48.2 Visible Language

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48.2 Design Research Journal

Special Edition:
Finding Our Way Through Environmental Communication

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Before there was reading there was seeing. Visible Language has been concerned with ideas that help define the unique role and properties of visual communication. A basic premise of the journal has been that created visual form is an autonomous system of expression that must be defined and explored on its own terms. Today more than ever people navigate the world and probe life's meaning through visual language. This journal is devoted to enhancing people's experience through the advancement of research and practice of visual communication.

If you are involved in creating or understanding visual communication in any field, we invite your participation in *Visible Language*. While our scope is broad, our disciplinary application is primarily design. Because sensory experience is foundational in design, research in design is often research in the experience of visual form: how it is made, why it is beautiful, how it functions to help people form meaning. Research from many disciplines sheds light on this experience: neuroscience, cognition, perception, psychology, education, communication, informatics, computer science, library science, linguistics. We welcome articles from these disciplines and more.

Published continuously since 1967, *Visible Language* maintains its policy of having no formal editorial affiliation with any professional organization – this requires the continuing, active cooperation of key investigators and practitioners in all of the disciplines that impinge on the journal's mission as stated above.

cover photography: Patricia Cué

Visible Language journal wishes to thank the following for kindly serving as readers for this special issue on environmental communication.

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Special Edition:
Finding Our Way Through Environmental Communication

CONTENTS

Whether with fingertip, legs, or by vehicle, people navigate dynamic seamless environments. Along the way, volumes of information instantly becomes accessible. Seeking to either play, purchase, learn, socially interact, or wayfind, environmental communication serves all human needs. Whether destinations be physical or virtual, the built environment traversed is increasingly being integrated with immersive and customizing technologies. The human experience is being affected in profound and accelerated ways.

Planning for effective environmental communication has always required holistic thinking, an inclusive design process and empathy for people's spatial narratives. Designing for environmental communication has provided the convergence of several related fields: architecture, landscape architecture, graphic design, industrial design, interaction design, anthropology, and cognitive science. Environmental communication is about building positive human experiences that provide people a sense of place, vital information accessed, comfort in spaces inhabited, and destinations found.

For design curriculum today, how are they adjusting to accommodate and sufficiently prepare students? How shall communication design education develop a necessary knowledge base, new pedagogical methods, more inclusive design process, and elevate human centered priorities? This special issue on environmental communication begins to explore these questions.

Beginning with *Map Design for Complex Architecture*, co-authors, Karen Cheng and Sarah Peréz-Kriz report on the design and testing of a hand-held map helping patients wayfind within a large medical complex. The second article, *The Environment is not in the Head*, Ashley Walton, provides another wayfinding viewpoint. She proposes that static representations of experience (like maps) may fail to capture the interactive idiosyncrasies within specific environments across time and provides an alternative. In *Learning Design by Designing Learning Experiences*, Lisa Fontaine, shares classroom findings where strategic critical thinking skills are developed through the design of interactive museum exhibitions. The last two articles explore the interrelationships between environmental communication and sociocultural elements. With, *On the Wall*, Patricia Cué, analyzes the dynamics that operate behind vernacular design and their capacity of defining the shape and use of public and private spaces. Lastly, *Rebuilding Perceptions,* Andrew Schwanbeck, explores the potential value that environmental communication design can create to help promote and improve perceptions of a neighborhood within a segregated urban landscape.

Hope you enjoy this special issue.

Oscar Fernández


UNIVERSITY OF WASHINGTON DENTAL CLINICS
Underground
Elevator
Stairs
Tunnel
Suggested Route
Parking
Wheelchair Access
Bus Stop
Taxi Stand
Valet Parking
Gatehouse
The Triangle Garage Tunnel leads to the main entrance of the UW Medical Center.
The UW Dental Clinics are located in the B and D wings of the Health Sciences Center.
WHEN ENTERING FROM PACIFIC STREET
YOU WILL BE ON THE 3RD FLOOR.
NE PACIFIC STREET
UNDERGROUND TRIANGLE GARAGE
WASHINGTON HEALTH SCIENCE CENTER
UW MEDICAL CENTER
COLUMBIA ROAD
ST GARAGE
The west ST garage tunnel leads to the B-WING of the UW Health Science Center.
WHEN EXITING ST GARAGE TUNNELS
YOU WILL BE ON LEVEL MINUS 1.
Steps in the ST GARAGE are not wheelchair accessible.
The west ST garage tunnel leads to the BB-WING in the UW Medical Center.
N

Map Design for Complex Architecture:

A User Study of Maps & Wayfinding

Karen Cheng & Sarah Pérez-Kriz

The following study seeks to determine if a printed, paper map can aid visitors in navigating through complex architectural environments. Specifically, we report on the design and testing of two different paper maps intended to help patients find dental clinics and related offices within a large medical and health sciences center. As part of an iterative design process, we first identified a variety of design factors that influence the cognitive aspects of using maps during wayfinding, and redesigned an existing map of the environment based on those principles. We then conducted user testing to further determine what information should be included or excluded on the map and to see if changes in format enhanced or detracted from communication goals. The results show that maps can indeed assist visitors in finding their way through complex buildings, but that there are limitations to their ability to overcome architectural barriers.

Healthcare facilities are often housed in complex, confusing, and difficult to navigate environments. Their spatial problems typically develop over time when existing units are renovated or relocated, or when new wings are built to contain advanced technology and new areas of practice. Unfortunately, given limitations of both time and budget, most medical centers build where they can, with little consideration of the most logical routes for public circulation. As a result, many healthcare facilities are decentralized and disorganized—adding wayfinding difficulties to the burden of patients who are already anxious, pressed for time, and physically impaired.

Ideally the structure of a building itself should facilitate the movement of its occupants. Numerous studies have examined the architectural factors that can influence spatial legibility. Research has shown that wayfinding is facilitated when: locations are visually differentiated (an area or zone looks different from others); travelers can see views inside or outside the structure, including interior, exterior and global landmarks; the floor plan and spatial configuration are simple and regular; and there are fewer decision points and corridor intersections (Best, 1970; McKean, 1972; Passini, 1980; Weisman, 1981; Bronzaft and Dobrow, 1984; Peponis, Zimring and Choi, 1990).

In addition to the architectural factors inherent in a built structure, directional signs and room numbers have been proven to help people find their way (Weisman, 1981). Researchers have determined that people made fewer wrong turns in settings with signage than in those without (O'Neill, 1991), and the presence of signs significantly reduced perceived crowding, discomfort, anger, and confusion amongst visitors to a correctional center (Wener and Kaminoff, 1983).

However, signage alone has not been able to overcome the navigational problems caused by an illegible building (Arthur and Passini, 1992). Similarly, Carpman, Grant and Simmons (1984) found that in a specific hospital corridor, wayfinding performance decreased as the number of signs increased.

Perhaps when signs are not enough, maps might be able to provide the necessary assistance to travelers. In a 1993 study by Wright, Hull and Lickorish, a paper sketch map was given to participants to supplement an inadequate signage system; this map was found to significantly reduce backtracking in a hospital setting. Additionally, maps have proven to be effective in other ways. Subjects who used a schematic map were able to find the most efficient routes to a destination (Bartram, 1980), and handout maps in museums were able to successfully orientate visitors (Hayward and Brydon-Miller, 1984). Furthermore, people view maps as effective and desirable sources of information when traveling to new destinations (Devlin and Bernstein, 1995).

There is significant evidence that maps are a unique mental aid to navigation. Numerous environmental and spatial cognition studies have examined how maps work in the mind, and it is generally accepted that maps can help people to create or develop a spatial mental model known as a "cognitive map."

A cognitive map (as originally defined by Tolman, 1948) is an internal, mental representation of an environment. The term should not be taken as a literal metaphor; cognitive maps often contain errors and are more likely to be coarse, not-to-scale representations of general spatial relations rather than precise, map-like constructs that can be mentally examined at will (Tversky, 1993). Nonetheless, there is broad agreement on the three types of spatial knowledge that are the basis of a cognitive map: landmark knowledge, route knowledge, and survey knowledge (Siegel and White, 1975).

Landmark knowledge allows people to determine where they are by using natural or man-made features that are easy to see and recognize (for example, a building, monument, lake, etc.) Route knowledge is the next level of understanding when landmarks can be mentally connected into a sequence (for example, "turn left at the church and go past the cemetery until you see the lake.") Survey knowledge is the highest form of spatial cognition when a combined understanding of how landmarks and routes are connected enables individuals to infer new paths they have not previously traveled (such as shortcuts and detours). Survey-level knowledge is often described as the ability to envision an environment from a bird's-eye view—the vantage point of most cartographic maps.

Given the unique characteristics of maps, the following study seeks to determine if a printed, paper map can aid visitors in navigating through a large, complex medical center. From a financial point of view, the design, production, and distribution of a paper-based map represents a significant cost savings when compared to the revision of physical signs or alterations in the built environment.

A paper map can easily be mailed to patients prior to their appointment or downloaded online and printed at home. Travelers can use the map to plan their trip in a relatively calm and unhurried manner, perhaps with the assistance of family or friends who will accompany them. Paper maps are portable, and can be consulted en-route, reducing the need for users to memorize a lengthy sequence of actions. A paper map can even be highlighted and annotated by the patient or healthcare staff to clarify or provide specific directions.

However, although paper maps offer the advantages described above, it may be overly optimistic to assume that a single building map, no matter how well designed, can eliminate the navigation errors that stem from architectural barriers. Maps are a single component of an integrated program

of wayfinding. An effective wayfinding system should take advantage of multiple elements that reinforce one another—including building maps, floor plans, signs, information desks, and in-person volunteer guides/escorts. Additionally, maps are not equally helpful to all travelers, because map reading is an acquired skill that varies in the population (as summarized by Carlson, Hölscher, Shipley, and Dalton, 2010), and may be declining due to the increased use of GPS devices (Klippel, Hirtle, and Davies, 2010).

THE RESEARCH SETTING

To investigate the potential benefits and limitations of handout maps in assisting visitor navigation in a complex building, we examined two different paper maps intended to help patients find dental clinics and related offices within a large medical and health sciences complex at the University of Washington.

The dental clinics are located within the single largest university building in the United States, the Magnuson Health Sciences Building—a complex with a total floor area of approximately 5,740,000 square feet. The building houses the University of Washington Medical Center, a teaching hospital, and five academic units—the School of Dentistry, School of Medicine, School of Nursing, School of Pharmacy, and School of Public Health.

Due to its large size and complexity, the building is difficult for visitors to navigate. There are more than 20 wings that were built during a period of over 50 years. When additions were made, administrators opted to fully connect all interior hallways, resulting in an irregular, asymmetric configuration—a spatial form known to present wayfinding difficulties.

The building complex is generally divided into two zones—the hospital (the University of Washington Medical Center) and the academic area. Both of these zones are further subdivided into a series of wings. The hospital names their wings with double letters (such as AA, BB, CC, etc.), while the academic units use single letters (A, B, C, etc.). Letter sequences do not necessarily follow alphabetical order—for example, the T-Wing stands for the "Teaching Wing" and the RR-Wing indicates the "Research Wing." Additionally, some wings are named after compass directions—for example, in the hospital, the NE-Wing is the name of the "North East Wing."

The building does not have a unified signage program. There are three sets of signs that dental patients must sift through in order to find their way. The first signs seen by most dental patients are for the hospital because the majority of visitors enter the building through the main hospital entrance. The hospital signs are, in general, well designed; they are typographically legible, visually consistent, logically placed, and properly maintained. However, the

hospital signs do not include information about the dental clinics because the dental clinics are not officially part of the hospital but instead are managed by the School of Dentistry, an academic unit.

Therefore, in order to guide dental patients and other academic visitors through the hospital, an additional set of signs with a competing visual identity has been designed and installed. These signs tend to be located in somewhat out-of-the-way positions because more prominent areas are taken up with official hospital signage.

As patients pass through the hospital and move toward the dental clinics, the secondary set of signs disappears, and a third signage system emerges. This last set of signs is part of an older system that is used by all academic units in the building, including the dental clinics and the School of Dentistry. These older signs are less well maintained and their positioning is, at times, questionable. In places the text within the signage system is inconsistent (for example, a covered exterior path is labeled as an "outdoor walkway" on the second floor, but as a "bridge" on the third floor).

The administrators of the School of Dentistry have consistently received complaints from patients who have difficulties navigating to the dental clinics. Therefore, in 2011 the School of Dentistry commissioned our design team to develop a new building map. This new map would replace an existing map (*figure 1*, next page) that they felt was too cluttered and too complex. Additionally, staff members believed that the current map did not adequately help visitors to understand: 1) that the building is organized in a series of wings; 2) that the dental clinics are located in the B-Wing and D-Wing; and 3) that the building is built on a sloped site, with the entry floor on Level 3.

Research studies from several fields (including environmental and spatial psychology, cognitive psychology, human geography, architecture and urban planning) provide some guidance for how to best construct a map that facilitates wayfinding. The following considerations governed our initial choices for both the form and content for new dental clinic map addressing the concerns identified above (*figure 2*, next page).

Figure 1: Original Map (double-sided 8.5" x 11")

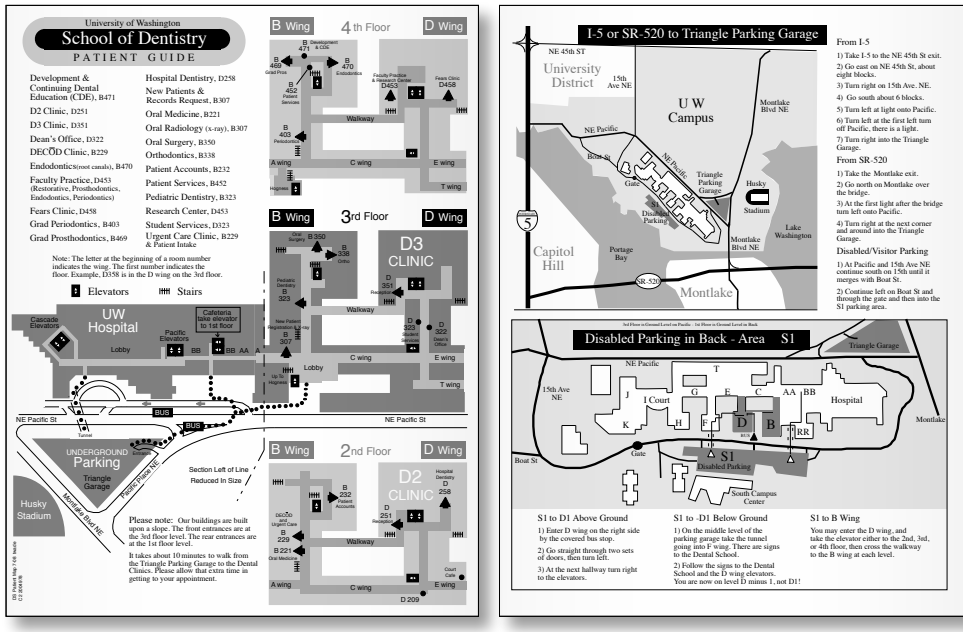
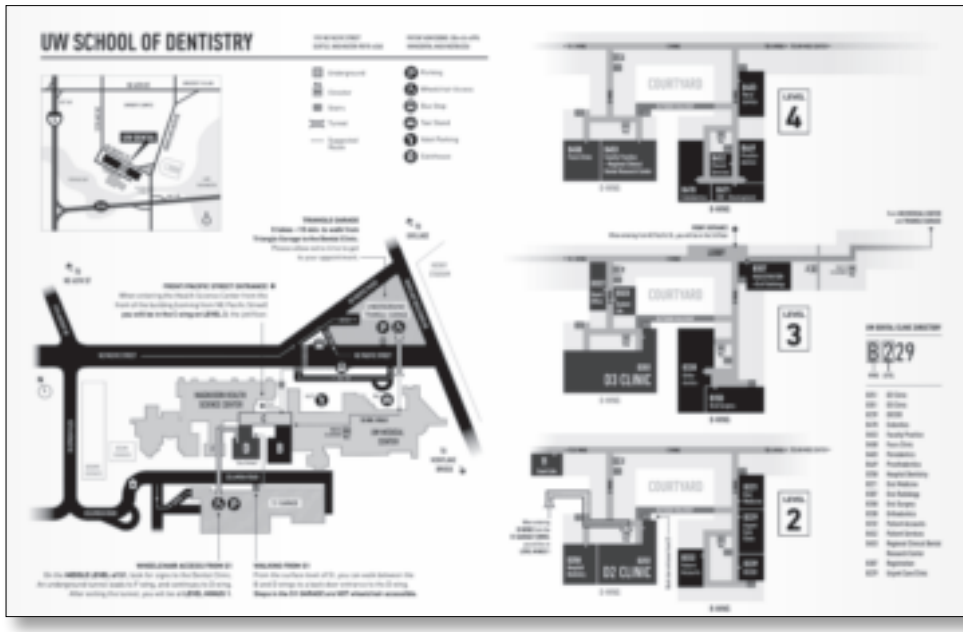


Figure 2: First Revision Map (single-sided 11" x 17")



1___Reducing Visual Clutter

Typographers and legibility researchers generally agree that "white space" aids in the readability of documents. Surrounding certain elements with negative space helps to establish a visual hierarchy of information where the reader's eye is directed to specific information in a logical sequence. White space can be also be used to lessen the density of large blocks of text, which makes long passages less intimidating to readers and easier to scan.

In order to recover white space from the original map, we replaced text with symbols wherever possible because icons generally take up less space than their corresponding words.

We selected the symbols designed by the AIGA (American Institute of Graphic Arts) for the US Department of Transportation in 1974–79, a system widely used both nationally and internationally and likely to be familiar to dental patients.

Figure 1 (left top)
The original map for patients of the University of Washington Dental Clinics. The map measures 8.5"x11," and is offset printed in two colors on both sides. Administrators felt that the original map was too cluttered and too complex, and that the map did not adequately help visitors to understand: 1) that the building is organized in a series of wings; 2) that the dental clinics are located in the B-Wing and D-Wing; and 3) that the building is built on a sloped site, with the entry floor on Level 3.

Figure 2 (left bottom)
Initial redesign of the dental clinic map. The map is 11"x17," and is offset printed in two colors on one-side. We increased white space on the map by replacing text with symbols, and by reducing overall information density. We also attempted to clarify the wing system by introducing a simplified building diagram with color-coding (offices in the D-Wing are shown in blue, while those in the B-Wing are in black).

2___Reducing Information Density

To simplify a map, designers must consider how much information to include. The concepts of "route knowledge" and "survey knowledge" described earlier can be used to define the poles of an information continuum. A minimalist approach involves designing a "route map," which shows only the relevant landmarks and the path segments that connect them. A maximalist approach favors the design of a "survey map," which provides a broad overview of an environment by depicting all information in a selected area.

The main advantage of a route map is the direct focus on the path to be taken. Each decision point on the route can be shown clearly, with turn-by-turn instructions. Because route maps are simplified in form and content, providing only the smallest possible set of information that is needed for people to find their way, they require relatively low cognitive effort—they are easy to understand and use.

However, route maps have a significant disadvantage. If a person using a route map deviates from the path by mistake, there is no information to help them re-orientate and get back on the route because this style of map does not show the surrounding environment. Therefore, once the travelers are off the route, they are lost.

The alternative to a route map is a survey map, which does show an entire environment in detail. The broader scope of a survey map makes it more efficient than route map because the same survey map can show multiple routes (a single survey map can direct many individuals who come from different origins to different endpoints).

In principle, survey maps should enable a better understanding of a place than route maps; a viewer builds survey knowledge by seeing routes in the context of their larger surroundings. However, researchers believe there are limits to how much graphic information can be absorbed from a map. Once a critical point of visual density has been reached, comprehension may decline (Dobson, 1980). This is the main disadvantage of survey maps—extracting, understanding and keeping track of a route within a dense and visually cluttered map can be cognitively demanding (Phillips, 1979; Rosenholtz, Li, and Nakano, 2007).

In the design of the new dental clinic map, our goal was to compromise and create a hybrid "schematic map" that would blend the two map archetypes described above. Schematic maps are simplified versions of survey maps that may distort certain spatial characteristics in order to emphasize and clarify specific aspects of a route and its environment. In this case, we hoped to focus attention on a central route that begins at the patient parking garage and continues through the hospital toward the dental registration office (typically the first destination for new patients). Several additional destinations would need to be shown on the map (such as specific clinics, patient services, etc.), but these would be subordinate in importance.

3___Communicating the Wing System

To facilitate the understanding of building's wing system and to clarify the location of the dental clinics, we created a simplified building diagram that highlighted the position of the B and D-wings. Because the map is offset printed in two colors, we were able to color-code these spaces (offices in the B-wing were shown in black, while those in the D-wing were shown in blue).

