Barry Wylant's piece on the implications of surprise as a design strategy focus our attention on the way designers think about designing. Early in their contribution to this issue, Daniel Christian Wahl and Seaton Baxter remind us that design is "fundamental to all human activity." There is nothing in this assertion that will strike the regular readers of this journal as outrageous. Indeed, the cumulative effect of the articles assembled here seems to reinforce our sense of design's pervasive presence in the past as well as the present and its critical role in giving shape and direction to the future. *Design Issues* has consistently served as a forum for promoting a more sophisticated understanding of design's contribution to the human-made order of things. This human-made order of things, Wahl and Baxter argue, is in crisis; our modern advanced civilization is unsustainable. They go on to note that given their location at the "nexus of values, attitudes, needs, and actions" designers can, indeed they must perform a role of enormous importance in the design and construction not just of signs, symbols, artifacts, and networks but of broadly-based conversations about the future of the world and our place in it. With their ability to envision, develop and communicate alternatives to the status quo, designers bring a distinctive set of skills to significant public discussions concerning the human community's migration to sustainable models of the future. Embedded in the challenge of designing conversations rather than commodities is the notion of co-creation and the designer as facilitator rather than form-giver. The challenge may appear daunting and in the context of pressing environmental and social concerns, the time frame available distressingly short. But designers routinely embrace daunting challenges; this is part of their distinctive identity as a professional community and a reason for all of us to be hopeful.

Bruce Brown
Richard Buchanan
Dennis Doordan
Victor Margolin

Design Thinking and the Experience of Innovation

Barry Wylant

An Overview of Innovation

Discussions on creativity, creative thinking techniques, social psychology, geography, and economic development inform much of the commentary on innovation. Such work usually focuses on techniques for achieving innovation; enhancing its role in increasing productivity, and contributing to the economic betterment of a given group or region. For instance, in economics, "clusters" often are associated with innovation. These are the "geographic concentrations" of companies and services that collectively link to focus on meeting the overall needs of a given industry sector.[1] Often, such companies both compete and cooperate, enhancing the cluster. The California wine cluster is an example which includes several vineyards, wineries, and those companies that contribute to all aspects of productivity in winemaking. This list covers those we might expect to be involved with wine production such as the manufacturers of bottles, corks, labels, and barrels; and also those who can provide a specialized advertising and media presence, offering linkages to related agribusinesses, the restaurant industry, and winery tourism.[2]

Due to geographic proximity and a linked focus, clusters are useful in enhancing the microeconomic capability of a given region. This occurs through improvements in the productivity of cluster members which enables them to compete effectively in both regional and global markets. The geographic concentration allows for access to capabilities, information, expertise, and ideas. They allow members to quickly perceive new buyer needs, and new technological, delivery, or operating possibilities. This allows members to quickly recognize and identify new opportunities far more readily than those residing outside the cluster. Pressure also exists within clusters. Competition and peer pressure can drive an inherent need for participants to distinguish themselves, and proactively force the pursuit of innovation. Also cluster participants tend to contribute to local research institutes and universities, and may work together to develop local resources collectively and privately in a manner beyond the mandate of local governments and other organizations. Activities such as these can enrich the work experience, and enhance innovation and the quality of life within the cluster community. In

1 Michael E. Porter, "Clusters and the New Economics of Competition," *Harvard Business Review* (November-December 1998): 78.

2 Michael E. Porter, "Location, Competition, and Economic Development: Local Clusters in a Global Economy," *Economic Development Quarterly* 14:1 (February 2000): 15–34, 17.

providing an economic focus, clusters provide a succinct context for idea generation and economic development through a variety of means.[3]

Categories of Innovation

An early writer on innovation, Joseph Schumpeter, distinguished it from invention, and saw it as a far more potent contributor to prosperity. In Schumpeter's estimation, inventors only generated ideas, while innovation occurs as the entrepreneur is able to implement and introduce the new idea into a form of widespread use. He referred to this as the entrepreneur's ability to "get things done," and saw it as a definitive aspect of the innovation process.[4] In this, Schumpeter discounts the need to reinvent the wheel and allows for nonradical innovations, such as the introduction of Deerfoot sausage.[5]

Others have focused on the degree of newness evident in innovation. Thomas Robertson proposed three classifications for innovation: "continuous," "dynamically continuous," and "discontinuous."[6] "Continuous" can be considered incremental or evolutionary in character, a small improvement over what already exists, such as a new flavor of chewing gum. Indicative of a general lack of newness in its manifestation, lesser forms of continuous innovation are more truly thought of as imitation. "Dynamically continuous" refers to the manner in which an existing functionality can be dramatically improved, such as the introduction of flat-screen monitors over older and larger cathode ray tube monitors. "Discontinuous innovation" is seen as the introduction of significantly different technology or infrastructure that, in turn, leads to unprecedented uses and functionalities.[7] It also is known as disruptive innovation because it can interrupt, disrupt, or otherwise interfere with concurrent use and behavior patterns facilitated by existing technologies.[8] Consider the introduction and subsequent widespread adoption of the Internet, and the attending boom in information technologies, as providing for a wholly new manner of user interaction and interface with technology that simply did not exist before. These categorizations are useful in such things as risk assessment. Here, a continuous innovation might seem less risky, being a simple variation on something that already exists and proven in its widespread use; versus the greater risks associated with the potential failure of a new discontinuous innovation, which can require significant and expensive development work.

Innovation Triggers

At the scale of the individual, certain conditions can be seen to enhance the pursuit of innovation and creativity. The psychologist Teresa Amabile proposes a componential framework for creativity. She identifies three main psychological components: domain-relevant skills, creativity-relevant skills, and task motivation. Domain-

3 Michael E. Porter, "Clusters and the New Economics of Competition," 83–89.

4 Joseph Schumpeter, "The Creative Response in Economic History" in *Essays on Entrepreneurs, Innovations, Business Cycles, and the Evolution of Capitalism,* Richard V. Clemence, ed. (Piscataway, NJ: Transaction Publishers, 1989): 221–224.

5 Ibid., 223.

6 Thomas Robertson, "The Process of Innovation and the Diffusion of Innovation," *Journal of Marketing* 31 (January 1967): 15.

7 Ibid., 15–16.

8 P. Thmond and F. Lettice, "Disruptive Innovation Explored" in *9th IPSE International Conference on Concurrent Engineering: Research and Application* (CE2002), (2002): 1–2.

relevance refers to areas of knowledge and skill embodied by an individual, such as factual knowledge and expertise in a given topic.[9] This could include the computational skills of a mathematician, the listening skills and manual dexterity of a pianist, and the drawing and visualization skills of an artist.

Creativity-relevant skills include the typical cognitive styles, work styles, and personality traits that influence how one approaches a particular problem-solving task. Creativity-relevant skills inform the way an individual may perceive, comprehend, navigate, manipulate, and otherwise consider issues and problems in novel and useful ways.[10] These skills influence the degree of novelty in a particular creative insight or product. Such skills are further influenced by personality traits such as self-discipline, the ability to entertain ambiguity and complexity, the capacity to delay gratification, an autonomous outlook on the world, and a willingness to take risks. If the domain-relevant skills constitute the knowledge that an individual applies in conducting a task or solving a problem, then the creativity-relevant skills inform the manner as to how those skills are applied, ultimately influencing the degree of creativity in the response.

While more traditional forms of education would inform the development of domain-relevant skills, creative heuristics can be used to develop one's creativity-relevant skill set. This is the focus for many of Kelley's insights in his book *The Art of Innovation.* Kelley offers many techniques that inform the process, activity, and consideration of innovation. He notes that observation, laterally organized group work, brainstorming, prototyping, the manipulation of environments, aspects of set-breaking, the role of chance (and by default the ability to allow for failure), and a certain perceptive quality which he refers to as "coloring outside the lines" all represent important cognitive devices that can be used to effectively enhance the occurrence of innovation.[11] Indeed, if Amabile's research seeks to establish more concrete means for the evaluation and prediction of creativity, Kelley's work focuses on specific techniques and ways of thinking that ultimately will enhance the process of achieving innovation.

Task motivation addresses the motivational state in which the creative act is pursued. Intrinsic motivation, is understood as those factors which exist from within the individual's own personal view. One can be seen as intrinsically motivated in a given task when engagement in that task is perceived as a meritorious end in itself. Extrinsic motivation or external factors such as deadlines, payment, aspects of supervision, etc. are understood as mitigating factors external to the task itself and are imposed externally to the person completing the task.[12] Amabile's research into the social-psychology of creativity is rooted in the hypothesis that intrinsic motivation represents a stronger positive influence in the pursuit of creativity

9 Teresa Amabile, *The Social Psychology of Creativity* (New York: Springer-Verlag 1983): 67–70.

10 Ibid., 67–69.

11 Tom Kelley, *The Art of Innovation* (New York: Doubleday, 2001): 231–246.

12 Teresa Amabile, *The Social Psychology of Creativity,* 76.

than extrinsic motivational. Her efforts examine the social environment in which creativity is pursued, and how that in turn might be manipulated to enhance the creative result.

Towards the Idea in Innovation

The discussion above spans various scales of inquiry regarding innovation, but is a more elemental understanding of innovation possible? A departure point to pursue such an understanding begins with a definition for the term "innovation." Schumpeter saw innovation as the domain of the entrepreneur who "gets things done." He defines the activity as "simply the doing of new things or the doing of things that are already being done in a new way."[13] The *Oslo Manual* defines innovation as "the implementation of a new or significantly improved product (good, or service) or process, a new marketing method, or a new organizational method in business practices, workplace organization, or external relations."[14] *ITP Nelson* simply defines innovation as the "act of introducing something new."[15] And the anthropologist H. G. Barnett considered innovation as the result of a process in which a new "thought, behaviour, or thing" is conceived of and brought into existence.[16]

Each of the definitions above note that to achieve innovation requires an action or process of some type that introduces something new. Evident here are the constituent elements of innovation, which can be identified as the new thing to be introduced, the act of introducing it, and some type of arena where the introduction occurs. However there can be some ambiguity in understanding what exactly constitutes the new thing and its introduction. A buyer for a given retail chain might view a new, fully developed product as the "new thing," and its subsequent adoption into market distribution as its "introduction." Others, more technically-minded, might view the development process of that product as its "introduction" and the idea behind the product as the "new thing." The introduction also could occur at the level of the individual, such as with early adopters of emerging technologies. Indeed, it could take place in a variety of ways.

From the definitions, new things can take on a variety of forms such as a product, behavior, system, process, organization, or business model. At the heart of all these "new things" is an idea which is deemed meritorious and, when acted upon, ultimately affects the innovation. To describe an idea as "innovative" suggests that it should be acted upon. Given this distinction, there is a point where the innovation can be seen to exist only as an idea. Initiating some action inspired by the idea starts the process through which the eventual "introduction" can occur, and thus initiates the innovation process which can encompass any subsequent activity necessary to further the idea's development along.

13 Schumpeter, "Creative Response," 223–24.

14 *Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data* (3rd Edition) (OECD/European Communities, 2005): 46.

15 *ITP Nelson Canadian Dictionary of the English Language* (Toronto: ITP Nelson, 1998): 702.

16 H. G. Barnett, *Innovation: The Basis of Cultural Change* (New York: McGraw-Hill Book Company, 1953): 7, quoted in Thomas Robertson "The Process of Innovation and the Diffusion of Innovation," *Journal of Marketing* 31 (January 1967): 14.

The Idea Experience

Some insight into the experience of an idea is evident in Scruton's discussion of aesthetic perception and the experience of architecture. The description of this experience can be used to inform a more general insight as to how ideas are generated. Scruton notes that one applies imagination to perceive form, order, balance, etc. in a given architectural piece.[17] At a base level, one might easily see that a building is constructed from various materials, however, it is our imagination that allows us to see forms in the arrangement of these base components, such as the semicircular composition of brick in an archway. As a cognitive mechanism, this is very similar to the ability to see a face in the clouds. Imagination allows us to entertain the notion of the shape of a face evident in the outline of clouds, just as one might see a pattern in the arrangement of bricks on the façade of a building. The viewer cognitively matches the shape of the cloud or the arrangement of bricks to a previously understood concept, that of a particular animal or geometric form such as a circle. Scruton refers to the acquisition of such insight as an act of imaginative perception.[18] *ITP Nelson* defines idea as the "conception existing in the mind as a result of mental understanding, awareness or activity."[19] With this, it can be argued that Scruton's notion of imaginative perception, as evident in the aesthetic experience of architecture, represents the genesis of an idea. Thus, in comprehending the semicircular arrangement of the bricks, one is effectively arriving at an idea about those bricks and the building constructed from them.

From this brief discussion on the occurrence of an idea, its constituent elements can be noted. These include a stimulus of some sort, that is, something that could arrest or hold the attention of a potential viewer. The examples above suggest something seen or physical, however, it could be otherwise such as a musical note or the spoken word. Such stimuli exist in settings or contexts, such as a cloud in the sky, a brick in a wall, or a musical chord in a song. And, of course, there must be a viewer, someone who can then perceive and consider the stimulus. It is in the consideration of such stimuli that one can cognitively nest perception within a body of experience and learning that then can inform the comprehension of a particular stimulus and make sense of it in an imaginative way.

The key to the interplay of these idea elements is the capacity of the stimulus to hold one's attention and engender its consideration. For example, an arresting piece of architecture can hijack one's focus, requiring that the viewer make sense of the building observed. In an instant, the mere presence of architecture (or any other stimuli) has the potential capacity to interrupt one's thoughts. At times, such an interruption can be leisurely, a building may simply command attention during a casual stroll. At other times, the experience is more pressing, such as the need to navigate the interior of a foreign train station to ensure one's timely arrival at the right platform.

17 R. Scruton, *The Aesthetics of Architecture* (Princeton: Princeton University Press, 1979): 76–78.

18 Ibid.

19 *ITP Nelson Canadian Dictionary of the English Language,* 674.

There is another aspect that can be derived from Scruton's discussion on imaginative perception, and that is the malleability of the perception itself. One can choose, at will, different ways of seeing, comprehending, or experiencing a given piece of architecture. Scruton refers to the upper story row of columns of the Palazzo Pisani-Moretta in Venice. Here, one can perceive that neighboring columns end in an aedicule (a pointed arch), or that every third column anchors a semicircular arch. There is an inherent ambiguity where one can perceive either one or the other compositions in the architecture. Further, if someone does not immediately see one or the other version of the columnar endings, another bystander in the vicinity could point it out, thus providing insight as to other ways of imaginatively perceiving the composition.[20] This ability to flexibly generate different imaginative responses to stimuli is open to influence from a variety of sources, anything that could then prompt one's reconsideration of the stimulus.

Idea Elements

The idea elements described above can be seen to act within a cognitive mechanism that engenders an idea. Certain historical instances are useful in illustrating how these idea elements work in different ways. For example, Archimedes' sudden insight into the relationship between an object's volume and water displacement is one of these. In noticing the water level of his bath rise as he lowered himself into it, Archimedes realized that water, displaced in such a fashion, could be used to measure the volume of an irregularly shaped gold wreath, a task he was under commission to determine. Here, the water level serves as the stimulus, and its relative position against the side of the tub is its physical context. In the consideration of this as a stimulus, Archimedes imaginatively contextualizes his observation within his pressing query, and the idea was formed.[21] In this instance, the previous experience is not explicit; rather it is knowledge in the form of a perplexing question known to the idea progenitor.

A similar experience can be found in the description of Kekulé's discovery of the molecular structure of benzene. In this story, Kekulé had been pursuing this question for some time, yet an accurate theory as to benzene's structure remained elusive. One day, he dozed off in his study with the fire burning in the fireplace. In his dozing state, he contemplated the flames, imaginatively seeing them first as snakes and then as snakes biting their tails, forming circles with their bodies. When he fully awoke, he realized that the molecular structure for benzene was indeed circular, or rather it formed a six-sided ring shape.[22] Such a structure allows for a greater number of molecular bonds than would be possible otherwise, a notion later confirmed by his student W. Körner.[23] The constituent idea elements are at play here. The fire provides the initial stimulus in this mix, and one can postulate that Kekulé's state of relaxation might well enhance his willingness to make sense of the flames imaginatively

20 R. Scruton, *Aesthetics of Architecture,* 85–87.

21 E. J. Dijksterhuis, *Archimedes* (Princeton, NJ: Princeton University Press, 1987), 19.

22 M. A. Boden "What Is Creativity?" in *Dimensions of Creativity,* M. A. Boden, ed. (Cambridge, MA: The MIT Press, 1994): 82–83.

23 David Knight, *Ideas in Chemistry: A History of the Science* (New Brunswick, NJ: Rutgers University Press, 1992), 123.

as writhing snakes. The idea of a circular snake can be seen as a new stimulus which, when considered in light of his research, is contextualized within the problem of benzene's structure. Upon his reveille, he is able to consciously put the pieces together and explicitly table the new idea. Moving from the idea of snakes dancing in the fire to that of circular snakes represents a cognitive micro-step which is similar to the flexibility noted above regarding architectural ambiguities. This is illustrative of how newly formed ideas can nest as stimuli to inform the genesis of subsequent ideas.

The Considered Idea

The examples noted above echo Krippendorf's discussion regarding product semantics. Krippendorf postulates that in viewing a given product, one imaginatively contextualizes the perception of that object as a means of comprehending significance.[24] In this, the viewer formulates ideas about the object, cognitively placing it into contexts that allow her to formulate an understanding of it. For instance, she might consider how a chair could look in her living room while seeing it in a store. Krippendorf notes that "Meaning is a cognitively constructed relationship. It selectively connects features of an object and features of its (real environment or imagined) context into a coherent unity." [25] The ability to comprehend a totality of meaning in this is seen in the summation of all potentially imaginable contexts by an individual. That potentially there is a limitless variety of contexts which can be used to construct meaning is indicative of the degrees of potential quality evident in any resulting idea about an object. Some ideas are more easily arrived at than others. Perceiving a horse in the sky or the circular arrangement of bricks can happen in an instant. One can arrive at scores of such ideas in the course of the day. Other ideas require more work. Often, the genesis of a useful idea requires that one work through the generation of sequential or chained ideas as evident in Kekulé's contemplation of the ringed snakes.

Given this mechanism of stimulus and context, a variety of factors can be seen to influence the occurrence and generation of ideas. This can include knowledge, experience, and one's capacity to fully consider and contextualize stimuli, echoing Amabile's components of creativity. Nesting stimuli within contexts is informed to some degree by the conceptual space where that contextualization takes place. Psychologist Margaret Boden states: "The dimensions of a conceptual space are the organizing principles that unify and give structure to a given domain of thinking."[26] The extensive knowledge base of a given profession or discipline (as evident in Amabile's notion of domain relevance skills) provides an example of such conceptual space, where there are accepted normative concepts, standards, and language that underlie the conduct of the discipline. Indeed, even language forms a type of conceptual space where the rules of spelling and grammar allow one to make sense

24 Klaus Krippendorf, "On the Essential Contexts of Artifacts or on the Proposition That 'Design Is Making Sense (of Things)'" in *The Idea of Design*, Victor Margolin and Richard Buchanan, eds. (Cambridge, MA: The MIT Press, 1995): 159, 156–184.

25 Ibid.

26 M. A. Boden "What Is Creativity?" 79.

of individual letters and words. As Krippendorf notes, the act of naming something immediately places it within a linguistic context, subsequently making it subject to the rules of language as part of the sense- making process.[27] Conceptual space also is interesting, because sometimes that space can limit or preclude the occurrence of an idea. Prior to Kekulé's epiphany, available experimental data might have been interpreted as describing a circular chemical structure for benzene. And yet if one is locked into a particular way of viewing such data, it can occlude other interpretations.

The Idea in Innovation

The expression "thinking outside the box" is commonly used in reference to new ideas and innovation. This colloquialism reflects an intuitive understanding of the idea generation process: cognitive contextualization can be seen as a space (or box) for the consideration of a stimulus. Given the intent of the expression, thinking "inside the box" refers to a more pedestrian form of sense-making. The need to make sense of things via fresh contexts and/or stimuli is necessary to break out of the "box." There is a significant duality to the nature of contexts in this. On the one hand, they provide the means by which one makes sense of a given stimulus, but if this becomes staid it then can interfere with the achievement of more useful ideas. More accurately, in thinking "outside the box," one is effectively thinking in a very *different* box. If the role of contextualization is true in the formation of an idea, then some kind of cognitive context or "box" always will be required to comprehend a particular stimulus, even if it is a radically different context.

Insights into the idea mechanism and the need to think outside of the box can inform the discussion on innovation. For instance, clusters allow individuals to work closely with others in contextually matched endeavors. In this clusters play to chance and serve, through proximity and convenient connectivity, to increase the likelihood that one might consider a given stimulus within a related, yet new and useful, context. This, in turn, can engender a new idea, cultivating the likelihood of any follow-through innovation.

The quality of a given innovation also is influenced through the idea mechanism. To move beyond imitative and continuous innovations, greater originality is required in the generation of new ideas. This entails the consideration of stimuli in increasingly disparate contexts. It also requires the continued motivation to reconsider fresh ideas as new stimuli. Towards this end, the use of heuristics and other innovative techniques, as noted by Kelley, address the capacity to catapult one's thinking into wide-ranging contexts. For example, in brainstorming the type of people included, the inherent structuring of the session, the suspension of judgment, and the use of various media to capture ideas, comments, and notions all can be seen as significant in the generation of new ideas. Brainstorming members who come from different backgrounds (sociologists,

27 Klaus Krippendorf, "On the Essential Contexts of Artifacts," 159.

psychologists, designers, engineers, etc.) are able to draw upon differing creativity-relevant and domain-relevant skill sets. Such differences can be very wide-ranging: in a discussion of "lead users" von Hippel (et al.) notes how 3M brought together their researchers, veterinary specialists, and makeup and special effects industry people to explore new product ideas for controlling infections after surgery.[28] Brainstorming members inherently will bring different approaches to considering stimuli, both in terms of willingness and capacity. Further, such breadth allows both for the discipline specific rigor necessary to fully comprehend sophisticated problems, and yet provide for various "boxes" of consideration that can lead to quite unexpected and useful ideas.

The brainstorming session provides an interesting example as to how the idea mechanism can play out. One member might table a topic for consideration and discussion. This serves as an initial stimulus. Any one of the group members can cognitively nest this into a context to arrive at new idea. This idea, in turn, can become a stimulus to another member, who can then contextualize it and arrive at another idea; and so on, initiating an idea chain. Within this dynamic, the deferment of judgment is useful because it allows members to continue nesting new ideas as stimuli to subsequent ideas, a process which judgment might interrupt or divert. Further, contributions to the discussion made in a prescribed order also can muzzle the free association between stimuli and useful contexts. According to Kelley, in an effective brainstorming session, ideas are not only verbally expressed but captured via notes, sketches, the quick model, etc.[29] These media are useful because they play to people's different capacities in their individual domain or creativity-relevant skill sets. People will respond to sketches or notes, as stimuli, in differing and original ways leading again to more unique ideas.

Introducing the New Idea

Amabile proposes a creative process in which components of creativity influence activities in different phases. One can see how the execution of domain- or creativity-relevant skills might occur in this, and how motivation can influence the creative result.

Her theoretical process also is intended to provide a framework indicative of how the overall creative process occurs, and this can be seen to correlate with a basic design process which might include the following steps: see Figures 1 and 2 on page 12.

In comparison to Amabile's process, the design brief and any relevant background research undertaken can be seen to correlate to the preparation step. Sketches and aspects of CAD are similar to the response generation, while prototyping and user testing correlate with the response validation. Amabile's notion of creative outcome corresponds to the resulting design itself, which takes form through specification documents and, ultimately, in the launch of a product.

28 E. von Hippel, S. Thomke, and M. Sonnack, "Creating Breakthroughs at 3M," *Harvard Business Review on Innovation* (2001): 31–53 and 44–46.

29 Tom Kelley, *The Art of Innovation,* 61–62.

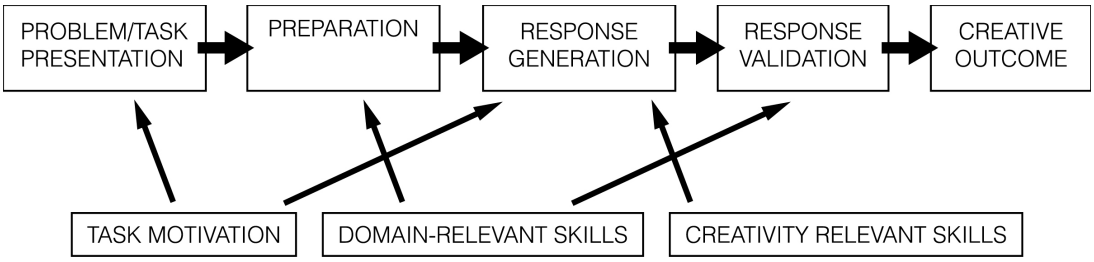


Figure 1
Proposed Creative Process
(from Amabile).[30]

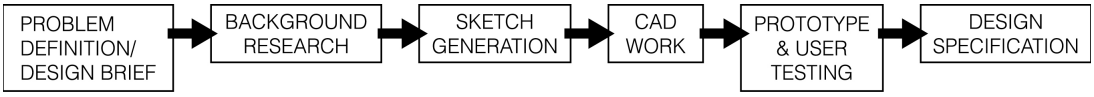


Figure 2
A Suggested Process for Design.

Such similarities are useful because design can be thought of as a professionalized version of the creative process and significant in the achievement of innovation.

Amabile's componential theory also is useful in understanding how smaller aspects of the design process, such as sketches, might be completed. A designer can prepare for this through the perusal of a couple of magazines or surfing-relevant Websites. Subsequently, the completion of any number of rough, initial sketches represents a response generation. Response validation is evident in any evaluation of these sketches, and the designer may then pursue more-polished sketches as an outcome. It becomes apparent in this that the application of Amabile's theory is *scalable* to the type of tasks undertaken, whether they are small interim steps or the entire process. Even within the completion of a single sketch there are aspects of preparation, validation, and outcome, and so the completion of any interim step can be seen as an execution of the larger creative process in miniature. In turn, aspects of all the noted creative activities are apparent in each of the larger phases of Amabile's overall process. Responses will be generated and validated within the preparation phase, and there will be aspects of preparation in the subsequent phases.