We wanted viewers to progress from this simplified diagram to a more detailed floor plan that showed the locations of all dental facilities on three floors. By first showing the simplified diagram, we hoped for a controlled, progressive disclosure of information that would avoid overwhelming the navigator. This strategy follows the broader psychological phenomenon of "chunking," where limits on the human capacity for processing information are extended by grouping similar items together in a "chunk" (Miller, 1956). The technique also makes sense given that people have been shown to mentally divide maps for "conquering"—by partitioning a map into sections, learners create manageable "chunks" that can be further examined individually for more information (Thorndyke and Stasz, 1980).

To encourage users to view the simple and detailed diagrams in a linear sequence, we placed them side-by-side. This composition required revising the original, double-sided 8.5x11" format to a single-sided tabloid sheet (11x17"). We were concerned that patients would find this tabloid map awkward to hold; we tried to alleviate this issue by folding the map in half

to letter size, and positioning elements around the fold. We anticipated that this larger format could be printed at home on letter size paper by using "shrink to fit."

To further clarify the wing system, we also created a small diagram that explained the room numbering scheme used in the building. We hoped that this diagram would be easier to scan and understand than the explanatory text caption currently used on the original map.

4___Communicating Floor Levels

Because the building is constructed on a sloped site, visitors entering from the front-facing street arrive on Level 3. At the back of building, street level entrances are on Level 2.

On the original map, the text label identifying the 3rd Floor is relatively small and easily overlooked. On the new map, we enlarged all floor labels and emphasized them via enclosure in a ruled box.

DESIGN DECISIONS REQUIRING USER TESTING

In any design project, there are questions that can only be answered through empirical evaluation. In this case, we hoped to resolve the following issues in map content by observing individuals using a map to perform wayfinding tasks in the actual environment.

1___Entry Points

It would be helpful to know which entrances to include and/or emphasize on the new map. There are three main entrances that could be used by visitors: a hospital entrance, an academic entrance, and an intermediate wing entrance. Staff members suspect that the hospital entrance is the most popular, and that the intermediate wing entrance is not used by visitors. However, the administration had no data to confirm this assumption.

2___Landmarks

In a five-year study of three American cities, urban planner Kevin Lynch found that people understand their environment through five elements: paths, edges, nodes, districts, and landmarks (Lynch, 1960). All of these elements are typically visualized on maps, but the last element, landmarks, is particularly important when navigating with maps.

A number of studies (as summarized by Davies and Peebles, 2007) suggest that people prefer to use a landmark strategy when using a map. Specifically, to orient themselves, travelers look for conspicuous landmarks in the environment that can be matched to visual representations on the map. In fact, this procedure is recommended by several instructional guides on "how

to use a map" such as the *Boy Scout Handbook* (2009). Therefore, to design a successful map, one must include the landmarks that people are likely to notice.

Certain features of our particular setting provide obvious and effective landmarks, but unfortunately, this building (and many other health care settings) consists mainly of long, featureless corridors. In such an environment, empirical evaluation may help to determine what objects or structures travelers use as landmarks.

3___Off-Route Information

It is not clear how much information should be included on the new map to help travelers who make wrong turns at decision points. Extensive context might be necessary to help them re-orientate and recover from mistakes—but adding excess detail may complicate and clutter the map.

Researchers, cartographers and design practitioners (Arnheim, 1976; Southworth and Southworth, 1982; Tufte , 1983; Arthur and Passini, 1992) generally suggest that maps should be as simple as possible to avoid cognitive overload. However, this advice fails to address the specifics of content inclusion in this particular context.

TEST PROCEDURE

To better understand how paper maps are used during wayfinding in a complex building and to answer specific questions regarding content inclusion on a patient map, our team recruited 24 paid adult volunteers who were unfamiliar with the building and its surrounding area. Participants were met by a researcher at a campus café and escorted to the pedestrian tunnel in the main parking garage of the medical center. Here participants were asked to wear a head-mounted camera that would record video from their lines of sight.

Using a head-mounted camera to capture user behavior was a novel aspect of this study. The camera tracked participants' gazes and visual focuses as they navigated through the environment, allowing the research team to analyze how and when participants consulted the map and environmental signage during their wayfinding experiences. Additionally, the head-mounted camera allowed the participants to navigate through the environment independently, without having to be accompanied or followed by an observer.

After helping the participants put on the camera, the researcher gave the participants a dental clinic map. Twelve participants received the original map, and twelve participants received the revised map.

Each participant was then asked to independently proceed from the parking tunnel to the Dental Registration Office (B-307). At the entrance to the Dental Registration Office, the participant was greeted by a second member of the research team. This second researcher then asked the participant to walk to the D-2 Dental Clinic. The researcher provided verbal directions that were considered typical from a script that was written by the Director of the Dental Patient Registration Office .

After participants reached the D-2 Dental Clinic, the researcher escorted them to a nearby waiting area, and asked them to complete a questionnaire that: 1) rated their familiarity with the building and area prior to the experiment; 2) rated their overall sense of being lost during the experiment; 3) estimated their overall sense of direction (based on the Santa Barbara Sense of Direction Scale, as developed by Hegarty, Richardson, Motello, Lovelace, and Subbiah, 2002), 4) rated the map that they received; and 5) provided demographic information.

After completing the questionnaire, participants were asked to look at their map again and draw the two routes that they had traveled on the map (from the parking garage to the Dental Registration Office and from the Dental Registration Office to the D-2 Dental Clinic). Participants were also asked if there was anything that they would change about the map and if they had any suggestions for improving the map.

The recorded video from each participant was analyzed and coded to determine the frequency and length of time that each participant looked at either the map or a sign. Gazes had to last at least two seconds in order to be coded. Timestamps on the video were used to calculate the duration of each gaze. The total travel time for each route was also calculated from the video timestamps, as well as the duration of errors and stops.

PARTICIPANT DEMOGRAPHICS

Twelve participants received the original map, and twelve participants received the revised map. The age range of those who received the original map was 21–54, with a mean age of 28; this group contained four men and eight women. The age range of those who received the revised map was 18–59, with a mean age of 30; this group contained two men and ten women.

On a scale of 1-7 (with higher scores indicating a better sense of direction), those who received the original map had a mean score of 5.0; those who received the revised map had a mean score of 4.2. Neither group was familiar with the building or area prior to the experiment. The group that received the original map had a mean score of 1.0 (on a scale of 1-7, with 1 being "Not Familiar" and 7 being "Very Familiar"). The group with the revised map had a

mean score of 1.5 for familiarity. Statistical testing revealed no significant differences between the two groups in terms of age, gender, sense of direction, or building familiarity.

RESULTS

All participants were able to reach the two target destinations (the Dental Registration Office and the D-2 Clinic). However, 22 of the 24 participants experienced navigation difficulties during the course of the experiment, stemming from omissions of content in the map, architectural barriers, illogical site organization, and inadequate signage, as described below.

No significant differences were found between the two groups of map users. Specifically, there was no statistical difference between participants who used the original or revised map in terms of their overall time to the destinations, the number or length of wayfinding errors, the number or length of pauses en-route, or overall satisfaction ratings of the map. Given these results, our discussion will focus on the general wayfinding behaviors observed in the study and the issues of content inclusion, with map type noted where relevant.

1___Building Entrances

As described earlier, there are three main entrances to the building complex: an entrance to the hospital, an entrance to the academic area, and an intermediate entrance between the other two, which leads to the BB-Wing (*figures 3A* and *3B*).

The hospital entrance is the most popular; 16 out of 24 participants (67%) used this entrance. The remaining eight participants were equally divided between the academic entrance and the intermediate BB-Wing entrance (each of these entrances were used by four participants, or 17% of the test group). These eight participants were all individuals who had chosen to exit the parking garage and continue on foot via the surface street. They later explained that they wished to avoid navigating inside the building complex; they thought it would be easier to avoid getting lost if they followed a street that runs parallel to the medical complex.

Unfortunately, on the new map we had removed the label to the intermediate BB-wing entrance because staff members believed that it was rarely used by visitors. As shown by the behavioral data, this assumption was not true. Although stakeholder input and opinions can serve as a valuable source of information, assumptions can sometimes be false. The wayfinding results underscore the importance of using a combination of user opinions and behavioral studies to determine how a space is actually used.

Figure 3A
The intermediate BB-Wing entrance.

Figure 3B
The first crosswalk by the main parking garage leads into the entrance to the BB-Wing. The academic entrance is not visible from this crosswalk.

All of the walking participants who had the original map used the BB-Wing entrance—possibly because this entrance is located directly opposite the main crosswalk near the parking garage. Participants did not continue towards the third academic entrance—perhaps because this entrance is set back from the street, and the building sign is not clearly visible from the crosswalk.

However, three out of four of the walking participants with new map did use the academic entrance. The remaining participant used the BB-Wing entrance. However, because the BB-Wing entrance was not shown on her map, she was confused and deliberated for ~1 minute before entry.

Similarly, of the three participants with the new map who used the academic entrance, there was one individual who first navigated to the BB-Wing entrance. This participant traversed the area for ~4 minutes due to uncertainty regarding her location. She eventually backtracked to the original crosswalk area and traveled to the academic entrance.

Clearly, in future iterations of the map, we need to include the BB-Wing entrance. This entrance also seems likely to be popular with patients who arrive by bus, or use the valet parking service since the entrance is closest to the bus stop and valet station.

2___Environmental Assumptions

Most people assume that when entering a building, they are arriving on the first floor, or Level 1. However, as described earlier, because this complex is built on a sloped site, participants entering from the street level arrive on Level 3 (at front of the building) or Level 2 (at the back of building). Level 1 is the lowest (basement) level on the hospital side of the complex. On the academic side, there are two additional lower levels, and these floors are designated as Levels "-1" and "-2."

Shortly after entering the building, four participants tried to take an elevator to Level 3. Two additional participants tried to use stairwells. Therefore, 25% of all participants (six out of 24) were not aware of the floor numbering system, despite floor number labeling on the maps. The six test participants who made these errors were evenly divided between those who had the original map, and those who had the revised map.

Three of the participants did not seem particularly stressed by their floor level error, perhaps because the time lost was relatively minimal (26 seconds spent climbing stairs and 7-35 seconds spent waiting for an elevator, entering the elevator, pushing a floor button, then exiting the elevator after realizing the mistake). The fourth participant seemed more irritated, possibly because she had spent longer (~2 minutes) repeatedly traversing stairs between Levels 1–3. Of course, such incidents may be more upsetting to actual patients, who are often pressed for time, anxious about upcoming procedures, and/or experiencing physical discomfort, as opposed to paid volunteer study participants.

For similar buildings constructed on a grade, Arthur and Passini have recommended the terms "Level 1" for the ground level, and "1 Below" and "2 Below" for basement levels (Arthur and Passini, 1992). A different solution was verified by a research study conducted at the University of Michigan General Hospital (Carpman, Reizenstein, Grant, and Simmons, 1983), where five floor-numbering options were tested with patients and visitors. In this study, the terms "Sub 1" and "Sub 2" were interpreted correctly most often.

To improve wayfinding, these or other naming options could be evaluated for this building. At minimum, perhaps the term "Minus" should be spelled out, because the negative sign is relatively small and easily missed.

It is possible that floor level information can be made more prominent on future design iterations of the map. However, this information may continue to be overlooked because people have strong pre-existing assumptions about floor levels based on their previous experiences in other buildings.

Figure 4A
To reach the dental clinics, patients must walk through an enclosed area that contains a set of elevators. From the main hallway, the enclosure appears to be a dead end.

3___Architectural Barriers

There are several areas in the building where the architecture is in conflict with the desired wayfinding behavior. For example, when entering from the main hospital entrance, visitors need to walk through a small enclosure in order to continue towards the dental clinics. This enclosure contains a set of elevators (the Pacific Elevators). However, from the main route, the enclosure appears to be a dead end—the opening to the subsequent hallway is not visible from the outside (*figures 4A* and *4B*).

Six participants (25% of all participants passing through this area) stopped or paused at this decision point and consulted their map. Two participants had the original map, and four participants had the revised map. Of the six participants who hesitated, five participants eventually proceeded through the enclosure (after 3-27 seconds of deliberation).

The remaining participant also paused at the decision point but made a wrong turn that continued into the maternity area of the hospital. In the maternity ward, the participant searched her map (neither map shows the maternity department) and decided to backtrack to the original position outside of the elevator enclosure. Back at the decision point, she again deliberated before correctly passing through. The participant spent approximately three minutes on this error loop.

In a similar fashion, outdoor walkways (*figure 5*) were also problematic for seven out of ten participants. The short hallway that leads to the walkway is small and easily overlooked, as evidenced by the six participants who missed the turning point and had to backtrack. In addition to those who missed the turn, there were two participants who reached the walkway door but did not go through. One participant turned away from the door immediately; the other participant looked through a small window set in the door before turning away. Several staff members later explained that

Figure 4B
Once inside the enclosed area, travelers can see the subsequent hallway that was not visible from the main hallway.

visitors often perceive these walkway doors to be locked or alarmed exits. This seems to be a common misapprehension, as several of these metal walkway doors have ad-hoc, occupant-created signs that state: "This door is NOT alarmed" and "This door does NOT lock behind you." Of the seven participants with walkway door issues, three had the original map, and four had the new map.

The problems described above occur because the architecture discourages users from the correct wayfinding behavior. It is also possible for the built environment to encourage an incorrect navigational response. For example, the main academic entrance opens into a lobby and waiting area with a highly visible staircase (*figure 6*) that leads to a single location—an auditorium used for special events. One test participant attempted to use this staircase to reach other areas of the building, despite passing a posted sign that states "To auditorium only."

In future iterations of the map, we need to include the location of the maternity ward, as it is a destination that is commonly reached by users. It also seems that neither map adequately shows the way through these architectural barriers (the elevator enclosure, the walkway doors and the auditorium stairs). We may be able to better explain the architectural elements by annotating the map with adjacent text. However, each annotation adds clutter and visual noise to what is already a complex layout.

4___Preference for Straight Routes

Participants who used the intermediate entrance—the entrance that leads to the BB-Wing—made a fairly consistent error. Instead of turning right towards the A-Wing and the first wayfinding target, the Dental Registration Office, three of the four participants (75%) continued traveling straight down into the RR-Wing (*figure 7*, next page).

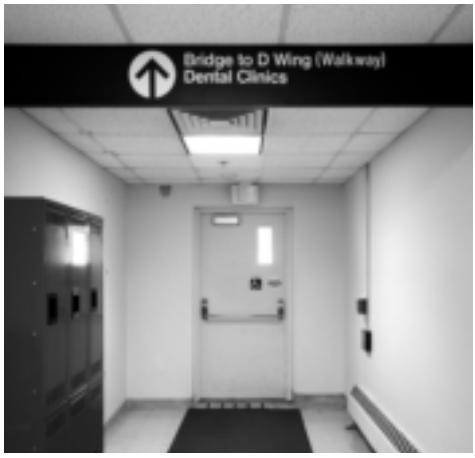
In the RR-Wing, these three participants searched their map (All three participants had the original map, which did not show the RR-Wing). There they deliberated for some time before backtracking to the original BB-Wing entrance and deciding to move down the correct path. This error loop consumed 33 seconds to ~2 minutes.

Interestingly, none of the other participants who reached this same decision point made the same error. When using the hospital entrance, participants must pass by the BB-Wing entrance on their way to the Dental Registration Office. Of the 16 participants who used the hospital entrance, none made a wrong left turn down to the RR-Wing.

A similar preference for straight routes was observed during the second wayfinding task, when participants were asked to navigate from the Dental Registration Office to the D-2 Clinic. Participants were directed by the research associate to make an immediate left into the B-Wing. (Signage also instructs visitors to travel down the B-Wing to reach the D-2 Clinic). However, half of the 20 participants who had been traveling straight (from the Hospital and BB-Wing entrances) ignored these directions and proceeded straight ahead into the C-Wing. Of the ten participants who moved straight into the C-Wing, six had the original map, and four had the revised map.

Figure 5 *bottom left*
Visitors often perceive the doors to the walkways to be locked or alarmed exits.

Figure 6 *bottom right*
The main academic entrance opens into a lobby and waiting area with a highly visible staircase. This staircase leads to a single location—an auditorium used for special events.



Based on this analysis, the map should be modified to include the RR-Wing since this is a common error destination. It is less clear how the map could be revised to prevent travelers from continuing straight and missing turns. It may be necessary to instead alter signage or the environment to make entrances to A-Wing and B-Wing more prominent.

Figure 7
Three participants (75%) who used the intermediate BB-Wing entrance continued straight down into the RR Wing. These travelers missed the secondary set of signs to the dental clinics posted by the elevators.

5___Room Numbering

For the four participants who used the academic entrance, a preference for straight routes should have neatly aligned with the initial wayfinding task. The first target destination (the Dental Patient Registration Office) is located in the B-Wing, and the entrance to the B-Wing is straight-ahead and visible from the academic entrance.

However, there is an addressing problem with the Dental Patient Registration Office, which is situated at the corner of A-Wing and B-Wing. The office has two doors; the address that patients are directed to (B-307, in the B-Wing) is permanently locked and no longer in use, and instead, the second door in the A-Wing serves as the main office entrance. The administrators have not provided the A-Wing door with a room number, although there are overhead text signs that point to this second door location.

Unsurprisingly, this addressing issue caused problems for two of the four participants who used the academic entrance. Upon entry, these two participants, both with the new map, proceeded straight down into the B-Wing. There, they spent 1-3 minutes traversing the wing (and trying the locked door to B-307) before deciding to backtrack to the entrance. After scanning the lobby area a second time, they discovered the signs that point to the office door in the A-Wing.

The location of B-307 was not an issue for participants who used the hospital and intermediate BB-Wing entrances, because these participants pass through the A-Wing on their way to the B-Wing. The office door in the A-Wing is visually prominent; if participants are passing through, they are unlikely to miss the office (*figure 8*).

Figure 8
The main office door to B-307 is visually prominent. However, the door is located in the A-Wing rather than the B-Wing.

It is not clear how the map could be altered to prevent the confusion caused by the existing naming scheme. Instead, we recommend that all room numbers be made consistent with their actual location.

6___Wing Names

Three participants (one with the original map, and two with new map) spent time backtracking in the BB-Wing, because they failed to distinguish between the B-Wing and the BB-Wing. This appears to be a common problem because the door to BB-306 is posted with occupant-created signs that direct dental patients to B-307. These unofficial signs are clear evidence of wayfinding failure.

We are unable to envision how the map could be altered to avoid confusion between wing names with the same letters (i.e., A-Wing/AA-Wing, B-Wing/BB-Wing, etc.). Instead, it may be desirable to give wings more distinctive and memorable names. Designer Paul Mijksenaar has discussed the similar problem of coding floors in car parks; he admires a system that exists at Disneyland, where floors are named after Disney characters, such as Pluto, Mickey Mouse, etc. The floor names are further reinforced in the environment by the use of character illustrations as wall graphics (Kinross, 1993).

7___Route/Wing Selection

During the second half of the test, while navigating from the Patient Registration Office to the D-2 Clinic, five participants (21%) selected the wrong wing at a decision point—a wing that led away from their desired destination. These errors all occurred on Level 2, after the participant had walked down one set of stairs from Level 3 (the entry floor).

Specifically, at the intersection of the C-Wing, D-Wing, and E-Wing, three participants continued straight ahead to the E-Wing (instead of turning left to the D-Wing). As described earlier, this error may be the result of a preference for straight routes. Two of these participants had the original map, and one had the revised map.

The other two errors are more difficult to explain. One participant made a wrong turn after going down the B2 stairwell, where it is possible to go left (correct) or right (a dead end). The other participant made an incorrect right turn at the intersection of the C-Wing, B-Wing, and A-Wing—and traveled back towards the hospital, rather than to the D-2 Dental Clinic.

Before making these errors, neither participant looked at their maps for a substantive length of time (both participants had the original map). The first participant looked at the map for seven seconds as he began the second route, then glanced at the map for two seconds while descending the stairs. The second participant is remarkable for not looking at the map at all during the entire experiment (he relied completely on signage).

There are several possible explanations for these wrong turns. Participants may have become disorientated after traveling down one level—research studies have shown that level changes can negatively impact navigation (Hölscher, Meilinger, Vrachliotis, Brösamle, and Knauff, 2006). Alternatively, it is possible that their route choice could be the result of a preference for right-hand turns—a number of studies have found a rightward turning bias in pedestrian behavior (as described by Bitgood and Dukes, 2006). In either case, it is not clear how the map could be modified to prevent these errors.

8___Map Orientation & Alignment

Two of the participants with the revised map made a wrong turn upon entry to the hospital (both of these participants missed the secondary set of signs to the dental clinic). Instead of turning right towards the dental clinics, they turned left and traveled deeper into the hospital area. One participant corrected his route after reaching the hospital elevators. The other participant traversed several hospital areas (including the hospital elevators, the hospital information desk and the hospital pharmacy) before self-correcting. These error locations were noted for inclusion in future map iterations (none of these hospital facilities were shown on the new map being tested).

The initial wrong turn of these two participants could be the result of the map alignment errors. The original map had a "forward-up" orientation from the parking garage. Dental staff felt this orientation was incorrect, since this configuration places South at the top of the map, counter to the "North-Up" convention that is standard in most modern-day maps. Therefore, administrators requested that the revised map be "North-Up" even though several studies of fixed "You-Are-Here" (YAH) maps (Levine, 1982, and Levine, Marchon, and Hanley, 1984) have shown that people make significantly fewer errors when their map is aligned to be "forward-up"—when the map directly corresponds to the traveler (i.e., left and right on the map are also left and right for the traveler).

Of course, unlike a fixed wall-mounted YAH map, a hand-held map can be freely rotated in any direction. The only indication of the "correct" orientation is the positioning of text labels. It is not certain if aligning the main route and text labels in a forward-up orientation on a hand-held map will necessarily facilitate better wayfinding, especially considering the violation of the classic North-up convention in this particular circumstance. However, both participants were observed examining their maps prior to making the wrong turn, and neither had rotated the map to match their forward movement. Also, this wrong turn error did not occur for any of the original map participants, who had the forward-up orientation.

Perhaps one solution to a possible orientation problem is to install wall mounted YAH maps at key decision points, such as the hospital entrance. While there are a few wall-mounted YAH maps in the wings where the dental clinics are located, these YAH maps only indicate position, not alignment. Additionally, these YAH maps vary widely in style and content. It would be desirable for all building maps and hand-held maps to be part of a unified system, so that patients can more easily relate the map that they receive and study in advance of their appointment to maps that identify their position and orientation in the actual environment.

9___Map Size

One of the twelve participants who received the new map failed to notice that the map was folded, and could be extended to a tabloid (11x17") format. Therefore, the participant navigated during the test using only the basic building overview—she did not view or use the area that shows the B-Wing and D-Wing in greater detail with specific dental clinics and offices.

There are a few possible explanations for this occurrence. People may not normally receive tabloid size documents, so it may not be immediately obvious to unfold the map. It is also possible that the participant focused on the first side of the map immediately after receiving it because it allowed her to see her initial starting point. Researchers have hypothesized that

travelers mentally divide their route into sub-segments that are bounded by landmarks or areas of relative familiarity (Tverksy, 1992). The first segment of the test route begins at the parking garage, so travelers may have wished to keep this known anchor point in view as they navigated toward an unknown destination. The parking garage was not shown on the second side of the map, so that side may have seemed irrelevant.

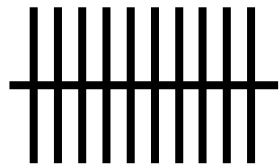
Given this analysis, it seems best to include the parking garage on the detailed side of the map. It may also be advantageous to reformat the map to fit on a single letter-size document.

10___Misunderstood/Missing Information

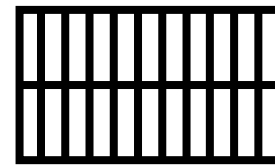
During the final stage of the test procedure, participants offered their suggestions for improving the map. These suggestions largely concerned areas that participants felt should be easier to anticipate and understand. Specifically, two participants asked if building entrances could be clarified and emphasized (see #1, Building Entrances). Three participants asked if the enclosure containing the elevators could be clarified (see #3, Architectural Barriers). One participant suggested that the sign to the Dental Patient Registration Office, B-307, be shown more prominently (see #5, Room Numbering). One participant asked if the difference between the B-Wing and BB-Wing could be shown more clearly (see #6, Wing Names).

In addition, participants suggested that certain elements be added to the map—these were either error locations (such as the RR-Wing, as described above in #4, Preference for Straight Routes), or landmarks (such as the escalators/stairs from the parking garage to the hospital entrance, the hospital information desk, and interim rooms.) This last suggestion came from participants who used room numbers to orientate themselves on the map. However, because of confusion with wing names (i.e., B-Wing vs. BB-Wing), door numbers were not always effective landmarks for participants.

On the original map, four participants commented that they did not understand the symbol used for stairs. This issue appears to be resolved on the revised map, where we used an enclosed form rather than the original "fishbone" icon (there were no participant comments regarding the new stair symbol).



Original 'fishbone' icon for stairs



Revised enclosed stairs icon

CONCLUSION

The goal of this study was to determine if a printed, paper map could aid visitors in navigating through a large, complex medical center. Given that all study participants were able to arrive at both target destinations by using a map, this artifact does appear to be of benefit to users. However, because almost all participants (22 out of 24) experienced wayfinding errors, there is clearly room for improvement.

Certainly, in this particular building there are a number of issues in spatial organization that make wayfinding with a map difficult. These factors are significant negatives for visitors to overcome when navigating in an unfamiliar environment. Clearly, the plan of this building needs to be re-examined. Potential solutions could involve operational changes (such as directing people to the most efficient building entrance or renaming specific wings), alterations to the built structure, and/or the adoption of new technologies for visitor communication and guidance.

Most importantly, what is needed is a wayfinding program that systematically integrates multiple wayfinding elements (floor plans, signs, verbal/written directions, information/help desks, and maps) into a coherent and consistently applied design program. Such an endeavor will require substantial, long-term effort, and significant dedication of financial resources. In the interim, a printed, paper map can function as an inexpensive supplementary measure while support is gathered for a larger initiative.

A secondary goal of this study was to determine was how to best design a paper map for a specific context. The research described above reveals the complexity of maps as information design problems. Even though maps are commonplace objects, and their purpose is well understood, determining the ideal form and content of an effective map is not trivial.

As part of an iterative design process, we began by identifying a variety of design factors that influence the cognitive aspects of understanding and using maps during wayfinding. For some cases, it was obvious how research findings could be applied to our design problem; in others, the research was descriptive rather than prescriptive, and empirical testing was required to determine what information should be included or excluded on the map and if changes in format enhanced or detracted from communication goals. Playback and analysis of participant videos did allow our team to identify specific information that was missing and should be included on future iterations of the map, including key landmarks and the locations of common route errors. Following this effort, we plan to revise the map accordingly, and conduct additional user testing. In this way, the combination of the design principles, client/stakeholder input, and behavioral results works to inform a continuous cycle of design development and refinement.

AUTHORS' BIOS

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Arnheim, Rudolf. 1976. "The Perception of Maps." *Cartography and Geographic Information Science*. 3 (1): 5-10.

Arthur, Paul, and Romedi Passini. 1992. *Wayfinding: People, Signs, and Architecture*. New York: McGraw-Hill Book Co.

Bartram, D. J. 1980. "Comprehending Spatial Information: The Relative Efficiency of Different Methods of Presenting Information about Bus Routes." *The Journal of Applied Psychology*. 65 (1): 103-10.

Best, G. A. 1970. "Direction-Finding in Large Buildings." *Architectural Psychology: Proceedings of the Conference Held at Dalandhui*, University of Strathclyde, 28 February-2 March 1969. D. Canter (Ed.), London: RIBA Publications, 72-91.

Bitgood, Stephen, and Stephany Dukes. 2006. "Not Another Step!" *Environment and Behavior*. 38 (3): 394-405.

Boy Scouts of America. 2009. *Boy Scout Handbook*. Irving, Texas: Boys Scouts of America.

Bronzaft, Arline L., and Stephen B. Dobrow. 1983. "Improving Transit Information Systems." *Journal of Environmental Systems*. 13 (4): 365-376.

Carlson, Laura, Christoph Hölscher, Thomas Shipley, and Ruth Conroy Dalton. 2010. "Getting Lost in Buildings." *Current Directions in Psychological Science*. 19 (5): 284-289.

Carpman, Janet Reizenstein, Myron A. Grant, and Deborah A. Simmons. 1983. "Wayfinding in the Hospital Environment: The Impact of Various Floor Numbering Alternatives." *Journal of Environmental Systems*. 13 (4): 353-364.

Davies C., & Peebles, D. (2007). *Strategies for Orientation: The Role of 3D Landmark Salience and Map Alignment*. Cognitive Science Society, Inc.

Devlin, Ann Sloan, and Jason Bernstein. 1995. "Interactive Wayfinding: Use of Cues by Men and Women." *Journal of Environmental Psychology*. 15 (1): 23-38.

Dobson, Michael W. 1980. "The Influence of the Amount of Graphic Information on Visual Matching." *The Cartographic Journal*. 17 (1): 26-32.

Hayward, D. G., and Brydon-Miner, M. 1984. "Spatial and Conceptual Aspects of Orientation: Visitor Experiences at an Outdoor History Museum." *Journal of Environmental Systems*, 13 (4), 317-332.

Hegarty, Mary, Anthony E. Richardson, Daniel R. Motello, Kristin Lovelace, and Ilavanil Subbiah. 2002. "Development of a Self-Report Measure of Environmental Spatial Ability." *Intelligence*. 30 (5): 425-447.

Hochmair, Hartwig H. 2005. "Investigating the Effectiveness of the Least- Angle Strategy for Wayfinding in Unknown Street Networks." *Environment & Planning B: Planning & Design*. 32 (5): 673-692.

Hölscher, Christoph, Tobias Meilinger, Georg Vrachliotis, Martin Brösamle, and Markus Knauff. 2006. "Up the Down Staircase: Wayfinding Strategies in Multi-Level Buildings." *Journal of Environmental Psychology*. 26 (4): 284-299.

Kinross, Robin. 1993. "Paul Mijksenaar: A Conversation and a Lecture." *Information Design Journal*. 7 (2): 105-114.

Klippel, Alexander, Stephen Hirtle, and Clare Davies. 2010. "You-Are-Here Maps: Creating Spatial Awareness through Map-like Representations." *Spatial Cognition & Computation*. 10 (2-3): 83-93.

Levine, Marvin. 1982. "You-Are-Here Maps: Psychological Considerations." *Environment and Behavior*. 14 (2): 221-237.

Levine, Marvin, Iris Marchon, and Gerard Hanley. 1984. "The Placement and Misplacement of You-Are-Here Maps." *Environment and Behavior*. 16 (2): 139-157.

Lynch, Kevin. 1960. *The Image of the City*. Cambridge, Mass: MIT Press.

McKean, J. 1972. "University of Essex: Case Study." *Architects Journal*,156: 645-667.

Miller, George A. 1994. "The Magical Number Seven, Plus or Minus Two: Some Limits on Our Capacity for Processing Information." *Psychological Review*. 101 (2): 343-52.

Passini, R. 1980. "Wayfinding in Complex Buildings: An Environmental Analysis." *Man-Environment Systems*, 10 (1), 31-40.

Peponis, John, Craig Zimring, and Yoon Choi. 1990. "Finding the Building in Wayfinding." *Environment and Behavior*. 22 (5): 555-590.

Phillips, Richard. 1979. "Making Maps Easy to Read: A Summary of Research." *Processing of Visible Language 1*, Kolers, P.A., Wrolstad, H.E. and Bouma, H. (Eds.) New York: Plenum, 165-174.

Rosenholtz, Ruth, Yuanzhen Li, and Lisa Nakano. 2007. "Measuring Visual Clutter." *Journal of Vision*. 7 (2): 1-22.

Siegel A. W., and S. H. White. 1975. "The Development of Spatial Representations of Large-Scale Environments." *Advances in Child Development and Behavior*. 10: 9-55.

Southworth, Michael, and Susan Southworth. 1982. *Maps: A Visual Survey and Design Guide*. Boston: Little Brown.

Thorndyke, Perry and Cathleen Stasz. 1980. "Individual Differences in Procedures for Knowledge Acquisition from Maps." *Cognitive Psychology*. 12 (1): 137-175.

Tolman, Edward C. 1948. "Cognitive Maps in Rats and Men." *Psychological Review*. 55 (4): 189-208.

Tufte, Edward R. 2001. *The Visual Display of Quantitative Information*. Cheshire, Conn: Graphics Press.

Tversky, Barbara. 1993. "Cognitive Maps, Cognitive Collages, and Spatial Mental Models. "*Spatial Information Theory: A Theoretical Basis for GIS, COSIT' 93*. A. U. Frank and I. Campari (Eds.) Berlin: Springer-Verlag, 14-24.

Weisman, Jerry. 1981. "Evaluating Architectural Legibility: Wayfinding in the Built Environment." *Environment and Behavior*. 13 (2): 189-204.

Wener, Richard, and Robert Kaminoff. 1983. "Improving Environmental Information." *Environment and Behavior*. 15 (1): 3-20.

Wright, Patricia, Audrey J. Hull, and Ann Lickorish. 1993. "Navigating in a Hospital Outpatients' Department: The Merits of Maps and Wall Signs." *Journal of Architectural and Planning Research*. 10 (1): 76.

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Overview:
Visual theorist and design historian Johanna Drucker, in *SpecLab: Digital Aesthetics and Projects in Speculative Computing*, defines the digital humanities as "the study of ways of thinking differently about how we know what we know and how the interpretative task of the humanist is redefined in these changed conditions"[1]. Design and the digital humanities connect through critical making practices, centering on human experience and advancing the prevailing expectations of their respective disciplines.

At the convergence of conceptual and material practices[2], the ongoing development of a framework for critical making offers a means to understand complex relationships between research, scholarship and production. In design, emphasis is placed on innovative notions of what criticism or authorship can be within the context of design-making; in the digital humanities, focus is on innovative notions of what "making" can be as a form of interpretation within the context of conventional scholarly dissemination. The intersection of these two areas presents opportunities to bring form and content together in ways that are practical and theoretical, rhetorical and physical.

Critical making in design is aligned with practices that facilitate innovation and exploration related to technology, materiality and communities. In graphic design — a discipline, a medium, a practice and a tool[3] — "critical practice" has been used to describe a range of activities that position the designer as author, producer, scholar, curator or programmer[4]. These endeavors, whether individual or collaborative, may involve humanistic or scientific inquiry, and move beyond the traditional structure of client-based relationships. From a pedagogical perspective, key components of critical making include "hands-on practice, the processing of enhanced seeing and perception, and contextualized understanding"[5].

In the digital humanities, critical making distinguishes its practices from traditional forms of humanities scholarship. With an emphasis on tool building, information visualization and digital archiving, the digital humanities merge two seemingly opposing modes of scholarship: reading and making. Critical making dichotomies of thinking/making, knowing/doing and cognition/embodiment permeate current digital humanities discourse[6] and projects demonstrate a desired interest in building through existing design and development processes. *The Critical Making Zine*[7] uses physical production to publish and distribute a series of essays on technology, society and DIY culture. *Speaking in Code*, an NEH-funded symposium hosted at the Scholar's Lab in 2013, addressed questions related to "DH code-craft": tacit knowledge as it relates to the design and development of digital humanities projects[8].

Perspectives:
This special issue of Visible Language investigates critical making at the intersection of design and the digital humanities, which is a site for expanding the role(s) of divergent scholarly and creative work. We invite submissions that address one or more of the following questions:

- What are the theoretical or pragmatic ways to frame critical making in design and/or the digital humanities? Where are the similarities, differences and challenges? How are these advantageous?
- In what ways might design authors and producers connect with the digital humanities? Where or how are digital humanists' experiences of critical making intersecting with designers? How do these crossover 'ways of seeing' impact our scholarly and creative work — and future hybrid practices?
- How might forms of understanding such as speculative design, prototyping or hacking play a role in critical making, and in what ways are these influencing the scope of work in both areas?
- In what ways might design and the digital humanities collaboration be fostered in the studio or classroom? What are some examples of pedagogical approaches to teaching critical making?
- What are the forms these arguments might take as part of this special issue?

Visible Language is a journal that invites evidence-based research. For this issue, we encourage exploratory, creative works that incorporate evidence-based research through critical commentary, traditional analysis, audience responses or participant feedback.

REFERENCES

[1] Johanna Drucker. SpecLab: Digital Aesthetics and Projects in Speculative Computing (Chicago: University of Chicago Press, 2009), xii.

[2] Mark Ratto, "Critical Making" in Open Design Now: Why Design Cannot Remain Exclusive, Bas van Abel et al. (The Netherlands: BIS Publishers, 2011), 202.

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Submissions:
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Proposals should include a 300-word written abstract and a brief outline to show the structure of your argument. A corresponding visual abstract is strongly encouraged. For digital work, please include a URL or screenshots. Final articles can range from approximately 3–5,000 words.

Please send proposals through January 15, 2015 to Jessica Barness, jbarness@kent.edu

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Guest Editors:
Jessica Barness is an Assistant Professor in the School of Visual Communication Design at Kent State University, where she teaches graphic and interaction design. She holds an MFA in Design from the University of Minnesota with a minor in Writing Studies, and an MA and a BA in Art from the University of Northern Iowa. Barness' research through design investigates theories in social issues, language and interactive technologies. Her work has been exhibited at venues such as Hebei Normal Museum, China and FILE Electronic Language Festival, Brazil, and published in Communication & Place and Currents in Electronic Literacy. She has also presented research at the International Committee for Design History and Design Studies Conference (2014), SEGD Academic Summit (2014), AIGA Design Educators Conference (2013) and HASTAC (2013), among others.

Amy Papaelias is an Assistant Professor in the Graphic Design program at SUNY New Paltz, teaching courses in web and interaction design, as well as 2D design and visual communication. She holds an MFA in Intermedia Design from SUNY New Paltz and a BA in Cultural Studies from McGill University. Her creative research lies at the intersection of design, culture and technology with specific interests in interactive typography and the digital humanities. She has presented her design work and pedagogy at Theorizing the Web 2014, AIGA Design Educators Conference (2007, 2013), TypeCon (2005, 2007, 2012), UCDA Education Summit (2011) among others. In 2013, she was selected to participate in One Week One Tool, an NEH-funded Institute for Advanced Topics in the Digital Humanities, hosted at the Center for History and New Media at George Mason University and co-authored a long paper on the experience that was presented at Digital Humanities 2014.

[3] Andrew Blauvelt, "Graphic Design: Discipline, Medium, Practice, Tool, or Other" (paper presented at counter/point: The 2013 D-Crit Conference, School of Visual Arts, New York, NY, May 11, 2013.

[4] Albinson, Ian and Rob Giampietro. Graphic Design: Now in Production (Minneapolis: Walker Art Center, 2011).

[5] Rosanne Somerson. "The Art of Critical Making: An Introduction" in The Art of Critical Making: Rhode Island School of Design on Creative Practice, ed. Somerson, R. and Hermano, M. (Wiley, 2013), 19.

[6] "Critical Making in the Digital Humanities: an MLA 2014 Special Session Proposal" by Roger T. Whitson, accessed on March 3, 2014. http://www.rogerwhitson.net/?p=2026

[7] Critical Making Zine by Garnet Hertz, accessed on March 3, 2014, http://www.conceptlab.com/criticalmaking/

[8] Speaking in Code, accessed on June 9, 2014. http://codespeak.scholarslab.org/

Design for Information: An Introduction to the Histories, Theories, & Best Practices Behind Effective Information Visualizations

Isabel Meirelles

Beverly, MA: Rockport Publishers, 2013.

For a complementary perspective of this book, please refer to the review written by Aaron Marcus in the *Information Design Journal* 20(3), 296–297

The book is a thorough representation of both the field of information visualization and the research interests of the author, whose focus is on "the theoretical and experimental examination of the fundamentals underlying how information is structured, represented and communicated in different media."

Beginning by the "big picture," the book includes an amazing collection of examples, the most thorough I have seen to date in a volume. The author organizes the content according to several categories represented by the titles of the chapters: 1) Hierarchical structures: trees; 2) Relational structures: networks; 3) Temporal structures: timelines and flows; 4) Spatial structures: maps; 5) Spatio-temporal structures; and 6) Textual structures. An appendix, notes, bibliography, contributors list, and index, complete the apparatus of the book.

Design for information is an extensive taxonomy of data visualization types, and is "a must" for anybody interested in the work done in the area. Each one of the hundreds of examples is explained and discussed, forming a kind of encyclopedia on the subject. It seems that nothing escaped from the through gathering of examples that Meirelles got involved in. The discussions and explanations normally focus on what information is represented and how it is represented.

It is interesting to see as well how many different professional fields use today diagrams to organize and represent information: basic science, applied science, education, engineering, medicine, technologies, etc. The value of the book is centered on the inclusion of examples of how many different problems are today being confronted by data visualizations, how many historical efforts preceded whatsoever is done today, and how the advent of the computers have allowed the field to explode, handling large data sets as well as dynamic representations.

At the end of the examination of the 224-page volume one becomes curious as to how might these diagrams have performed with the users they were intended for in terms of ease of comprehension; what conclusions could one arrive at from an evaluation of the examples included regarding perceptual and cognitive human factors; or how could a complementary book contribute to the development of best practices. I would not expect that one volume could be so extensive as this one and also cover the field critically. One, however, has to wonder how the super-complex visualizations permitted by computer programs today would perform regarding comprehension, memorization, and use of the information presented. The discussion on perception and cognition is very brief, and it might leave some readers wondering about the assertions made: they are proposed as principles without them being discussed. This topic, as well as Gestalt theory, are not considered during the description of examples. The size of some reproductions is too small to assess their quality as data visualizations, they appear as samples of problems dealt with but not as information in themselves. To compensate for this, the book includes valuable URLs for people interested in seeing in better detail many of the diagrams shown.