The notion of scale in the creative endeavor is interesting: if the final creative outcome is based on a single idea, then (depending on the complexity of the outcome) this end-state is achieved from working through the genesis of many smaller ideas. Indeed, the quality of the end product can be enhanced if a number of smaller ideas are explored first; a principle design is predicated upon. The character of consideration for these smaller ideas is evident in Buchanan's thoughts on design thinking and, specifically, his discussion of *placements*. Buchanan uses the term "placement" as

30 Teresa Amabile, *The Social Psychology of Creativity*, 78.

something of a synonym for context with the qualification that the boundaries of consideration are less tightly defined than one might expect with the word context.[31]

For instance, a given sketch represents an idea for a product's design. The product does not exist, yet the designer will need to evaluate his or her intent within the idea. In considering whether the intended product appears attractive or ungainly, would be easy to manufacture, or comfortable to use, the designer is placing consideration of the sketched product into placements of aesthetics, manufacturability, and ergonomics. Even in creating the sketch, one drawn line will be considered within the placement of other lines and the product's overall form. The sketch is exploratory, effectively a mini-hypothesis in a what-if scenario used to establish relevance.[32] The use of placements here allows the designer to make sense of one's design intent without an undue commitment to the idea while it is still embryonic. There is an inherent flexibility in this where ideas evident in the sketch may be adopted, or they may be forfeited in favor of other ideas as captured in other sketches. Further, features in one sketch may be interwoven with ideas from additional sketches. In evaluating the sketch using placements, the designer can learn more about the extent of the design problem, his or her design intent, and the necessity for further exploration.

To move the process along, other characteristics of the placement dynamic come into play, namely aspects of temporality, commitment, scale, and notions of dominance. While a placement may be entertained initially on a temporary basis, if it is found to be significantly valid, a designer can commit to it as a premise for subsequent design work, effectively dominating the consideration of later ideas in the process. The idea of dominance is a familiar visual and spatial device for designers. It is evident in the Gestalt of figure/ground relationships, and is a principle of the design pedagogy espoused by Roweena Reed Kostellow.[33] What is interesting in this is that it is a spatial principle which is applied to the consideration of any idea (not only those of visual composition) evident in the process. It also is interesting to note that, as with visual composition, the perception of dominance is flexible depending on how one might focus in on a given placement. Further, a notion of dominance evokes notions of scale. Usually, larger ideas dominate smaller ones. For example, an understanding of a product's position in the market usually is established before the design of its overall shape, and the shape is established before the detailed design of features such as keys or buttons.

The idea mechanism noted above is evident in placements. Features of a sketch, model, CAD, or any other design deliverable can act as stimuli to further consideration within the flexible contexts of placements. It is interesting to note how Amabile's components of creativity inform one's engagement with placements. Domain-relevance is evident in design skills and theoretical basis for the

31 Richard Buchanan, "Wicked Problems in Design Thinking" in *The Idea of Design,* Victor Margolin and Richard Buchanan, eds. (Cambridge, MA: The MIT Press, 1995): 10, 3–20.

32 Ibid, 16.

33 Gail Greet Hannah, *Elements of Design: Roweena Reed Kostellow and the Structure of Visual Relationships* (New York: Princeton Architectural Press, 2002), 50.

consideration of design deliverables, while the inherent curiosity and discipline of the designer influences the promulgation of the design effort. Moving beyond skills, attitude, and motivation, it also is intriguing to note the spatial quality to the designer's thinking in the design effort, where aspects of temporality, dominance, and scale are at play in the weighing of issues and the contemplation of design problems.

Innovation often is seen as a process of finding solutions necessary to introduce a new thing. Yet the exercise of finding solutions can be deterministic, depending upon how the development effort is conceptually framed. The continued drive to use one idea as a stimulus to a subsequent one is indicative of curiosity. A significant lesson that can be drawn from design thinking and the consideration of placements is that it is more a process of raising (several) good questions versus one for finding the right answers. That one does not make an a priori commitment in the initial entertainment of a given placement means that it is used to learn more about the issues under consideration. Indeed, that one *entertains* a placement is indicative of the playful quality inherent in the design pursuit. Given the curiosity that drives such play, and the skill with which it is executed, an effectively broad range of issues can be raised and duly considered in the development and introduction of innovative new things.

The "Advance" of American Postwar Design in Europe: MoMA and the *Design for Use, USA* Exhibition 1951–1953

Gay McDonald

In March 1951, the Museum of Modern Art's *Design for Use, USA* opened at the *Landesgewerbemuseum* in Stuttgart, West Germany[1] (Figure 1). This large exhibition of American design for the domestic setting represents a key episode in the evolving history of MoMA's offshore activities. More importantly, it was the first time that MoMA had profiled the output of American designers for audiences abroad, with the Stuttgart show alone attracting 60,000 visitors over a five-week period.[2] Moreover, the exhibition, selected by Edgar Kaufmann, Jr., presented Europeans with the first large-scale survey of some of the most prominent producers of modern design at work in the U.S. at mid-century; among them Charles Eames, Eva Zeisel, Freda Diamond, and Earl Tupper of Tupperware fame. *Design for Use, USA* also is notable as one of the earliest postwar

Figure 1
Cover design for the exhibition catalogue *Design for Use, USA,* displayed in Germany as *Industrie und Handwerk schaffen neues Hausgerat in USA.* Reprinted with the permission of the Württembergisches Landesmuseum Stuttgart.

1 For the German leg of the tour, the exhibition title was *Industrie und Handwerk schaffen neues Hausgerät in USA.* Saul Steinberg designed the cover for the exhibition catalogue, and the American architect Alexander Girard made the demountable units used to install the exhibition at each venue.

2 B. Chamberlain, "Letters to the Editor," *Interiors* CXI:4 (November 1951): 10.

projects undertaken by MoMA to expand its international profile, while simultaneously supporting the U.S. government during the Cold War. Through the exhibition's selection and the rhetoric of the catalogue essays for *Design for Use, USA,* MoMA strove to persuade audiences of the high quality, affordability, and seemingly limitless choice of American domestic design available to American consumers. Such issues conveniently dovetailed in broad terms with the U.S. government's prevailing efforts to build a positive image of the American way of life abroad, and to counter Soviet propaganda in the escalating tensions of the Cold War.

Rather than evolving from an artistic or cultural base, the sponsorship and organization of the tour of *Design for Use, USA* primarily was the responsibility of the Economic Cooperation Administration (ECA) a federal government agency established specifically to administer the Marshall Plan between 1948 and 1951. The government launched this massive relief effort after the war to rebuild economically dislocated countries, and ex-enemy territories in part to prevent them from succumbing to communism. The ECA's substantial involvement in the implementation of *Design for Use, USA* seems to make clear the exhibition's economic and political aspirations, as part of the Marshall Plan. However, it was neither the ECA nor MoMA, but Stuttgart's State Department of Trade and Commerce in cooperation with the Office of the Land Commissioner for Baden-Würtemberg, that conceived of the idea for the exhibition.[3] This paper maps the organization and development of *Design for Use, USA,* and asserts that, for MoMA and the ECA, this display of domestic design became the site for advancing their respective and ambiguously framed agendas that slipped between the economic, political, and aesthetic.

Regaining German Design Dominance in the Global Marketplace

To understand why Stuttgart's State Department of Trade and Commerce invited the U.S. to send an exhibition of recent domestic design at this time requires some (cursory) idea of Germany's position following World War II. On the losing side, facing significant war reparations, and with much of its industrial base destroyed, Germany began the difficult process of rebuilding its devastated economy. In some ways, the commencement of the 1950s represented a point of acceleration for West Germany's recovery. This is clearly illustrated by the point that its gross national product for the period 1950–1964 outstripped all other European countries.[4] Yet, at the outset of this period, there still was much work to be done to improve the bleak living standards of many Germans. As Brigitte Wolff writes:

> People's lives were ruled by material hardship, fundamental supply problems, and the need to carry out the most urgent tasks connected with rebuilding a country

3 Stuttgart's *Landesgewerbesmuseum* (State Museum of Trade and Commerce) also was involved in conceiving the idea for the exhibition "Industry and Commerce Creating New Domestic Objects in the USA" *Industrie und Handwerk schaffen neues Hausgerät in USA,* Druckeri Erich Zander, Berlin, n.p.

4 J. M. Woodham, *Twentieth Century Design* (Oxford: Oxford History of Art, 1997), 128.

> that lay in ruins. There was a shortage of everything—in housing, household goods and furniture, clothing, articles of personal hygiene ... efforts were dedicated above all to securing the bare necessities and to restoring something like normal, everyday life and industrial production.[5]

For some, the devastation of Germany's industrial and economic might provided an opportunity to rethink the nature and role of design in German society. In the early twentieth century, Germany, partly through the efforts of the *Deutscher Werkbund,* had become well-known in international art and design circles for its efforts to reform German design and to influence consumer choices. In the early 1950s, the German government and state agencies continued this reformist impulse through a range of programs implemented with the goal of reeducating the aesthetic tastes of designers and consumers. Via the provision of appropriate models of "good form," they hoped to progress the standard of German design.[6] In harmony with the educational spirit of such initiatives, Stuttgart's State Department of Trade and Commerce conceived the idea for a survey of quality contemporary American design wares to be sent to Stuttgart in 1951.

For more than a hundred years, a key focus of state support for trade and commerce in Stuttgart had been to present international exhibitions of useful objects to inspire local trade and industry.[7] In the new conditions of the postwar era, Professor Edgar Hotz, president of Stuttgart's State Department of Trade and Commerce, hoped that exhibitions such as *Design for Use, USA* would help to inform Germans about key developments in design and manufacture that had occurred since the interwar years.[8] In short, the State Department of Trade and Commerce had initiated a program of socially educative exhibitions from abroad to be used as the vehicle for bringing about the state's economic and cultural evolution. For Hotz, this was a strategy adopted to help postwar Germany regain its position of dominance in the global marketplace as a major manufacturer of contemporary designs. As Hotz put the matter in his essay for the catalogue accompanying *Design for Use, USA*:

> The prerequisites for contemporary design, impeccable quality and high cost effectiveness must be met by our local industries and trades. It is not sufficient for us to rest on tradition if we wish to regain the global position that we once held and have now lost. It is important for us to recognise and appreciate the past two decades' successful developments from all over the world.[9]

Hotz's interest in using exhibitions like *Design for Use, USA* as a model of successful design practice for German industry coincided to some extent with the broad objectives of the ECA. Still engaged with the implementation of the Marshall Plan in Germany, the ECA

5 B. Wolf, "Design in Daily Life" in *Designed in Germany Since 1949,* Michael Erlhoff, ed. (Munich: Prestel Verlag, 1990), 15.

6 Ibid., 16. For example, the *Deutscher Werkbund* provided special kits of approved items for distribution to children in the school setting. By the close of the 1950s, it was apparent that these educational initiatives had failed.

7 Professor E. Hotz, Ph.D. (Engineering), "First Exhibition of Contemporary Objects from the USA" in *Industrie und Handwerk schaffen neues Hausgerät in USA,* Druckeri Erich Zander, Berlin, n.p.

8 Ibid. Edgar Hotz began working as a civil servant in 1922 and from 1924, after obtaining his Ph.D. in engineering, also lectured at various Technical Institutes (*Technischen Hochshule*) across Germany. From 1946 to 1950, he served as the Assistant Head of the Department of Trade and Commerce, Baden-Würtemberg (Stuttgart). In January 1951, a month prior to the arrival of *Design for Use, USA* in Stuttgart, Hotz was promoted to the position of president of the same organization. In the latter position, Hotz assisted Inge Scholle, Otl Aicher, and others in the establishment of the Ulm School of Design. See R. Spitz, *HFG Ulm: The View Behind the Foreground: The Political History of the Ulm School of Design, 1953–1968* (Stuttgart and London: Edition Axel Menges, 2002), 112, 115.

9 Hotz, Ibid.

worked to promote the benefits of American practices in Europe and to share knowledge about the "key principles of economic efficiency, high wages, and unlimited productivity." [10] Such efforts to familiarize Germany with American-style democracy would be redoubled by the U.S. from 1950 on because of the escalating tensions of the Cold War with the Soviet Union, and because of U.S. concerns about Soviet interest in Germany.[11]

An Invitation for the U.S. to Advance Core Business

Within such a framework, it should come as no surprise that the ECA and the Department of State responded favorably to Stuttgart's formal request for an exhibition. Such an "invitation" signaled Stuttgart's apparent willingness to learn more about American methods of design and manufacture. Here was an opportunity for the ECA and the Department of State to persuade European countries to adopt or adapt American practices by promoting the benefits of the American way of life, and of mass production and consumerism. This was a process designed to change existing relations between the two countries. If handled well, the staging of such an exhibition could promote what official histories of the ECA describe as its desire "to build cohesion amongst countries of the so-called 'Free World,' and to present the U.S. as a worthy partner with whom to cooperate." [12] The participation of MoMA, a world-renowned museum, in the exercise was crucial to doing the job well. With its emphasis on high-end, mass-produced design wares, MoMA's *Design for Use, USA* simultaneously could accommodate Stuttgart's need for an exhibition that presented "successful" models of recent, mass-produced design that were not only cost-effective, but also of high quality. At the same time, such an exhibition had the potential to reinforce the ECA's efforts to provide Europeans with evidence of the gains of unlimited productivity enjoyed by American consumers. In addition, the invitation to the U.S. to display *Design for Use, USA* at the *Landesgewerbesmuseum* at least theoretically would allow the U.S. to proselytize the benefits of the American model within a legitimate and respected cultural institution—in the process minimizing the likelihood that local audiences would dismiss the exhibition as merely American propaganda.

Today, art museums might balk at the negative ramifications of agreeing to contribute to a program so closely associated with generating and disseminating propaganda. However, as a long-term supporter of the U.S. government's efforts to meet its "informational" objectives abroad through the arts, MoMA was more than willing to assist in preparing such a display for Stuttgart.[13] Through its Department of Circulating Exhibitions, MoMA had actively supported various U.S. government agencies during WWII by assembling and circulating exhibitions of painting, architecture, sculpture, film, and photography.[14] To better accommodate the many requests for such shows, MoMA's Department of Circulating Exhibitions

10 R. Pells, *Not Like Us: How Europeans Have Loved, Hated, and Transformed American Culture Since World War II* (New York: Basic Books, 1997), 54–55.

11 C. A. Thomson and W. H. C. Laves, *Cultural Relations and U.S. Foreign Policy* (Bloomington, IN: Indiana University Press, 1963), 78.

12 Thomson and Laves, 81.

13 G. McDonald, "The Launching of American Art in Postwar France: Jean Cassou and the Musée national d'art moderne," *American Art,* Smithsonian Institution, 13:1 (Spring, 1999): 40–61.

14 H. Franc, "The Early Years of the International Program and Council" in *The Museum of Modern Art at Mid-Century: At Home and Abroad, Studies in Modern Art 4* (New York: The Museum of Modern Art, 1995), 113.

underwent an expansion during this period. Pleased with the success of its wartime operations, MoMA remained committed to the view that such international exhibitions could facilitate the attainment of national goals in the changed political and cultural climate of the Cold War. From 1949 on, the museum accelerated its efforts to foster international understanding through cultural exchange.[15]

The "Advance" of Postwar U.S. Design

Given its long history of aiding the U.S. government in realizing its foreign policy objectives, we cannot doubt that MoMA would support Stuttgart's State Department of Trade and Commerce and the ECA in preparing an exhibition of recent quality American domestic design for Stuttgart. By agreeing to select and present this exhibition under its own imprimatur, this prestigious museum effectively cast a veil of art world respectability over an initiative apparently also constructed to cultivate economic and diplomatic ties between the U.S. and Europe. At the same time, MoMA used the West German government's request as an opportunity to persuade Europeans of the unique and valuable contribution now being made by a "select" group of U.S.-based designers and manufacturers. This was a goal the U.S. government endorsed and MoMA, for its part, was well poised to pursue. Through regular exhibitions of local and European design, as well as its international design competitions, MoMA had taken on a leading role in setting the standards of American modern design by the outset of the 1950s. As Terry Smith notes, MoMA, rather than the burgeoning profession of industrial design, "shaped the modern visual culture of the U.S., determining its look and setting its standards." [16]

A crucial part of MoMA's taste-making activities included its annual *Good Design* exhibitions (1950–1955). These exhibitions, also conceived by Edgar Kaufmann, Jr. in association with Chicago's Merchandise Mart, were launched to promote quality design within the U.S.[17] Of course, the concept of good design was not new, having emerged in various forms in Europe, the U.S., and England in the early twentieth century. While each country put its individual spin on the concept, what unified these various manifestations was a singular commitment to the production and championing of "good design," which often translated into the promotion of a spare (modern) design without applied decoration. In keeping with this spirit, Kaufmann, in consultation with panels of experts from the design industry and museum world, chose wares for MoMA's "Good Design" exhibitions on the basis of quality and "eye appeal" from the best designs available on the American market during the previous six months. The resulting exhibitions were marketed to manufacturers, designers, and consumers with the goal of cultivating the appreciation, production, and consumption of "good" design in the U.S.[18]

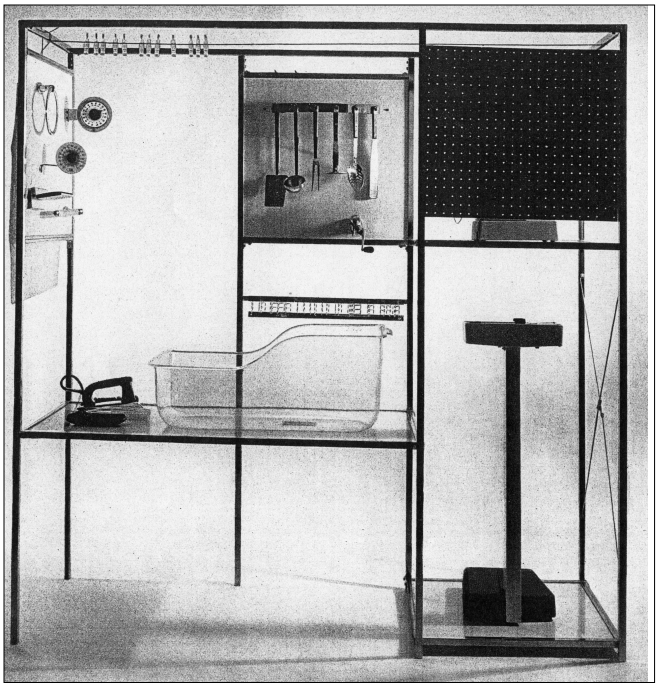
15 M. Wheeler, "René d'Harnoncourt: A Tribute," D'Harnoncourt Papers, Museum of Modern Art Archives, Microfilm roll 2924. See Helen Franc, "The Early Years of the International Program and Council," 111.

16 T. Smith, *Making the Modern: Industry, Art, and Design in America* (Chicago: University of Chicago Press, 1993), 395.

17 Chicago's Merchandise Mart was the largest wholesale marketer in the United States.

18 *Good Design, 1953* exhibition pamphlet, "Merchandise Mart: The Museum of Modern Art," n.p. in M. Staniszewski, *The Power of Display: A History of Exhibition Installations at the Museum of Modern Art* (Cambridge, MA: The MIT Press, 2001), 176. For a brief discussion of Kaufmann's ideas on good design, see "What Is Good Design?" in Edgar Kaufmann, Jr., *What Is Modern Design?* (New York: The Museum of Modern Art, 1950).

Figure 2
Flint Kitchen Tool range (centre back of display unit). Reprinted with the permission of the Württembergisches Landesmuseum Stuttgart.



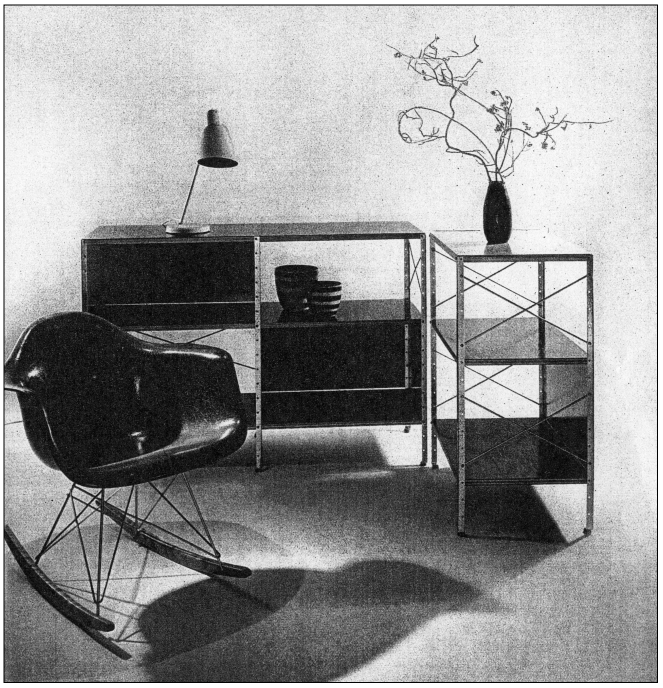
Less than a year after the launch of the "Good Design" series, Kaufmann, at the request of the U.S. government, selected *Design for Use, USA* for its European tour. In the lead-up to the exhibition's departure, a number of articles appeared in newspapers and trade journals across the U.S. announcing MoMA's new international design initiative, and underscoring its importance and timeliness. One such article in the New York–based trade journal *Retailing Daily*, quoted Kaufmann commenting that, in the past, the U.S. tended to look to Europe for:

> ... style leadership. But since the war European magazines have been increasingly active in showing American home furnishings.... [Now] we are beginning to be accepted by Europeans as design originators; they recognize American progressive design in its own right in addition to their interest in the purely commercial side of the United States market.[19]

Having garnered an enthusiastic response from Americans and Europeans to the *Good Design* exhibitions, MoMA, under Kaufmann's direction, had confidently extended the reach of its promotion of American design into the international arena.

19 E. Kaufmann, Jr. quoted in "U.S. Exhibit Abroad to Reflect Scope of Design," *Retailing Daily* (January 8, 1951).

Figure 3
Charles Eames' fibreglass shell armrocker (1950) and wall unit for the Herman Miller Furniture Company. Reprinted with the permission of the Württembergisches Landesmuseum Stuttgart.



The U.S. as Design Originators?

In exploring the actual constitution of *Design for Use, USA,* it now is necessary to assess whether the exhibition supported the claims made by Kaufmann about the originality of American design. On behalf of MoMA, Kaufmann selected more than 500 objects for inclusion in *Design for Use, USA,* featuring wares that were either mass-produced, handmade, or a combination of the two. Many design items were manufactured from relatively new materials such as plastic, laminates and alloys, and innovative combinations of metal and molded plastic materials. The exhibition also included traditional materials such as timber, ceramic, glass, and fiber. Dominating the selection were mass-produced products by reputable large-scale American companies including Libbey Glass, Tupperware, Corning Glass, Revere Copper and Brass, and the Ecko Products Company. Smaller-scale manufacturers such as Heath Ceramics, Menlo Textiles, and Blenko Glass also were represented. For some of these firms, new lines of merchandise had been developed during or after the war partly because of a major rethinking of the place and importance of design within the manufacturing process. For example, the "Flint" kitchen tool range by Ecko Products had been developed in 1946 by staff from management, engineering, and merchandising (Figure 2). Overturning the dominant view that such tools were cheap and of limited durability, the Flint products, with their flexible flat shafts and handles riveted to full-length tangs, were a well-balanced, easy to use set of tool resembling Ecko's fine cutlery products. By the 1950s, Ecko was the leading U.S. manufacturer of kitchen tools and cutlery.[20]

20 D. Wallance, *Shaping America's Products* (New York: Reinhold Publishing Corporation, 1958), 130–131.

Figure 4
Chair by Edward Wormley for Dunbar Furniture Manufacturing Company. Reprinted with the permission of the Württembergisches Landesmuseum Stuttgart.

For the furniture section of the exhibition, considerable emphasis was placed on recent innovations in American design. Here, MoMA showcased the work of the small furniture design firms responsible for manufacturing some of the most inventive U.S. furniture of the postwar period. Included were chairs, divans, couches, light fittings, and tables by Eero Saarinen for Knoll Associates, Inc.; and Charles Eames, Isamu Noguchi, and George Nelson for the Herman Miller Furniture Company. Eames's and Nelson's designs figured prominently thanks to their metal-and-wood chairs and Eames's molded-plywood and molded-plastic chairs (Figure 3). To manufacture these novel chair designs, the Herman Miller Company developed groundbreaking methods of furniture construction, including the use of molds, presses, and production tooling. But not all the furniture was "cutting-edge." The exhibition also profiled popular furniture designed by Edward Wormley for the Dunbar Furniture Manufacturing Company. From the mid-1940s, Wormley's furniture was promoted as a kind of accessible, even conservative, modernism, one that, while working within the idiom of modernist formal vocabulary, emphasized fine workmanship and a respect for tradition (Figure 4).

Design for Use, USA also presented a range of design wares that made exclusive or partial use of hand production methods. For Kaufmann, these design items served as a countermeasure to the dominance of mass-produced wares available on the market:

> Among American hand-crafted objects there is a general tendency to emphasize the object's uniqueness and the living character of the hand-crafted surfaces ... as unique pieces and exceptions in an industrialized environment, this tendency of hand-crafted products seems to be well-considered rather than whimsical, providing an important balancing factor over the entire development of American designs.[21]

Kaufmann's evident commitment to handcrafted design wares not withstanding, such items made up only a small percentage of the overall selections. He did, however, present the work of a number of highly regarded artist-craftspeople, some of whom had made a significant contribution to twentieth-century American design. A case in point was George Nakashima, a Japanese-American architect and noted furniture designer who drew on a disparate range of sources including Shaker furniture, Japanese woodworking, and international style architecture. Nakashima developed a distinctive method of furniture construction, combining hand-production methods and machine tools. By the 1940s and 1950s, he was widely recognized in the U.S. as offering a viable alternative and model to furniture makers working within an industry dominated by mass-produced furniture.