While the above could be perceived as a weakness, the strength of the book is its truly amazing array of examples and the rare historical diagrams it offers. It also displays an uncommon erudition, and includes an extensive and useful bibliography. One does not know how long Meirelles took to complete the manuscript, but it feels like a life-time project. These assets, coupled by an excellent production, make it an indispensable publication for whoever can be interested in information visualization.

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Before there was reading there was seeing. Visible Language has been concerned with ideas that help define the unique role and properties of visual communication. A basic premise of the journal has been that created visual form is an autonomous system of expression that must be defined and explored on its own terms. Today more than ever people navigate the world and probe life's meaning through visual language. This journal is devoted to enhancing people's experience through the advancement of research and practice of visual communication.

If you are involved in creating or understanding visual communication in any field, we invite your participation in *Visible Language*. While our scope is broad, our disciplinary application is primarily design. Because sensory experience is foundational in design, research in design is often research in the experience of visual form: how it is made, why it is beautiful, how it functions to help people form meaning. Research from many disciplines sheds light on this experience: neuroscience, cognition, perception, psychology, education, communication, informatics, computer science, library science, linguistics. We welcome articles from these disciplines and more.

Published continuously since 1967, *Visible Language* maintains its policy of having no formal editorial affiliation with any professional organization – this requires the continuing, active cooperation of key investigators and practitioners in all of the disciplines that impinge on the journal's mission as stated above.

cover photography: Patricia Cué

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The Environment is (Still) Not in the Head:

Harry Heft & Contemporary Methodological Approaches to Navigation and Wayfinding

Ashley Walton

Traditional approaches to spatial cognition focus on postulating underlying mental mechanisms, such as cognitive maps. Alternative theoretical approaches from the field of Ecological Psychology pioneered by Harry Heft offer needed perspectives with respect to how we understand and investigate navigation and wayfinding behavior. Successful environmental communication is about orchestrating an interaction that is flexible and robust; that can capture the idiosyncrasies of everyday activities. Abstracted, disembodied, and static representations of experience like the cognitive map fail to capture these idiosyncrasies. Employing a theoretical framework that focuses on the on-going perception-action processes of navigation will provide new ways to conceptualize communication systems that are adaptive, dynamic, and can successfully operate amongst the increasing technological complexity of contemporary spaces. New methodological tools from the field of Ecological Psychology can provide ways to identify these on-going processes that modulate interactions within environments as the interaction unfolds. These processes are constituted by patterns of physical movement and sensory experience as well as socio-cultural factors. The way individuals are engaged in these processes can change throughout the course of the interaction; the way designers establish, fluctuate, and disrupt the flow of this engagement is driven by when and how they intend users to perceive features of a visual communication system.

New technological methods for communication have emerged that allow information and interaction to be further embedded in physical spaces and feedback loops to become further intertwined. These communication exchanges happen simultaneously across different mediums and between both users and technological systems (*figure 1*).

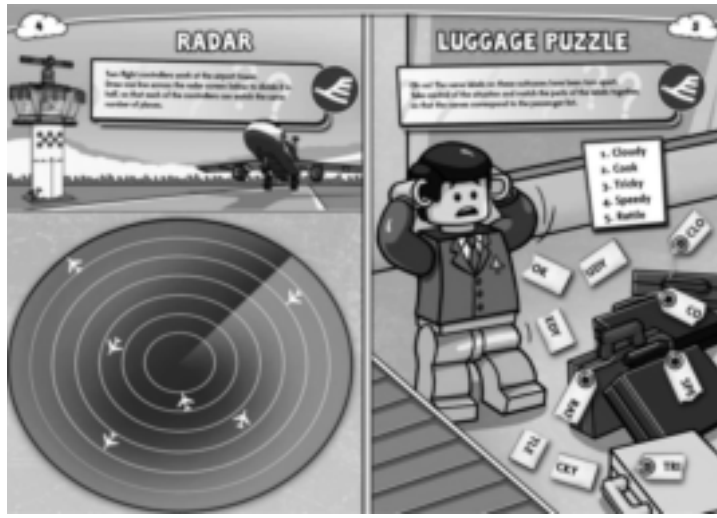

Figure 2
Complex spaces like airports have multiple communication exchanges that operate on different scales through different mediums, both between users and technological systems.

It is no longer possible to consider pieces of a design solution in isolation from one another. Design and ecological psychology both continue to take on the challenge of understanding how individuals behave and interact within the complexity of their environments. The tenets of ecological psychology are not unfamiliar to designers. The founder of the field, James Gibson, introduced the concept of affordances which was then popularized in the field of design by Donald Norman's book, *The Design of Everyday Things*. Lesser-known and more contemporary developments in ecological psychology can provide new approaches to investigating how users navigate amidst the increasing complexity of contemporary space.

Dr. Harry Heft, a professor of psychology at Denison University, has an extensive history of writing about how ecological psychology provides a needed perspective concerning how we perceive and interact with our environments (Heft, 2010,1999,1997). The focus here will be his more recent work regarding an ecological approach to studying spatial cognition and wayfinding processes (Heft, 2013,2012,1996).

Heft discusses in his chapter titled "Wayfinding, navigation, and spatial cognition from a naturalist's standpoint" in *The Handbook of Spatial Cognition*, how the field is traditionally focused on describing our use of cognitive maps. Cognitive maps are overviews of a layout that focus on geometric relations not seen from the ground surface, but from a bird's-eye-view. Heft argues against the idea that exercising spatial knowledge requires referencing a cognitive map existing in the head. First, it is problematic because it is not the way we experience the world. The vantage point of a bird's-eye-view is something we rarely directly experience, thus it is disconnected from the nature of our everyday interactions with the world. For example consider the difference between Googlemaps and Google Streetview (*figures 2 and 3*). The bird's-eye-view of Googlemaps is a simplification of what is depicted in Streetview. Objects are shown in isolation, but as Heft explains, the objects we experience while navigating environments rest on surfaces among multiple other objects and perceptual features. This creates a multitude of relational properties among these features that can be used to identify spaces and paths of locomotion. Second, cognitive maps are problematic because they are static, not dynamic (Heft, 2012). Not only do these simplifications neglect how objects are situated in relationship to each other, the relations between these features are constantly changing because the perceiver is constantly moving. Cognitive maps depict only one moment in time, failing to capture the on-going processes of change in perceptual experience that unfold while traversing an environment (Heft, 2012). As we move, the relational properties we perceive among environmental features change, and these transitions provide crucial information about where we are and where we have been. Heft has experimentally investigated these claims demonstrating that individuals are sensitive to transitions while navigating a route, and that these transitions can aid the wayfinding process (1979, 1983, 1996). Accordingly Heft provides his own definition of wayfinding: "a continuous, integrated perception-action process controlled by the detection of information over time" (2012, p. 268). It is clear that cognitive maps alone cannot properly capture these ongoing time-dependent processes.

Figure 2
Googlemaps displays a disembodied, bird's-eye-view of the navigation trajectory.

Figure 3
Googlemaps' Streetview provides depictions of the immediate experience of navigating the environment.

"GETTING SOMEWHERE SOCIALLY"

Another key criticism of cognitive maps is what Heft calls the "out thereness": the idea that space exists independently of the individuals that occupy it (2012, p. 270). He claims instead that our relationship with our environment is central: we adapt to our surroundings, and the environment is modified as a result of our actions. These reciprocal changes happen across multiple time scales. Socio-cultural processes play a crucial role in modulating behavior outside the time frame of the interaction, across the time scales of years and even generations. Heft claims that underestimating the contribution of these processes has dire consequences to our success in understanding how we execute and develop wayfinding skills. He explains that unfortunately most research regarding these skills has come from North American and Western European samples. So in order to understand the role of culture in wayfinding behavior, Heft describes accounts provided by ethnographic studies, including the two summarized below (2013, 2012).

THE HAI||OM OF NAMIBIA.

Heft describes the accounts of Widlock, ethnographic studies of the Bushmen of Namibia in southern Africa who are known for their exceptional tracking and hunting skills (1997). During his fieldwork, Widlock tested the men and women's ability to accurately point at distant features, to places they had never been. When compared with GPS readings their performance demonstrated high levels of accuracy, as depicted in Widlock's table (*table 1*). Widlock also found that women outperformed the men at this task, a surprising result because it is the men in the society that are responsible for hunting and tracking. But then what contributes to these accurate pointing skills, if not experience hunting and tracking? Widlock proposed the source to be the way he observed the Bushmen of Namibia pointing

frequently during everyday conversation. This pointing was often oriented towards locations, invoking shared reference of different landscape features. Widlock termed this "topological gossip" (1997). Heft explains that Bushmen's orientation skills are puzzling if one looks to the mind for an explanation, because Widlock's documentation of their references does not form a coherent unified set of locations like that of a map. Instead these references are connected to goal-directed action and social discourse. Widlock explains that for the Bushmen of Namibia wayfinding is not about moving from one geographic location to another (1997). It is about getting somewhere socially, navigating towards the location of a task, of a meal, or a conversation. Here we see an example of socio-cultural processes dictating the structure of spatial understanding, in place of geometric abstractions.

Table 1
Table from Widlock (1997) displays the accuracy of direction estimates when the Hai||om were asked to estimate the distance of different landscape features.

TABLE 1. Hai‖om estimates of direction.

Subject	*N*	*average deviation*	*skewed to east*	*skewed to west*	*not known*
HO, y. man	21	12.24°	10	9	1
AK, eld. man	21	10.7°	5	15	0
HU, y. woman	20	12.35°	9	8	3
MK, y. man	20	10.85°	8	4	7
GK, eld. woman	20	10.95°	9	9	2
AS, eld. woman	20	8.55°	4	14	2
DD, eld. man	19	31.63°	1	17	1
AB, eld. man	20	27.7°	0	20	0
DK, eld. man	13	18.15°	5	7	0
AR, boy	12	28.67°	2	10	0
Total	186	16.40°	53	113	16

CAROLINE ISLANDERS OF MICRONESIA.

Heft also cites Edwin Hutchins, describing an example of culturally dictated navigation processes from Hutchin's 1995 book *Cognition in the Wild*. Hutchins observed the navigation methods of Micronesian sailors in the Caroline Islands (*figure 4*, next page). The Micronesians would frequently embark on voyages between the islands, which necessitated knowing both the direction the boat was going as well as the distance it was traveling across a large area of ocean. What Hutchins found was that the Micronesians' knowledge of both distance and direction did not originate from the use of maps or a compass, instead they made use of relational properties between

themselves and features in their environment. In order to understand the direction of their course, they used the stars. The rising and setting of stars on the eastern horizon traces consistent paths across the sky, so they can serve as a reference point that does not involve the calculations necessary if distance was to be tracked using the global reference system of a compass and a map. The way the Micronesians sailors kept track of distance made use of unique relational properties; instead of calculating the bearings of stars in reference to their moving boat, they would imagine that their boat was stationary and that islands were moving past them. To index the distance they were traveling towards their destination they identified a reference island off to the side of the direction of their course, called an *etak island*. As they progressed along their journey they checked the bearing of the island in relationship to star locations until the etak island was at the bearing known to be associated with their destination (*figure 5*). And so why do the islands move? Hutchins explains that using a frame of reference that can be visualized from the natural point of view of the canoe decreases the number of moving systems that a navigator needs to keep track of. It is more difficult to update positions of the boat and stars with respect to a reference island, than only update the position of an island with respect to the boat and stars. Star paths and etak represent a dynamic reference system that prioritizes the immediate perceptual experience of the traveler in maintaining the course of direction, without reference to a detached, disembodied representation. Of course with the introduction of GPS these practices among the Micronesian are less common, but Hutchins' ethnographic work provides a window into strategies that developed in the absence of Western navigation tools.

Figure 4
The Caroline islands in the Pacific Ocean, the home of the Micronesian sailors described in Hutchins (1995).

Figure 5
Diagram from Hutchins (1995) describing how Micronesian sailors navigated between islands by monitoring the bearing of the reference (etak) island until it was at the bearing known to be associated with the final destination.

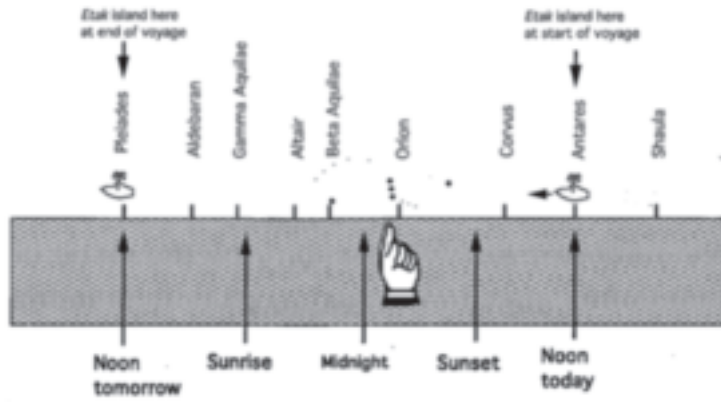

Figure 2.15 Just before midnight the navigator points to the etak island. All he needs to do is point to the location of the current time on the time scale that is superimposed on the spatial landmarks provided by the star points.

METHODOLOGICAL APPROACH: DYNAMIC SYSTEMS THEORY

To say that cognitive maps do not effectively capture our navigation experience is not to say that this particular mode of visualization cannot function as a communicative tool. Designers often employ cognitive maps as a way of visualizing the experience among team members throughout the design process, or even include some version of a bird's-eye-view as a way of communicating information to the end user. But what Heft is trying to point out through his examples is that the cognitive map does not function as a neutral tool or harmless metaphor. Believing that individuals use cognitive maps in the process of navigating the world constitutes a theoretical framework that filters and ultimately warps our understanding of wayfinding behavior. How a behavioral phenomenon is conceptualized is pivotal to defining the vocabulary we use, the tools we employ, the kinds of questions we ask, and how we interpret what we see. In designing ever more complex technological systems to be responsive to human interaction, we may need to start asking new questions, and using new words. Orchestrating communication that is flexible and robust requires a theoretical framework that is motivated towards capturing the dynamic, on-going processes that characterize the way we experience the world.

Ecological psychology has a history of developing methodologies for capturing these processes of behavior through the use of dynamical systems theory (see Ashby, 1960; van Gelder, 1998). In this approach behavior is understood as the result of a coupled brain-body-behavior system where the individual and their environment are in constant

interaction (Beer, in press, p. 16). Randall Beer, whose earlier work focused on building a six-legged robot that could walk, conceptualizes the environment "E" and the agent "A" as coupled with a sensory equation "S" and a motor equation "M" shown in Figure 6 (Beer, 1992). These equations take into account how environmental variables affect the agent's behaviors and states, and how the agents' behavior can change environmental variables. They are mutually coupled in that one does not dominate the other, and they simultaneously constrain one another—or limit one another's actions.

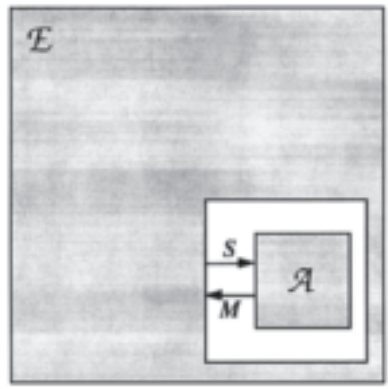

Figure 6
Visualization from Beer (1992) depicting how a sensory equation "S" and a motor equation "M" couple the environment and the animal, or organism.

Behavioral dynamics applies the dynamical systems approach to navigation, capturing the coupling not only between individuals and their environments but also the coupling that emerges between the individuals themselves (Warren, 2006). The relationship between two individuals and their environment is represented by two sets of dynamical equations like that described above by Randall Beer, and the relationship between the two individuals is captured with another set of dynamical equations. These equations are meant to account for how different factors influence the way that these users coordinate their movements across time and space, including physical structures in the environments, biomechanics of the body, and perceptual information. To better understand these processes, experimenters design movement coordination tasks that are inspired by everyday goal-directed behaviors. Across different trials, aspects of the task context are manipulated to reveal how environmental changes influence the movement and coordination patterns of individuals throughout the interaction, captured by a magnetic motion tracking system. For example, an experiment at the University of Cincinnati's Cognition, Action and Perception Lab, explores the act of navigating a two dimensional space with another person. As in Figure 7, the participants stand across from each other, on the opposite sides of a large table. Visual stimuli are projected

onto the table from below; participants can manipulate these stimuli using motion-tracking sensors that are attached to their fingers. Each participant controls a dot that appears on one side of the table. Their task is to navigate their respective dots using the motion sensors to the goal box depicted on the opposite side of the table. White dots also appear on the surface that serve as obstacles, participants are told to navigate to the goal box without running into any of these obstacles and to do so in such a way that both of them end at the goal location at the same time.

Figure 7
The interactive virtual table in University of Cincinnati's Cognition, Action and Perception lab where participants complete navigation tasks while their movement trajectories are recorded. *Image taken by Ashley Walton (2014).*

This simple two-dimensional task is an initial step to capturing the key challenges of behaviors like walking through a crowded city street to get lunch with a friend: moving towards an end destination, making sure you don't run into anything or anyone in the process, and reaching that destination at the same time as your companion. This approach can help build a better understanding of how these patterns of synchronized movement emerge in the context of the interaction. Approaching behavior from a dynamical system framework produces a picture of behavior that is not a static representation of a single moment of time, but a description of how different components and features of the environment interact to give rise to an individual's actions and experiences. By emphasizing the ongoing process of the interaction, we may become better equipped to create communication systems that are robust to unpredictable changes.

As Heft has demonstrated, understanding how perceptual information is experienced during wayfinding requires an understanding of what this information conveys to individuals in relation to these socio-cultural processes. The patterns of movement and sensory coordination necessary to successfully navigate an environment must be synchronized with the patterns of cultural and social behavior that guide the interpretation of symbols within that space.

As users become coupled with communications systems and engage with information to stabilize behavior to accomplish different tasks, the manner in which they are coupled to that information changes. In constructing a communication system designers must establish the coupling of users to the visuals and information in the environment, and maintain that coupling across time and space. This coupling not only has practical implications but also contributes to the communicative aesthetic. The way designers disrupt, fluctuate and maintain the flow of this coupling of the user to the environment can be thought of as the orchestration of the aesthetic experience of a space.

Ecological psychology has drawn inspiration from Martin Heidegger in exploring the different ways users are coupled with their environment. Heidegger describes human behavior as skillful engagement with entities in the world, but environmental influences can cause disruptions in this engagement (1962). He distinguishes between three modes of coupling with the environment: ready-to-hand, unready-to-hand and present-at-hand. Ready-to-hand is when we are engaging with the world and do not exercise explicit awareness of the properties of objects we are engaged with. If we are using a hammer, we do not notice its size, color or shape. Unready-to-hand is when our skillful coupling with the world is temporarily disturbed, we become aware of the properties of the hammer, nails and board that are interfering with its functionality. Our coupling with the environment is characterized by frustration and explicit awareness of the details of our activity. Present-at-hand is when we are not engaged in a task but are focused on considering the specific properties of objects; the hammer is no longer a tool but merely an object with various properties.

Understanding these different modes can provide ways to conceptualize how communication systems can be constructed to facilitate and disrupt the flow that couples users to their environment. Paul Dourish in *Where the Action Is* explains how both the ready-to-hand and present-at-hand modes are critical; there is a need for ways to transition between them in our use of physical tools as well as abstract entities. As users navigate through a space

they instigate different patterns of engagement with objects, other users, technological systems, and abstract communicative symbols. Heidegger's ready-to-hand defines a type of coupling marked by efficiency and the unconscious, unready-to-hand by frustration, and present-at-hand by the appreciation of specific properties of the environment with which we are engaged.

These distinctions can provide ways for designers to approach the management of the coupling of users and communication systems. In answering the questions "Where am I?" or "Where am I going?" with efficiency seems to require Heidegger's ready-to-hand coupling between the user and environmental entities. But the additional challenge of constructing environmental communication systems is answering the question "Where am I?" with more abstract meaning, understanding location as part of a social narrative instead of geographic coordinates. Doing so may require transitions to present-at-hand, where there is a conscious awareness of features and properties. The experience of a space depends on the orchestration of how and when communicative meanings emerge as a salient aspect of our experience, or operate to support the completion of tasks unbeknownst to our explicit conscious attention. "Bumping into" the communication infrastructure can be thought of as the disruption of the coupling that establishes a flow of the experience of a space. Ensuring that this manner of coupling is disrupted or established at the right moments, facilitating and obscuring the conscious experiences of different aspects of communication systems can be a way to conceptualize wayfinding that is both efficient and aesthetically pleasing.

CONCLUSION

In advocating for researchers to focus on the emergent relationships between behavioral processes and the environment, Wolhwill titles his paper with an emphatic exclamation: "The Environment Is Not in the Head!" (1973). This plea leaves researchers the daunting task of understanding behavior within infinitely variable contexts. Design and ecological psychology have the right tools: at their best they are refinements of everyday thinking that employ thoughtful rigor and disciplined imagination. Psychology is in the position to invest in an extensive and disciplined description of human behavior, and design can provide expertise in harnessing the complexities of real-world contexts that include emerging technologies and socio-cultural processes. Endeavors of these disciplines can be combined to build robust interactive principles that guide the optimization of communication systems to be adaptive to how users respond to novel situations and unforeseen errors. The goal of this interdisciplinary collaboration is not to control or simplify interactions, but establish a dialogue with the coupling of users to place and context—designing new ways to manipulate and communicate information in our exchanges with the environment and others.

AUTHOR BIO

Ashley Walton was awarded a Bachelors of Science in Design as well as a Bachelors of Interdisciplinary Studies in Brain and Mind Studies from the University of Cincinnati. She focuses on combining quantitative and qualitative methods in understanding behavior in order to create interactions that are both beautiful and reflect an understanding of human need. She is currently pursuing a Ph.D. in Experimental Psychology and working in Behavioral Medicine at Cincinnati Children's hospital developing pain management tools for Sickle Cell patients.

REFERENCES

Ashby, W.R. (1960). Design for a Brain (2nd Edition). John W. Wiley & Sons.

Beer, R.D. (1992). A dynamical systems perspective on autonomous agents. Technical Report CES-92-11, Dept. of Computer Engineering and Science, Case Western Reserve University.

Beer, R.D. (in press). Dynamical systems and embedded cognition. To appear in K. Frankish and W. Ramsey (Eds.), The Cambridge Handbook of Artificial Intelligence. Cambridge University Press.

Dourish, Paul. (2001). Where the Action Is: The Foundations of Embodied Interaction. Cambridge, MA: MIT.

Heft, H. (2013). Environment, cognition, and culture: Reconsidering the cognitive map. Journal of Environmental Psychology, 33, 14-25.

Heft, H. (2012). Way-finding, navigation, and spatial cognition from a naturalist's standpoint. In D. Waller & L. Nadel (Eds.). The handbook of spatial cognition (pp.265-294). Washington, D.C.: American Psychological Association.

Heft, H. (2010). Affordances and the perception of landscape: An inquiry into environmental perception and aesthetics. In C.W. Thompson, P. Aspinall, & S. Bell (Eds.), Innovative approaches to researching landscape and health (pp. 9-32). London: Routledge.

Heft, H. (1999). Affordances of children's environments. In J. Nasar & W. Preiser (Eds.), Directions in person-environment research and practice. (pp.43-69). Aldershot, UK: Ashgate Publishing. (reprint of Heft, 1988a, with a new afterword).

Heft, H. (1997). The relevance of Gibson's ecological approach for environment-behavior studies. In G.T. Moore & R.W. Marans (Eds.), Advances in environment, behavior, and design, Vol. 4. (pp. 71-108) New York: Plenum.

Heft, H. (1996). The ecological approach to navigation: A Gibsonian perspective. In J. Portugali (Ed.), The construction of cognitive maps (pp. 105-132). Dordrect: Kluwer Academic Publishers.

Heidegger, M. (1962). Being and Time. Originally published in 1927. Harper and Row.

Hutchins, E. (1995). Cognition in the wild. Cambridge, MA: MIT Press.

Norman, Donald A. (2011). Living with Complexity. Cambridge, Mass.: MIT Press.

Van Gelder, T. (1998). The dynamical hypothesis is cognitive science. Behva. Brain Sci. 21:615-628.

Widlok, T. (1997). Orientation in the wild: The shared cognition of Hai||Om bush-people. Journal of the Royal Anthropological Institute, 3, 317-332.

Wohlwill, J.F. "The environment is not in the head:. In W.F.E. Preiser (Ed.), Environmental design research, Vol. 2. Stroudsburg, PA: Dowden, Hutchinson, & Ross, 1973.

William, Warren. (2006). "The Dynamics of Perception and Action." The Psychological Review. (pp. 358-389).

Overview:
Visual theorist and design historian Johanna Drucker, in *SpecLab: Digital Aesthetics and Projects in Speculative Computing*, defines the digital humanities as "the study of ways of thinking differently about how we know what we know and how the interpretative task of the humanist is redefined in these changed conditions"[1]. Design and the digital humanities connect through critical making practices, centering on human experience and advancing the prevailing expectations of their respective disciplines.

At the convergence of conceptual and material practices[2], the ongoing development of a framework for critical making offers a means to understand complex relationships between research, scholarship and production. In design, emphasis is placed on innovative notions of what criticism or authorship can be within the context of design-making; in the digital humanities, focus is on innovative notions of what "making" can be as a form of interpretation within the context of conventional scholarly dissemination. The intersection of these two areas presents opportunities to bring form and content together in ways that are practical and theoretical, rhetorical and physical.

Critical making in design is aligned with practices that facilitate innovation and exploration related to technology, materiality and communities. In graphic design — a discipline, a medium, a practice and a tool[3] — "critical practice" has been used to describe a range of activities that position the designer as author, producer, scholar, curator or programmer[4]. These endeavors, whether individual or collaborative, may involve humanistic or scientific inquiry, and move beyond the traditional structure of client-based relationships. From a pedagogical perspective, key components of critical making include "hands-on practice, the processing of enhanced seeing and perception, and contextualized understanding"[5].

In the digital humanities, critical making distinguishes its practices from traditional forms of humanities scholarship. With an emphasis on tool building, information visualization and digital archiving, the digital humanities merge two seemingly opposing modes of scholarship: reading and making. Critical making dichotomies of thinking/making, knowing/doing and cognition/embodiment permeate current digital humanities discourse[6] and projects demonstrate a desired interest in building through existing design and development processes. *The Critical Making Zine*[7] uses physical production to publish and distribute a series of essays on technology, society and DIY culture. *Speaking in Code*, an NEH-funded symposium hosted at the Scholar's Lab in 2013, addressed questions related to "DH code-craft": tacit knowledge as it relates to the design and development of digital humanities projects[8].

Perspectives:
This special issue of Visible Language investigates critical making at the intersection of design and the digital humanities, which is a site for expanding the role(s) of divergent scholarly and creative work. We invite submissions that address one or more of the following questions:

- What are the theoretical or pragmatic ways to frame critical making in design and/or the digital humanities? Where are the similarities, differences and challenges? How are these advantageous?
- In what ways might design authors and producers connect with the digital humanities? Where or how are digital humanists' experiences of critical making intersecting with designers? How do these crossover 'ways of seeing' impact our scholarly and creative work — and future hybrid practices?
- How might forms of understanding such as speculative design, prototyping or hacking play a role in critical making, and in what ways are these influencing the scope of work in both areas?
- In what ways might design and the digital humanities collaboration be fostered in the studio or classroom? What are some examples of pedagogical approaches to teaching critical making?
- What are the forms these arguments might take as part of this special issue?

Visible Language is a journal that invites evidence-based research. For this issue, we encourage exploratory, creative works that incorporate evidence-based research through critical commentary, traditional analysis, audience responses or participant feedback.

REFERENCES

[1] Johanna Drucker. SpecLab: Digital Aesthetics and Projects in Speculative Computing (Chicago: University of Chicago Press, 2009), xii.

[2] Mark Ratto, "Critical Making" in Open Design Now: Why Design Cannot Remain Exclusive, Bas van Abel et al. (The Netherlands: BIS Publishers, 2011), 202.

Proposal due: January 15, 2015
Abstract **acceptance/rejection:** March 15, 2015
Full papers / works due: June 15, 2015
Review period: June 15 – August 1, 2015
Review feedback: August 1, 2015
Final paper submission: September 15, 2015
Anticipated publication: October 2015

Submissions:
In keeping with the theme of merging form and content, the traditional printed journal will be expanded to include a corresponding online space for interactive and digital work. We invite dialogue on what defines scholarly works in regard to non-traditional forms of writing and disciplinary crossovers. Submissions may include, but are not limited to, case studies, interactive reading experiences, audial and visual works.

Proposals should include a 300-word written abstract and a brief outline to show the structure of your argument. A corresponding visual abstract is strongly encouraged. For digital work, please include a URL or screenshots. Final articles can range from approximately 3–5,000 words.

Please send proposals through January 15, 2015 to Jessica Barness, jbarness@kent.edu

Open Peer-Review Process:
Submissions will be reviewed through an open peer-review process. An open peer-review process makes available the submission author's name to the peer-reviewer. Reviewer names and reviews will be published on the Visible Language journal website. Proposals will undergo review; a selection will be shortlisted for development into full-length papers / works and these will also be peer-reviewed prior to publication.

Interested in serving as a peer-reviewer?

Peer-reviewers will be responsible for providing feedback about abstracts and/ or final submissions between January – August 2015. If you are interested in serving as a peer-reviewer, please get in touch.

Guest Editors:
Jessica Barness is an Assistant Professor in the School of Visual Communication Design at Kent State University, where she teaches graphic and interaction design. She holds an MFA in Design from the University of Minnesota with a minor in Writing Studies, and an MA and a BA in Art from the University of Northern Iowa. Barness' research through design investigates theories in social issues, language and interactive technologies. Her work has been exhibited at venues such as Hebei Normal Museum, China and FILE Electronic Language Festival, Brazil, and published in Communication & Place and Currents in Electronic Literacy. She has also presented research at the International Committee for Design History and Design Studies Conference (2014), SEGD Academic Summit (2014), AIGA Design Educators Conference (2013) and HASTAC (2013), among others.

Amy Papaelias is an Assistant Professor in the Graphic Design program at SUNY New Paltz, teaching courses in web and interaction design, as well as 2D design and visual communication. She holds an MFA in Intermedia Design from SUNY New Paltz and a BA in Cultural Studies from McGill University. Her creative research lies at the intersection of design, culture and technology with specific interests in interactive typography and the digital humanities. She has presented her design work and pedagogy at Theorizing the Web 2014, AIGA Design Educators Conference (2007, 2013), TypeCon (2005, 2007, 2012), UCDA Education Summit (2011) among others. In 2013, she was selected to participate in One Week One Tool, an NEH-funded Institute for Advanced Topics in the Digital Humanities, hosted at the Center for History and New Media at George Mason University and co-authored a long paper on the experience that was presented at Digital Humanities 2014.

[3] Andrew Blauvelt, "Graphic Design: Discipline, Medium, Practice, Tool, or Other" (paper presented at counter/point: The 2013 D-Crit Conference, School of Visual Arts, New York, NY, May 11, 2013.

[4] Albinson, Ian and Rob Giampietro. Graphic Design: Now in Production (Minneapolis: Walker Art Center, 2011).

[5] Rosanne Somerson. "The Art of Critical Making: An Introduction" in The Art of Critical Making: Rhode Island School of Design on Creative Practice, ed. Somerson, R. and Hermano, M. (Wiley, 2013), 19.

[6] "Critical Making in the Digital Humanities: an MLA 2014 Special Session Proposal" by Roger T. Whitson, accessed on March 3, 2014. http://www.rogerwhitson.net/?p=2026

[7] Critical Making Zine by Garnet Hertz, accessed on March 3, 2014, http://www.conceptlab.com/criticalmaking/

[8] Speaking in Code, accessed on June 9, 2014. http://codespeak.scholarslab.org/

Design for Information: An Introduction to the Histories, Theories, & Best Practices Behind Effective Information Visualizations

Isabel Meirelles

Beverly, MA: Rockport Publishers, 2013.

For a complementary perspective of this book, please refer to the review written by Aaron Marcus in the *Information Design Journal* 20(3), 296–297

The book is a thorough representation of both the field of information visualization and the research interests of the author, whose focus is on "the theoretical and experimental examination of the fundamentals underlying how information is structured, represented and communicated in different media."

Beginning by the "big picture," the book includes an amazing collection of examples, the most thorough I have seen to date in a volume. The author organizes the content according to several categories represented by the titles of the chapters: 1) Hierarchical structures: trees; 2) Relational structures: networks; 3) Temporal structures: timelines and flows; 4) Spatial structures: maps; 5) Spatio-temporal structures; and 6) Textual structures. An appendix, notes, bibliography, contributors list, and index, complete the apparatus of the book.

Design for information is an extensive taxonomy of data visualization types, and is "a must" for anybody interested in the work done in the area. Each one of the hundreds of examples is explained and discussed, forming a kind of encyclopedia on the subject. It seems that nothing escaped from the through gathering of examples that Meirelles got involved in. The discussions and explanations normally focus on what information is represented and how it is represented.

It is interesting to see as well how many different professional fields use today diagrams to organize and represent information: basic science, applied science, education, engineering, medicine, technologies, etc. The value of the book is centered on the inclusion of examples of how many different problems are today being confronted by data visualizations, how many historical efforts preceded whatsoever is done today, and how the advent of the computers have allowed the field to explode, handling large data sets as well as dynamic representations.

At the end of the examination of the 224-page volume one becomes curious as to how might these diagrams have performed with the users they were intended for in terms of ease of comprehension; what conclusions could one arrive at from an evaluation of the examples included regarding perceptual and cognitive human factors; or how could a complementary book contribute to the development of best practices. I would not expect that one volume could be so extensive as this one and also cover the field critically. One, however, has to wonder how the super-complex visualizations permitted by computer programs today would perform regarding comprehension, memorization, and use of the information presented. The discussion on perception and cognition is very brief, and it might leave some readers wondering about the assertions made: they are proposed as principles without them being discussed. This topic, as well as Gestalt theory, are not considered during the description of examples. The size of some reproductions is too small to assess their quality as data visualizations, they appear as samples of problems dealt with but not as information in themselves. To compensate for this, the book includes valuable URLs for people interested in seeing in better detail many of the diagrams shown.

While the above could be perceived as a weakness, the strength of the book is its truly amazing array of examples and the rare historical diagrams it offers. It also displays an uncommon erudition, and includes an extensive and useful bibliography. One does not know how long Meirelles took to complete the manuscript, but it feels like a life-time project. These assets, coupled by an excellent production, make it an indispensable publication for whoever can be interested in information visualization.

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48.2 Visible Language

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48.2 Design Research Journal

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Before there was reading there was seeing. Visible Language has been concerned with ideas that help define the unique role and properties of visual communication. A basic premise of the journal has been that created visual form is an autonomous system of expression that must be defined and explored on its own terms. Today more than ever people navigate the world and probe life's meaning through visual language. This journal is devoted to enhancing people's experience through the advancement of research and practice of visual communication.

If you are involved in creating or understanding visual communication in any field, we invite your participation in *Visible Language*. While our scope is broad, our disciplinary application is primarily design. Because sensory experience is foundational in design, research in design is often research in the experience of visual form: how it is made, why it is beautiful, how it functions to help people form meaning. Research from many disciplines sheds light on this experience: neuroscience, cognition, perception, psychology, education, communication, informatics, computer science, library science, linguistics. We welcome articles from these disciplines and more.

Published continuously since 1967, *Visible Language* maintains its policy of having no formal editorial affiliation with any professional organization – this requires the continuing, active cooperation of key investigators and practitioners in all of the disciplines that impinge on the journal's mission as stated above.

cover photography: Patricia Cué

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Learning Design Thinking by Designing Learning Experiences:

A Case Study in the Development of Strategic Thinking Skills through the Design of Interactive Museum Exhibitions

Lisa Fontaine

Realities of contemporary graphic design seem to mandate the development of broad thinking skills since graphic designers are increasingly asked to design innovative solutions that go beyond the boundaries of print and web-based media. This emphasis on ideas rather than objects suggests a move toward what is often referred to as design thinking, an approach that is seen as a response to the needs of the 21st Century innovation economy. Design thinking is said to be the creative process that focuses on user needs and motivations as the major impetus for creative solutions. It is vital for graphic design educators to prepare students to view themselves as design thinkers: problem-solvers first, image-makers second. A popular curricular response to this paradigm shift has been the inclusion of user-centered design projects that involve the design of experiences rather than of objects. The design thinking process requires students to develop an understanding of the user by listening, watching and learning about their preferences, needs, and limitations.

Throughout education, there is widespread belief that all students should be better prepared with relevant skills to enter the evolving workplace, regardless of their chosen discipline. Commonly referred to as 21st Century skills, these include important abilities that are not currently emphasized in the K-12 curriculum, such as critical thinking, problem solving, collaboration, creativity, and innovation (Goldman 2010). It is easy to see direct correlations between these widely desired skills and those developed in the practice of design thinking.

photography: Emily Nizzi

In the Graphic Design Department at Iowa State University, the curriculum is continually evaluated for opportunities to figure graphic design as a problem-solving discipline rather than one of form-making or self-expression. As we begin to make this transition, it has become clear that our design students are ill prepared for these new expectations, having been educated in a system that prioritizes standardized test scores. Graphic design educators are now struggling to devise new pedagogy that efficiently incorporates design thinking in the classroom. Experience design, with its open-ended challenges, is seen as an ideal setting for this and is now integrated into our curriculum through courses in mobile and time-based media, as well as through increasingly complex project briefs for brand identity and other design problems. Similar initiatives are being effectively implemented in many other graphic design programs, especially as the profession has begun identifying the design of experiences as being within our expertise. Unique to Iowa State University's graphic design program, however, is the integration of an interactive museum exhibition as a curricular opportunity to teach experience design and practice lateral thinking. By designing the visitor's learning experiences, it is believed that the design students become skilled in user-centered design and gain a deep understanding of how to create environments where people learn.

DESIGNING INTERACTIVE EXPERIENCES

The design of interactive museum experiences is extremely challenging for students as they are presented with unique requirements not encountered before. This makes it effective pedagogy and is an efficient way to introduce new skills.

Museums have an incredibly diverse audience, ranging across ages and education levels, so they require a multiplicity of approaches to allow each visitor to have a unique experience with meaning making (Rawson 2010). It can be especially challenging to identify communication and participation strategies that will resonate with a variety of user groups. Interactive exhibits need to relate to the visitors' interests as well as their current knowledge (Jacob, 2011), a task that is made even more difficult for design students when one considers in the limited attention span of a child visitor. The challenges of communicating to diverse audiences make interactive experience design an especially good vehicle to cultivate design thinking skills since consideration of user needs is a significant criteria.

The design of interactive exhibits is an example of an ill-defined problem: we know something about what needs to be communicated, but how this should occur is open-ended (King, 1994). This is quite different from many of the well-defined problems typically included in a graphic design curriculum,

where the solution is prescribed (i.e. it's either a website, a magazine, or a logo). Ill-defined problems are ideal for broadening students' thinking skills, which will be fundamentally useful as students enter an evolving profession. The skills learned here can be utilized later in other visual communication work, from print to web and mobile media.

For the past 23 years, the author has incorporated museum exhibition design into the graphic design curriculum in order to introduce students to critical thinking and problem solving. In 2008, this evolved into an ongoing collaboration with the Field Museum of Chicago, which has included the design of exhibitions about conservation, ants, Egypt, biomechanics, and paleontology. Each semester the museum's Exhibit Design Director, Alvaro Amat, challenges the students with a different exhibit theme and presents them with the museum's content outline, learning objectives, and relevant artifacts. Students design and propose several exhibits that include experiential learning components to help visitors learn about the scientific subtopics. While designing these exhibits, the students are learning to apply their design thinking skills since the Field Museum has very specific intentions regarding their themes and sub-themes but has intentionally offered no suggestions about possible outcomes. Students quickly realize that design solutions focusing primarily on graphic form or self-expression cannot succeed in this user-centered arena. Working with a real client also demands accountability, as one cannot simply avoid difficult obstacles in the design problem but must design a way around them. Although the Field Museum does not expect to implement the students' designs, both sides of the collaboration treat the project as realistically as possible.

Design studio projects are, by their nature, examples of experiential learning, a method of learning by doing, so there is nothing new about incorporating project-based learning in design studio. For this assignment, however, the students are learning to facilitate experiential learning for the museum visitors. So they are learning design thinking by designing learning experiences.

MUSEUMS & EXPERIENTIAL LEARNING

Exhibits that engage the museum visitor through interactive experiences build interest and help with comprehension and retention of the information. Interactive museum exhibitions, where an individual can directly encounter a phenomenon, are productive environments for experiential learning. Through personal contact, information that was once abstract can be translated into concrete realities. An exhibit can encourage the visitor to understand scientific phenomena through interactive engagement that allows for choice and initiative (Caulton, 1998). By allowing for human individuality, experiential learning encourages creativity and invention.

Experiential learning has been long understood in the education field, as far back as John Dewey who identified the importance of learning through experience in 1925 (Dewey, 1937). Museum educators adopted his theories; Dewey's influence on them is immeasurable (Shaffer, 2010). Constructivist theory in education built upon Dewey's work. This theory focuses on how the prior experiences of the learner influence how s/he learns. By engaging with information through the lens of their existing knowledge, "…learners are active agents, constructing knowledge rather than passively receiving it" (p. 38). Constructivist theory has also been enthusiastically adopted by museums, so they can better respond to the diversity of their audience by offering a multitude of ways to access the exhibit content. Museums no longer attempt to create a single, consistent visitor experience; instead they view themselves as facilitators of co-produced experiences (Simon, 2010).