Many of the design wares featured in *Design for Use, USA* already had been shown in *Good Design* exhibitions in the U.S. during the previous year. A comparison of exhibition checklists reveals a similar emphasis on mass-produced over handcrafted design items, and a focus on new materials and technologies. This might suggest that *Design for Use, USA* merely represented a speedy and pragmatic solution for MoMA to fulfill the government's request. However, two significant differences distinguish *Design for Use, USA* from the *Good Design* exhibitions. First, Kaufmann selected only American wares for *Design for Use, USA,* a decision likely motivated by a desire to promote only American design practice within a European context. For the *Good Design* exhibitions, design wares made abroad could be selected if available on the U.S. market. Second, while the *Good Design* exhibitions had served as a platform for promoting only the latest in modern design, *Design for Use, USA* featured "older" modern design wares, such as Eva Zeisel's "Museum" range manufactured in 1943 by Castleton China and the water kettle (1947) by Dr. Peter Schlumbohm for Chemex.

While ineligible for inclusion in the *Good Design* exhibitions, almost all these "older" design wares had received the imprimatur of the Museum, having appeared at MoMA between 1938 and 1947 in the *Useful Objects* exhibitions, the forerunner to the *Good Design* series. Through this judicious mixture of old and new, of the more traditional exhibited alongside the latest innovations in modern U.S.

21 E. Kaufmann, Jr., "Introduction," *Industrie und Handwerk schaffen neues Hausgerät in USA* (Berlin: Druckeri Erich Zander, 1951), n.p.

design, MoMA attempted to construct a case for the emergence of an original American design tradition. Kaufmann as well as William Foster from the ECA addressed this point directly in their respective catalogue essays.

On Par with Europe: The "Advance" of U.S. Design

Bruce Ferguson rightly argues that exhibitions are part of the "cultural industries," Theodor Adorno's term for those entertainment and news industries aiming to show audiences "sets of prescribed values to alter social relations." [22] Exhibitions, Ferguson claims, communicate in various ways to a range of audiences inside and outside the professional art spheres. For him *all* facets of the exhibition—the selection of works, the installation, catalogues, posters, advertising, etc.—actively contribute to the meanings generated. "[These] exhibitionary procedures," he claims "combine as aspects of the exhibition's active recitation. They emphasize, de-emphasize and re-emphasize braided narratives with purposes—fictions of persuasion, docudramas of influence." [23]

This way of thinking about exhibitions provides a potentially useful means of decoding the "braided narratives" embedded within recent exhibitions. The task becomes more complex when dealing with historical exhibitions such as *Design for Use, USA,* which was staged more than fifty years ago. Furthermore, the case is made more interesting because much of the extant documentation on the exhibition was crafted by the exhibition organizers. Such resources shed no light on the exhibition's reception. However, a critical analysis of the exhibition catalogue (read in concert with the exhibition's selection) provides a partial assessment of how the exhibition organizers made use of modernist notions of progress. The task of persuading Europeans of the emergence of a unique contemporary American design within the larger narrative of international modernism required intervention on the part of the U.S. exhibition organizers.

In their respective catalogue essays, both Kaufmann and Foster made a range of claims (aesthetic and otherwise) about current American design practice, and about its strong kinship with, as well as its divergence from, European design practice. Kaufmann believed that all modern design, whether from the U.S., Britain, or Europe, was in need of improvement. As he put the matter, modern design "could be much better if the insights offered by the past were only appreciated and used better." [24] What was required was innovation, not mere imitation. For Kaufmann, there was still much to be learned from the drive to reform brought on by the staging of London's *Great Exhibition* of 1851. This seminal exhibition precipitated the formulation of reforms to improve the quality of mass-produced objects. Reforms of this kind, Kaufmann claimed, should still underpin the objectives of modern design practice.

22 B. Ferguson, "Exhibition Rhetorics: Material Speech and Utter Sense" in *Thinking About Exhibitions,* R. Greenburg, B. W. Ferguson, and S. Nairne, eds. (London: Routledge, 1996), 181.

23 Ibid.

24 E. Kaufmann, Jr., "Introduction," *Industrie und Handwerk schaffen neues Hausgerät in USA.*

While clearly interested in paying his dues to the nineteenth century, British origins of all modern design, Kaufmann gave greater prominence to the *Deutscher Werkbund* and the *Bauhaus.* According to Kaufmann, the conception and development of the burgeoning U.S. design industry coincided with, and was substantially informed by, the radical design ideas espoused by the *Bauhaus* and the *Werkbund* in circulation during the first three decades of the twentieth century. To illustrate the point, Kaufmann identified the high-profile *Werkbund* exhibitions of design circulated in the U.S. in the early twentieth century as having influenced American museums to set high standards for mass-produced design in the U.S. Complimenting such efforts, Kaufmann also noted that the relocation of many former *Bauhaus* teachers and students to the U.S. had exerted a decisive influence on modern American design practice.

As befitting an essay supporting the launch of contemporary American design in Germany, Kaufmann invited visitors to take the opportunity to use *Design for Use, USA* to assess whether the U.S. had expanded on the revolutionary design principles of the *Werkbund* and the *Bauhaus.* While he urged viewers to make up their own minds, Kaufmann confidently claimed that:

> It is, however, a healthy ingenuity which has made American design what it is today. It will always trace its origins to Europe—as the entire American way of life has its origins in Europe—but it has begun to develop its own forms, its own processes, and its own characteristics in the United States. [25]

Such an assertion is significant. Kaufmann in effect had claimed that American designers were now capable of contributing something new to modern design practice. After productively borrowing from key European design precedents, American designers and manufacturers had successfully developed original design solutions in response to the specific conditions of the American environment.

Impact of Local Conditions

At various points in his essay, Kaufmann discussed the ways in which contemporary American design had been informed by the particular, local conditions generated by the "American way of life." American designers, Kaufmann claimed, harbored little desire to produce lasting design, a hallmark of traditional European design practice. Rather, they offered a new model—one of continual development and improvement. This was a model devised to accommodate the lifestyle choices of Americans who were less interested in the "individual product," and more interested in regularly updating to affordably priced, well-designed, mass-produced objects of design utility. Kaufmann agreed that, for the American consumer, the reduction of domestic drudgery was essential. "The American consumer," he wrote:

25 Ibid.

> ... constantly demands new products and ... readily accepts without prejudice any technical invention able to reduce human drudgery. While the democracy of Athens was based on slave labor, the democracy of the 20th century is to be based on robot work as far as Americans are concerned.[26]

While acknowledging that this constant cycle of production and consumerism might perplex some European viewers, Kaufmann worked to naturalize such a practice claiming that "it does seem to be the instinctive process for the design of objects of utility in a country whose origins coincided with the beginning of the Industrial Revolution." [27] In addition, he made plain his confidence that American designers, informed by the American way of life and with access to new materials and technologies, now were making a unique and valuable contribution to design practice, a sentiment he conveyed by way of a metaphor from nature:

> To some extent ... this concentration on further development, this disinterest in the individual final product is similar to Nature itself. Who would be able to tell which leaf of an elm tree was the most beautiful? [28]

William Foster, head of the ECA, agreed with Kaufmann's claim about the uniqueness of U.S. design.[29] However, he took a slightly different tack, arguing that U.S. designers distinguished themselves from European design practice in the way in which they resolved the competing matters of traditional skill and progressive design:

> In the U.S. it seems ... that the respect for traditional design is less deeply rooted .... In our country modern design aims at giving new objects the same fullness, warmth, and perfection of traditional crafts ... in order to create something perfect [rather] than for reasons of tradition.[30]

For Foster, the differences of approach adopted by European and American designers were not at all problematic. Rather, they presented an opportunity for consumers on both sides of the Atlantic to participate in an "international exchange of goods," and to assist with the construction of "our new world" through familiarization of American methods and practices:

> As we believe that this international exchange of goods is an absolute necessity in our new world which we all hope we will be able to construct, it seemed to be a good idea to give Europeans the opportunity to familiarise themselves ... with American public attitudes and the products that Americans are enthusiastic about .... These objects are shown to you as witnesses of a powerful attitude towards current life in our country... it is only through mutual familiarisation with the attitudes of the Other that we can hope to continue our active cooperation.[30]

26 Ibid.

27 Ibid.

28 Ibid.

29 William C. Foster, former president of Pressed and Welded Steel Products Co. (Long Island City, NY) left the private sector in 1946 to serve as Under-Secretary of Commerce to President Truman. Having developed a formidable reputation as an administrator, he was invited to join the ECA in 1948 as Deputy Administrator and, by 1950, had succeeded Paul Hoffman as head of the program.

30 W. C. Forster *[sic]*, "Introduction" in *Industrie und Handwerk schaffen neues Hausgerät in USA* (Berlin: Druckeri Erich Zander), n.p.

In making such claims, the interests of the ECA move to the surface in an overt way. The focus of the discussion shifts from matters of design to the building of trade and political alliances. Foster's was an effort to persuade Europeans of two key points: first, that they share much in common with Americans, including cultural ties, and, second, that the U.S. could offer European consumers something different and new and, in the process, benevolently help to construct one "new world"—made up of the U.S. and like-minded friends.

As befitting the cultural field within which he ostensibly operated, Kaufmann's essay, by contrast, dealt more exclusively with aesthetic matters. Through the exhibition selection and the rhetoric of the catalogue essay, Kaufmann, as MoMA's representative, promoted the view that modern design in the U.S. had cleverly adapted in response to European design precedents and the conditions of the unique, American context. On this basis, it now was making a unique contribution to the history of modern design. In part, his was an effort to construct a legitimate place for American design within design history. However, it is fair to say that through these same means MoMA used the cultural field to subtly advance the U.S. government's foreign policy objectives in a recovering postwar Europe: to present the positive gains of American-style, mass-produced domestic design wares to economically vulnerable and strategically significant European countries, to foster trade links, and to increase international understanding. The U.S. government could not work towards such goals effectively by promoting the general qualities of American culture. It could, however, be done by a highly respected cultural institution such as MoMA lending its reputation to the government, but at the same time exercising its authority by maintaining control over what design objects it would select and promote within the context of seemingly neutral exhibitions of design.

The many decisions and selective processes at work in this or any exhibition's construction are difficult to discern because curatorial and exhibitionary practices typically work to erase the hand of the curator in the exhibition's final presentation. However, these practices, uncovered in this paper through a critical analysis, work to enhance the professional look of the exhibition and, important for this paper, increase the persuasive power of the narratives or stories embedded within it. In this instance, *Design for Use, USA,* with its apparent focus on quality American design, ultimately was deceptive because it depoliticized the economic and political aspirations of the exhibition. In other words, MoMA presented this group of works as a "selection" of the best, but carefully chose these objects and promoted them to tell persuasive stories about the originality of recent American design and indirectly as an endorsement about the quality and character of the American way of life.

Surprise As a Design Strategy

Geke D. S. Ludden, Hendrik N. J. Schifferstein, and Paul Hekkert

Introduction

Imagine yourself in a line waiting for a checkout in a supermarket. Naturally, you picked the wrong line, the one that doesn't seem to be moving. You get tired of waiting. How would you feel if the cashier suddenly started to sing? Many of us would be surprised and, regardless of the cashier's singing abilities, feel amused. This is a good example of how a surprise can transform something very normal and maybe even boring into a pleasant experience. Analogously, a surprise in a product can overcome the habituation effect caused by people encountering many, similar products every day. Colin Martindale describes this effect as "the gradual loss of interest in repeated stimuli." [1]

A surprise reaction to a product can be beneficial to both a designer and a user. The designer benefits from a surprise reaction because it can draw attention to the product, leading to increased product recall and recognition, and increased word-of-mouth.[2] Or, as Jennifer Hudson puts it, the surprise element "elevates a piece beyond the banal." [3] A surprise reaction has its origin in encountering an unexpected event. The product user benefits from the surprise because it makes the product more interesting to interact with. In addition, it requires updating, extending, or revising the knowledge the expectation was based on. This implies that a user can learn something new about a product or some aspect of a product.

Designers already use various strategies to design surprises in their products. Making use of contrast, mixing design styles or functions, using new materials and/or new shapes, and using humor are just a few. The lamp "Porca Miseria!" designed by Ingo Maurer shown in the left part of Figure 1 consists of broken pieces of expensive porcelain tableware, making it a lamp with a unique shape. The idea that another product had to be destroyed to make this lamp may elicit feelings of puzzlement and amusement from someone who sees this lamp. The perfume "Flowerbomb" (right part of Figure 1), designed by fashion designers Victor & Rolf, is another example. The bottle is shaped like a hand grenade, and it holds a sweet-smelling, soft- pink liquid. By combining conflicting elements in a perfume bottle, Victor & Rolf have succeeded in creating a perfume that attracts attention amid the dozens of perfumes that line the walls of perfumeries.

1 Colin Martindale, *The Clockwork Muse: The Predictability of Artistic Change* (New York: BasicBooks, 1990).

2 Christian Derbaix and Joëlle Vanhamme, "Inducing Word-of-Mouth by Eliciting Surprise—A Pilot Investigation," *Journal of Economic Psychology* 24:1 (2003): 99–116; and Adam Lindgreen and Joëlle Vanhamme, "To Surprise or Not Surprise Your Customers: The Use of Surprise As a Marketing Tool," *Journal of Customer Behavior* (2003): 219–242.

3 Tom Dixon and Jennifer Hudson, *The International Design Yearbook 19* (London: Laurence King, 2004).

Figure 1
Lamp "Porca Miseria!" designed by Ingo Maurer. Photo: Tom Vack. Courtesy of designer. Perfume "Flowerbomb" designed by Viktor & Rolf. Photo by Geke Ludden.

Figure 2
Logo of Kia with payoff: "The power to surprise." Courtesy of Kia. Advertisement of Swatch with claim "Always surprising." Courtesy of Swatch.

Surprise also is used in product marketing as a positive quality of products or brands. Kia Motors Corporation, a South Korean car manufacturer, even uses surprise as the brand's major payoff: "Kia, the power to surprise." Furthermore, Swatch, the famous Swiss watch manufacturer, claims that their brand is "always surprising."

This paper will outline the use of surprise in contemporary design. Based on an analysis of a set of surprising products and on discussions with the designers of some of these products, we will give insight into how and why designers create surprising products, and the effects of creating surprises. We noticed that designers often make use of visual-tactual incongruities to create surprising products. For example, an analysis of designs in five issues of *The International Design Yearbooks* (IDY 1999–2003)[4] showed that one to six percent of these designs incorporate some form of visual-tactual incongruity. Therefore, we decided to focus our discussion of surprise in product design on this type of products.

4 Jasper Morrison, Michael Horsham, and Jennifer Hudson, *The International Design Yearbook 14* (London: Laurence King, 1999); Ingo Maurer and Susan Andrew, *The International Design Yearbook 15* (New York: Abbeville, 2000); Michele de Lucchi and Jennifer Hudson, *The International Design Yearbook 16* (New York: Abbeville, 2001); Ross Lovegrove and Jennifer Hudson, *The International Design Yearbook 17* (Amsterdam: BIS, 2002); and Karim Rashid, *The International Design Yearbook 18* (London: Laurence King, 2003).

Visual-Tactual Incongruities and Surprise

Visual-tactual incongruities occur when people perceive incongruent information through vision and touch. Some object properties can be experienced through both vision and touch. People can, for example, both see and feel a texture or a shape. However, the information the two modalities provide is not always the same. Sometimes, you feel something different from what you (thought you) saw. If you feel something unexpected, you will be surprised.

We studied one-hundred-and-one products with visual-tactual incongruities (sixty-three found in the IDYs, and thirty-eight found at design fairs, on the Internet, and in shops), and distinguished two types of surprising products that have different mechanisms underlying the surprise reaction. We defined these two types of surprising products as "Visible Novelty" (VN) and "Hidden Novelty" (HN). The distinction between the two surprise types is based on the initial sensory expectations the potential user forms.

Expectations can be based on different sources of information. Oliver and Winer[5] mention three sources for expectations as conceptualized by Tolman: "memories of actual experiences, perceptions of current stimuli, and inferences drawn from related experiences such as [the] trial of other objects."[6] With respect to expectations about how a product will feel, taste, smell, or sound, this implies that a person's visual impression of a product, his/her previous experiences with that product, or experiences with similar products can be the basis for the expectation.

An expectation involves uncertainty,[7] the degree of which depends on the source of the expectation. When the expectation is based on a memory of an actual experience, the level of uncertainty is likely to be lower than when it is based on inferences drawn from related experiences. In the latter case, the perceiver cannot be sure that the current experience is fully comparable to the related experiences, and thus will be more uncertain about what to expect.

The sources for expectations and their uncertainty differ between the two surprise types. The VN surprise type consists of products that seem unfamiliar to the perceiver. Consequently, the perceiver is not able to form an expectation based on previous experiences with the product. The perceiver forms an expectation about how the product will feel based on resemblances to other products in, for example, shape or material. A high degree of uncertainty will accompany this expectation. A surprise is experienced whenever the uncertain expectation is disconfirmed. A VN product can, for example, be made out of a new material that the perceiver vaguely associates with a material he/she knows. An expectation then could be based on experiences with the known material, but the new material can have very different tactual properties.

The HN surprise type includes products that seem familiar to the perceiver, but have unexpected tactual properties. In this case, the expectation about how the product feels is based on previous

5 Richard L. Oliver and Russell S. Winer, "A Framework for the Formation and Structure of Consumer Expectations—Review and Propositions," *Journal of Economic Psychology* 8:4 (1987): 469–499.

6 Edward C. Tolman, *Purposive Behavior in Animals and Men* (New York: Appleton-Century-Crofts, 1932).

7 Richard L. Oliver and Russell S. Winer, "A Framework for the Formation and Structure of Consumer Expectations—Review and Propositions."

experiences with a similar product. The perceiver is quite certain about his/her expectation. A surprise is elicited, because the apparent familiarity is evidently proven wrong by touching the product, disconfirming the expectation: the visual perception is misleading or the product has hidden characteristics that prohibit the perceiver from forming a correct expectation. An example of a HN product is a plastic bowl that looks like a crystal bowl. Upon seeing this product, the perceiver thinks that the product will be heavy. When the product is touched and lifted, however, the perceiver is surprised about the much lower weight of the bowl.

Design Strategies

Designers seem to create products in the HN and VN types by making use of several different design strategies. We identified six different design strategies (DS): "new material with unknown characteristics"; "new material that looks like familiar material"; "new appearance for known product or material"; "combination with transparent material"; "hidden material characteristics"; and "visual illusion."

In all six strategies, a combination of two opposites is used: something new is used ("newness"), and a reference to something familiar is made ("familiarity"). The combination of new and familiar elements is likely to result in surprise. The familiar element of the product forms the basis for an expectation about its other elements. Subsequently, the new element will disconfirm this expectation. New and/or familiar elements can be used in the visual domain in the appearance of the product (e.g., in shape, material, or type of product), and/or in the tactual domain in the material properties of the product (e.g., in weight, flexibility, or balance).

The newness of a product is likely to be relative. According to Daniel Berlyne, it is highly unlikely that an adult encounters an absolutely novel stimulus, a stimulus unlike anything that individual has experienced before.[8] Probably, what someone perceives as new will consist of previously experienced elements in a different combination, or will resemble familiar stimuli. This is what Berlyne describes as "relative novelty." Paul Hekkert et al. found that people prefer products with an optimal combination of typicality and novelty.[9] Their findings are consistent with the design principle called "MAYA" (Most Advanced, Yet Acceptable) by designer Raymond Loewy.[10] Analogously, people will prefer products that have a combination of both familiar (i.e., typical) and new (i.e., novel) elements.

The next sections discuss how these two elements are present in each design strategy. In addition, we will present examples of products that could have been designed by following that strategy. The design strategies can result in the two different types of surprising products discussed. Four strategies can lead to a product in the VN type. One of these strategies also can lead to a product in the HN type, and the two other strategies can only lead to a product in the

8 Daniel E. Berlyne, *Aesthetics and Psychobiology* (New York: Appleton-Century-Crofts, 1971).

9 Paul Hekkert, Dirk Snelders, and Piet C. W. van Wieringen, "'Most Advanced, Yet Acceptable': Typicality and Novelty as Joint Predictors of Aesthetics Preference in Industrial Design," *British Journal of Psychology* 94 (2003): 111–124.

10 Raymond Loewy, *Never Leave Well Enough Alone* (New York: Simon and Schuster, 1951).

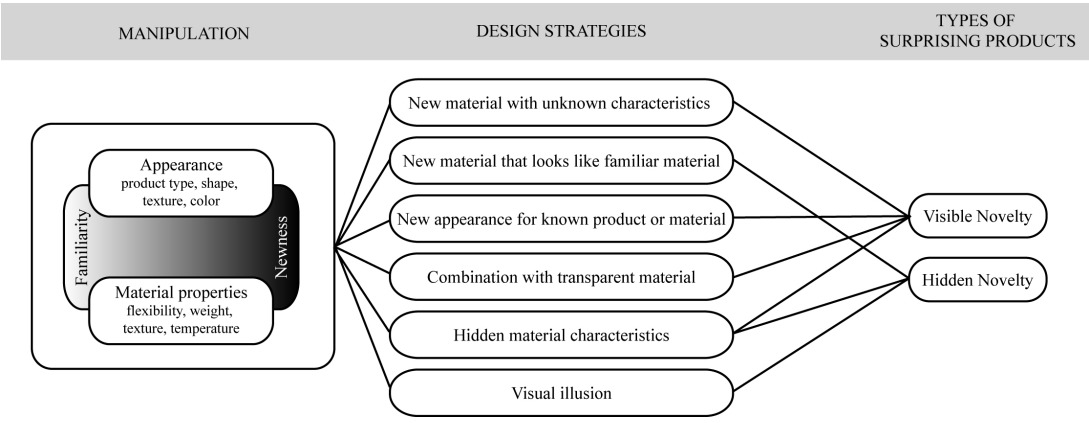


Figure 3
Relationships between design strategies, their underlying dimensions, and resulting types of surprising products.

HN type. Figure 3 illustrates the relationship between the six design strategies, newness and familiarity, and the two types of surprising products.

Design Strategies 1 and 2: New Materials

New materials are likely to have new and unknown characteristics that can lead to new visual and/or tactual experiences. According to Ezio Manzini, more and more surprising products have appeared on the market due to a "loss of recognition" since the introduction of plastics.[11] Many new plastic materials possess unknown material characteristics. Upon seeing these materials, people experience uncertainty about their feel characteristics because they do not know them. Upon touching the materials, they might be surprised by their feel. For example, the much lighter weight of many plastics, combined with their strength relative to previously known materials such as steel and wood, surprised many people when plastics were first introduced.

The development of smart(er) materials also offer wide opportunities for designers to explore new sensory experiences.[12] An example of the use of a smart material is a water kettle made out of a thermochromic material that changes color when its temperature rises. Thus the kettle visually "warns" the user when it is hot. Several companies and institutes; such as Material Connexxion, Materia, and Innovathèque; assist designers in their search for new and innovative materials.

When observing a new material, a perceiver will form a feel expectation based on its resemblance to familiar materials. If the new material looks exactly like a known material, these expectations can be certain. If not, they will be uncertain. These two cases yield very different design approaches and therefore are discussed as two separate design strategies.

11 Ezio Manzini, *The Material of Invention* (London: Design Council, 1989).

12 Marion Verbücken, "Towards a New Sensoriality" in *The New Everyday: Views on Ambient Intelligence,* Emiel Aarts and Stefano Marzano, eds. (Rotterdam: 010 Publishers, 2003).

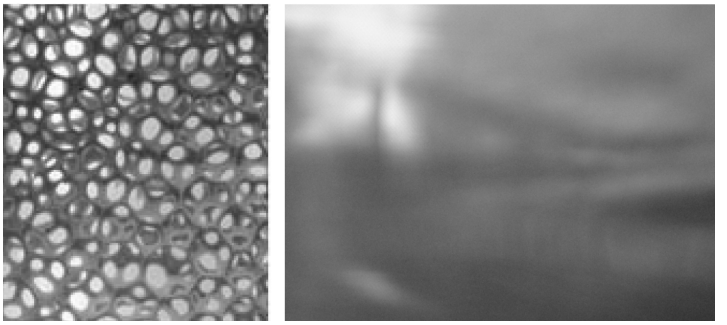


Figure 4
Examples of products corresponding to DS1, new material with unknown characteristics. Foam for Prada, designed by OMA. Polyamide/viscose cloth, designer unknown. Photo by Geke Ludden.

Design Strategy 1: New Material with Unknown Characteristics
The foam developed for Prada depicted on the left in Figure 4 is a structure with large holes, which make it look like it is flexible. However, when seen in a large construction, it also resembles hard plastic because it seems to hold a certain weight. Someone who sees this foam may not be certain about how it feels. The same holds for the cloth depicted on the right in Figure 4: it looks like flexible plastic, but it reflects light slightly differently, leading to an uncertain expectation. In reality, the cloth has feel characteristics different from plastic: it feels soft, very similar to silk. A new material with unknown characteristics will lead to a product in the VN type, because someone who sees the material is uncertain about how it will feel.

Design Strategy 2: New Material That Looks Like Familiar Material
If someone sees a new material and nevertheless is certain about how it will feel, he or she can be surprised upon touching the product. Apparently, he or she had incorrectly identified the new material as a familiar material, and is surprised that this material feels different. Designers often deliberately use this effect when they create a generally well-known product out of another material. This design strategy always leads to products in the HN type. After all, for a

Figure 5
Examples of products corresponding to DS2, a new material that looks like a familiar material. Polycarbonate vase, designer unknown. Photo by Geke Ludden. Lamp "Flexlamp," designed by Sam Hecht. Courtesy of designer.

surprise to occur, the product must look exactly like a familiar product. Examples of products that employ this strategy can be found in Figure 5.