Contemporary museums embrace their role as a source of informal learning. This term is used to define learning that occurs outside the formal classroom (Bitgood, 2013). It is considered to be a lifelong process that allows for learning in a variety of environments. Museums provide an informal setting that can allow learners to become immersed in a particular time or place and can offer simulated experiences through activities and games. This is, in fact, what brings visitors to museums: they come with the intention of engaging in alternative educational experiences (Anway, 2010). The methods of delivering educational content in museums now include immersive and multi-media environments, but can also include low-tech engagements through physical exploration and play (Jacob, 2011). Informal learning also allows for social experiences; families can learn together even though they have different levels of experience and attention (Bitgood, 2013).

Gardner's theory of Multiple Intelligences has also played a significant role in museum education. Gardner proposed that there are several different components to a person's intelligence; it is not a single entity. He proposed eight (and later nine) different types of intelligences, including linguistic/verbal, logical/mathematical, visual/spatial, bodily/kinesthetic, musical/rhythmic, interpersonal, intrapersonal, naturalist, and existential (Gardner 1993). According to Gardner, the first two are the ones highly valued in formal education, yet each of us has a unique blend of abilities involving many or all of them. He recommended a more holistic approach to learning that empowers learners by providing multiple access points into information to allow each person to devise his/her own path. His ideas about the many ways that people learn have been widely accepted in the museum world since they support the intentions of informal learning environments, where learners construct knowledge through non-traditional learning environments (Caulton, 1998).

Approximately twenty graphic design students per year have participated in the Exhibition Design Studio and its collaboration with the Field Museum since 2008. The course meets six hours per week; it is a required class for students pursuing the MA degree in Environmental Graphic Design, and is an option class for other graphic design students in the BFA or MFA degree programs. Most students enrolled in the course have little or no prior coursework in 3-dimensional design; some have had exposure to experience design through web or mobile media courses. The Interactive Exhibit assignment is a 10-week project.

The students work through several steps in the process of designing interactive visitor experiences for the museum's exhibits. These steps align directly with those typically described in the Design Thinking Process Guide (2014). Table 1 shows the specific steps and learning outcomes of this assignment as they relate to the design thinking phases, critical thinking phases, and 21st Century skills outlined in the literature.

	design thinking skills	critical thinking skills	21st century skills	The Interactive Museum Exhibit Assignment	intended learning outcomes
Phase 1	empathize			**1.1** learning styles and education theory	Students understand that people learn in different ways.
				1.2 universal design	Students become responsive to the different needs + abilities of users.
				1.3 ethnographic observations of museum visitors	Students are able to use observations to inform their design solutions.
Phase 2	define, develop strategies	critical thinking + collaboration		**2.1** collaboration with museum experts	Students learn to value the contributions of other disciplines.
		collect information		**2.2** investigation of visitor interaction types	Students understand how to choose and implement interactive methods.
		define the problem		**2.3** research on scientific topic	Students are able to synthesize topic research to establish parameters.
Phase 3	ideate	invent creative solutions	creativity, problem solving	**3.1** ideation	Students are able to define the problem + freely explore diverse ideas.
				3.2 establish and develop exhibit narrative	Students are able to develop a compelling + relevant story.
Phase 4	prototype and test	construct prototypes	critical thinking, innovation	**4.1** design of the interactive learning experiences	Students are able to test ideas quickly and evaluate results.
				4.2 exhibition design components	Students are able to apply principles of universal design to 3-d structures.
	defend and evaluate	evaluate		**4.3** graphic and information design	Students are able to use information hierarchy to enhance clarity.
Phase 5			communication	**5.1** present design proposal	Students are able to articulate about their creative solutions.
				5.2 self assessment	Student is able to reflect on personal process + evaluate its effectiveness.

Table 1
Intended Learning Outcomes

Brown (2009) considers the first phase of design thinking to be empathy; the designer must become concerned with the needs, abilities, and interests of the user (Brown 2009). This is where the students need to define the museum's wide-ranging audience members and understand their varied learning styles. In this project, audience definition and analysis are addressed in steps 1.1, 1.2, and 1.3.

Step 1.1: Learning Styles & Education Theory

Students receive a basic introduction to Dewey's theory on experiential learning, and learn how it is being applied in museum education. They learn about the many different learning styles articulated in Gardner's Multiple Intelligences theory. They explore these multiple intelligences to determine how particular interaction methods can appeal to different kinds of learners. They study examples of constructivist theory as it applies to visitor interactions. If each visitor constructs meaning based on their own knowledge and experiences, then it's also important to think about how a child's way of understanding an exhibit will differ from that of an adult due to basic developmental milestones (Rawson 2011).

Step 1.2: Universal Design

As students of graphic design, most have not yet been introduced to the principles of universal design and have not needed to consider safety issues in their design work. All aspects of accessibility need to be understood in order to design museum exhibits. As a basic introduction, students are exposed to principles such as perceptibility, operability, simplicity, forgiveness, and constraint (Lidwell, 2003). These general guidelines are supplemented with the more specific mandates in the Smithsonian's Guidelines for Accessible Exhibition Design (Majewsky, 2013).

Step 1.3: On-site Visitor Observation in Museums

Students conduct ethnographic observation at several museums in Chicago: the Children's Museum, the Nature Museum, the Museum of Science and Industry, and the Field Museum. They observe the ways that interactive experiences succeed or fail with users, and the effectiveness of various interaction types for different kinds of knowledge transfer. Students locate examples of each of the interaction types they have studied and observe the examples' effectiveness at engaging the visitors with the exhibit theme. Students are able to personally experience immersive environments. While on the site visit, students are able to observe how well the principles of universal design are being implemented and what happens when a museum overlooks these principles. While examining the displays, they are able to observe that "… the final exhibit will live or die based on the interface…"(Beale, 2011, p. 215.)

This observation phase is vital, as it provides an understanding of visitor behavior. Upon returning from the field trip, students document their observations in writing and photos, analyzing what methods worked well to engage different kinds of learners and how visitors really interacted with exhibits. They also analyze and document unresolved visitor interactions: did they fail due to perceptibility, operability, simplicity, forgiveness, or constraint?

PHASE 2: **PROBLEM DEFINITION & STRATEGY DEVELOPMENT**

Problem definition and strategies for solving them are addressed in steps 2.1 – 2.3. This is typically a period of analysis and investigation.

Step 2.1: Collaboration with Museum Experts
The class then meets with the design director and exhibit curator to discuss the exhibit theme and how it fits into the museum's broad educational goals. The design director invites each student to define their own specific goals and to determine the most engaging aspects of their subtopic. This collaboration continues throughout the phases of the project.

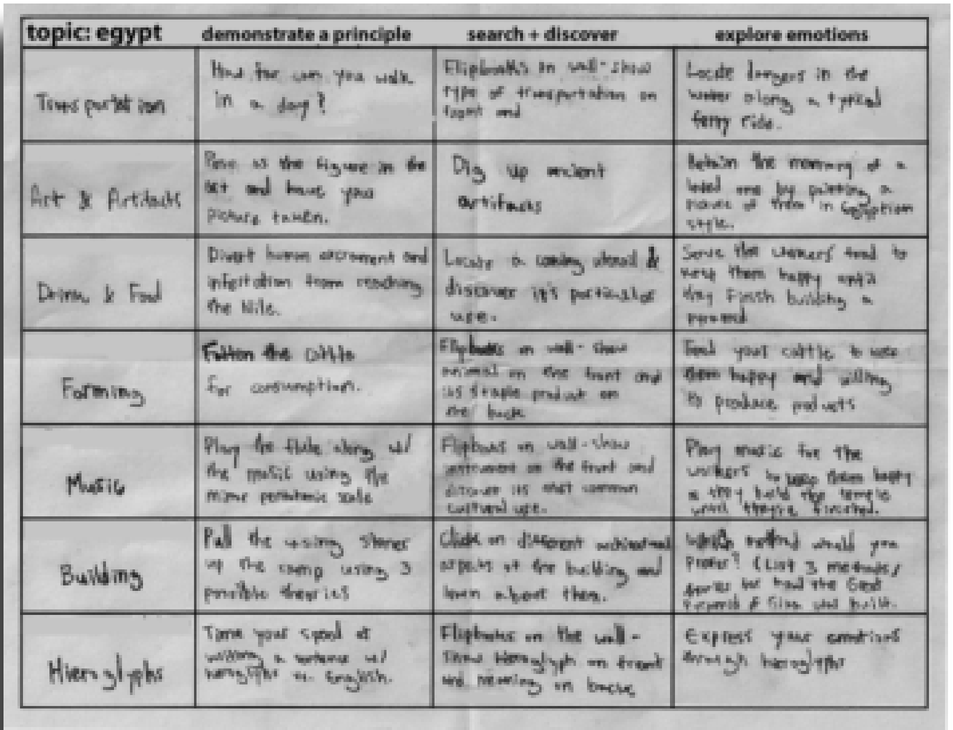
Step 2.2: Investigation of Visitor Interaction Types
Students are introduced to a taxonomy of interaction types, devised by the author, which include role-play, create and build, search and discover, demonstrate a principle, test your abilities, and explore emotions. As they begin to define their own exhibit goals, they study these interaction types to determine their usefulness for engaging visitors with different learning challenges.

Step 2.3: Research on Scientific topic
Students research the overall theme of the exhibit, with special focus on the subtopic they've been assigned. Within the Biomechanics exhibit, for example, students are given subtopics that contribute to the overall understanding of how animals adapt to their environment; these include locomotion, generating forces, temperature regulation, and staying in one piece. From this broadly defined subcategory, the students need to determine what part of that 'story' to tell and how to tell it.

A strategic plan is submitted by each student that defines the parameters of the learning experience; key facts or 'take-aways' are identified that align with the museum's exhibit goals.

Step 3.1: Ideation

Ideas are generated using an ideation matrix, which cross-references several potential subtopics with the interaction types to encourage multiple ideas for discovery-based interactions (*table 2*).



topic: egypt	demonstrate a principle	search + discover	explore emotions
Transportation	How far can you walk in a day?	Flipbooks on wall - show type of transportation on front and	Locate dangers in the water along a typical ferry ride.
Art & Artifacts	Pose as the figure in the art and have your picture taken.	Dig up ancient artifacts	Retain the memory of a loved one by painting a picture of them in Egyptian style.
Drink & Food	Divert human excrement and infestation from reaching the Nile.	Locate a cooking utensil & discover it's particular use.	Serve the workers food to keep them happy until they finish building a pyramid
Farming	Fatten the cattle for consumption.	Flipbooks on wall - show animal on the front and its staple product on the back	Feed your cattle to make them happy and willing to produce products
Music	Play the flute along w/ the music using the minor pentatonic scale	Flipbooks on wall - show instrument on the front and discover its most common cultural use.	Play music for the workers to keep them happy as they build the temple until they're finished.
Building	Pull the [illegible] stones up the ramp using 3 possible theories	Click on different architectural aspects of the building and learn about them.	Which method would you prefer? (List 3 methods/ theories for how the Great Pyramid & Giza was built.
Hieroglyphs	Time your speed at writing a sentence w/ hieroglyphs vs. English.	Flipbooks on the wall - Show hieroglyph on front and meaning on back	Express your emotions through [illegible]

Table 2
Ideation Matrix
student: Kyle Holcombe

Once a promising idea has been found, the student is asked to prepare three interactive exhibit proposals for visitor engagement that identify specific learning outcomes (Beale, 2011) and tasks the visitor will do in each engagement. The student also needs to describe why this is the best possible way to teach this information. Many of the interactive methods can be accomplished through either a physical or virtual experience. There are situations where a virtual simulation is not sufficient, but others where technology is critical to the experience (Jacob, 2011). Students must consider the advantages and disadvantages of each approach.

One proposal is selected out of three by the museum staff. The selection is based on how well the proposed interaction teaches the topic, how well it engages the visitor, how wide the audience could be, and how aligned it is to the museum's content outline.

Step 3.2: Establish Exhibit Narrative
Within each of the three proposals, students must establish a narrative for the proposed interaction. Skilled as they are with visual storytelling, this is often one of the least challenging aspects of the assignment for graphic designers. Included within their ideation they must propose possible headlines, explanatory text, and invitational text. This helps them establish the narrative within which the interactive learning will occur. Considerable testing and revising is needed to best align the narrative with the learning outcome, and ensure access for the widest audience.

PHASE 4: **PROTOTYPE**

Prototyping has been defined as a willingness to try something out and is thought to be the most effective way to create new ideas (Brown, 2009).

Step 4.1: Design of the Interactive Learning Experiences
At this point, students design quick prototypes of the interactive learning components and explore several different options for each interaction. For example, what do visitors do? How do they know what to do? If there's a guessing game, how will they know if they got it right? How might they misinterpret what you want them to do? In these refinements of the interactions, they also question the 'reward for learning. How does this teach the intended learning objective? Students experiment with affordances—physical characteristics that influence the user's understanding of how something gets used. What kinds of affordances (buttons, levers or devices) are most effective for meaningful engagement (Lidwell, 2003)? The students' prototypes are presented in class, tested, and reviewed with museum staff.

Whether designing an interaction about soil erosion, green buildings, endangered species, or coral reefs, the student's focus needed to always be on the ways that these complex topics can be made engaging and understandable through interactive experiences.

Step 4.2: Design of the Interactive Component
Students design the structure of the interactive component to house their visitor interactions, whether physical or touch screen. To facilitate family or group gatherings, the exhibit workstations must remain approachable from at least three sides. This ensures that children are not isolated from their parents within the exhibit space (Falk and Deering 1995). The interactive component should allow for more than one visitor to interact with it at the

same time. The placement of images, typography, artifacts and interactive elements should be carefully determined so that they enhance the information hierarchy and are located at appropriate heights for visitors; instructions and invitational text "…should go where the visitors' hands and eyes go when they use it" (Rand, 2010, p. 278.)

Step 4.3: Graphic and Information Design

At this final stage of refinement, there is a focus on how information hierarchy can be best used to simplify and clarify the message. Students become aware of the important role of information design in museum interaction; graphic design cannot be brought in merely as decoration or personal expression here. According to Roberts, "… the manner of presentation affects not just the effectiveness of the communication but also the particular meaning it bears" (2008, p. 74.) Graphic design students are most familiar with this step as this has been the focus of much of their prior coursework. As a result, they already know that attention to hierarchy can greatly influence the comprehension of text and images.

Typically within the design process, there is a testing phase, where the selected design is implemented and evaluated. Given the hypothetical nature of the assignment and the expense and time involved in testing, this phase is not included in the assignment.

PHASE 5: **PRESENTING & REFLECTING**

Upon completion of the design revisions, students must present a comprehensive proposal to the museum's Exhibition Design Director. This proposal includes all aspects of the functionality and learning intentions of the visitor interaction, including visual prototypes of each step the visitor takes and its result. Students document the design process to review their decisions and reflect on the effectiveness and innovation of their solutions.

Assessment of Outcomes

As with any project-based studio assignment, the Interactive Exhibit Project cannot be assessed with the objectivity of a multiple-choice exam but rather is measured with a reflective rubric tool that includes the intended learning outcomes listed in Figure 1.

Sample Outcomes of the Interactive Exhibit Assignment

The following outcomes vary widely in interaction method and learning intentions; the samples show the range of solutions that can be developed by following the design phases of this assignment. In order to be effective, each interactive exhibit must avoid confusing messages, teach the intended lesson, and reward the visitor's participation.

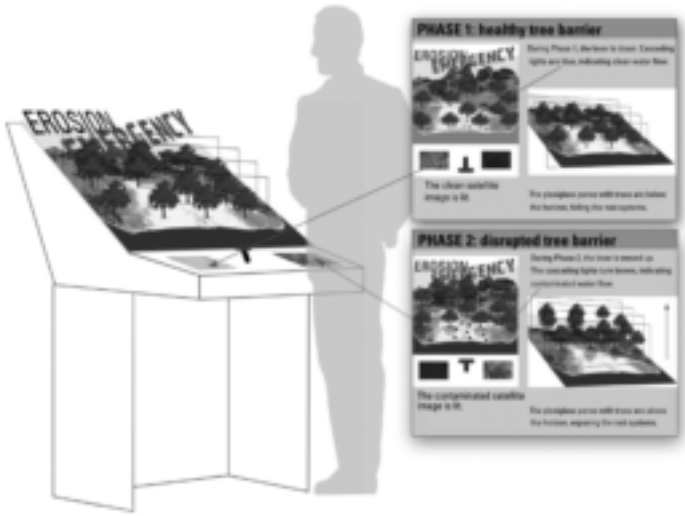
Leafy Truth Exhibit
Justin Rumpza

In the Conservation project, students were assigned a wide range of subtopics identified by the museum staff. These included soil erosion, green buildings, endangered species, coral reefs, and urban ecology. In the Leafy Truth exhibit, the student has created an interactive experience that demonstrates a principle about the cooling factor of trees within a city. In the physical simulation of urban pavement, he invites visitors to compare the area shaded by trees to the area not shaded. The visitor can feel the difference in heat on the pavement; this sensory involvement engages bodily/kinesthetic learning. While this could have been simulated in a virtual exhibit, the sensation of heat seems critically important to the learning.

Below: Overhead view of the simulated pavement (not shaded vs. shaded) for visitors to compare.

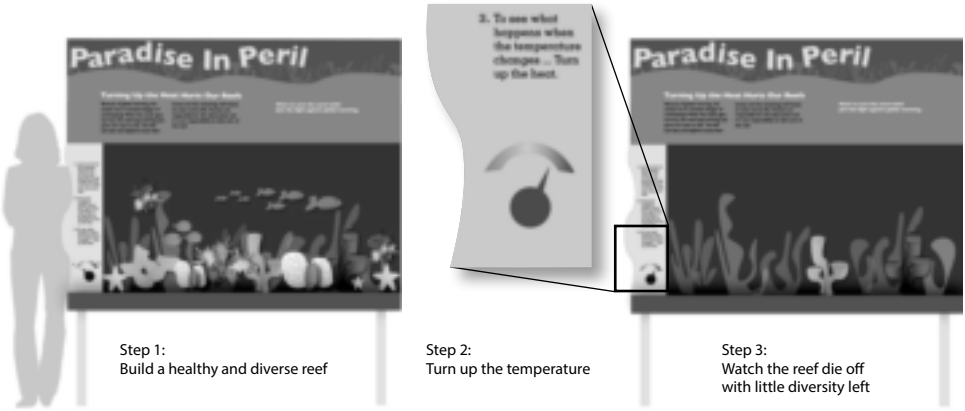
Erosion Emergency Exhibit
Emily Graves

In this exhibit, the student's intention was for visitors to learn how important trees are in preventing soil runoff. The interaction she designed demonstrates a principle by showing the different pathways rainwater will take to a river, depending on whether there are trees to impede its journey. By lifting the lever, visitors uproot the rows of trees which causes rushing rainwater to become contaminated with soil. This simulation compresses time to quickly show a process that likely takes weeks or months. A clear cause and effect relationship is evident through this narrative, so visitors of varying ages and abilities can easily learn the lesson.



Paradise in Peril Exhibit
Kelsy Postelthwait

In this conservation exhibit, the student wants to teach the visitor that global warming is destroying the coral reefs; many of the diverse species in a reef cannot tolerate the increased water temperatures. First the reef is presented in all its healthy diversity; then the visitor is invited to see what happens if the temperature rises. This action de-magnetizes many of the flora and fauna, resulting in one sorry looking coral reef. The act of turning up the dial is a metaphor that puts visitors in the position of the cause agents, and shows them the consequences of their actions. This simulation allows us to travel across oceans and to compress years of time into a few moments (Beale, 2011). This could have been accomplished with a virtual interaction, but the student has opted to reach a younger audience through the loose manipulation of physical components.



Step 1:
Build a healthy and diverse reef

Step 2:
Turn up the temperature

Step 3:
Watch the reef die off
with little diversity left

The Ant Hill Exhibit
Nick Riha

Another student designed a create/build interaction, where the visitor learns about the chambers of the anthill by constructing a cross-section model. This design demonstrates a principle so that the visitor understands how the interconnecting chambers work in relation to the anthill's construction. Children will be especially drawn to the loose manipulation of simple shapes, and the message seems age appropriate for this user group. This interaction especially appeals to visual/spatial learners.

Above: Anthill puzzle pieces showing cross-section of tunnels and chambers.

Egypt Timeline Exhibit
Taylar Jacobson

In the Egypt Timeline exhibit, the student has designed an interactive timeline showing seven time periods in Egypt's history, and featuring changes in territorial size over time, as well as the different religions, population, and art of each of the periods. While the information is presented on a video screen, the student has decided to provide a large sliding knob to activate the chronological shifts from ancient to contemporary Egypt. She feels that the strong left to right movement helps make a reference to chronology, and the physical engagement strengthens this understanding and incorporates bodily/kinesthetic learning.