The vase on the left looks like a crystal vase. Its shape and the decorations on the surface are very similar to those used for traditional crystal vases. However, this vase is made out of plastic, which results in entirely different feel characteristics: this vase is much lighter than the crystal vase it resembles. The lamp on the right looks like it is made out of matt glass. Again, it resembles typical glass lamps in shape and surface texture. This lamp is actually made out of flexible polyurethane rubber, and it feels much more flexible than a lamp made out of glass.

Design Strategy 3: New Appearance for Known Product or Material

Using a new appearance for a familiar product or material can lead to an uncertain, incorrect feel expectation. If the new appearance resembles another well-known product or material, a designer creates a deliberate reference to a familiar thing. Since the new appearance is immediately visible, this leads to an uncertain feel expectation, and thus to a VN-type product.

The tiles on the left in Figure 6 are made out of ceramics like most tiles. However, using a new shape (resembling the shape of a softer material) for this product results in the uncertain expectation that these tiles may feel soft. The tiles actually feel hard, like other ceramic tiles.

Alternative or new production techniques also can be used to create new shapes for known materials. The lamp on the right in Figure 6 is made using a 3D printing technique, creating a new shape for a lamp and for the material, a polyamide. The lamp looks like it is made out of cloth or paper, and may be expected to feel light and flexible. However, it feels solid, heavy, and unflexible.

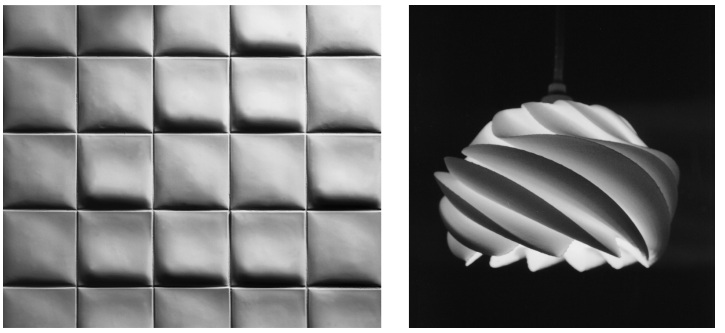


Figure 6
Examples of products corresponding to DS3, new shape or product for known material. Tiles "Tactiles," designed by Baukje Trenning. Courtesy of Koninklijke Tichelaar Makkum. Lamp "Konko," designed by Willeke Evenhuis and Alex Gabriel. Courtesy of designers.

Figure 7
Examples of products corresponding to DS4, new combination of materials. Tables "Apple," designed by Ilaria Marelli. Courtesy of designer. Natural Acrylic, designed by Pyrasied Xtreme Acrylic. Courtesy of designer.

Design Strategy 4: Combination with Transparent Material

A new combination of a familiar material with a transparent (also familiar) material can produce conflicting information about feel characteristics, leading to an uncertain feel expectation. A combination with a transparent material therefore can lead to a product in the VN type.

The benches on the left in Figure 7 are made of a combination of soft foamy cushions and a hard plastic cover. The cushions are associated with softness, leading to the expectation that the cover is soft, too, and that the cushions will be felt when sitting down. However, the hard cover makes the bank feel completely rigid.

The natural acrylics range of Pyrasied Xtreme Acrylic[13] is another example of a new combination of materials. In this range of acrylics, natural materials are combined with transparent plastic (see picture on the right in Figure 7). Someone seeing this material may not be sure whether or not the natural material, in this case bamboo, can be felt. In reality, only a smooth plastic surface is felt.

Design Strategy 5: Hidden Material Characteristics

Some of the materials used in a product may be hidden. By hiding these materials, relevant feel characteristics cannot be observed. The feel expectation is based only on the visible materials, thus leading to an incorrect feel expectation. This expectation can be either uncertain or certain, depending on how familiar the product looks. Consequently, this strategy can lead to either a product in the VN type (see first example) or in the HN type (see second example).

The chair on the left in Figure 8 looks like it is made out of paper, which is uncommon for a chair. This appearance may lead to the uncertain expectation that this chair is very light. However, beneath the paper there is wood, a much heavier and more rigid material.

13 Els Zijlstra, *Material Skills, Evolution of Materials* (Rotterdam: Materia, 2005).

Figure 8
Examples of products corresponding to DS5, hidden material characteristics. Chair "Bastian," designed by Robert Wettstein. Courtesy of designer. Bench from Bisazza's "Soft Mosaic Collection," designed by Jürgen Mayer. Courtesy of Bisazza.

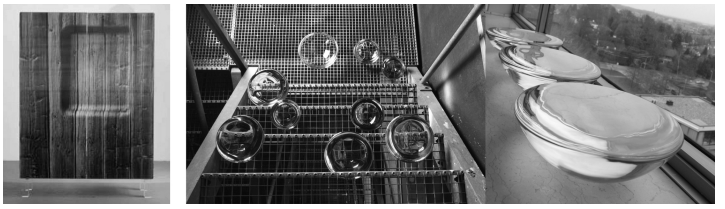


Figure 9
Examples of products corresponding to DS6, visual illusion. Cupboard "Yourside," designed by Markus Benesch (Money for Milan). Courtesy of designer. Bowls "Solid, solid+liquid and liquid," designed by Monique Borsboom. Courtesy of designer.

The bench on the right in Figure 8 is from Bisazza's "Soft Mosaic Collection." The bench looks like it is made out of glass tiles. Someone who sees this bench probably will be certain that it feels hard and rigid. However, beneath the small tiles is a soft foam-type underlay. The bench, therefore, yields when sat upon.

Design Strategy 6: Visual Illusion

Visual illusions can be used to form a misleading appearance. Artists have used visual illusions such as *trompe l'oeils* for a long time. Applied in product design, similar techniques can lead to certain, but false feel expectations.

The cupboard on the left in Figure 9 has a printed laminate that makes it look like there is a cove in the cupboard, which actually doesn't exist. The glass bowls on the right in Figure 9; called "Solid, solid+liquid and liquid"; look like they all are hollow shapes when viewed from above. However, some of the bowls actually have an almost flat upper surface.

It must be noted that a visual illusion often is solvable by using vision only, usually by changing viewing position. However, when a visual illusion is solved by touching the product, a visual-tactual incongruity is perceived.

Surprise as a Design Strategy?

Considering the frequent use of visual-tactual incongruities in product design and the variety of strategies that designers use to create them, one might conclude that designers think of creating surprises as an effective strategy to create interesting and original products. However, from discussions with designers, some of whom designed products we used to illustrate the design strategies, we learned that this not always was the case. The surprises they had created sometimes were only the by-product of other aims, such as searching for new experience, using new materials or techniques, or creating conflict within a product. This illustrates that designers not always were aware that they were creating surprises.

We would like to stress how important understanding the mechanism of surprise and being aware of the impact of a surprising product is to designers. After all, if designers understand how a surprise is created, they will be able both to avoid surprise when they do not want it, and to effectively use surprises in other situations. This is significant because using surprise as a strategy to create interesting and original products may not always produce the

Figure 10
Bench "Shrunken Furniture," designed by Bertjan Pot. Photo by Geke Ludden.

desired effect. Although most designers who use surprise think that people appreciate the surprises their products evoke, by its nature, using surprise can be dangerous, too. Besides evoking pleasant and/or new experiences, unexpected events also can lead to disappointment, and users may even feel misled or fooled upon experiencing a surprise. In addition, some designers remarked that they were disappointed because the surprise seemed to distract potential users from another message they wanted the product to communicate. Furthermore, although discovering a surprise in a product initially may be a pleasant experience, the effect of this surprise may be negligible or even unpleasant in the long term.

So far, our knowledge about people's reactions (both on the short and the long term) to surprising products is limited. In general, in market research studies, surprise was found to be positively related to satisfaction with the product.[14] More specifically, our research on surprising products suggests differences in people's reactions to VN and HN products.[15] People tended to exhibit more exploratory behaviours when interacting with VN products; possibly because they enjoyed exploring these products, or because they wanted to discover the exact material properties of these products. It is possible that they needed more time in order to understand the origins of their surprise reaction. On the other hand, for HN products, it seems that the experienced surprise upon touching the product is immediately understood, and further exploration or cognitive effort is unnecessary. This may partly explain why people often viewed VN products as more interesting than HN products.

Apparently, using different design strategies can lead to surprises that are appreciated differently. It should be noted that it also is possible to use a combination of design strategies in one product. For example, the bench in Figure 10 seems to comprise elements from DS 5 hidden-material characteristics and DS 3, new material that looks like familiar material. The bench is made out of polystyrene, which is covered in knitted cloth, and then vacuumed and hardened with wax. As a result, the polystyrene is completely hidden. The combination of materials with the new shape makes the bench look like it is made out of a familiar soft material, such as foam rubber. In reality, the bench feels hard.

The type of product in which a surprise is created also seems to influence people's appreciation of the surprise.[16] In products with a complicated functionality that requires full attention from the user, a surprise probably will not be appreciated. However, in products that people can use without any cognitive effort—for example a vase—a surprise may be welcomed by the user.

Further research into people's appreciation of surprises in products will provide more definitive conclusions on how and when surprise can effectively be used as a design strategy. This research has to be aimed at providing detailed knowledge into what causes a positive or negative surprise. For example, the relative pleasant-

14 Joëlle Vanhamme and Dirk Snelders, "The Role of Surprise in Satisfaction Judgments," *Journal of Consumer Satisfaction, Dissatisfaction, and Complaining Behavior* 14 (2001): 27–44.

15 Geke D. S. Ludden, Hendrik N. J. Schifferstein, and Paul Hekkert, "Visual-Tactual Incongruities in Products as Sources of Surprise," forthcoming, *Emperical Studies of the Arts* 27:1 (2009).

16 Geke D. S. Ludden, Hendrik N. J. Schifferstein, and Paul Hekkert, "Sensory Incongruity, Comparing Vision to Touch, Audition, and Olfaction" (Paper presented at the 5th Conference on Design & Emotion, Göteborg, Sweden, Sept. 27–29, 2006).

ness of the expected and the actual feel characteristics, as well as the product attribute the surprise is experienced in (e.g., weight and flexibility) may both affect the evaluation of the surprise. Future research in these directions can help in understanding how to use surprise in product design more effectively.

Acknowledgments
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"Arabizi": A Contemporary Style of Arabic Slang

Mohammad Ali Yaghan

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I would like to thank architect Rejan Ashour (Arabizi: Rijan 3ashur), who helped me teach the course and supervise the students with much diligence and enthusiasm. I also would like to thank the wonderful group of students I worked with during the fall of 2006 (written in Arabizi, and ordered alphabetically): 3abdalla 5ashman, Bandar al-3arishi, Fara7 6as, Firas Dodin, 3'ada al-3ashuri, Hala Barjakli, I7san 2bu-Hahi, Kamal al-Sa77ar, Mai Jarrar, Minas al-Dreni, Mohammad al-Ruqban, Mohammad Shaltaf, Muta9ir 3abbasi, Mu3taz al-6'ahir, Remi 5ayya6, and Yousef Nabil.

Introduction

"Arabizi" is a slang term (slang: vernacular, popular informal speech) describing a system of writing Arabic using English characters. This term comes from two words "arabi" (Arabic) and "engliszi" (English). The actual word would be "3rabizi" if represented in its own system, but due to the possible unfamiliarity of the reader with the system, it would be hard to pronounce the word. Thus "Arabizi" and not "3rabizi" will be used throughout this paper. Arabizi is a text messaging system used over the Net and cellular phones.

The Arabic Script

The basic characteristics of Arabic script pose the typographical problem of "a huge character set," which led to the call to adopt Latin instead of Arabic characters.[1] There are twenty-eight letters in Arabic (Table 1). The combination of "Lam ل" and "Alif ا" usually is thought of as a distinct letter "لا" making the total number twenty-nine. The "hamza" is a mark added to other letters, and considered as a variation of the "alif ا" but could be considered, practically, a separate letter as well. These letters include the consonants and the long vowels. Short vowels are represented as vocalization marks placed on top or bellow a character. Figure 1 shows samples of these marks and their English readings. The vocalization marks are, however, used only in certain texts (such as in educational texts) or whenever needed to prevent confusion. The writing system is cursive, and thus the shapes of the letters vary contextually according to their location in the word, and to the letters before and after them. Some letters would have more than eight glyphs in some writing styles (creating a huge number of ligatures). The total number

1 For a thorough discussion on Arabic script and type in general, see: S. Huda, *AbiFarès, Arabic Typography* (London: Saqi Books, London 2001), 85–16.

Figure 1
Short vowels in Arabic as vocalization marks.

Table 1
Basic Arabic Letters and their shapes according to their position in the word.
(This is the very basic level for simplest typefaces; many would have more shapes according to the letter before and after which are added as ligatures.)

Single	Initial	Medial	Final
ا	ا		ا
ب	بـ	ـبـ	ـب
ت	تـ	ـتـ	ـت
ث	ثـ	ـثـ	ـث
ج	جـ	ـجـ	ـج
ح	حـ	ـحـ	ـح
خ	خـ	ـخـ	ـخ
د	د		ـد
ذ	ذ		ـذ
ر	ر		ـر
ز	ز		ـز
س	سـ	ـسـ	ـس
ش	شـ	ـشـ	ـش
ص	صـ	ـصـ	ـص
ض	ضـ	ـضـ	ـض
ط	طـ	ـطـ	ـط
ظ	ظـ	ـظـ	ـظ
ع	عـ	ـعـ	ـع
غ	غـ	ـغـ	ـغ
ف	فـ	ـفـ	ـف
ق	قـ	ـقـ	ـق

Single	Initial	Medial	Final
ك	كـ	ـكـ	ـك
ل	لـ	ـلـ	ـل
م	مـ	ـمـ	ـم
ن	نـ	ـنـ	ـن
ه	هـ	ـهـ	ـه
و	و		ـو
ي	يـ	ـيـ	ـي
Lam-Alif			
ال	لا		ـلا
The hamza			
ء	أ		ـأ
	إ		ـإ
	ؤ		ـؤ
	ئـ	ـئـ	ـئ
Spcial type of Alif			
ا			ـى
Vocalization marks			
Short vowels			
ـَ	a	ـّ	Stress
ـِ	i	ـْ	Silent
ـُ	u		

of glyphs in traditional printing exceeds four hundred in many typefaces. If other languages such as Farsi and Urdu that use Arabic letters are to be accounted for, then the total number of glyphs at the most basic level (i.e., without ligatures) would exceed three hundred. This constituted a typographical problem, with regard to typesetting and font diversity, that was a common characteristic of traditional Arabic pre-computer type. Accordingly, there were many calls to divert to the Latin characters.

Writing Arabic Using Latin Characters

Over the last two centuries, there have been many proposals to replace the Arabic letters with Latin ones. The first recorded one was by Wilhelm Spitta in 1880 in his book *Vulgardialectes von Agypten Grammatik des Arabischen* [The Rules of Slang Arabic in Egypt] in which he suggested using Latin characters to write the Egyptian Arabic slang, with the overall aim to adopt the slang language instead of classical Arabic.[2] Spitta was followed by K. Vollers in 1890 and Seldon Willmore in 1901, both of whom strongly supported his proposal.

There were many other supporters for this proposal during the following forty years. Among them was Abdul Aziz Fahmi (Arabizi: 3abd 2l3aziz Fahmi), who proposed a full practical scheme in response to a competition organized by the Academy of the Arabic Language in Cairo in 1943. The competition's aim was "easing Arabic writing and grammar." His proposal was presented in Arabic (while the earlier suggestions were in other languages), and was intended for both slang and classical Arabic. Thus it generated much discussion and, as a result, the proposal for using English characters for Arabic was associated with him. He proposed a combination of Arabic and English characters, and included short vowels within (usually short vowels are added as diacritic marks to the Arabic glyphs). Other supporters of Fahmi's proposal, including Sa'id 'Aqil (Arabizi: Sa3id 3aqil) and Anis Freha (Arabizi: 2nis Fre7a), developed their own proposals.[3] They found additional support in Turkey, where Kamal Ataturk ordered the adoption of English characters to write Turkish instead of the Arabic characters in 1928.[4]

At the time, the proposal to write Arabic with Latin letters was fought and severely criticized by Arab nationalists and Muslim enthusiasts, who considered it as a direct attack on the Arabic identity. They also saw it as a threat to the Holy Quran, which is written in classical Arabic using a writing system that has lasted for more than fourteen centuries.

Currently, however, due to the advancement of the Internet and the global use of the English language (and without any imperialistic implications) the use of Latin letters to write Arabic over the Internet and on text-messaging cellular phones is becoming increasingly common and natural.

2 Emil Ya3qub, *Al-5a6 al-3arabi* (*Arabic Calligraphy* [in Arabic]) (Lebanon: Gross Press, 1986), 81; and *Ta3rib al-3ulum al-6ibbiya* (*The Arabization of the Medical Sciences* [in Arabic]), published by the Arabization of Health Sciences Network "AHSN": www.emro.who.int/ahsn/arabicpublications-DrKhayat-97-Section1-1.htm (accessed January 31, 2007).

3 Emil Ya3qub, 86–9.

4 For details on the reforms regarding the Turkish writing system, as well as the vocabulary of the language see: Burak Sensal, "Ataturk's Reforms": www.allaboutturkey.com/reform.htm (accessed January 31, 2007).

In the following sections, I will present this phenomenon, as well as its rules and current state in society (rising from complete refusal to a silent acceptance during the past one-hundred years). Finally, I will present some typefaces designed for Arabizi.

The Arabizi Phenomenon

The Arabizi Rules

The following rules were developed and modified in discussions with second-year graphic design students in the College of Art and Architecture at the University of Petra.

1 In general, the Arabizi system is contextual.
2 The traditional Arabic vocalization marks are substituted by vowels. The "fatha" by a; the "kasra" by i or e; and the "damma" by u, ou, or o.
3 The use of the vowels is optional in Arabizi, and they could be omitted. Three factors determine this omission: the reader's background; the contextual clarity of the word; and the allowable number of characters per message.
4 As with slang Arabic, which borrows English words and phrases (for example "please," "OK," "nice meeting you," "thanks," etc.), Arabizi uses English within the text. Common World Wide Web and cellular phone message abbreviations are used ("plz" for "please," "thnx" for "thanks," etc.).
5 The use of capital letters indicates yelling, excitement, emotions, or calls for special attention (as with most messaging systems).
6 There are many ways of representing the same situation and conveying the same meaning.
7 Besides the English abbreviations, there are many abbreviations regarding some word endings in Arabic. For example @ is used for the affix added for certain types of plurality in Arabic (…aat طت); and 8 as an affix to indicate the first-person past tense of certain verbs in slang Arabic (…eet يت).
8 The Arabizi system differs for every Arabic country, depending on the local dialect.
9 The Arabic language uses a special mark when stressing a consonant instead of doubling it (Figure 1). In Arabizi, it is written twice unless it was a compound letter. Then it is left to the context to be understood.
10 Some combinations of English letters are used to draw the actual shape of an Arabic word. For example, the combination oLI I for the Arabic هلال.

Table 2
The Arabic characters and their Arabizi counterparts.

	Arabizi possibilities			
	numerals		**letters**	
ء	2			
أ	2		a	
إ	2e		e	i
ؤ	2		o	
ا			a	
آ	2a		aa	
ب			b	
ت			t	
ث			th	s
ج			j	g
ح	7		h	
خ	7′	5		
د			d	
ذ			th	z
ر			r	
ز			z	
س			s	c

Arabic	Arabizi possibilities				
	numerals		**letters**		
ش			sh	ch	
ص	9				
ض	9′		d		
ط	6		t		
ظ	6′		th		
ع	3				
غ	3′				
ف			f		
ق	8	2	k	q	
ك			k		
ل			l		
م			m		
ن			n		
ه			h		
و			w	o	ou
ي			y	i	e

The Letter Set

The Arabizi character set is the same character set for any English typeface. What is meant by the "letter set" is: the English counterparts of the Arabic letters in the Arabizi system. These are tabulated in Table 2. The rest of the marks in the usual character set are used in the same way as in English.

Studying the table one can deduce the following:

1 The Arabic consonants that have their counterparts in English are given their counterpart shapes.
2 Some consonants need compound letters.
3 The consonants that do not have an English counterpart are represented by numerals. This representation is based mostly on the similarity of the shape of the Arabic original consonant to the numeral. In this context, an apostrophe is added to the numeral simulating the dot added to some Arabic letters in order to differentiate them from those that share that same body. For example, the letters ح and ج are represented by 7 and 7′. The only exception to the similarity of the shape is the letter خ when 5 is used to represent it. The first letter of the pronunciation of 5 in Arabic is the letter خ, thus it was chosen.
4 There still is some ambiguity regarding ذ ث (and ظ if it is written in letters), where all share the "th" compound letter; and د ض where they both share "d" (if ض was written in letters). In slang Arabic, these letters quite often share the same sound.
5 There is more than one alternative for most of the letters. The use of these alternatives is contextual in many cases, but is a matter of choice in many others.
6 The Arabizi system does not need any special characters compared to other systems of translating Arabic into English, such as that of the *Encyclopedia of Islam,* which needs dots below many letters.[5]

Arabizi's Current Role in Society

Arabizi is used by most Arabic-speaking people, and its acceptance is growing, but there still are many adversaries who totally refute the concept. First, I will explore the reasons why young people use Arabizi and the growing domains of its use. I also will present the view against it.

Reasons Why Young People Use Arabizi

During intensive group interviews with students, one of the major questions was "Why do you use Arabizi?" There were many answers; all confirmed the widespread use of Arabizi. For some, it was the historical precedence of English over Arabic in Internet and cellular phones. At times, the Arabic language was not supported by the widespread technology, thus Arabizi was the only possible way

5 *The Encyclopedia of Islam, New Edition,* Vol. 1, H.A.R. Gibb, et al., eds. (Leiden: E.J. Brill, 1960, reprint 1967), XIII.

to chat over the Net or to send messages over cellular phones, and thus it was adopted. This is still valid, because some cellular phones have no Arabic language capabilities.

Some students felt that classical Arabic letters (glyphs) should be used for classical Arabic and not for slang. They felt more relaxed using the Arabizi system for day-to-day topics and songs in slang Arabic. Others emphasized that they felt that Arabizi can express things that cannot be expressed otherwise. Slang Arabic letters are pronounced differently, depending on the social status of the speaker and on the group, sex, and origin. (For example, the letter "Qaf" ق is pronounced "Ga," "Qa," "Ka," and "A," depending on the person.) These sounds could be expressed in Arabizi, but not in classical Arabic. In addition, Arabizi supports uppercase and lowercase letters. Thus, shouting, calmness, and some other emotions can be expressed using this system, but not in classical Arabic. Jokes, however, cannot be expressed in this system, because they lose their "spirit," as many of the students stated.

Another major reason for using Arabizi is economics. The number of characters allowed in a written English message is much greater than that in an Arabic one (for example, on my own phone, the maximum allowed numbers are seven hundred and sixty characters for a message in English, and three hundred and thirty characters for one in Arabic). Moreover, many English words and phrases are used within Arabic slang. So in writing messages, one would have to switch between the two languages in the same message. Thus, learning and using one set of "English" keys that can be applied to the two languages is more convenient, and less confusing.

In addition to all of the above reasons, using the Arabizi system is considered to be "cool" and free of errors. It is not taught at any level, and is acquired by practice. Because of the flexibility of its rules, it supports a person's intuition, and there are no typos in this sense.

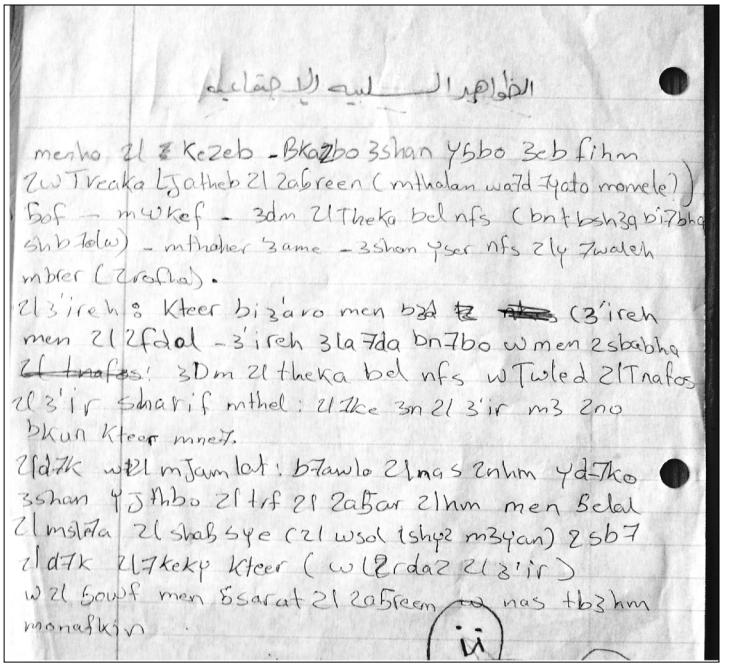
Why Writing Arabic with English Is More Acceptable Now[6]

In middle of the last century, Arabic nationalism was widespread throughout the Arab world, together with the declaration of independence from the European colonizing powers—mainly France and England. The Latin alphabet represented the colonial powers which were resisted by the younger generation. Currently, nationalism is resurgent and is supported by many governments. The Internet and the concept of "a small knowledge village," with English as its principal tool; along with the domination of "Western culture"; makes the younger generation less hostile to Latin characters.

Other hostile reactions were triggered because the earlier suggestion to use Latin characters aimed at totally altering the Arabic writing system, which represented a departure from all historical and cultural ties to the past. In many cases, this was looked upon as

6 For a historical discussion of the call for adopting Latin letters for writing Arabic and the reactions it provoked, and still is provoking in many, refer to: Emil Ya3qub, "Ta3rib al-3ulum al-6ibbiya"; and Mohammad al-9awi, "Fi Kitabat al-3arabiyya Bil7arf allatini" ("On Writing Arabic in Latin Letters" [in Arabic]): www.almarefah.com/print.php?id-611 (accessed January 31, 2007).