Right: Video screen shows changes of territory, religion, and art over time.

Trade by Barter Exhibit
Kegeng Liu

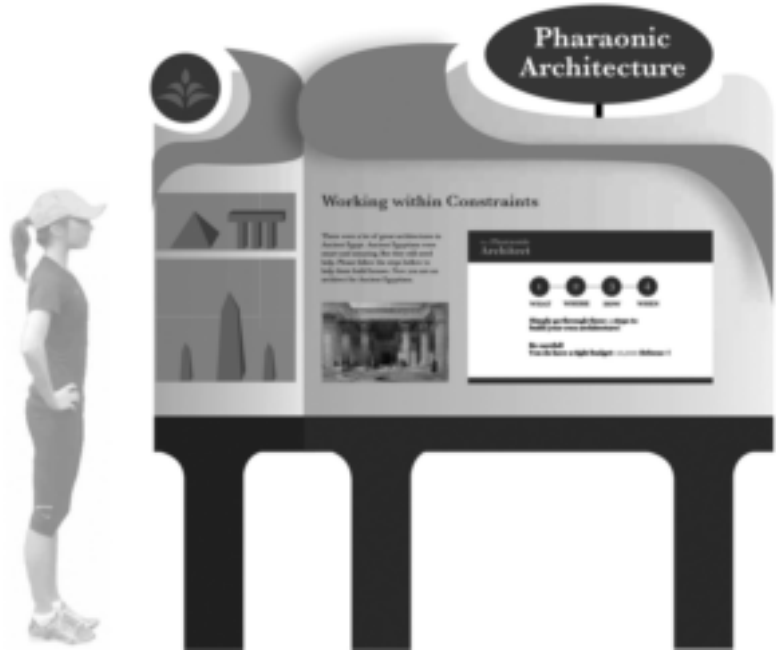
Ancient Egyptians used bartering in the marketplace, so this student invites the visitor to role play by engaging them in a simulation game with physical props that are coded by value. Visitors select a prop of unknown value and attempt to trade it for a different item; players place their items on the scale. The scale reads RFID labels to know the value of each prop, which enables the nearby screen to indicate if the items are a fair trade or not. The game requires two players; this allows for social learning that is often a key component of informal learning. By inviting visitors to engage in a negotiated experience, she has created a condition where "… the dialogue improves the learning" (Bekerman, 2006, p. 3.) This interaction will appeal to many visitors but works especially well for interpersonal learners.

Visitors engage in social learning while playing the 'trade by barter' game.

Pharaonic Architecture Exhibit
Yun Wang

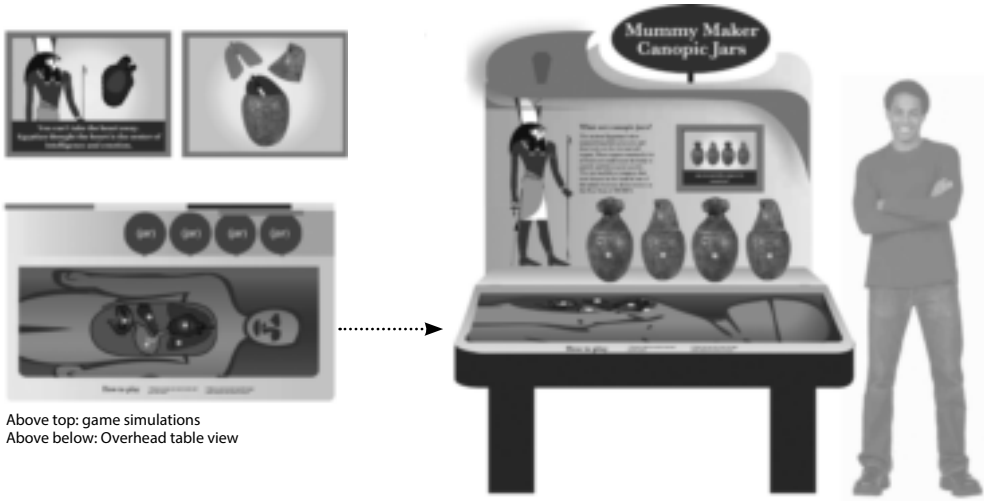
This student noticed that Egyptian architects dealt with the same constraints as contemporary ones: limitations of time, money, materials, and location. She designed a role play game that lets the visitor become a pharaonic architect and make decisions about the design of a building in ancient Egypt. As the visitor makes decisions for the project, costs rise and compromises must be made. Visitors will likely be familiar with this type of negotiation game, used in computer games as far back as The Oregon Trail. The visitor learns that little has changed in project management for thousands of years, creating a bond that connects the visitor to the people of ancient Egypt. Through design iterations the student determined that this is best done as a virtual experience. Applying the principles of accessible design (Lidwell, 2003) she allows for forgiveness of errors and employs meaningful constraints that motivate and focus the learning experience (Simon, 2010).

Right: Excerpted interactive game simulations that offer choices to the visitor at each stage of the building process



Mummy Maker Exhibit
I-yun Liu

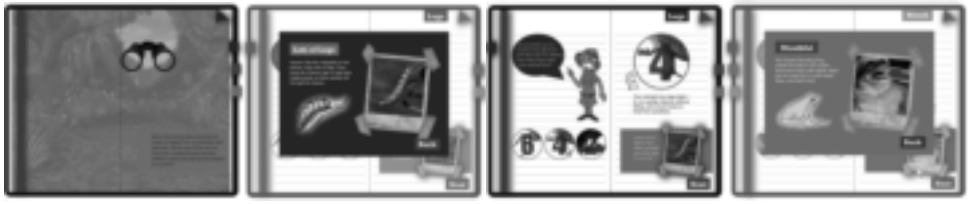
In the Egypt project, topics ranged from cultural history to archeology and agricultural history. In the Mummy Maker Exhibit, the student has devised an interaction based on the popular game Operation, where the visitor learns about the process of preserving human organs in canopic jars. Museum experts suggest the use of familiar games as a method for making exhibit topics approachable to visitors (Goldowsky and McConnell, 2011). For each organ there is a god that guards its particular jar. On a table in front of the canopic jars, a body with exposed organs allows the visitor to guess which canopic jar is intended for each of the organs and which Egyptian god is designated as its guardian. Through a series of iterative prototypes and feedback from museum staff, the student determined that a purely physical simulation game was functionally impractical. Her final solution incorporates both physical and virtual, with the three-dimensional body and jars connected to a video simulation of the organs dropping into the jars.



Above top: game simulations
Above below: Overhead table view

Discover a New Species Exhibit
Megan Fynaardt

In the Biomechanics project, students developed interactive experiences that explained some of the ways that animals and humans have adapted to their environments. In the Discover a New Species exhibit, the student has designed a touch screen game that teaches visitors how scientists categorize and identify species based on characteristics such as the quantity and type of legs, type of skin, and type of mouth. The visitor gets to play the role of the field scientist, and to fill out a field journal with wildlife discoveries. This seems to work best as a virtual experience since the sizes of the species and their habitats are too varied to effectively use physical simulation. Through this carefully constrained narrative, the student introduces the visitor to the fascination of being a field scientist (one of the museum's broad goals).



Above: Excerpted game simulations.

Built for Speed Exhibit
Holly Kayser

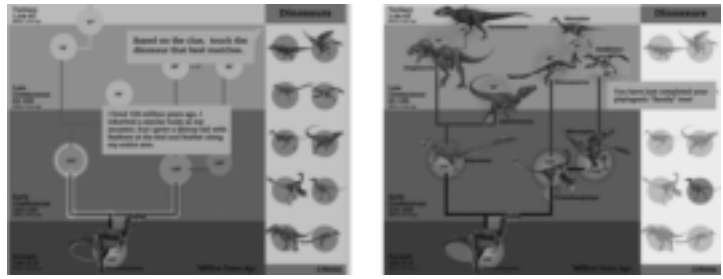
This student chose to teach about biomechanics by showing how each creature has adapted according to its needs. Cheetahs are really fast, but they don't need endurance. That's where humans are superior. In the Built for Speed exhibit, visitors run in place on a responsive floor pad (similar to that of the Dance Dance Revolution game), which reads their pace and compares it to that of the cheetah. While pretending to be the world's fastest sprint runner, or the world's best endurance runner, visitors will always have consistent race results: the cheetah will always win on speed alone, but the human will always win if the race is long enough. The comparison could be made simply by watching the human and cheetah race each other, but by including the floor pad, the student has added a feature that is especially inviting for bodily/kinesthetic learners.

Right: Excerpted interactive game simulations comparing speed racing to endurance racing.

Phylogeny Exhibit
Kayla Brown

Phylogeny is the study of the evolutionary development and history of a species. In this exhibit about dinosaur evolution, the student uses the metaphor of a family tree to help visitors understand relationships between phyla across eras that span millions of years. The interaction uses a test your ability method, which allows visitors to make increasingly informed guesses as they progress through the game. The student has determined that this works best as a virtual experience, where millions of years and a multitude of dinosaur species can be viewed on one frame. This interaction will be particularly inviting to logical/mathematical learners.

Right: Excerpted interactive game simulations showing progressive construction of a phylogenic tree



It is not known whether the skills developed during this assignment will become a permanent addition to a student's skill set. While an assessment rubric has been previously shown to be a useful tool to assess student ability in completing the project, Goldman et al point to the difficulty of using this type of reflective tool to assess the long-term shifts in a student's thinking. For this they suggest a performance assessment task after the project is completed, to see if the student has become more human-centered in his/her approach to new design problems (Goldman et al, 2010). Future offerings of this collaboration with the Field Museum could be assessed with a pre/post test, which would help to determine if the student is more likely to approach subsequent projects with empathy for the user than before this project began. Goldman describes this phenomenon as mindshift: the development of new viewpoints and instincts that can be seen through changes in the student's actions as a design thinker. The pre/post test could also determine the successful carryover of other design thinking skills; for example, if a student is better able to define a problem, to determine a strategy, and to develop rapid prototypes and test them.

CONCLUSION

There are several pedagogical advantages to incorporating interactive exhibition design into the curriculum. As a method for emphasizing strategic/design thinking, this challenge is well suited, since it is only possible to achieve the museum's learning objectives with a focus on user needs. Visually appealing graphic solutions cannot be the primary goal of the students. By learning to prioritize the visitor's learning challenge, the students become more versed in user-centered design. By defining the problem, structuring the narrative, devising and testing their own solutions, and documenting their process, they are practicing the higher order thinking that will be expected of them as 21st Century design professionals. These skills will, of course, be translatable to other areas of their graphic design careers, whether they be in print, web, or physical space.

Alvaro Amat, the Exhibit Design Director of the Field Museum and collaborator on the assignment, recognizes these expanded student skills as an indication of what new designers will be bringing to the profession:

"Some of the ways in which the students approach the creative process guided by Professor Fontaine, and the inherent talent of this new generation of designers, have had an impact on the way I see exhibition design management. One concrete aspect that has been affected is that in our institution graphic design, media and interactive development tend to be all independent divisions, separate from each other and from exhibition design which we call 3D Design. Through this collaboration in ISU's projects, I've

witnessed how students integrate all aspects of the exhibition experience, providing an insight into how our professional process could make more sense, in accordance with the kind of tools and skills that these new designers bring along with them. As these new professionals begin to participate in the profession, we will see a turn towards more integral design practices that are beneficial for the expansion of the field."

AUTHOR BIO

Lisa Fontaine is an Associate Professor of Graphic Design at Iowa State University, where she has taught since 1987. Professor Fontaine recently helped to develop ISU'S new MA degree program in Environmental Graphic Design, the first of its kind in the nation. She was a member of the 'Hablamos Juntos,' design consortium, a national initiative for healthcare symbols, and was its national research director; the project was awarded 'Best in Healthcare Design 2011' by the International Institute for Information Design (IIID). Through the Institute for Design Research and Outreach, she has supervised the student design of over 180 identity projects, sign systems, placemaking, exhibition design, wayfinding and downtown revitalization projects for Midwestern communities and clients. She has presented research at the American Institute of Graphic Arts (AIGA), Society of Experiential Graphic Design (SEGD), IIID, Icograda, and other national and international design conferences.

REFERENCES

Adams, Robin S., Shanna R. Daly, Llewellyn M. Mann, Gloria Dell'Alba. 2011. Being a Professional: Three Lenses into Design Thinking, Acting and Being. Design Studies, 32.6.

Anway, Andrew, and Neal Mayer. 2010. "Shaping the space: designing for kids." In Connecting Kids to History with Museum Exhibitions, McRainey, D. Lynn, and John Russick, editors. Walnut Creek, CA: Left Coast Press.

Beale, Katy, editor. 2011. Museums at Play: Games, Interaction and Learning. Edinburgh: MuseumsEtc. Ltd.

Bekerman, Zvi, Nicholas C. Burbules, Diana Silberman Keller. 2006. Learning in Places: The Informal Education Reader. New York: Peter Lang Publishing.

Bennett, Audrey. 2006. Design Studies, Theory and Research in Graphic Design. New York: Princeton Architectural Press.

Bitgood, Stephen. 2013. Attention and Value: Keys to Understanding Museum Visitors. Walnut Creek, CA: Left Coast Press.

Bowers, John. 2011. Introduction to Graphic Design Methods and Processes. Hoboken, NJ: John Wiley and Sons.

Brown, Tim. 2009. Change by Design. New York: Harper Collins.

Butler, Heather et al. 2012. The Halpern critical thinking assessment and real world outcomes: cross national applications. Thinking Skills and Creativity. 7, 112-121.

Carmel-Gilfilen, Candy. Uncovering pathways of design thinking and learning: inquiry on intellectual development and learning style preferences. Journal of Interior Design, 37:3, 47-66.

Caulton, Tim. 1998. Hands-on Exhibitions. New York: Routledge.

Darry, Ross, editor. 2010. Museums in a Digital Age. New York: Routledge.

De Bono, Edward. 1994. De Bono's Thinking Course. New York: Facts on File.
"Design thinking for educators toolkit," 2012. IDEO LLC. (accessed January 4, 2014). http://designthinkingforeducators.com.

Dewey, John. 1937. Education and social change. Bulletin of the American Association of University Professors. 23:6, 472-474.

Domenjo, Carles Sora. 2011. "Learning about palaeontology through interactive games." In Museums at Play: Games, Interaction, and Learning. Beale, Katy, editor. Edinburgh: MuseumsEtc. Ltd.

Doppelt, Yaron. 2009. Assessing creative thinking in design based learning. International Journal of Technology and Design Education. 19, 55-65. DOI 10.1007/s10798-006-9008-y.

Falk, John H. 2000. Learning from Museums. Walnut Creek, CA: Alta Mira Press. Falk, John H. and Lynn Dierking. 1995. Recalling the museum experience.Journal of Museum Education, 20:2, 10-13.

Gardner, Howard. 1993. Frames of Mind: The Theory of Multiple Intelligences. New York: Basic Books.

Geller, Tom. 2006. Interactive tabletop exhibits in museums and galleries. IEEE Computer Graphics and Applications. 26:5, 6-11.

Goldman, Shelly, Maureen P. Carroll, Zandile Kabayadondo, Leticia Britos Cavagnaro, Adam W. Royalty, Bernard Roth, Swee Hong Kwek, and Jain Kim. 2010. "Assessing d.learning." In Design Thinking Research, Understanding Innovation, H. Plattner et al, editors. Berlin, Heidelberg: Springer-Verlag.

Goldowsky, Alexander, and Maureen McConnell. "The one-two punch: synergy between simulation games and other interactive approaches in exhibitions." In Museums at Play: Games, Interaction, and Learning. Beale, Katy, editor. Edinburgh: Museums Etc. Ltd.

Heath, Christian, and Dirk vom Lehn. 2008. Configuring 'interactivity': enhancing engagement in science centres and museums. Social Studies of Science. 38: 63.

Huba, Mary E, and Jann E. 2000. Learner-centered Assessment on College Campuses. Needham Heights, MA: Allyn and Bacon.

Hasso Plattner Institute of Design at Stanford. "Design thinking process guide." (accessed Jan 20, 2104).

Jacob, George. 2011. Exhibition Design: The Future. Charleston, SC: Createspace.

King, P.M. & Kitchener, K. S. 1994. Developing Reflective Judgment: Understanding and Promoting Intellectual Growth and Critical Thinking in Adolescents and Adults. San Francisco: Jossey-Bass.

Lidwell, William, Kritina Holden, Jill Butler. 2003. Universal Principles of Design. Beverly MA: Rockport Publishers.

Lockwood, Thomas, editor. 2010. Design thinking. New York. Allworth Press. McDonald, George F. and Stephen Alsford. 2010. "The museum as information utility." In Museums in a Digital Age, Parry, Ross, editor. New York: Routledge.

McRainey, D. Lynn, and John Russick, editors. 2010. Connecting Kids to History with Museum Exhibitions. Walnut Creek, CA: Left Coast Press.

Roberts, Lisa C. 1997. From Knowledge to Narrative. Washington DC: Smithsonian Institution Press.

Rand, Judy. 2010. "Write and design with the family in mind." In Connecting Kids to History with Museum Exhibitions, McRainey, D. Lynn, and John Russick, editors. Walnut Creek, CA: Left Coast Press.

Rawson, Elizabeth Reich. "It's about them: using developmental frameworks To create exhibitions for children (and their grown-ups)." In Connecting Kids to History with Museum Exhibitions, McRainey, D. Lynn, and John Russick, editors. Walnut Creek, CA: Left Coast Press.

Shaffer, Sharon. 2010. "Never too Young to Connect to History: Cognitive Development and Learning." In Connecting Kids to History with Museum Exhibitions, McRainey, D. Lynn, and John Russick, editors. Walnut Creek, CA: Left Coast Press.

Simon, Nina. 2010. The Participatory Museum. Santa Cruz, CA: Museum 2.0. Majewsky, Janice. "Smithsonian guidelines for accessible exhibition design." http://www.si.edu/accessibility (accessed December 30, 2013).

Stogner, Maggie Burnette. 2009. The media-enhanced museum experience: debating the use of media technology in cultural exhibitions. Curator, October, 52:4, 385-397.

Wiggins, G. 1989. A true test: toward more authentic and equitable assessment. Phi Delta Kappan, 70:9, 703-13.

Zaharias P, Machael D, and Chrysanthou, Y. 2013. Learning through multi- touch interfaces in museum exhibits: an empirical investigation. Education Technology and Society, 16:3, 374-384.

Overview:
Visual theorist and design historian Johanna Drucker, in *SpecLab: Digital Aesthetics and Projects in Speculative Computing*, defines the digital humanities as "the study of ways of thinking differently about how we know what we know and how the interpretative task of the humanist is redefined in these changed conditions"[1]. Design and the digital humanities connect through critical making practices, centering on human experience and advancing the prevailing expectations of their respective disciplines.

At the convergence of conceptual and material practices[2], the ongoing development of a framework for critical making offers a means to understand complex relationships between research, scholarship and production. In design, emphasis is placed on innovative notions of what criticism or authorship can be within the context of design-making; in the digital humanities, focus is on innovative notions of what "making" can be as a form of interpretation within the context of conventional scholarly dissemination. The intersection of these two areas presents opportunities to bring form and content together in ways that are practical and theoretical, rhetorical and physical.

Critical making in design is aligned with practices that facilitate innovation and exploration related to technology, materiality and communities. In graphic design — a discipline, a medium, a practice and a tool[3] — "critical practice" has been used to describe a range of activities that position the designer as author, producer, scholar, curator or programmer[4]. These endeavors, whether individual or collaborative, may involve humanistic or scientific inquiry, and move beyond the traditional structure of client-based relationships. From a pedagogical perspective, key components of critical making include "hands-on practice, the processing of enhanced seeing and perception, and contextualized understanding"[5].

In the digital humanities, critical making distinguishes its practices from traditional forms of humanities scholarship. With an emphasis on tool building, information visualization and digital archiving, the digital humanities merge two seemingly opposing modes of scholarship: reading and making. Critical making dichotomies of thinking/making, knowing/doing and cognition/embodiment permeate current digital humanities discourse[6] and projects demonstrate a desired interest in building through existing design and development processes. *The Critical Making Zine*[7] uses physical production to publish and distribute a series of essays on technology, society and DIY culture. *Speaking in Code*, an NEH-funded symposium hosted at the Scholar's Lab in 2013, addressed questions related to "DH code-craft": tacit knowledge as it relates to the design and development of digital humanities projects[8].