Figure 2
Handwritten Arabizi in place of the Arabic writing system, is it a future evolution?



cultural treason, and an alliance with the enemy. The Arabizi system, however, does not suggest that. It is an alternative that is mainly used for slang, rather than classical Arabic.

At the personal level, using Latin characters did not bring any direct benefit (economic, for example), and it wasn't a necessity at any technical level. On the other hand, sending a message in Arabizi is less costly than in Arabic, and, in some cases, it is necessary due to the unavailability of Arabic language support in the technology. A final point to note here is that Arabizi spread without a formal proposal, in a silent way, as a must-use practicality. Even those who refute the use of Latin characters in Arabic had to use Arabizi in the Internet addresses where they published their articles.[7]

Arabizi in Other Fields

The use of Arabizi is growing to cover more fields than those related to cellular phones and the Internet. It is used by young people to express themselves through writing on the walls, illegally in most cases, in the current graffiti art (if these writings could be categorized as such). Sometimes Arabizi also is incorporated in movie posters and music CD covers, mostly in the titles.

One interesting development in its growth is that it is being used in handwriting. I was really astonished to see that two of my first-year design students submitted a draft-story of a pop-up book design project handwritten using Arabizi (Figure 2). They "like writing this way," and they scattered phrases and paragraphs all over their university notebooks written in this manner. Moreover,

7 "Ta3rib al-3ulum al-6ibbiya" and Mohammad al-9awi.

an Arabizi typeface design project for second-year students also was received with much enthusiasm. All this indicates a direction that might continue to evolve.

Arguments against Arabizi

Not everyone likes the use of English in writing Arabic. The reasons for refuting the use of Latin characters in Arabic over the last century mentioned earlier are still applicable for many.[8] Romanticizing about the visual beauty of Arabic calligraphy creates another barrier, so I want to suggest the possibility that Arabizi could have an Arabic look.

Arabizi Typefaces

As stated earlier, "Arabizi" is a slang term that describes a system of writing Arabic with English characters. Sometimes, it is even extended to include using the English verbs and conjugating them according to the Arabic grammatical rules.

Nevertheless, there are no studies of this phenomenon and, as a result, its visual part—the typeface—has never been highlighted. Because the Arabizi writing system is used by people without the constraints of clear systematic rules, users adopt any available typeface. Neither the typeface nor the shapes of the characters are thought of as factors in this system. My intent in this paper, in addition to properly characterizing the Arabizi system, is to make typeface design an integral part of the Arabizi system.

Accordingly, a pilot project was conducted in two stages. The first was to define the Arabizi system in general. The second was to design a typeface (English letters) that best conveys the Arabic characteristics of the Arabizi system, and to make the type design an issue within the system. The project was assigned to second-year graphic design students at the University of Petra in Jordan. The explorations done by the students focused on how an English letter could have an Arabic look; how an Arabic identity could be implemented to create a new English language typeface; and what makes something "Arabic" in the first place.

Designs that addressed these questions used four approaches. The first was to take an existing, traditional Arabic calligraphic style and imitate its design in a new Arabizi typeface. The second was to adopt the free-style strokes of the reed pen (the traditional tool for Arabic calligraphy). The third was to design the type around an Islamic architectural form (muqarnas). The fourth approach was completely different. It tried to represent the current "Arabic" attitude in Arabizi, rather than a traditional, historical typeface. The following sections include sample designs for each of these categories. All of the designs are still at the concept level, and none have been turned into actual fonts. They are presented here to illustrate how Arabizi can have its own, visual appearance in the minds of its users.

8 Ibid.

Figure 3
Sample of an Arabic "Kufi" writing style
(by the author).

Figure 4
Typeface with a "Kufi" spirit.

Figure 5
The grid-writings repeated around the drum of the dome over the mausoleum of Gur-i Amir, Samarqand (by the author).

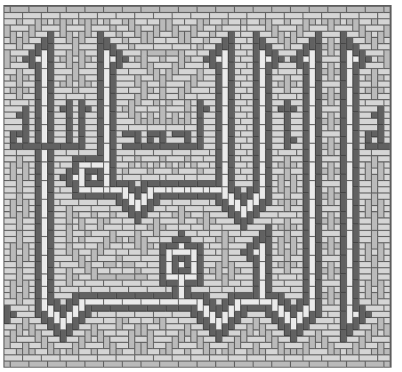
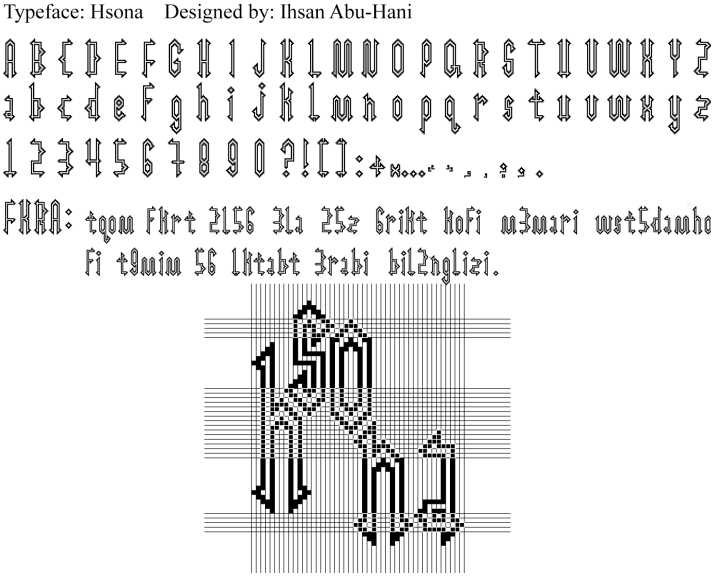


Figure 6
A typeface based on the gird-writing on famous Islamic buildings.



Typefaces Imitating Traditional Calligraphic Styles

Some typeface designs based the shapes of their letters on traditional Arabic geometrical writing styles. The first one was inspired by the "Kufi" style (a wide range of geometrical decorative styles), in which the shapes and the endings of the strokes copied those of a Kufi (Figures 3 and 4). Another typeface was inspired by the Arabic grid-writing on the facades of famous historical buildings such as the drums of the domes over the sanctuary of Masjid-I jami' of Timur, Samarqand, and over the mausoleum of Gur-I Amir, Samraqand (Figures 5 and 6).

Typefaces Utilizing Strokes of the Reed Pen

The most famous Arabic calligraphy is written with a reed pen, which is cut and prepared in a certain method.[9] The calligrapher would inscribe the curves of the letters in a free style, but according to a set of rules. Many of the student typeface designs imitated these strokes, and the students built their typefaces accordingly (Figure 7).

9 3umar Fa7il: *Iqa3 al-5a6 al-3arabi* (*The Arabic Calligraphy Rhythm* [in Arabic]), Cairo: Dar al-6ala23, 1997), 20–21; and S. Huda, AbiFarès, 94.

Figure 7
Typefaces adopting the free-style strokes of the traditional tool for writing Arabic calligraphy (the reed pen).

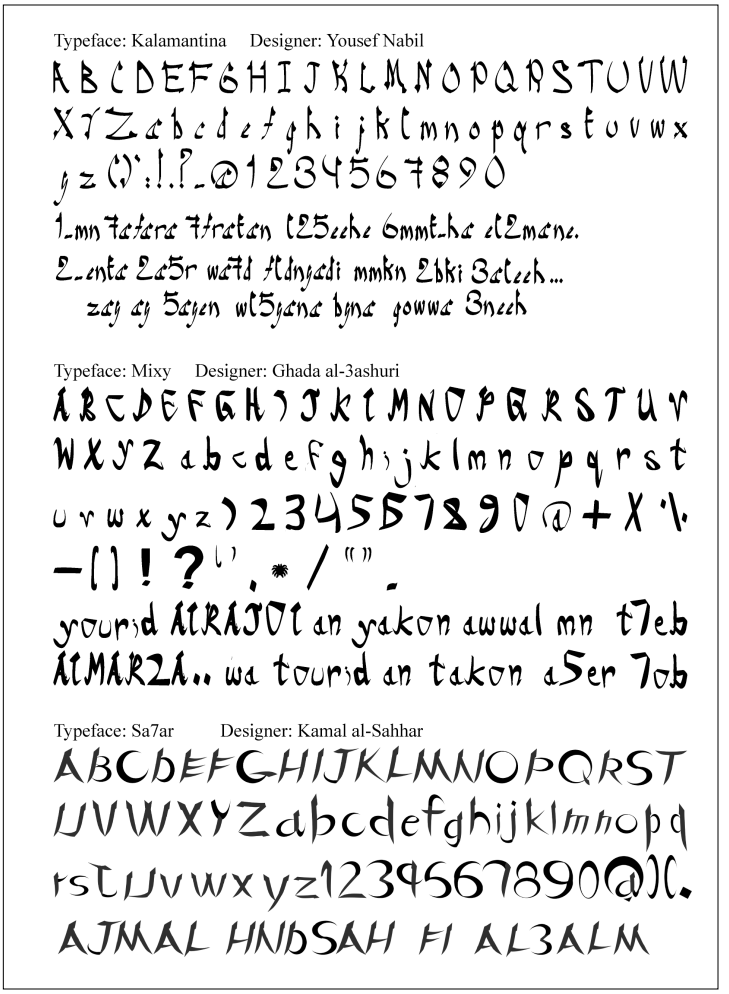
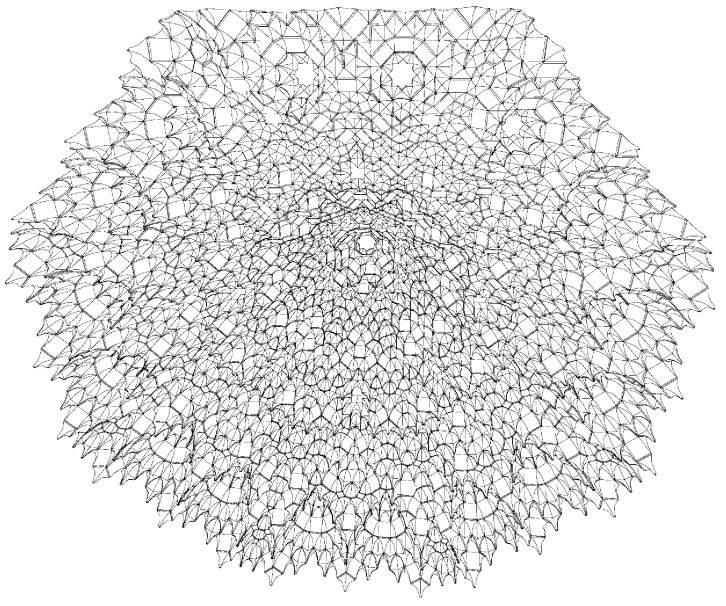
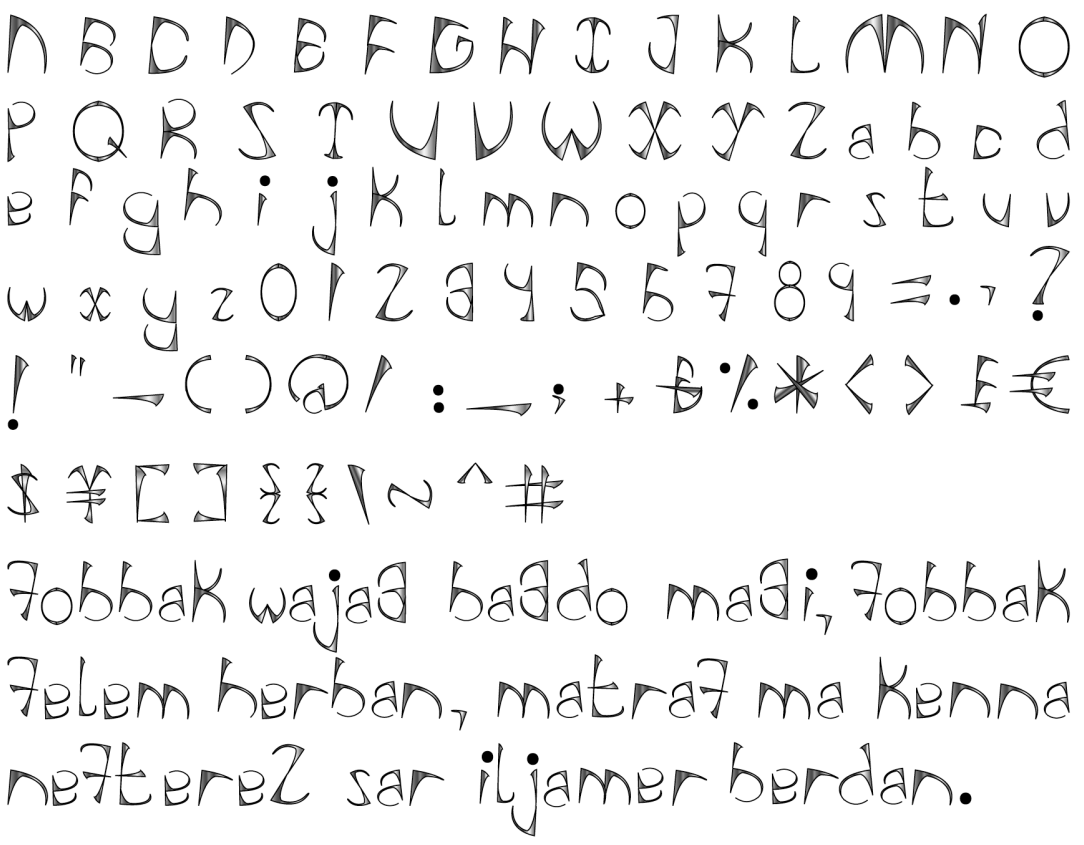


Figure 8
The muqarnas of the "Hall of Two Sisters" in the Alhambra.



Typeface: Remuqarna Designer: Remi 5ayya6



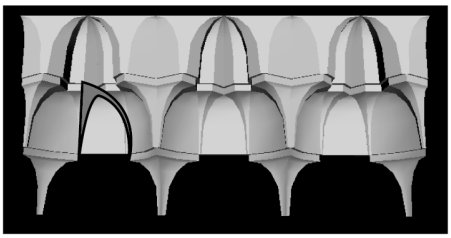


Figure 9
A typeface designed around muqarnas by deriving a two-dimensional stroke and using its variations.

Typefaces Inspired by an Islamic Architectural Element

Muqarnas is an Islamic architectural element, defined as a three-dimensional form whose visual function is to provide the gradual transition between two levels, two sizes, and/or two shapes. The famous "hall of two sisters" in the Alhambra is an example of a complex muqarnas form (Figure 8).[10] One typeface took a rather simple, two-dimensional approach to capturing the muqarnas style. A stroke was defined according to a basic unit in muqarnas, and it was used, along with its variations, to build the whole typeface (Figure 9).

10 For more information on muqarnas, refer to: Mohammad Ali Yaghan: "Muqarnas." http://muqarnas.muqarnas.org/index.html (accessed January 31, 2007).

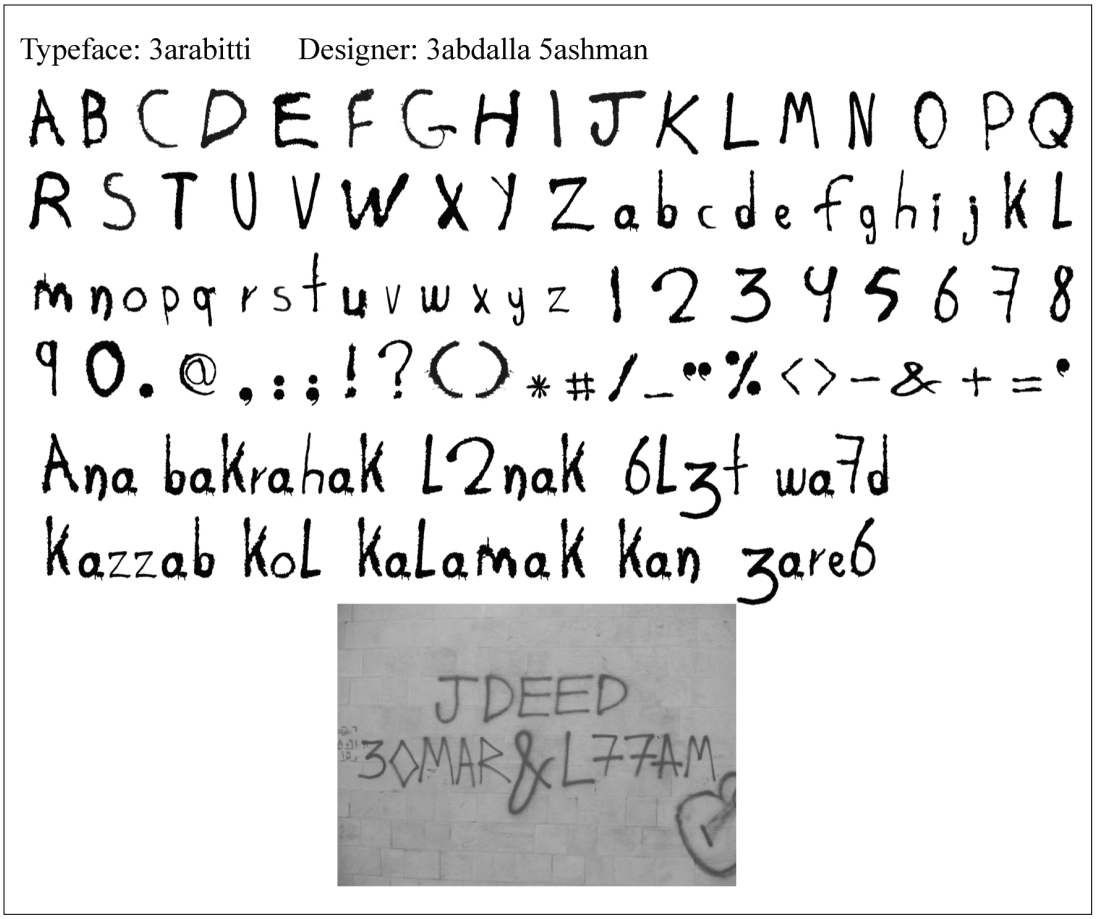


Figure 10
A typeface designed in the spirit of the Arabizi-graphite wall-writings.

Typefaces Reflecting Current "Arabic" Identity

The designer of this typeface took a different approach in an attempt to define the current "Arabic" rather than the historical, traditional identity. According to the designer, "The current Arabic culture is based on borrowing from the West. But what is borrowed is distorted and ill-represented in poor quality." The designer found in the graffiti wall-writings in Arabizi a source for his type (Figure 10).

Conclusion

The spread Arabizi requires more attention, and the typeface design promoted in this paper is only one aspect. Other needed tools that can save users a lot of time and effort, and enhance their experience, are creating a specialized Arabizi dictionary for cellular phones and computers, and providing an automatic letter-selection for typing text messages on cellular phones. (This originally was suggested by my colleague, the architect Rejan Ashour, who helped me teach the course.) Since Arabizi is chosen and developed by society rather than suggested by an elite group of researchers, I suggest its adoption as the official system of translating Arabic characters into English.

Stanley Morison's Aldine Hypothesis Revisited

Kay Amert

Admiration for the graphic vigor of the past brought historic fonts back into use in the modern period and renewed scholars' discussions of stylistic influence in type design. In this context, the British type historian, Stanley Morison, proposed in the 1920s a hypothesis that was to alter the writing of typographic history in the twentieth century. Then at the beginning of his career, and busy scouring archives for examples of fine printing, Morison observed that, at origin, the French roman types of the early sixteenth century shared traits with the romans used by the Italian Renaissance publisher, Aldus Manutius. The observation was at variance with the scholarly opinion of the period. Aldus was known for his Greek type, and for having had Francesco Griffo cut the first italic in 1501. Aldus's roman, by contrast, was overlooked by historians as they assessed the influence of Italian fonts on later French ones. Nicolaus Jenson's 1470 roman was heralded instead as the most likely model for the designs.

Praise for Jenson's roman was rampant in the literature. The most recent volley had come in 1922 with the publication of Daniel Berkeley Updike's landmark study, *Printing Types, Their History, Forms, and Use*.[1] Updike identified the strengths of Jenson's font as "its readability, its mellowness of form, and the evenness of colour in mass," and continued:

> Jenson's roman types have been the accepted models for roman letters ever since he made them, and, repeatedly copied in our own day, have never been equalled.... No other man produced quite so fine a font, or had better taste in the composition of a page and its imposition upon paper.[2]

Updike went on to characterize the Aldine roman as "distinctly inferior to Jenson's."[3]

Even so, with little debate, Morison's Aldine hypothesis was quickly considered proven. It was supplemented by others, and is incorporated as fact in the modern literature on the history of typography. Scholars who work in the area, however, constantly encounter both the value of Morison's insight and the limitations of his construct. My work on some of the principal theorists and practitioners of French Renaissance typography,[4] for instance, has raised many questions about the utility of the hypothesis, suggesting that it needs to be rethought and, if necessary, revised.

1 Daniel Berkeley Updike, *Printing Types, Their History, Forms, and Use, A Study in Survivals,* 2 vols. (Cambridge, MA: Harvard University Press, 1922; revised edition, 1937). Citations are from the revised edition.

2 Ibid., vol. 1, 73–74.

3 Ibid., vol. 1, 76.

4 Kay Amert, "Origins of the French Old-Style: The Roman and Italic Types of Simon de Colines" in *Printing History* 13:2, 14:1 (double issue) (1992): 17–40; "The Phenomenon of the *Gros Canon,*" in *The Papers of the Bibliographical Society of America* 99:2 (2005): 231–263; and "Intertwining Strengths: Simon de Colines and Robert Estienne" in *Book History* 8 (2005): 1–10.

The discussion that follows examines the development of the Aldine hypothesis and situates it in the cultural concerns of the period. It explores the relation of the Jenson and Aldine romans through microanalysis of their features. It considers contributions made by scholars other than Morison. It applies the hypothesis to the text romans used by Simon de Colines and Robert Estienne, and considers their relation to a roman cut by Claude Garamond. The substance of the Aldine hypothesis is reconsidered at the essay's end.

The Development of the Hypothesis

In the decades before Morison formulated the Aldine hypothesis, admiration for Nicolaus Jenson's roman prevailed not only among scholars but also among designers in their critique of nineteenth-century fonts and typographic practices. Begun mid-century and incorporating the "Fell Revival," [5] the criticism fostered interest in the use of historic fonts. It took a new turn in 1888, when William Morris established the Kelmscott Press. Dissatisfied with all romans available for his use, Morris chose Jenson's roman as the basis for the cutting of a new one he named "Golden." When, twelve years later, Thomas Cobden-Sanderson and Emery Walker established the Doves Press, they, too, chose Jenson's roman as the basis for their proprietary Doves type.

Study of these romans has shown that neither was modeled solely or closely on Jenson's. Instead, Morris redrew a related roman used by the Venetian printer, Jacobus Rubeus.[6] He increased its weight to intensify its color, and added sturdy "slab" serifs to anchor letters and words. Percy Tiffin's drawings for the Doves roman were based on letterforms from several sources including the Rubeus, Jenson, and other romans.[7] Thus, both romans differed from Jenson's: each incorporated taller capitals and heavier serifs, and the Golden type was much weightier than Jenson's. Despite this, the revivals were understood at the time as resurrections of Jenson's roman, inviting conflation of the features of the modern fonts with those of the Renaissance original.

Stanley Morison's letters to D. B. Updike suggest that he was rankled by the adulation heaped upon Jenson and the new fonts. In September 1923, he wrote:

> I must regret that even you share their tremendous regard for Jenson.... I harbour the wish to pull down the mighty from his seat & to exalt the humble Aldus.... I am quite sure it is wrong to make the upper case the same height as the ascenders, it means that the caps are overlarge & dominate where they appear. Even Jenson though he reduced his caps retained, as I think, too much strength. A better proportion is kept in the Aldine *Poliphilus*—so it seems to me.[8]

5 Martyn Ould and Martyn Thomas, *The Fell Revival, Describing the Casting of the Fell Types at the University Press Oxford and Their Use by the Press and Others Since 1864* (Bath, England: The Old School Press, 2000).

6 John Dreyfus, "New Light on the Design of Types for the Kelmscott and Doves Presses" in *The Library,* fifth series, XXIX (March 1974): 36–41.

7 Marianne Tidcombe, *The Doves Press* (London: The British Library and New Castle, Delaware: The Oak Knoll Press, 2002), 12–23.

8 *Stanley Morison & D. B. Updike, Selected Correspondence,* David McKitterick, ed. (New York: The Moretus Press, 1979), 65.

Writing again on October 30, 1923, he reported that:

> A few days ago we dined together at Emery Walker's house and talked most of the time about the late Mr. W. Morris of whose work I am by no means fond & whose Golden type I think positively foul—but then I do not revere Jenson as much as [Bernard] Newdigate & Walker, not as much as you do even. The Doves type is alleged by [A. W.] Pollard to be the finest roman fount in existence. I wish I could think so. Last week, I protested to Pollard that respect for Jenson had degenerated into superstition & that there were other types...[9]

In 1924, Morison published an essay in *The Fleuron* that argued on principle the superiority of the Aldine roman, and identified the path of its influence on later ones. "Towards an Ideal Type" [10] posited that, while the best manuscript models for romans show capitals ranged below the full height of ascending letters, the romans first cut in Venice neglected this principle. The error, Morison argued, was carried forward by Jenson and Erhardt Ratdolt, and later revived by Morris and Walker. The roman cut by Griffo for Aldus he characterized as a "letter of better proportions" for its smaller capitals, the absence of slab serifs on the capitals, and its consequent ability to produce a "restful page." [11] The key artifact in the transfer of its influence was the woodcut-illustrated *Hypnerotomachia Poliphili* published by Aldus in 1499.

> French interest in the Poliphilo and the notoriety of the Aldine editions abroad drew attention to Griffo's roman, and the Paris and Lyon typefounders followed this pattern. The prestige of French printing carried the Aldine design to other parts of Europe....[12]

In 1925, Morison published an article specific to that roman and its influence. In "The Type of the *Hypnerotomachia Poliphili*," Morison argued that:

> The Poliphilus type is a direct ancestor of the family we know in England as "old face" ... as distinct from the types of the Jensonian school. The difference between the characters cut by Geofroy Tory or Claude Garamond and those of Jenson is obvious—and considerable. Nevertheless, it is a received tradition that Garamond modelled his letters upon those of Jenson. I cannot bring myself to believe this. Rather I suggest he had before him the "Poliphilus." [13]

Pointing to the parallel of the short capitals used in the *Hypnerotomachia Poliphili* and the "Tory-Garamond-Estienne" roman of 1535, Morison also mentioned similarities in the horizontal strokes in the "eye" of the "e," and in the forms of the capitals "R," "M," and "C," concluding that "on this hypothesis, it would appear that the

9 Ibid., 72.

10 First published as "Towards an Ideal Type" in *The Fleuron* II (1924), a revised version appears as "Towards an Ideal Roman Type" in Stanley Morison, *Selected Essays on the History of Letterforms in Manuscript and Print*, 2 vols., David McKitterick, ed. (Cambridge: Cambridge University Press, 1981), 23–29. Citations are from the revised version.

11 Ibid., vol. 1, 27.

12 Ibid., vol. 1, 27.

13 Stanley Morison, "The Type of the *Hypnerotomachia Poliphili*" in *Gutenberg Festschrift* (Mainz, Germany: A. Ruppel, 1925), 255.

roman of Griffo is the *fons et origo* of the so-called 'old-faces.'" [14] The article ends with a discussion of the original state of the *Poliphilus* roman first used by Aldus in 1495 in Pietro Bembo's *De Aetna.* Morison described it as "brilliantly executed and showing the type to remarkable advantage,"[15] and reproduced four of its sixty pages.

The *De Aetna* state of the roman figured more prominently in Morison's later discussions of the Aldine romans than did the *Poliphilus* state. His introduction to the second edition of *Four Centuries of Fine Printing,* for example, argued that "Aldus never employed types which were immediately based on the Jenson model," [16] and continued:

> The type of the *De Aetna* marks a new epoch in typography. The fame of the publisher added to the prestige of the new letter. It was copied in France (by Garamond, Colines and others).... Thus Italian and French typography merged in the stream of that vigorous "old-face" tradition which took its rise from the type of the Aldine *De Aetna.*[17]

Morison identified the key figures in the adaptation of the Aldine roman in France as Geofroy Tory, Simon de Colines, Robert Estienne, and Claude Garamond. His understanding of the roles they played, however, changed over time, as had his understanding of the relative merits of the states of Aldus's roman. Initially, Morison construed Tory, for example, as a designer of types and mentor to Claude Garamond, later settling, instead, on understanding Tory as an advocate for Italian aesthetic ideals in Paris. He viewed Colines and Estienne primarily as scholarly publishers whose discernment led them to commission and use fonts on an Aldine model, and Garamond as the punchcutter responsible for the new types they used. On the basis of information contained in the unpublished Le Bé memorandum,[18] Morison later added Antoine Augereau to the group, identifying him as Garamond's teacher and a second Paris punchcutter dedicated to forwarding the Aldine model. Morison's discussions regularly emphasized the importance of royal support for these efforts. The appointment by Francis I of Geofroy Tory and Robert Estienne as King's Printers, for example, he considered a reward for their design reforms.

Two statements perhaps can stand for positions taken and connections made elsewhere by Morison on the French developments. First, *On Type Designs Past and Present* argued that Robert Estienne's folio Bible of 1532:

> ... contains what is probably the finest use ever made of [the Garamond] letter. Estienne's device and the headpiece of the title-page are signed with the Lorraine Cross, then the mark of Geofroy Tory, one of the foremost scholars responsible for the introduction of Italian fashions in the arts and crafts, and the headpiece encloses the word 'Biblia' cut in

14 Ibid., 256.

15 Ibid., 256.

16 Stanley Morison, *Four Centuries of Fine Printing: Two Hundred and Seventy-two Examples of the Work of Presses Established Between 1465 and 1924,* 2nd ed., revised (New York: Farrar, Straus and Company, 1949), 25.

17 Ibid., 26–7.

18 The memorandum was later published as *Sixteenth-Century Typefounders: The Le Bé Memorandum,* Harry Carter, ed., Documents Typographique Français III (Paris: André Jammes, 1967).

> virtually the same characters that are found in Tory's own *Champfleury,* printed in Paris in 1529. Thus a link is established between Garamond and his Italian models.[19]

And second, here is Morison on Claude Garamond from *A Tally of Types*:

> [Garamond] was incomparably the finest engraver of romans among the great first generation of French renaissance printers and publishers who, with Geofroy Tory, Henri Estienne and his foreman and executor Simon de Colines, led the movement away from gothic and towards roman. Their patron and pattern was Aldus, deliberately chosen by Colines.... Augereau's and Garamond's romans were modelled closely and intelligently upon Aldus's.[20]

One aspect of Stanley Morison's professional affairs relevant to the Aldine hypothesis is his relationship with the Monotype Corporation. In 1921, he provided advice and specimens to the corporation toward its work on the revival of "Garamond," a project initiated by Morison himself.[21] In 1923, he was appointed Typographical Advisor to the Monotype Corporation,[22] and in that capacity he was intimately involved in its program of revivals, including two based on Aldine romans. In 1924, he made the first use of "Poliphilus," employing it as the text type of his *Four Centuries of Fine Printing*.[23] In 1929, he supervised the cutting of "Bembo," a roman modelled on that of Aldus's *De Aetna*.[24] While most of Morison's research on the history of typography was not "sponsored research" in the modern sense of that term, there was much overlap between his scholarly and commercial concerns.

The Jenson and Aldine Romans

As the quotations from D. B. Updike and Stanley Morison suggest, both men engaged in an approach to the writing of typographic history that was based in connoisseurship. Each endeavored to identify superior models for the design of roman types and to trace lines of descent from them over time. It was the traditional (and a valuable) method for organizing such accounts: it created paths through the welter of individual fonts produced over time, and it made connections that helped explain processes of evolution.

While thoroughly committed to that method, D. B. Updike clearly was aware of its limitations. On the relation of the Jenson and Garamond romans, for example, he said bluntly in his *Printing Types*, "Garamond is said to have based his roman on Jenson's model, but on comparing the two types, this appears untrue."[25] Stanley Morison was spurred by the incongruities he found to identify another model in the Aldine roman, one that, in his judgment, better explained the features of later fonts. At the same time, Morison was willing to overlook material evidence of some features of the Italian romans. Enlarging and comparing the fonts establishes intriguing points both

19 Stanley Morison, *On Type Designs Past and Present,* revised edition (London: Ernest Benn, 1962), 40.

20 Stanley Morison, *A Tally of Types,* new edition, Brooke Crutchley, ed, (Boston: David R. Godine, Publisher, 1999), 66.

21 *Stanley Morison & D. B. Updike, Selected Correspondence,* 58.

22 Nicolas Barker, *Stanley Morison* (Cambridge, MA: Harvard University Press, 1972), 123.

23 Stanley Morison, *Four Centuries of Fine Printing: Upwards of Six Hundred Examples of the Work of Presses Established During the Years 1500 to 1914* (London: Ernest Benn, 1924). For Morison's comments on Poliphilus, see *A Tally of Types,* 53–56.

24 Morison, *A Tally of Types,* 46–52.

25 *Printing Types,* vol. 1, 234.

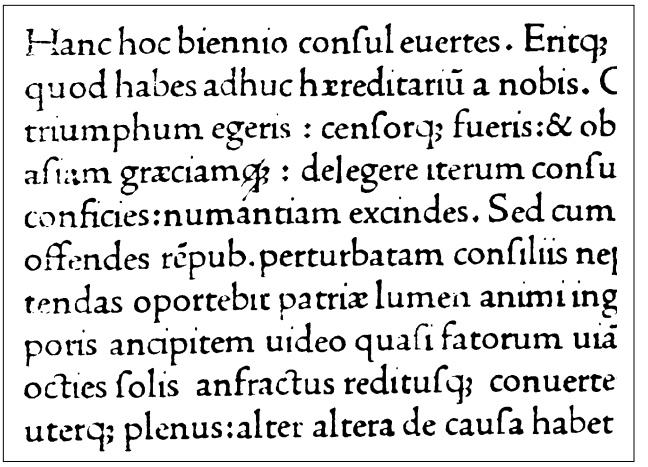

Hanc hoc biennio conſul euertes. Eritq;
quod habes adhuc hæreditariũ a nobis. C
triumphum egeris : cenſorq; fueris:& ob
aſiam græciamq; : delegere iterum conſu
conficies:numantiam excindes. Sed cum
offendes rẽpub.perturbatam conſiliis nej
tendas oportebit patriæ lumen animi ing
poris ancipitem uideo quaſi fatorum uiã
octies ſolis anfractus redituſq; conuerte
uterq; plenus:alter altera de cauſa habet

Figure 1
Jenson roman (113mm/20 lines) from Macrobius, *In Somnium Scipionis Expositio. Saturnalia* (Venice: Nicolaus Jenson, 1472). Special Collections Department, University of Iowa Libraries, Iowa City, Iowa.

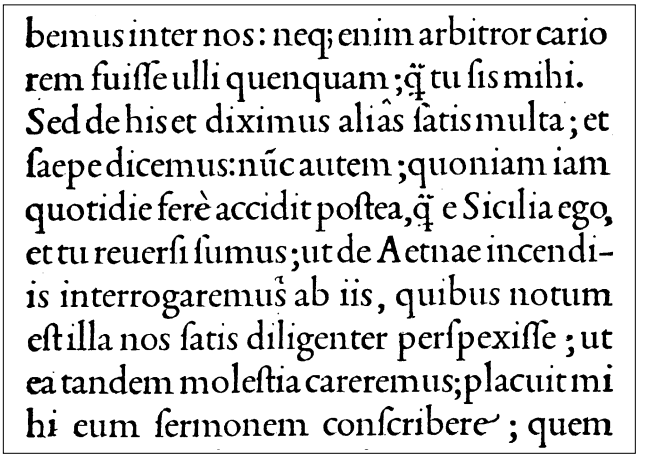

bemus inter nos: neq; enim arbitror cario
rem fuiſſe ulli quenquam ;q̃ tu ſis mihi.
Sed de his et diximus aliâs ſatis multa ; et
ſaepe dicemus:nũc autem ;quoniam iam
quotidie ferè accidit poſtea,q̃ e Sicilia ego,
et tu reuerſi ſumus ;ut de Aetnae incendi-
is interrogaremus̃ ab iis, quibus notum
eſt illa nos ſatis diligenter perſpexiſſe ; ut
ea tandem moleſtia careremus;placuit mi
hi eum ſermonem conſcribere ; quem

Figure 2
Griffo roman (114mm/20 lines) from Pietro Bembo, *De Aetna* (Venice: Aldus Manutius, 1495). Courtesy of the John M. Wing Foundation on the History of Printing, The Newberry Library, Chicago.

of similarity and difference between the Jenson and Aldine romans, some well known, but others unacknowledged in the literature.[26] It also begins to demonstrate the perils of construing either one as the sole generative model for the later French romans.

One unexpected finding to emerge in a comparison of these romans, for example, is the extent of the likeness found in the forms of their lowercase letters. This undercuts an impression left by optical comparison of the fonts: seen at reading distance, Jenson's roman (Figure 1) appears wider. But in fact, the romans are overwhelmingly similar in lowercase letter shapes and widths, with only a few of Griffo's (Figure 2) slightly narrower than Jenson's, and one wider. The letterforms in these romans also are alike in the consistency of their axes, and both are calligraphic in that regard: the angle of stress created by the movement from thick to thin within the strokes of the letters is regular and predictable. The broadest stroke width also is uniform in the lowercase of both romans: there is only the barest hint of the paring or flaring of stems in either one. And optical impressions to the contrary, the romans also are similarly "fitted": both contain generous allotments of white space at the sides of individual characters.

26 For the purpose of comparison, the romans were enlarged to seven times their actual size. Features of the Jenson roman were checked against those of the fresh type shown in plate 11 of Joseph Blumenthal, *Art of the Printed Book 1455–1955* (New York: Pierpont Morgan Library and Boston: David R. Godine, 1973). Except for the elimination of some alternate characters in later uses of the type, the lowercase letters in the two states of Griffo's roman are alike. Samples of both are provided to illustrate the fresh condition of the roman in the 1495 *De Aetna* and the lighter capitals found in the 1499 *Hypnerotomachia Poliphili*.

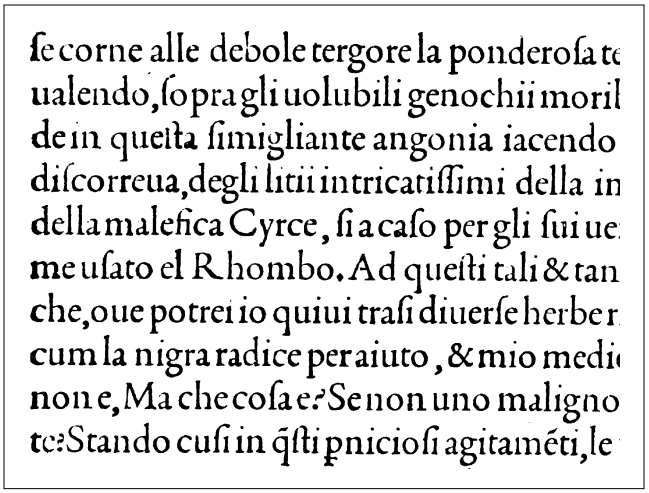
Under enlargement, the differences between the romans are intriguing, too. One of those differences revolves around weight: contrary to some assertions about it, Griffo's roman is heavier than Jenson's. Expressed as a proportion based on the width of letter stems in relation to their heights in ascending characters, Jenson's shows a ratio of 1:11, while Griffo's is heavier at 1:10.

In the lowercase, another key difference is found in serif structure. Jenson's roman incorporates a sophisticated range of serif treatments: the shape, size, and lengths of his serifs differ greatly, with many biased in their lengths to the right of the stems. While both romans incorporate straight foot serifs, Jenson's roman also shows a slight concavity in the top serifs of the "m," "n," and "u." The first state of Griffo's roman included more assertive or fully flourished versions of some of Jenson's right-biased serifs as variants in the font. His treatment of serifs in the second state, however, is much more uniform. He used a compact, triangular top serif throughout the suite of lowercase letterforms, and his foot serifs are more or less evenly divided on either side of the stems. While serifs are the tiniest features of these fonts, the difference in the handling of serif structure is telling: Jenson prized variation, while Griffo moved toward uniformity.

The capitals devised for these two romans also vary greatly. Contrary to Stanley Morison's assertions in print (although he nearly acknowledged it in the September 1923 letter to Updike quoted above), both Jenson and Griffo reduced the heights of their capitals, dropping them one stem width below the height of the ascenders, making Jenson's 1:10 and Griffo's 1:9 in their proportions. Griffo's *De Aetna* capitals, however, carried weight beyond that of the stem widths of the lowercase, producing a heavier letter with a weight ratio close to 1:7. Griffo reduced that weight when he cut (or refashioned) the *Poliphilus* capitals in 1499 (Figure 3), making the stems of the capitals consistent in width with those found in the font's lowercase.

Closely inspected (and again contrary to Morison's assertions about them), few of Jenson's capitals employ slab serifs: most of them, in fact, are notably demure. Unlike the serifs found in his lowercase, they also are generally consistent in their shapes and forms. The great difference in the Jenson and Griffo capitals lies instead in the less sophisticated and classically informed analysis of letter widths (and thus shapes) found in the Jenson capitals. Without access to the later treatises of writing masters and geometers, with the advice they contain on restraining the widths of certain capitals, Jenson's capitals are wide, many of them built on the scaffold of a full square. As a consequence, the interior white spaces or "counterforms" they contain are large and thus noticeable in composition. Griffo, in contrast, constrained the widths of many of his capitals,

Figure 3
Griffo roman (115mm/20 lines) from Francesco Colonna, *Hypnerotomachia Poliphili* (Venice: Aldus Manutius, 1499). Courtesy of the John M. Wing Foundation on the History of Printing, The Newberry Library, Chicago.



creating smaller counterforms and, as Morison suggested, a more harmonious relationship between the forms of the lowercase letters and those of the capitals.

In sum, under enlargement, both the Jenson and the Aldine romans are exceptionally well cut. They are much alike in the forms of their lowercase characters. Each reveals a carefully integrated approach to design that created consistency in stroke widths, angle of stress, and letter shapes, sizes, and proximities. The result in each case is an admirable regularity, lightly offset in Jenson's roman by its variation in serif structure. Particularly given the fashioning of his capitals, Griffo's roman is the more consistent, but also the more solemn and "mechanical" of the two, while Jenson's roman is lighter and more rhythmical.

Other Contributions to the Hypothesis

Its framework established by Stanley Morison, the Aldine hypothesis was supplemented by other scholars whose research focused mostly on French developments. Writing under the pseudonym of Paul Beaujon, Beatrice Warde published an article in *The Fleuron* in 1926 on the origin of the "Garamond" types.[27] In a survey of Garamond's career, Warde accepted the idea that Garamond was a student of Geofroy Tory, and she sought to substantiate the link between Tory and Aldus Manutius posited by Morison. Warde suggested that Aldus's *Hypnerotomachia Poliphili* was "universally admired as a typographic monument," and that Tory's interest in the book was evidenced by the fact that he had found within it the idea for his own printer's mark, the broken vase (*pot cassé*).[28]

Warde also established a chronology for the expression of Aldine influence in fonts produced in Paris. Simon de Colines's use in 1528 of a new Greek and italic marked "the introduction into that city of Italian (and particularly Aldine) characters."[29] The romans Colines then had at his disposal were "heavy in colour" and based on "the Jenson model," but the new roman he introduced in 1531

27 Paul Beaujon [Beatrice Warde], "The 'Garamond' Types, Sixteenth and Seventeenth Century Sources Considered" in *The Fleuron* V (1926): 131–179; reprinted in *Fleuron Anthology* (Boston: David R. Godine, 1979), 181–213. Citations are from the reprint. Warde used the original spelling of Garamond's name ("Garamont") throughout the article.

28 Ibid., 183.

29 Ibid., 191.

was as different from its predecessors as it could be; its "narrower proportions and longer descenders" produced "a lightness well carried by the carefully modelled serifs."[30] Warde characterized Colines's roman as "not copied closely after any former fount, but italianate in cutting."[31]

In assessing the features of the similar romans introduced shortly thereafter by Robert Estienne, Warde followed Morison in describing them as directly derived from Aldus's *De Aetna* roman. Presuming that "the three sizes are the same in form," she based her analysis of the features of the Estienne romans on those of the largest size, a *gros canon,* finding that:

> It is a narrower and lighter letter than Colines's, a difference which makes the descenders seem longer. The capitals of the smaller sizes are noticeably lower than the top serifs of ascending letters, and condensed far more than in the case of Colines.[32]

Warde's list of letters particular to the Estienne romans, including several capitals similar to those of the *De Aetna* font, also largely was based on the features of the *gros canon.*

Warde linked Claude Garamond to the cutting of the Estienne romans by noting that the dozen roman capitals adapted for use with the first of the royal Greek types Garamond cut in the 1540s for Robert Estienne's use came from one of Estienne's earlier romans. The new roman capitals, different in their features, that were used with another size of the Greek Warde found to be identical with some labeled as Garamond's in a specimen sheet issued in Frankfort in 1592. The same capitals, she noted, also appeared in a roman used in books published in Paris from the 1550s. Warde concluded that "the lower-case of this design which we can safely call Garamont's 'later' roman is similar to the Estienne 1532 fount: but the wider and more conservative capitals reflect the pattern of the pioneer Colines."[33] "It remained the most popular roman in France until the end of the seventeenth century."[34]

In 1928, A. F. Johnson published an article in *The Fleuron* reassessing the career of Geofroy Tory.[35] It dispatched Tory as a designer of types,[36] but it widened the argument for Tory as a channel for Aldine influence in Paris. While his citation was faulty, Johnson provided a reference for the broken vase Beatrice Warde spotted and further suggested that the style of Tory's illustrations for his Books of Hours also derived from the *Hypnerotomachia Poliphili.* Tory's drawings, Johnson said, were:

> ... made with few lines on a white ground and almost always without shading. They remind us irresistibly of Venetian book illustration, and especially of Francesco Colonna's *Hypnerotomachia Poliphili.* The fantastic style of this book would certainly appeal to the author of *Champ Fleury.*[37]

30 Ibid., 191–92.

31 Ibid., 192.

32 Ibid., 195.

33 Ibid., 199.

34 Ibid., 199.

35 Alfred F. Johnson, "Geofroy Tory" (1928) in *Selected Essays on Books and Printing* (Amsterdam: Van Gendt, 1970), 166–89.

36 "Of direct Tory influence on French typography there is no trace." Ibid., 187.

37 Ibid., 172.

Johnson's chapter on the sixteenth century in the 1938 survey, *A History of the Printed Book,*[38] contained a capsule statement of the Aldine hypothesis as it then stood. Johnson noted Claude Garamond's self-professed interest in cutting italics on an Aldine model, and his work cutting the royal Greek types on "cursive models like the Aldine."[39] As had Beatrice Warde, Johnson identified the roman capitals used with one of the royal Greek types with those labeled as Garamond's in the 1592 specimen, and he added:

> The lower case also of Estienne's type of 1532 is identical with the lower case of the Frankfort types. It seems to follow then that it was Garamond who cut Robert Estienne's new romans.[40]

Stanley Morison, Johnson acknowledged, had pointed out:

> The striking resemblances between Estienne's roman and the first roman used by Aldus in the *De Aetna* of Pietro Bembo.... Apart from the general similarity of design, the modest height of the capitals, and the comparative narrowness of these two romans in contrast with Jenson, some small peculiarities of serif formation in the type of Griffo, repeated in Garamond, are a convincing proof of Mr. Morison's thesis.[41]

Elsewhere, however, A. F. Johnson discussed developments that altered or otherwise qualified the Aldine hypothesis. In his 1934 *Type Designs, Their History and Development,* for instance, Johnson amended the chronology established by Warde when he noted that:

> Colines seems to have been experimenting with the design of roman for some years; editions of the Greek medical writer, Galen, printed in 1528 show a roman which except for a few letters is the same as the type of 1531. Even as early as 1525 the roman in which the first Tory Book of Hours was printed is an advance on the types which Colines had acquired from Henri Estienne.[42]

The several romans introduced in Paris in the early 1530s, Johnson asserted, "cannot have been cut by one man, but that one at least was the work of Claude Garamond seems almost certain."[43] But it is clear that about even this, A. F. Johnson wasn't absolutely certain. After reviewing the evidence linking the French fonts of the 1530s with those of the 1550s, he concluded:

> Either Garamond cut the Estienne fount or he accepted it as his model. At all events he won credit with posterity for the design.[44]

38 *A History of the Printed Book, Being the Third Number of the Dolphin,* Lawrence C. Wroth, ed. (New York: Limited Editions Club, 1938).

39 Ibid., 138.

40 Ibid.

41 Ibid.

42 A. F. Johnson, *Type Designs, Their History and Development* (London: Grafton, 1934), 62.

43 Ibid., 62–64.

44 Ibid., 64.

Despite the questions raised by A. F. Johnson and later by H. D. L. Vervliet[45] and others, the Aldine hypothesis was repeated often enough that it ceased to be a hypothesis. It passed instead into the realm of fact in the literature of the second half of the twentieth century. Popular surveys such as Geoffrey Dowding's *An Introduction to the History of Printing Types*[46] incorporated it, as did a scholarly survey as important as Harry Carter's *A View of Early Typography.*[47] Nicolas Barker's 1974 study, "The Aldine Roman in Paris, 1530–1534,"[48] assumed Aldine influence in the entire cluster of new romans cut in Paris in the 1530s, acknowledging Colines's 1528 roman, but crediting Claude Garamond with cutting fonts for Robert Estienne that ignited an Aldine "revolution." By the last quarter of the century, the notion of Aldine influence on later French practice had been broadly enough accepted to have fostered this familiar account within the mainstream of Renaissance history:

> The Aldine roman types were being studied and imitated. ... The intermediary in this case appears to have been an antiquarian fanatic named Geofroy Tory, who returned to Paris some time in the early 1520s after a long stay in Italy and much earnest reading of the *Hypnerotomachia Polifili.* His views on the proper formation of antique letters were embodied in a work named *Le Champ Fleury,* which he published in April 1529, and which drew heavily on earlier Italian examination of classical inscriptions. The tradition that he "taught" the typefounder Garamond has never been substantiated: but by the early 1530s, Colines and Estienne, both of whom dealt regularly with Garamond, were using roman founts modelled on the type in which Aldus had printed *De Aetna,* and it was from Garamond's workshop that this style spread rapidly across Europe during the second quarter of the century.[49]

Tory, Colines, Estienne, and Garamond

Geofroy Tory was indeed a central figure in the flowering of the graphic arts that took place in Paris in the 1520s and 30s. The Books of Hours he produced from the mid-1520s transformed that genre, and his *Champ Fleury* brought to Paris entirely new ways of thinking about language and letterforms. Certainly, his design ideas and his writing were informed by Italian Renaissance practice, but the striking thing about all of Geofroy Tory's efforts is their originality. It is an ideal he discussed in his writing, and a quality that makes his work distinctive to this day.

From this perspective, the understanding of Tory as fundamentally indebted to the example of Aldus seems a particularly weak link in the chain of the logic of the hypothesis. The "French interest in the *Poliphilo*" mentioned by Morison, for instance, began only in the 1540s, more than a decade after Tory's death. It is possible that, like Jean Grolier and Francis I, Geofroy Tory owned a copy of the

45 Hendrik D. L. Vervliet, *"Les Canons de Garamont, essai sur la formation du caractère romain en France au seizième siècle,"* in *Refugiam Animae Bibliotheca* (Weisbaden, Germany: Guido Pressler, 1969), 481–500.

46 Geoffrey Dowding, *An Introduction to the History of Printing Types* (London: Wace, 1961).

47 Harry Carter, *A View of Early Typography up to about 1600* (Oxford: Clarendon Press, 1969), 70–73 and 81–86.

48 Nicolas Barker, "The Aldine Roman in Paris, 1530–1534" in *The Library*, 5th ser., 29 (1974): 5–32.

49 Martin Lowry, *The World of Aldus Manutius, Business and Scholarship in Renaissance Venice* (Ithaca, NY: Cornell University Press, 1979), 284–85.

Hypnerotomachia Poliphili. It is unlikely, however, that the broken vase on folio q5 suggested his mark in the same way that the dolphin and anchor on folio d7 had suggested Aldus's. The simple vase in the *Hypnerotomachia Poliphili* and the inscription at its base are many times removed from the elaborately articulated mark and the meaning of the motto Tory developed in the *pot cassé*. Similarly, Tory's motive for the use of an outline style in the illustrations for his Books of Hours likely had more to do with plans for their completion and sale than it did with homage to the Aldine woodcuts. Some copies of the *Hours* Tory sold as they were printed in red and black inks; others were fully illuminated, their initial letters and images completely covered by tempera and gilding; yet others, however, were half-colored in transparent washes that partially filled the outlined forms, creating a sense of modeling and three-dimensionality that made linear shading redundant.[50]

Of the printers working in Paris, Tory was most closely allied with Simon de Colines. In 1523, Colines printed for Tory the *Epitaphia* he wrote after the death of his daughter. Colines was Tory's collaborator in the production of his Books of Hours. Colines published Tory's *Aediloquium* in 1530. And in 1531, Colines furnished the roman type for Tory's first endeavors as King's Printer. It appears that Tory, in turn, provided counsel to Colines. The revision of Colines's woodcut initial letters, a process that began in the early 1520s, for example, culminated with the production from 1527 of new suites of initials used both by Colines and Robert Estienne. The design of these initials has long been linked to features of the capitals that appeared later in *Champ Fleury*.

While earlier scholars were uncertain whether to accept a tradition that he cut types, it is now clear, in the words of the Le Bé memorandum, that Colines was "an expert in types."[51] The program of typographical improvements and additions he launched in the early 1520s was extensive. It began with the cutting of a set of roman titling capitals and the revision of a *philosophie*, a small text roman, and soon involved the production of entirely new fonts. The first of them was a *saint augustin*, a medium-sized roman Colines used from 1526 and then forwarded to his stepson, Robert Estienne, for use in his folio Bible of 1528.

Along with an italic and a Greek, in 1528 Colines introduced two new romans: a *gros romain*, or large text roman, and a smaller *cicéro*. Their designs continued the lines of experiment and change begun earlier in the *philosophie* and *saint augustin*: both romans were lighter in weight and had more delicate serifs, longer descenders, and more inscriptional capitals than extant Paris romans. Colines later revised the design of both the *gros romain* and the *cicéro*. The 1531 roman Beatrice Warde described as "italianate in cutting" is in fact the second state of Colines's *gros romain*, as A. F. Johnson suspected.

50 The Pierpont Morgan Library copy of the 1525 Hours reproduced as no. 40 in Roger S. Wieck, *Painted Prayers, The Book of Hours in Medieval and Renaissance Art* (New York: Braziller, 1997), 59, is one copy that displays this tinted treatment.

51 *The Le Bé Memorandum*, Carter, ed., 29.

While construed in the literature as a separate font, the *gros romain* used by Robert Estienne from 1530 appears to have been an intermediate product of the same revision. Enlarging and comparing all three romans reveals that some of that font's lowercase characters are identical with those in the 1528 roman and many others with Colines's 1531 roman, while a few others and the capitals are unique to Estienne's variant. The font was one of three related romans that included a distinctive *gros canon,* a large roman Estienne used for the display of titles and headings in his books. While markedly similar to Colines's, the *gros romain* and the third roman, a *saint augustin,* have features, particularly the simplified forms and slightly heavier weight of their capitals, that were tailored to coordinate with those of the *gros canon.*

Robert Estienne made exclusive use of the *gros canon* from 1530 to 1536, when Colines began to employ it in his books as well. Colines revised the design of several characters and added others to fill out the font, an indication that he both cut and retained the punches for the *gros canon.* From 1537, he made it available on a selective basis to other printers in Paris. The design of the *gros canon* also was many times copied and rapidly entered into international use.

Beatrice Warde based her analysis of the Estienne romans on the features of the *gros canon,* and thus understood Estienne's as "a narrower and lighter letter than Colines's." Microanalysis of the *gros canon,* however, suggests that it was a letter designed very much for its purpose, a special case in the trio of Estienne's romans. It is both narrower and lighter, and has longer ascenders and descenders than any text roman.[52] Mistaking the features of the *gros canon* for those of the entire group of Estienne romans obscured the similarity between the Colines and Estienne text romans, as did, perhaps, a difference in production methods. Robert Estienne printed mostly on dry paper rather than on dampened stock; this often made the quality of his inking and impression, and thus the appearance of his types, lighter than Colines's and other printers of the period.

The understanding of the relationship between Simon de Colines and Robert Estienne also may have contributed to a presumption of divorce in their typographic practices. The separation of their workshops in 1526 had been read as a sign of disagreement between them, something that might have set the stage for competitive publishing policies and a battle of typographic taste. The relations between Colines and his stepson, however, appear to have been far more genial than traditional accounts suggest. Carefully scrutinized, their publishing programs were, in fact, complementary. A pattern of cooperation and of the sharing of typographic resources begun in the 1520s also is evident through the end of Colines's career and beyond.[53] That this included the new romans introduced

52 Amert, "The Phenomenon of the *Gros Canon,*" 241–43.

53 Amert, "Intertwining Strengths," 1–10.

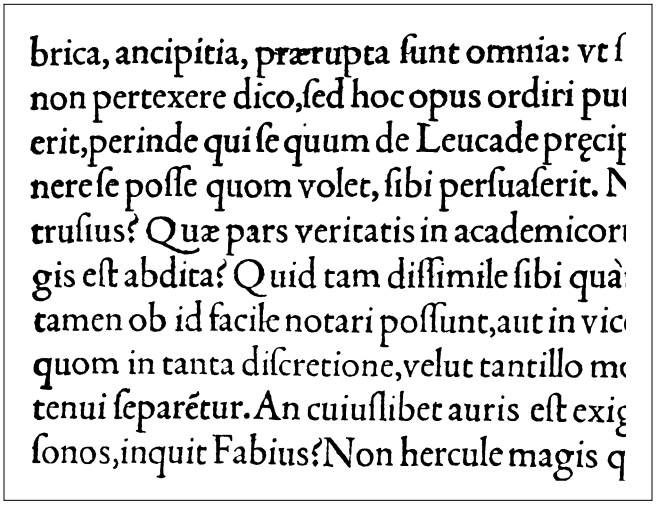


Figure 4
Colines roman (119mm/20 lines) from Terentianus, *De Literis* (Paris: Simon de Colines, 1531). L. Tom Perry Special Collections, Harold B. Lee Library, Brigham Young University.

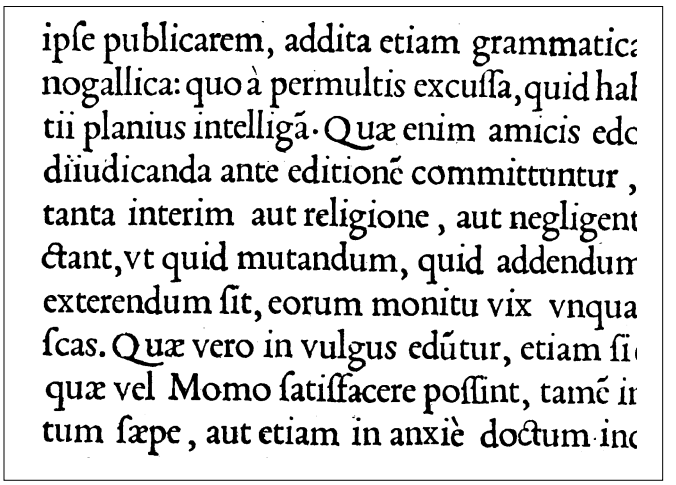


Figure 5
Estienne roman (115mm/20 lines) from Jacobus Sylvius [Jacques DuBois], *In Linguam Gallicam Isagωe* (Paris: Robert Estienne, 1531). Courtesy of The Newberry Library, Chicago.

in the 1520s and 30s helps to explain the similarity in the design of these types, and does so more economically than a thesis of rivalry between them.

How much do their romans owe to the example of Aldus? The answer, in brief, is some things, but by no means everything. Comparing enlargements of the text romans used by Colines (Figure 4) and Estienne (Figure 5) with the fonts of similar size cut by Jenson and Griffo reveals, for example, that the Paris romans are identical in weight with that of Jenson and, at 1:11, are lighter than Griffo's. Like Jenson, Colines set the height of his capitals at 1:10. His analysis of their forms, however, is far more sophisticated than Jenson's, and is like Griffo's in this regard, taking into account classical inscriptional practice.

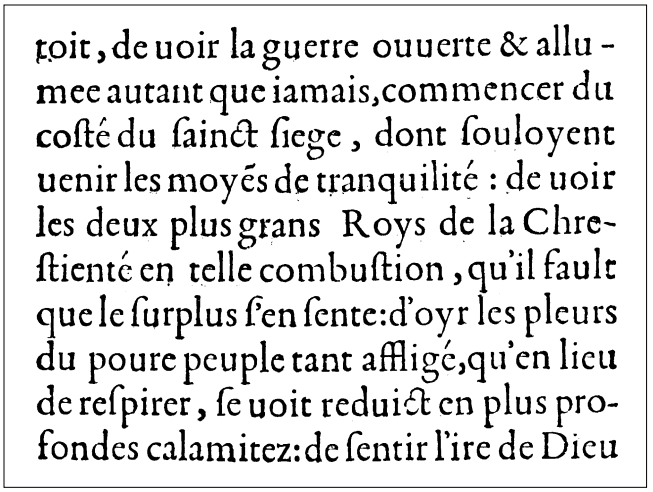


Figure 6
Garamond roman (118mm/20 lines) from [Charles de Marillac], *Discovrs svr la rovptvre de la trefve en l'an M.C.LVI* (Paris: Michel Vascosan, 1556). Special Collections Department, University of Iowa Libraries, Iowa City, Iowa.

While both Morison and Warde thought Robert Estienne's capitals shorter than Colines's, they actually are identical in height and differ rather in their weight. The heavier weight of the capitals is a point of parallel with Aldus's *De Aetna* roman, but a more immediate parallel probably had precedence. As do their shapes and bias toward vertical stress, the heavier weight of the Estienne capitals echoes the *gros canon*, where the lowercase is built on a 1:13 basis, and the capitals are heavier at 1:10. One of the capitals, the "G," also is idiosyncratically shorter than others, as in the *gros canon*. Two "earmark" capitals in the *De Aetna* roman, the flat-topped "A" and the "M" absent a top serif on the right, appear in Estienne's. But both forms also can be found elsewhere in the years preceding the cutting of the Estienne roman.

In a general sense, the Paris romans are like both Venetian romans in employing nonarbitrary relationships among letter widths, with a unit of width based on x-height the most common lateral measure in all four. The Paris romans also are like the Venetian romans in conversely permitting variation in height among ascending and descending characters, variation that, in later romans, was replaced by uniformity. Beyond these general parallels, however, a host of differences between the Aldine and Paris romans emerge.

The fit of the Paris romans, for example, is tighter than Griffo's, creating an optically denser presence on the page, an effect that is counterbalanced by lighter weight and more silvery color. The Paris romans exhibit much less fidelity to calligraphy than had Griffo's, incorporating variation in stress, for instance, and thus an inner tension that brings a different texture to the type. While incorporating less variation in serif structure than Jenson's, the Paris romans have far more than Griffo's, with cupped foot serifs to keep baselines from getting leaden and individually tailored serifs found elsewhere. The nuances of the cutting of the Paris romans also differ considerably from Griffo's. Some letterforms, for instance, display

flared stems, a feature common in the traditions of punchcutting rooted in Strasbourg and Basel, the sources of many of the fonts earlier used in Paris. Both Paris romans also display slimming of the stems in the x-heights of selected letters, a technique nascent in the Jenson roman and developed by Colines to address the Renaissance problem of letting more "light" into letterforms.

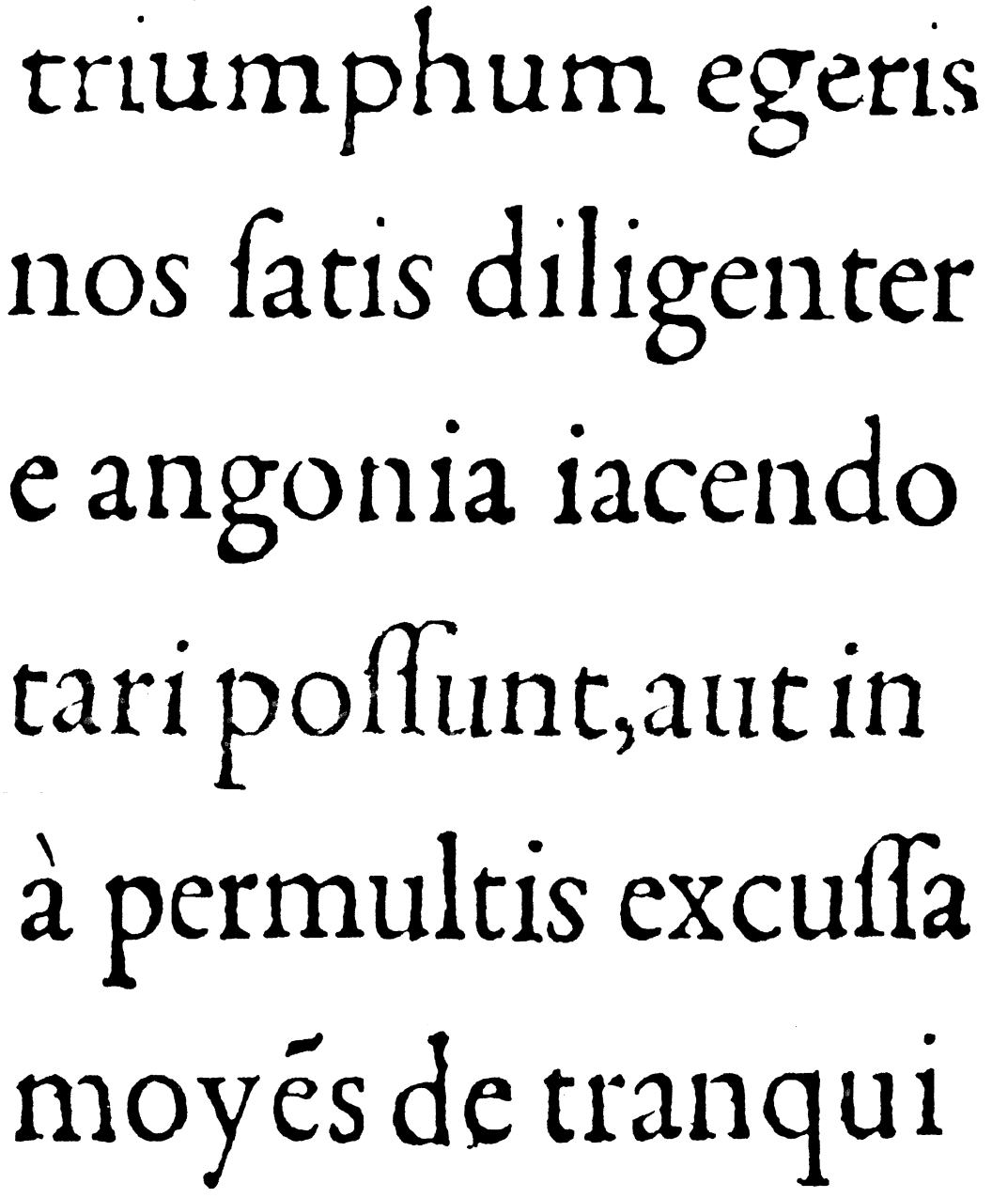
Put differently, the approach found in the Paris romans differs from the Aldine by establishing suites of letterforms that are lighter in color but more tightly fitted, that are further removed from any calligraphic model, that embody more liveliness and graphic tension, and that arise from a combinatory technique that fused graphic ideas and practices from several milieux. They are inherently international in character, in part because they were the result of a relatively late, but nevertheless fresh analysis of the requirements and aesthetic of a roman.

The *gros romain* of similar cut identified as Claude Garamond's (Figure 6) dates to the 1550s.[54] It is notably similar in appearance to Colines's *gros romain* and is not, as A. F. Johnson and others had thought, identical with Robert Estienne's 1530 *gros romain*. Comparing enlargements establishes that, at 1:11, Garamond's *gros romain* is identical in weight to the earlier Paris romans, and thus lighter than Griffo's. While much like Colines's in their structural features, the capitals are slightly shorter than his at 1:9.5. Garamond subtly regularized many other features of the earlier Paris romans, making uniform the heights of ascenders and descenders and restoring some of the consistency of stress found in the Venetian romans. He eliminated much of their variation in serif structure, instead relying largely on compact, triangular serifs like those found in Griffo's roman. There are hints of cupping, however, in some of Garamond's foot serifs, and one stem is flared, faint echoes of the features of the original.

While optically similar to the Colines and Estienne romans of the early 1530s, internally, Claude Garamond's *gros romain* is a tamer creature. It is less lively and more stately, and thus resembles the *gros canon* Garamond cut in the 1550s, a roman which also is more reserved than the original. With regard to the Aldine hypothesis, Garamond's *gros romain* may owe more to the example of the Aldine roman than did Colines's: his compact triangular top serifs, for example, are strongly reminiscent of Griffo's. But his font's relation to the earlier Paris romans also bears an interesting parallel to the relation between the two Venetian romans. As was Griffo's in relation to Jenson's lighter and more rhythmical roman, Garamond's roman is more consistent, more solemn, and more "mechanical" than Colines's, and the interval of time that divided the cutting of the two sets of romans is virtually the same.

54 Garamond's *gros romain* is shown in *Type Specimen Facsimiles II* (London: The Bodley Head, 1972) as facsimile 18, nos. 15 and 16, in two specimens annotated by Guillaume Le Bé. As used by Michel Vascosan (Figure 6) and other Paris printers, the *gros romain* often was more loosely fitted.

Figure 7
Comparison of 4x enlargements of (top to bottom):
Jenson roman,
1495 Griffo roman,
1499 Griffo roman,
Colines roman,
Estienne roman, and
Garamond roman.



Revisiting the Aldine Hypothesis

Just as the contention that Garamond based his roman on that of Jenson will not stand scrutiny, neither does the notion that he "had before him the 'Poliphilus.'" The light weight and silvery color of the Paris romans have more in common with Jenson's roman than with Griffo's, and while different in character, there is a liveliness to them that parallels Jenson's. On the other hand, the structural features of the capitals found in the Paris romans parallel the Aldine roman, and such things as commonality in the configuration of a lowercase character as important as the "e" also suggest a debt to Griffo's ingenuity. But an analysis of the influences expressed in the Paris romans isn't complete unless it takes into account punchcutting practices developed in Strasbourg and Basel, and in Paris, too. The Paris romans are more than a blend of Italian styles: they fuse a broader range of styles to create a new sort of model for the roman.

The connoisseurship that led Stanley Morison to grasp the importance of the Aldine roman for later punchcutters is misplaced when imputed in a literal sense to the punchcutters themselves. Rather than suggesting the close copying that is the method of modern revivals, the approach to the romans produced by these punchcutters suggests, instead, the application of a synthesizing intelligence, the exercise of a keen critical sensibility cultivated in the practice of the craft, and a desire for originality in its pursuit.

Despite many differences in their approaches, Jenson, Griffo, Colines, and Garamond together shared a goal in the cutting of their romans, one that was very much bound up with a Renaissance ideal. Relinquishing the rich color and heft of blackletter, they brought to the page a letter that was rounder, lighter, and more buoyant. Clarity is the central virtue of roman: individual letterforms are easily distinguished from each other, as in turn are words, easing a reader's traffic along lines and through pages of poetry or prose.

The romans discussed in this essay brought different concerns to the concept of clarity. They were cut at intervals of about twenty-five years, spanning the entire first century of printing and the experiment with typographic letterforms it inspired. Jenson's roman resides close to calligraphy, and carries with it some of the lightness and grace of the pen. Griffo's roman evinces steel, and is more overtly responsive to the materials and techniques of punchcutting. Colines's romans fuse the features of several typographic styles, and established an international idiom for the letterform. Garamond's polished the result, fully regularizing a roman that had a distinctly typographical identity.

Many have argued that the "incunabula" period or infancy of printing is better understood as comprising one-hundred years, rather than the fewer than fifty that demarcate the period in the older literature. Viewed from this perspective, there is a larger evolutionary process at work in the development of these romans. It is one that connects each of them to the others, and that fully accounts for the movements from a fundamentally calligraphic to an inherently typographic model for the roman, and from regional to international expressions of its form.

The Designer's Role in Facilitating Sustainable Solutions

Daniel Christian Wahl and Seaton Baxter

Introduction

Sustainability is rapidly becoming an issue of critical importance for designers and society as a whole. A complexity of dynamically interrelated ecological, social, cultural, economic, and psychological (awareness) problems interact and converge in the current crisis of our unsustainable civilization. However, in a constantly changing environment, sustainability is not some ultimate endpoint, but instead is a continuous process of learning and adaptation. Designing for sustainability not only requires the redesign of our habits, lifestyles, and practices, but also the way we think about design. Sustainability is a process of coevolution and co-design that involves diverse communities in making flexible and adaptable design decisions on local, regional, and global scales. The transition towards sustainability is about co-creating a human civilization that flourishes within the ecological limits of the planetary life support system.

Design is fundamental to all human activity. At the nexus of values, attitudes, needs, and actions, designers have the potential to act as transdisciplinary integrators and facilitators. The map of value systems and perspectives described by Beck and Cowan[1] as "Spiral Dynamics" can serve as a tool in facilitating "transdisciplinary design dialogue." Such dialogue will help to integrate the multiple perspectives and diverse knowledge base of different disciplines, value systems, and stakeholders. Further expansion of the "integral vision" by Wilber[2] consolidates a framework for understanding, acknowledging, and weaving together different perspectives and worldviews. Esbjörn-Hargens and Brown[3] describe the application of this framework to solving complex problems of local and global relevance, and to sustainable development. When applied to design, this kind of framework can help us to conceptualize how different value systems and different onto-epistemological assumptions change our experience of reality, and therefore intentionality behind design. This change in *why* we design things and processes in turn affects *what* and *how* we design.

Since sustainability requires widespread participation, communities everywhere need to begin to shape local, regional, and global visions of sustainability, and to offer strategies to engage humanity collectively in cooperative processes that will turn visions

1 D. Beck and C.C. Cowan, *Spiral Dynamics: Mastering Values, Leadership, and Change* (Cambridge: Blackwell, 1996).

2 K. Wilber, *A Theory of Everything: An Integral Vision of Business, Politics, Science and Spirituality* (Dublin: Gateway, 2001).

3 S. Esbjörn-Hargens, "Integral Ecology: The *What, Who,* and *How* of Environmental Phenomena" in "World Futures," *Journal of General Evolution* 61:1–2 (2005): 5–49; and B.C. Brown, "Theory and Practice of Integral Sustainable Development (Part 1)," *AQAL Journal of Integral Theory and Practice* 1:2 (2006): 1–39.

(designs) into reality. However, rather than believing that we can design universally applicable blueprints to bring about sustainability by prediction and control-based, top-down engineering, it may be more useful and appropriate to think of the outcome(s) as an emergent property of the complex dynamic system in which we all participate, co-create, and adapt to interdependent biophysical and psycho-social processes. Such a view has enormous consequences for the way we view design. As an integrative and transdisciplinary process, design thinking can inform more integral/holistic solutions that promote the emergence of systemic health and sustainability as properties of the complex dynamic system that contains culture and nature, and of which we are integral participants. This paper is a contribution to the project of rethinking how we think about design in the context of an urgent need for sustainable solutions in the face of uncertainty, turbulence, and rapid change.

Metadesign Shapes, Awareness, and Intentionality

Design can most broadly be defined as the expression of intentionality through interactions and relationships. At the *downstream* end of this process our cultural artifacts, institutions, patterns of production, and consumption express intentionality materially. *Upstream*, in the immaterial dimension, the "metadesign" of our conscious awareness, value systems, worldviews, and aspirations defines the intentionality behind materialized design. Here, the term "metadesign" refers to the concepts and onto-epistemological assumptions we employ to define ourselves, and to make sense of experiencing our participatory involvement in complex ecological, cultural, and social processes. The perspectives of different cultural worldviews, and of different academic and professional disciplines, all are shaped by the metadesign of the intentions, aspirations, and basic assumptions that inform them. Each of these different perspectives generates different specialized knowledge about certain aspects of perceived reality. Appropriate decision-making, within complex eco-social dynamics, requires us to consider insights generated by a diverse range of perspectives and disciplines. Richard Buchanan writes:

> There is no area of contemporary life where design—the plan, project or working hypothesis which constitutes the "intention" in intentional operations—is not a significant factor in shaping human experience. Design even extends into the core of traditional scientific activities, where it is employed to cultivate the subject matters that are the focus of scientific curiosity.[4]

Materially, the intentionality behind design, is expressed through the interactions and relationships formed by consumer products, transport systems, economies, systems of governance, settlement patterns, and resource and energy use, with the complexity of

4 R. Buchanan, "Wicked Problems in Design Thinking" in *The Idea of Design,* V. Margolin and R. Buchanan, eds. (Cambridge, MA: The MIT Press, 1995), 6.

social and ecological processes. *Immaterially,* our organizing ideas, worldviews, and value systems express how we make sense of our experience of reality through metadesign. Transdisciplinary dialogue and collaboration can encourage researchers and practitioners to contextualize and situate their specialist knowledge within a larger holistic/integral meta-perspective that acknowledges the validity and contributions of multiple points of view. Changes in the culturally dominant worldview, value system, and aspirations will lead to fundamental changes in intentionality and lifestyle. Such metadesign-induced changes are catalytic in the transition towards a sustainable human civilization.

In general, sustainable decision-making and design processes must be open to contributions from diverse disciplines and perspectives and, at the same time, they must remain aware of the epistemological and ontological metadesign assumptions that define the perspective of each discipline. There is an important visionary element to design that affects how we experience and shape our environment. "Designers deal with possible worlds and with opinions about what the parts and the whole of the human environment should be." [5]

The transformation towards a more sustainable human civilization requires a process of inclusive and participatory dialogue that ultimately will turn visions of sustainability into reality. This will require the individual and collective participation of everyone. In the face of climate change, national and international inequity, social and ecological disintegration, and rapid resource depletion, nothing less than a societal and civilizational change—without precedence in scale and profundity in the history of our species—is *urgently* required. It has to occur during the next few decades if humanity wants to avoid ecological and social meltdown.

David Orr argues: "The very idea that we need to build a sustainable civilization needs to be invented or rediscovered, then widely disseminated, and put into practice quickly." [6] Design plays a central role in shaping a sustainable civilization. It does so in the material dimensions of product design, architecture, industrial design, and town and regional planning, as well as in the immaterial dimension of the metadesign of concepts and inclusive multi-perspectives from which a holistic/integral worldview can emerge.

Choosing Sustainable Futures by Design

This paper proposes that transdisciplinary design dialogue, guided by the underlying intention to create healthier and more appropriate solutions to the complex challenges of sustainability, can be a powerful tool for societal change. Buchanan calls design thinking the "new liberal art of technological culture" and points towards its potential in integrating the knowledge of the natural, social, and

5 R. Buchanan "Rhetoric, Humanism and Design" in *Discovering Design,* R. Buchanan and V. Margolin, eds. (Chicago, IL: The University of Chicago Press, 1995), 25.

6 D.W. Orr, *The Nature of Design: Ecology, Culture, and Human Intention* (Oxford: Oxford University Press, 2002), 50.

humanistic sciences into adequate solutions to the wicked problems of design.[7] Wahl has suggested that the transition towards a sustainable human presence in the world is *the* wicked problem for design in the twenty-first century.[8]

Based on the work of Horst Rittel in the 1960s, Buchanan proposed that most of the problems faced by designers are "wicked problems," defined by Rittel as "a class of social system problems which are ill-formulated, where the information is confusing, where there are many clients and decision makers with conflicting values, and where the ramifications of the whole system are thoroughly confusing."[9] Basically, wicked problems are real-world problems that acknowledge the complex interdependence of diverse factors and stakeholders, rather than simplistic, linear cause and effect abstractions that isolate the product of design from its context. Wicked problems call for integrated and flexible design solutions that are appropriately adapted to the eco-social complexity of their scale-linking context.

Buchanan argues that the creative power behind design thinking is in "turning to the modality of *impossibility*," and recognizing that the impossible "may actually only be a limitation of imagination that can be overcome by better design thinking." He suggests design thinking in this context is "not thinking directed toward a technological 'quick fix' in hardware but toward new integrations of signs, things, actions, and environment that address the concrete needs and values of human beings in diverse circumstances."[10] Metadesign and design both envision and create the future, just as they often perpetuate past design decisions.

John Wood also stresses the need for designers to engage in cross-disciplinary co-operation and a "professional discourse that acknowledges the complexity of wholeness." He argues that, while engaging in the design of individual products, we simultaneously have to be aware of the kind of "meta-design" these products effect in human culture. What kind of society uses such products and how? Designers "will alternatively need to 'step further back' in order to acknowledge the 'bigger picture,' whilst engaging self-reflexively in the system itself."[11] This process can be facilitated by transdisciplinary design dialogue. Integrative and transdisciplinary design thinking can ensure that our choices are conscious and well-informed by a holistic/integral perspective, rather than hastily forced and based on the limited perspective of a specific discipline.

As *Homo faber*—humans as makers—our material actions, mental constructs, and value systems shape our world and guide our perception of it. Design, when broadly conceived, can help us to integrate the remarkable wealth of specialized knowledge and skill that rests within humanity. Design is fundamentally worldview-dependent. Rittel suggested in 1972: "For every *wicked problem* there is always more than one possible explanation, with explanations depending on the *Weltanschauung* [worldview] of the designer."[12]

7 R. Buchanan, "Wicked Problems in Design Thinking," 3.

8 D. C. Wahl, "Bionics vs. Biomimicry: From Control of Nature to Sustainable Participation in Nature," *Transactions on Ecology and the Environment,* 87: 289–298 (2006).

9 R. Buchanan, "Wicked Problems in Design Thinking," 14.

10 Ibid., 19–20.

11 J. Wood, "(How) Can Designers Enhance Organic Synergy within Complex Systems?" *European Academy of Design Conference Proceedings* (Bremen 2005), Paper No. 96, 1.

12 R. Buchanan, "Wicked Problems in Design Thinking," 14.

Since all design decisions are fundamentally worldview and value-system dependent, a dynamic map of the emergence of progressively more inclusive worldviews in human society could help us to understand past design decisions, as well as provide a way to make future design decisions from a more holistic and inclusive perspective. Through transdisciplinary design dialogue, it will be possible to create engaging local, regional, and global visions of sustainability. Transdisciplinary design dialogue can help humanity to face the intricate complexity of sustainability as *the* wicked problem of design. In a fundamentally unpredictable and constantly changing complex dynamic system there are no guarantees of success. Nevertheless, humanity can—with imagination, humility, and caution—*intend* to choose and materialize *sustainability by design.*

Transdisciplinary Design Dialogue, Spiral Dynamics, and Integral Theory

In a complexly interconnected system, collective and inclusive decision-making is likely to create more sustainable solutions, since it is informed by a broader knowledge base than decisions that are based on the advice of only a single specialist discipline. Transdisciplinary integration, synthesis, and decision-making will require mediation between the perspectives of different stakeholders. "Spiral Dynamics" provides a useful tool to structure transdisciplinary design dialogues, thereby offering a framework for mediation and integration. Dialogue is used here in the sense first proposed by David Bohm,[13] but with a significant distinction. While, for Bohm, dialogue was not goal-oriented, here dialogue is explored as a tool to create more sustainable solutions. Such dialogue draws on the contributions of all the diverse fields of human knowledge. It maintains that different perspectives are not something that should be avoided through dogmatic adherence to a particular set of onto-epistemological assumptions, exemplified by the exclusively reductionistic, dualistic, and materialistic perspective that defines most contemporary science. Rather, dialogue acknowledges the pluralism of perspectives as an expression of the evolution of human consciousness itself. It aims to explore the wisdom of many minds and multiple perspectives. According to Bohm:

> ... dialogue is a multifaceted process, looking well beyond typical notions of conversational parlance and exchange.... Perhaps most importantly, dialogue explores the manner in which thought [viewed by Bohm as an inherently limited medium, rather than an objective representation of reality] is generated and sustained at a collective level. Such an inquiry necessarily calls into question deeply held assumptions regarding culture, meaning and identity. In its deepest

13 D. Bohm, *On Dialogue* (London: Routledge, 1996).

> sense, then, dialogue is an invitation to test the viability of traditional definitions of what it means to be human, and collectively to explore the prospect of an enhanced humanity.[14]

In order to create a sustainable civilization, we have to confront the issue of how different value systems and worldviews are affecting our design solutions and how—at the metadesign level—our material and immaterial design decisions create the culture we live in. The interrelated social and ecological dynamics that link the local, regional, and global scale are now so complex, and humanity has become such a dominating influence on the health and resilience of the complex dynamic system in which we participate, that it now is crucially important to raise widespread awareness of the effects of our actions and attitudes, and to take responsibility for our collective future. This process has to occur simultaneously and cooperatively at a local, regional, and global scale. This is no small challenge, but it is likely to be crucial to the survival of our species.

Graves's map of psychological types and "spiral dynamics" may help us to better understand and acknowledge the valuable contributions offered by varying perspectives and ways of knowing; and Bohmian dialogue offers a participatory process through which we can gain a more holistic perspective. The intention here is to suggest, and begin to demonstrate, that the application of dialogue, spiral dynamics, and integral theory to design thinking and practice make it possible to integrate diverse perspectives into a more inclusive basis for complex decision-making and more sustainable design solutions. The remainder of this paper expands on these ideas.

In 1974, the American psychologist Clare Graves published a paper entitled "Human Nature Prepares for a Momentous Leap" in which he argued that human society is facing a period of fundamental change, "... the most difficult, but at the same time most exciting transition the human race has faced to date." Graves believed that humanity was at the beginning of "... not merely a transition to a new level of existence, but the start of a new movement in the symphony of human history."[15]

After more than a quarter of a century of research into how human beings live, act, engage in decision-making processes, and change as participants of complex systems, Graves provided a dynamic map of the developmental stages of human consciousness, value systems, and worldviews. He described a number of behavioral systems, based on the biological, psychological, and social interactions and relationships that these "biopsychosocial systems" result in.[16] The Gravesian model so far "has been tested in more than fifty thousand people from around the world, and there have been no major exceptions found to the general scheme."[17] Graves himself summarized his model of human development as follows:

14 Ibid., vii

15 D. Beck and C.C. Cowan, *Spiral Dynamics: Mastering Values, Leadership, and Change,* 319.

16 Ibid., 49.

17 K. Wilber, *A Theory of Everything: An Integral Vision of Business, Politics, Science and Spirituality,* 6.

> Briefly what I am proposing is that the psychology of the mature human being is an unfolding, emergent, oscillating spiraling process marked by progressive subordination of older, lower order behavioural systems to newer, higher-order systems as an individual's existential problems change. Each successive stage, wave, or level of existence is a state through which people pass on their way to other states of being. When the human is centralized in one state of existence, he or she has a psychology which is particular to that state. His or her feelings, motivations, ethics and values, biochemistry, degree of neurological activation, learning system, belief system, conception of mental health, ideas to what mental illness is and how it should be treated, conceptions of and preferences for management, education, economics, political theory and practice are all appropriate to that stage.[18]

Don Beck and Christopher Cowan, both former research associates of Clare Graves, then developed the Gravesian model further, changing some of the terminology but little of its content. They suggested that "a spiral vortex best depicts [the] emergence of human systems as they evolve through levels of increasing complexity" and argued that "each upward turn of the spiral marks the awakening of a more elaborate version on top of what already exists." Their dynamic spiral map "consists of a coiled string of value systems, worldviews and mindsets, each the product of its times and conditions." [19] Beck and Cowan proposed:

> The same principles of Spiral Dynamics apply to a single person, an organization, or an entire society. Since it describes human nature in a universal sense rather than through personality types or racial, gender, and ethnic traits, the model provides a common language for grappling with both local and global problems. It offers a unifying framework that makes genuinely holistic thinking and actions possible.[20]

One of the changes in terminology proposed by Beck and Cowan relates to what Graves called "biopsychosocial systems," which they renamed "vMEMEs" as a shorthand for value memes. First described within a limited neo-Darwinian context by Dawkins,[21] Csikszentmihalyi subsequently used the word "meme" (from Greek *mimesis* meaning imitation) as a descriptive term for a unit of cultural information, attitude, or way of thinking that is replicated through cultural tradition and imitation. Csikszentmihalyi defines it as "any permanent pattern of matter or information produced by an act of human intentionality." [22] As such, vMEMEs can be understood as patterns of metadesign that determine *why*, *what*, and *how* we design.

18 Ibid., 5–6.

19 D. Beck and C.C. Cowan, *Spiral Dynamics: Mastering Values, Leadership, and Change,* 29.

20 Ibid., 30.

21 R. Dawkins, *The Selfish Gene* (Oxford: Oxford University Press, 1976).

22 M. Csikszentmihalyi, *The Evolving Self: A Psychology for the Third Millennium* (New York: HarperCollins, 1993), 120.

Beck and Cowan proposed "vMEMEs are so vital they reach across whole groups of people and begin to structure mindsets on their own. [In doing so] they structure the thinking, value systems, political forms, and worldviews of entire civilizations." Each person may operate from the position described by a different vMEME in a different context or situation and various vMEMEs can be active at the same time. The vMEME stacks that are active within an individual are central to our personalities and cause us to form relationships in a certain way.[23] Beck and Cowan explain: "A vMEME transposes itself into a world *view*, a value *system*, a *level* of psychological existence, a belief *structure*, an organizing *principle*, a *way* of thinking, and a *mode* of living."[24] Clearly, vMEMEs are an important influence on how and what we design. They describe patterns of metadesign.

Wilber explains: "[vMEMEs] are not rigid levels but flowing waves, with much overlap and interweaving, resulting in a meshwork or dynamic spiral of consciousness unfolding."[25] He used the work of Graves, Beck, and Cowan to develop the framework of integral theory. Wilber emphasizes that all the memes are potentially available to everyone, and that this redraws the lines of social tension completely, since they no longer are "based on skin colour, economic class, or political clout, but on the type of meme a person is operating from." He stresses the importance of understanding that "the focus is not on types *of* people, but types *in* people."[26]

While new vMEMEs might emerge during the evolution of consciousness, currently, eight basic vMEMEs have been described. In distinguishing these different vMEMEs, the aim is not to sort people into different boxes, but rather to make certain value systems and modes of thinking more intelligible. It is possible to stand at several places on the spiral vortex at once.[27] Each of these biopsychosocial systems has important and appropriate contributions to make, depending on the circumstances. Each level higher up the spiral transcends and includes the attitudes and thought patterns of the preceding levels. Wilber refers to Howard Gardner's idea that "the whole course of human development can be viewed as continuing decline in egocentrism." He suggests that there is an expansion of empathy and identification along the spiral that moves from egocentrism to ethnocentrism to world centrism, as the perspective becomes more encompassing.[28]

Graves pointed out that individuals, companies, and societies alike, "respond positively only to those managerial principles, motivational appeals, educational formulas, and legal or ethical codes that are appropriate to their current level of human existence."[29] This insight has important implications for the practice of transdisciplinary design dialogue aimed at creating more sustainable solutions. The dialogue about transdisciplinary integration and collaboration has to meet participants at their corresponding perspective on the spiral—working with people where they are at, not where you want them to be.

23 D. Beck and C.C. Cowan, *Spiral Dynamics: Mastering Values, Leadership, and Change,* 32.

24 Ibid., 40.

25 K. Wilber, *A Theory of Everything: An Integral Vision of Business, Politics, Science and Spirituality,* 7.

26 Ibid., 6.

27 D. Beck and C.C. Cowan, *Spiral Dynamics: Mastering Values, Leadership, and Change,* 85.

28 K. Wilber, *A Theory of Everything: An Integral Vision of Business, Politics, Science and Spirituality,* 20.

29 D. Beck and C.C. Cowan, *Spiral Dynamics: Mastering Values, Leadership, and Change,* 29.

Table 1 combines the descriptions that Beck, Cowan, and Wilber give to the various levels of human existence first proposed by Graves. The vMEMEs are color-coded in order to facilitate communication about them during processes of transdisciplinary or trans-stakeholder dialogue. The first six levels were described by Graves as the "subsistence levels" of the "first tier," and the yellow and turquoise vMEMEs express an expansion of consciousness into "second tier" thinking. They are referred to as "being levels." [30] (For a detailed description of the different vMEMEs and their application to the consultancy sector, please refer to *Spiral Dynamics—Mastering Values, Leadership, and Change* by Beck and Cowan.)

All the different levels or vMEMEs always will remain a part of the range of human psychological expression and decision-making, since healthy psychological development moves through all of the levels. Wilber emphasizes that only from a second tier perspective can we begin to fully appreciate the existence of the other vMEMEs.[31] The bio-centric or world-centric perspective, and the associated values and ethics that are characteristic of second tier thinking, acknowledge the validity of all of the diverse onto-epistemological assumptions on the spiral, and contextualize them on the basis of their effects on human and planetary health. A global perspective appears to be emerging around the need for, and intention to create, sustainability. From this perspective, "finding what makes living healthier for *Homo sapiens* and other living things is the job to be done." [32] Salutogenic or health-generating design, as a framework for transdisciplinary integration and as a cooperative strategy to move toward sustainability, has recently been explored by Wahl.[33]

The underlying goals and intentions of design solutions based on second tier thinking are the maintenance and improvement of systemic health and the facilitation of healthy and cooperative interactions across the whole spiral of human worldviews and value systems, as well as across all physical and temporal scales of material design. A holistic/integral perspective fosters conscious and responsible design, and metadesign thinking aimed at the creation of healthy societies in healthy environments.

A change in worldview, intention, and lifestyle, facilitated by dialogue and education, may be a far more effective way of problem-solving than the creation of more artifacts and technical fixes. Being unable to shift between the different levels on the spiral and to acknowledge the insights of diverse perspectives are the most common causes of bad design, because we fail to consider the design within the complexity of its material and immaterial context.

As international consultants, Don Beck and Christopher C. Cowan have applied the principles of spiral dynamics to a wide range of situations, from leadership training, community development, large-scale systems transformation, health care, education, and public safety, to management supervision. Beck was critically

30 Ibid., 45–47.

31 Ibid., 12.

32 D. Beck and C.C. Cowan, *Spiral Dynamics: Mastering Values, Leadership, and Change*, 299.

33 D.C. Wahl, "Design for Human and Planetary Health: A Transdisciplinary Approach to Sustainability" in *Management of Natural Resources, Sustainable Development and Ecological Hazards*, Brebbia, Conti, and Tiezzi, eds. (Southampton: WIT Press, 2006), 285–296.

Table 1
The vMEMEs or Biopsychosocial Systems of Spiral Dynamics[34] and Integral Theory.[35]

vMEME (Biopsychosocial System)	Beck & Cowan (Based on Clare Graves)	Wilber (Based on Beck & Cowan)	Occurrence and Influence (after Wilber)	Mode of Thought
BEIGE Subsistence Level 1 First Tier	SurvivalSense: Staying alive through innate sensory equipment.	Archaic-Instinctual: Distinct self is barely awakened or sustained.	Approximately 0.1% of people and 0% of power.	Automatic: The structures are loose bands; the process is survivalistic
PURPLE Subsistence Level 2 First Tier	KinSpirit: Blood relationships and mysticism in a magical and scary world.	Magical-Animistic: Thinking is animistic and kinship or linage establishes political links.	Approximately 10% of people and 1% of power.	Animistic: The structures are tribal; the process will be circular.
RED Subsistence Level 3 First Tier	PowerGods: Enforce power over self, others, and nature through exploitive independence.	PowerGods: First emergence of self distinct from the tribe; powerful, impulsive, ego-centric.	Approximately 20% of people and 5% power.	Egocentric: The structures are empires; the process is exploitative.
BLUE Subsistence Level 4 First Tier	TruthForce: Absolute belief in one right way and obedience to authority.	Mythic Order: Life has meaning, direction, and purpose with outcomes determined by an all-powerful "other" or "order."	Approximately 40% of people and 30% of power.	Absolutistic: The structures are pyramidal; the process is authoritarian.
ORANGE Subsistence Level 5 First Tier	StriveDrive: Possibility thinking focused on making things better for self.	Scientific Achievement: The self "escapes" from the "herd mentality" of BLUE and seeks truth and meaning in individualistic terms.	Approximately 30% of people and 50 % of power.	Multiplistic: The structures are delegative; the process is strategic.
GREEN Subsistence Level 6 First Tier	HumanBond: Well-being of people and building consensus get highest priority.	The Sensitive Self: Permeable Self, relational self, communitarian, ecological sensitivity, networking, pluralistic.	Approximately 10% of people and 15% of power.	Relativistic: The structures are egalitarian; the process is consensual.
YELLOW Being Level 1 Second Tier	FlexFlow: Flexible adaptation to change through connected, big-picture views.	Integrative: Life is a kaleidoscope of natural hierarchies [holarchies], systems and forms. Flexibility, spontaneity, awareness of spirals.	Approximately 1% of people and 5% of power.	Systemic: The structures are interactive; the process is integrative.
TURQUOISE Being Level 2 Second Tier	GlobalView: Attention to whole-earth dynamics and macro-level actions.	Holistic: Unites feeling with knowledge; multiple levels interwoven into one conscious system.	Approximately 0.1% of people and 1% of power.	Holistic: The structures are global; the process is flowing and ecological.

involved in facilitating the post-apartheid reconciliation process in South Africa. As such, spiral dynamics already is a well-tested, effective tool for mediation and metadesign. Beck and Cowan suggest that, in applying spiral dynamics to transdisciplinary and trans-stakeholder mediation and decision-making, we can begin to appreciate chaos and start to think "more like a creative designer than a reengineer. The process links functions, people, and ideas into new, more natural flows that add precision, flexibility, rapid response, humanity, and fun to getting the work done." [36]

Spiral dynamics, Wilber's "integral theory," and their application to the complex ecological and social problems of sustainability in the form of the recently developed approach of "integral ecology" [37, 38] offer informative points of departure for designers intent on acting as transdisciplinary integrators and facilitators in the challenge of creating a more sustainable human civilization.

Brown [39] calls the application of the integral framework to sustainable development "natural design." Baxter [40] and Wahl [41] have both, independently of Brown, used the term "natural design" to describe a fundamental rethinking and expansion of design in the context of ecological awareness and sustainability. Labels and terminological issues aside, apparently they all agree that an application of integral theory and spiral dynamics to processes of decision-making, complex problem solving, and visioning can support designers in their potential role as transdisciplinary integrators and facilitators of more sustainable solutions.

Conclusion

A modified form of Bohmian dialogue offers a way to collectively explore how our thought process reflects which vMEMEs or biopsychosocial systems we employ in approaching a design problem, and how we suggest solutions. Transdisciplinary design dialogue can help to contextualize the contributions that diverse perspectives can make to more inclusive decision-making processes that are informed by a wider knowledge base. Often, problems dissolve if we shift to a different perspective. As we explore different scales of context from the perspectives of different value-systems, we might suddenly reconsider the soundness of the underlying design brief, or begin to question the need for, or purpose of, the design in question.

The solutions to the "wicked problems of design" are more likely to be new processes, lifestyles, and changes in meaning, rather than purely material artifacts. Sustainability is an emergent property of appropriate interactions and relationships among active participants in the complex cultural, social, and ecological processes that constitute life in the twenty-first century. The necessary shift towards more appropriate and sustainable modes of participation requires that design and education contribute to a widespread increase in social and ecological awareness through transdisciplinary design dialogues.

34 Ibid., 41–44.

35 K. Wilber, *A Theory of Everything: An Integral Vision of Business, Politics, Science and Spirituality,* 8–13

36 D. Beck and C.C. Cowan, *Spiral Dynamics: Mastering Values, Leadership, and Change,* 107.

37 S. Esbjörn-Hargens, "Integral Ecology: The *What, Who,* and *How* of Environmental Phenomena."

38 M.E. Zimmerman, "Integral Ecology: A Perspectival Developmental, and Coordinating Approach to Environmental Problems," *World Futures, Journal of General Evolution* 61:1–2 (2005): 50–62.

39 B.C. Brown, "Theory and Practice of Integral Sustainable Development (Part 2)," *AQAL Journal of Integral Theory and Practice* 1:2 (2006): 35.

40 S. Baxter, "Deep Design and the Engineer's Conscience: A Global Primer for Design Education," *Crossing Design Boundaries,* Rodgers, Brodhurst, and Hepburn, eds. (London: Taylor & Francis Group, 2005), 283–287.

41 D.C. Wahl, *Design for Human and Planetary Health: A Holistic/Integral Approach to Complexity and Sustainability* (Ph.D. Thesis, School of Design, University of Dundee, Scotland, 2006).

Sustainable development is a community-based process of coevolution and learning that involves design decisions informed by a holistic/integral perspective. It requires responsible citizens everywhere to become co-designers of our sustainable future. At the same time we have to remain keenly aware of the indeterminacy of final solutions and the unpredictability of the complex, dynamic, and interconnected systems and/or processes in which we participate on a local *and* global scale. Design for sustainability is not about prediction and control, but about appropriate participation, flexibility, and constant learning.

Acknowledgement of the interconnectedness and interdependence of nature and culture, as social constructs *and* ecological realities, shifts the aim of design towards increasing health throughout the whole system. A holistic/integral perspective can help us to "act locally and plan globally, while acting globally and planning locally at the same time." [42]

Sustainability requires the ability of an informed citizenry to engage in the process of continuous lifelong learning through transdisciplinary dialogue. Sustainability depends on the full participation of responsible and informed local communities that meet their needs within the limits of their local ecosystems and the biosphere, thus remaining able to respond and adapt to global and local changes of both nature and culture.

Designers have to become more aware of the power of imagination and visioning at the metadesign level. As facilitators of transdisciplinary integration, designers can help to change culturally dominant worldviews and value systems. In helping to shape the intentionality behind material design, designers can effect changes in life-styles and resource use that will drive the sustainability transition. With a large and influential proportion of humanity arrested in the psychology of the blue and orange MEMEs (see Table 1), our decision-making processes are dominated by the quantity-centered approach of scientific and economic rationalism and materialism. Transdisciplinary design dialogue will help us to incorporate qualitative considerations regarding whole-system health, happiness, well-being, meaning, and quality of life into our decision-making and design processes. Transdisciplinary dialogue about how to design sustainably will help us to integrate the specialist knowledge of diverse disciplines in the search for more meaningful and sustainable solutions.

42 D. Beck and C.C. Cowan, *Spiral Dynamics: Mastering Values, Leadership, and Change,* 13.