Perspectives:
This special issue of Visible Language investigates critical making at the intersection of design and the digital humanities, which is a site for expanding the role(s) of divergent scholarly and creative work. We invite submissions that address one or more of the following questions:

- What are the theoretical or pragmatic ways to frame critical making in design and/or the digital humanities? Where are the similarities, differences and challenges? How are these advantageous?
- In what ways might design authors and producers connect with the digital humanities? Where or how are digital humanists' experiences of critical making intersecting with designers? How do these crossover 'ways of seeing' impact our scholarly and creative work — and future hybrid practices?
- How might forms of understanding such as speculative design, prototyping or hacking play a role in critical making, and in what ways are these influencing the scope of work in both areas?
- In what ways might design and the digital humanities collaboration be fostered in the studio or classroom? What are some examples of pedagogical approaches to teaching critical making?
- What are the forms these arguments might take as part of this special issue?

Visible Language is a journal that invites evidence-based research. For this issue, we encourage exploratory, creative works that incorporate evidence-based research through critical commentary, traditional analysis, audience responses or participant feedback.

REFERENCES

[1] Johanna Drucker. SpecLab: Digital Aesthetics and Projects in Speculative Computing (Chicago: University of Chicago Press, 2009), xii.

[2] Mark Ratto, "Critical Making" in Open Design Now: Why Design Cannot Remain Exclusive, Bas van Abel et al. (The Netherlands: BIS Publishers, 2011), 202.

Proposal due: January 15, 2015
Abstract **acceptance/rejection:** March 15, 2015
Full papers / works due: June 15, 2015
Review period: June 15 – August 1, 2015
Review feedback: August 1, 2015
Final paper submission: September 15, 2015
Anticipated publication: October 2015

Submissions:
In keeping with the theme of merging form and content, the traditional printed journal will be expanded to include a corresponding online space for interactive and digital work. We invite dialogue on what defines scholarly works in regard to non-traditional forms of writing and disciplinary crossovers. Submissions may include, but are not limited to, case studies, interactive reading experiences, audial and visual works.

Proposals should include a 300-word written abstract and a brief outline to show the structure of your argument. A corresponding visual abstract is strongly encouraged. For digital work, please include a URL or screenshots. Final articles can range from approximately 3–5,000 words.

Please send proposals through January 15, 2015 to Jessica Barness, jbarness@kent.edu

Open Peer-Review Process:
Submissions will be reviewed through an open peer-review process. An open peer-review process makes available the submission author's name to the peer-reviewer. Reviewer names and reviews will be published on the Visible Language journal website. Proposals will undergo review; a selection will be shortlisted for development into full-length papers / works and these will also be peer-reviewed prior to publication.

Interested in serving as a peer-reviewer?

Peer-reviewers will be responsible for providing feedback about abstracts and/ or final submissions between January – August 2015. If you are interested in serving as a peer-reviewer, please get in touch.

Guest Editors:
Jessica Barness is an Assistant Professor in the School of Visual Communication Design at Kent State University, where she teaches graphic and interaction design. She holds an MFA in Design from the University of Minnesota with a minor in Writing Studies, and an MA and a BA in Art from the University of Northern Iowa. Barness' research through design investigates theories in social issues, language and interactive technologies. Her work has been exhibited at venues such as Hebei Normal Museum, China and FILE Electronic Language Festival, Brazil, and published in Communication & Place and Currents in Electronic Literacy. She has also presented research at the International Committee for Design History and Design Studies Conference (2014), SEGD Academic Summit (2014), AIGA Design Educators Conference (2013) and HASTAC (2013), among others.

Amy Papaelias is an Assistant Professor in the Graphic Design program at SUNY New Paltz, teaching courses in web and interaction design, as well as 2D design and visual communication. She holds an MFA in Intermedia Design from SUNY New Paltz and a BA in Cultural Studies from McGill University. Her creative research lies at the intersection of design, culture and technology with specific interests in interactive typography and the digital humanities. She has presented her design work and pedagogy at Theorizing the Web 2014, AIGA Design Educators Conference (2007, 2013), TypeCon (2005, 2007, 2012), UCDA Education Summit (2011) among others. In 2013, she was selected to participate in One Week One Tool, an NEH-funded Institute for Advanced Topics in the Digital Humanities, hosted at the Center for History and New Media at George Mason University and co-authored a long paper on the experience that was presented at Digital Humanities 2014.

[3] Andrew Blauvelt, "Graphic Design: Discipline, Medium, Practice, Tool, or Other" (paper presented at counter/point: The 2013 D-Crit Conference, School of Visual Arts, New York, NY, May 11, 2013.

[4] Albinson, Ian and Rob Giampietro. Graphic Design: Now in Production (Minneapolis: Walker Art Center, 2011).

[5] Rosanne Somerson. "The Art of Critical Making: An Introduction" in The Art of Critical Making: Rhode Island School of Design on Creative Practice, ed. Somerson, R. and Hermano, M. (Wiley, 2013), 19.

[6] "Critical Making in the Digital Humanities: an MLA 2014 Special Session Proposal" by Roger T. Whitson, accessed on March 3, 2014. http://www.rogerwhitson.net/?p=2026

[7] Critical Making Zine by Garnet Hertz, accessed on March 3, 2014, http://www.conceptlab.com/criticalmaking/

[8] Speaking in Code, accessed on June 9, 2014. http://codespeak.scholarslab.org/

Design for Information: An Introduction to the Histories, Theories, & Best Practices Behind Effective Information Visualizations

Isabel Meirelles

Beverly, MA: Rockport Publishers, 2013.

For a complementary perspective of this book, please refer to the review written by Aaron Marcus in the *Information Design Journal* 20(3), 296–297

The book is a thorough representation of both the field of information visualization and the research interests of the author, whose focus is on "the theoretical and experimental examination of the fundamentals underlying how information is structured, represented and communicated in different media."

Beginning by the "big picture," the book includes an amazing collection of examples, the most thorough I have seen to date in a volume. The author organizes the content according to several categories represented by the titles of the chapters: 1) Hierarchical structures: trees; 2) Relational structures: networks; 3) Temporal structures: timelines and flows; 4) Spatial structures: maps; 5) Spatio-temporal structures; and 6) Textual structures. An appendix, notes, bibliography, contributors list, and index, complete the apparatus of the book.

Design for information is an extensive taxonomy of data visualization types, and is "a must" for anybody interested in the work done in the area. Each one of the hundreds of examples is explained and discussed, forming a kind of encyclopedia on the subject. It seems that nothing escaped from the through gathering of examples that Meirelles got involved in. The discussions and explanations normally focus on what information is represented and how it is represented.

It is interesting to see as well how many different professional fields use today diagrams to organize and represent information: basic science, applied science, education, engineering, medicine, technologies, etc. The value of the book is centered on the inclusion of examples of how many different problems are today being confronted by data visualizations, how many historical efforts preceded whatsoever is done today, and how the advent of the computers have allowed the field to explode, handling large data sets as well as dynamic representations.

At the end of the examination of the 224-page volume one becomes curious as to how might these diagrams have performed with the users they were intended for in terms of ease of comprehension; what conclusions could one arrive at from an evaluation of the examples included regarding perceptual and cognitive human factors; or how could a complementary book contribute to the development of best practices. I would not expect that one volume could be so extensive as this one and also cover the field critically. One, however, has to wonder how the super-complex visualizations permitted by computer programs today would perform regarding comprehension, memorization, and use of the information presented. The discussion on perception and cognition is very brief, and it might leave some readers wondering about the assertions made: they are proposed as principles without them being discussed. This topic, as well as Gestalt theory, are not considered during the description of examples. The size of some reproductions is too small to assess their quality as data visualizations, they appear as samples of problems dealt with but not as information in themselves. To compensate for this, the book includes valuable URLs for people interested in seeing in better detail many of the diagrams shown.

While the above could be perceived as a weakness, the strength of the book is its truly amazing array of examples and the rare historical diagrams it offers. It also displays an uncommon erudition, and includes an extensive and useful bibliography. One does not know how long Meirelles took to complete the manuscript, but it feels like a life-time project. These assets, coupled by an excellent production, make it an indispensable publication for whoever can be interested in information visualization.

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48.2 Visible Language

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48.2 Design Research Journal

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Finding Our Way Through Environmental Communication

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Before there was reading there was seeing. Visible Language has been concerned with ideas that help define the unique role and properties of visual communication. A basic premise of the journal has been that created visual form is an autonomous system of expression that must be defined and explored on its own terms. Today more than ever people navigate the world and probe life's meaning through visual language. This journal is devoted to enhancing people's experience through the advancement of research and practice of visual communication.

If you are involved in creating or understanding visual communication in any field, we invite your participation in *Visible Language*. While our scope is broad, our disciplinary application is primarily design. Because sensory experience is foundational in design, research in design is often research in the experience of visual form: how it is made, why it is beautiful, how it functions to help people form meaning. Research from many disciplines sheds light on this experience: neuroscience, cognition, perception, psychology, education, communication, informatics, computer science, library science, linguistics. We welcome articles from these disciplines and more.

Published continuously since 1967, *Visible Language* maintains its policy of having no formal editorial affiliation with any professional organization – this requires the continuing, active cooperation of key investigators and practitioners in all of the disciplines that impinge on the journal's mission as stated above.

cover photography: Patricia Cué

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On the Wall:

Designers as Agents for Change in Environmental Communication

Patricia Cué

Environmental communication plays a vital role in determining the use of public space through the design of artifacts that connect users to a physical environment and assign meaning to spaces. By strategically establishing order and consistency in environmental communications, designers have significantly contributed to the privatization, commodification, and sanitization of corporatized and privately-owned public spaces that often fail to fulfill their intended use and, most importantly, to generate solutions that are sensitive to the cultural identity, social needs and values of communities. By investigating a particular form of vernacular design applied to hand-painted, large-format murals that advertise music band appearances in Mexico, this project examines the social capital of environmental communication and the dynamics that shape it into a culture-defining medium that connects people and efficiently uses resources in an environment where the forces of regulation and the needs of people are in balance. This article advocates for the practice of environmental design to align with people's needs to facilitate more inclusive, sustainable and socially engaged solutions.

"Learning from the existing landscape is a way of being revolutionary."

Robert Venturi (Learning from Las Vegas)

Modernism, the Bauhaus, and the International Typographic Style provided the principles upon which contemporary graphic design has been based. The practice and education of this discipline have been largely shaped around the ideal of a universal design style where designers are considered conduits for information, clarity, and order. These principles were essential to developing graphic design as a tool for democracy when the access to information and the elevation of aesthetic and functional qualities in mass production were paramount. Although the context and technology in which today's graphic designers practice have changed dramatically, the paradigm of a universal language of graphic design form has not., Graphic design has asserted itself through the language of modernism by instituting order and uniformity and by consistently applying strict guidelines, order and uniformity on visual communication in the current landscape of globalization, digital communications, and corporate expansion.

Setting a distance between design and everyday life was one of the founding acts of modernism, which posed a divide between the consumer culture and a critical avant-garde (Lupton and Miller, 1996, 158). Consequently, graphic design's practice is largely based in completely eradicating existing solutions —a "before" and "after" approach that particularly disregards vernacular forms or user-generated solutions that may work in spite of their improvised nature and poor aesthetic appearance. "Designers, even more than artists, are battlers against entropy. The designer attempts to create not just aesthetic order, but structural and systematic kinds of order. A vital task, it goes without saying, but taking the long view, often also a doomed, quixotic mission (Poynor, 2004).

In the discipline of environmental design, a designer's task consists of connecting users to a physical environment by assigning meaning and function to spaces and by defining their intended use through clear visuals. Through their skills and strategic alignment with the interests of clients, designers have positioned themselves as one of the most important and credible players in the shaping of corporate and privately-owned public spaces. But the imposition of visual order onto space does not always suit everybody's interests and the appearance of harmony may constrain the use of space or may mask chaos behind the scenes (Franck and Stevens, 2007, 22).

It is the increasing privatization, commodification, and sanitization of corporatized and privately-owned public spaces that often fail to fulfill their intended use (Hou, 2012) that motivates this research. By examining a form of vernacular environmental design, Mexican wall painting for music advertising, or bardas de baile, I intend to show how environmental communication and its connection to its social context can transform the

way visual messages are shaped and displayed, thus nurturing truly democratic public spaces. The specific form, use, and meaning of Mexican wall painting for music advertising demonstrates the capacity of individuals and communities to transform urban spaces and how wall painting mediates relations between different community groups. The aim of this paper is to foster a more inclusive, sustainable, and socially engaged environmental communication practice by better aligning design with people's needs and by framing opportunities to contribute in the making of truly accessible and inclusive spaces

BARDAS DE BAILE

Wall painting, as an art form or as a means for mass communication, constitutes an important part of Mexico's material and visual culture. Throughout the twentieth century, renowned muralists Diego Rivera, David Siqueiros, José Orozco, and Rufino Tamayo used public and private walls to render the scale and drama of their (largely political) artistic visions. Parallel to this art form and with a different purpose, walls in Mexico are a traditional medium for graphic communication when it comes to reaching large audiences with political and social campaigns or with the announcement of popular events such as bands' performances or dances. Bardas de baile or music walls (*figures 1* and *2*) first appeared in the late 1960's, as a response to the increased popularity of music genres from northern Mexico such as grupera, Norteña, banda, ranchera, narcocorrido, and technocumbia, among others. More popular than ever, these bands tour out-of-the-way towns and villages, singing songs of love and loss, full of the trials and tribulations of life north of the border. Bardas de baile are the preferred and most efficient way of announcing the awaited dances.

Figures 1 and 2
In Mexico, Bardas de baile are typographic murals that announce the arrival of popular bands' or local dances through a consistent visual language developed as part of the sign painting tradition.

Music advertisement on bardas (walls) is pervasive throughout rural and suburban Mexico. They have become part of the country's physical and cultural landscape. On cemetery walls, bridges, abandoned houses, roadside buildings and ledges, small businesses, and empty lots, these hand-painted murals are fully integrated into the landscape, amid the ubiquitous cacti,

sprawling vegetation and hanging branches, among the bus shelters, unfinished soccer stands, and vacant warehouses (*figure 3*). These typographic murals are a form of what in Mexico are called rótulos, or commercial hand-painted signs.

Figure 3
Driving through rural Mexico, one is struck by the colorful and ubiquitous presence of Bardas de baile or music walls on irregularly claimed surfaces.

Traveling by car through central Mexico and implementing an ethnographic approach, I conducted interviews with sign painters, or rotulistas, to research their sources, their way of life, and their work practices and completed a thorough photographic documentation of the different styles and venues for these music murals.

Rotulistas, or sign painters, have traditionally worked for commercial, political, or, in the case of bardas de baile, for entertainment purposes. Before the rise of digital technology and vinyl lettering, these hand-painted signs, or rótulos, were the only viable wall-advertising option leading to the birth of a tradition, one that is now practiced throughout Mexico. Rótulos have long been popular for their charisma and impact and for being affordable and durable. As well as announcing upcoming dances, rótulos advertise electoral candidates, social campaigns for healthcare initiatives, or signal small businesses (restaurants, barbers, hardware shops, etc.). Regarded as guildsmen and artisans, rotulistas are proud practitioners of a craft that has been handed down from fathers to sons and, sometimes, to daughters. Young aspiring painters learn from a senior family member or become apprenticed to a master, who then mentors them. Rotulistas aren't graffiti artists. There's no tagging, and they are not interested in creative authorship or in following advertising trends; they simply perform a craft that has its own rules and methods. In communicating through a visual language based mostly on typography and letterform design, the uniformity and consistency in design and style among the different rotulistas is striking. For these sign painters craft creativity is secondary; it's their pride in a well-executed craft and the tradition that counts (*figures 4* and *5*).

Figures 4 and 5
Unlike graffiti, in painting bardas de baile there's no tagging or creative authorship on the part of the sign painters whose mission is to perform a craft with its own rules and methods.

While rotulistas are valued as providers of affordable advertising, what they do is technically illegal. They do not pay rent for the spaces they use, they are not licensed or certified, and they do not write any contracts with clients, yet they operate in a culture that tolerates them for the social and cultural value embedded in their craft.

Through repetition and consistency in their typographic style, bardas de baile have evolved into an iconic representation of the norteña and banda music that characterizes the migration from rural to urban areas and from Mexico to the US. Their typographic formulations, arrangements, and color palettes are immediately associated with the type of events they advertise, thus becoming a form of "vernacular branding." Despite the changes in how music is produced and marketed and how technology dominates the design and advertising worlds, the rotulistas' aesthetics and techniques have stayed the same. The tradition they embody has no place for vinyl lettering, global branding, or large format four-color reproduction. In an age that's clamoring for a global audience, where everything is so intently decentralized and where mass exposure seems to be the collective ultimate goal, rotulistas are proud anachronisms—rooted to their communities and keeping their craft alive.

While these wall paintings address basic commercial communication needs such as showing the featured bands and marking the date and venue of the events (*figure 6*), they also achieve two important goals that make them not only effective in terms of communication but also flexible and open in terms of their use of public space. First the wall paintings express the characteristics and aspirations of the audience in a credible, genuine and empathic manner. Second, they involve the local social network in the distribution of the message.

Figure 6
Bardas de baile address basic commercial communication needs such as marking the date and venue of the events through typographic arrangements that are consistently reproduced by all wall painters.

These painted walls are cultural artifacts with narratives that extend beyond their commercial function through their resonance in the broader context as cultural icons are open and responsive to the complex social networks that emerge in their implementation. The links forged and the dynamics between the event organizers, the wall painters, the owners of property whose walls are painted, the authorities and the community at large connect people in the public and private domains in an ever-growing network where everyone participates and nothing is wasted (*figure 7*).

Culture refers to whatever is distinctive about the way of life of a people, community, nation or social group (Hall, 1997, p. 2). How a culture is perceived is largely determined by how it is presented, thus the important role of graphic design in environmental communication. As cultural readers and interpreters, we look for signs and symbols to help us make sense of the space around us (Hall, 1997, p. 4). In the Mexican rural landscape, bardas de baile are powerful coded symbols that communicate a wealth of cultural information and play a vital role in affirming the visual identity not only of the music they advertise but also of the Mexican contemporary culture of rural-urban and Mexico-US migration (*figure 8*).

Figure 8
In the Mexican rural landscape, bardas de baile play a vital role in affirming the visual identity of the Norteña and banda music as a part of Mexican contemporary culture.

The sign painters use their creativity (always within the same style and tradition) to design logotypes and typographic arrangements that the bands often adopt as their logotype. It is through this design improvisation that the style of the bardas de baile has permeated the visual culture of banda music beyond wall advertisements, thus configuring a visual language that is imitated and applied to posters, CD covers and web sites. Thus bardas de baile, as a form of vernacular branding, constitute a system of representation that confers a specific meaning and validity to the events they advertise through the use of a consistent formal discourse (*figures 9—11*). Although most Mexicans will admit to "not seeing" the bardas de baile due to their ubiquitous and unchanging presence, they signify their key elements —typographic formulations, arrangements and color palettes—not only as representative of the norteña and banda music that is favored in rural Mexico by a specific social group but also as place-making artifacts that designate meeting points, bus stops, or simple landmarks for orientation.

Figures 9—11
As a form of vernacular branding, bardas de baile confer differentiation and legitimacy to the events they advertise through the use of a consistent visual language.

To announce each dance or concert, a group of rotulistas will be hired to paint fifteen to twenty-five walls, on average, within a ten-mile radius of the host town or village. For each event, sign painters claim public and private surfaces in an irregular and need-based manner; this means for free and often without explicit permission from the owner. Always on the lookout for the most visible walls which may be on highway ledges, underpasses, cemeteries, sidewalks, home façades or abandoned construction sites, the sign painters utilize public and private property on the rural landscape as a canvas for music-related advertising (see *figures 12—14*). In either case authorities will turn a blind eye, or rotulistas will obtain verbal authorization from the property owners in exchange for event tickets or simply as the result of a previously established relationship. This irregular appropriation of surfaces has converted public and private walls into common property that can be claimed by any member of the sign-painter community, occasionally creating territorial conflicts that have prompted tactics such as the whitening and marking of reserved walls with messages and personal signatures or tags (*figure 15*).

Figures 12—14
Surfaces such as highway ledges, underpasses, sidewalks, abandoned constructions or private homes are favored by wall painters for their scale and high visibility.

Figure 15
The more successful and entrepreneurial wall painters use personal signatures, logotypes, or tags to appropriate walls and prevent territorial conflicts.

Homeowners are surprisingly willing to let rotulistas paint the street-side of their walls, especially if they're in disrepair, as a form of beautification. If the home is in a highly visible area, such as in the village center or by a main highway, it is the prestige of advertising a famous band and being part of an event with great social value that constitutes the currency given that the concerts and dances advertised by these music walls are highly anticipated by everyone in the town and its surrounding villages. Teenagers and singles congregate there to date, to dance, and to meet new people. For couples and families, the dances are a special and affordable, night out.

We cannot simply draw a line between the public and the private; the line must also be drawn across them, through them, linking the two sides of the divide while separating them, canceling the opposition while marking it (Lupton and Miller, 1996, p. 156-157). This permissive attitude towards the use of public and private spaces has allowed for the spontaneous development of a self-organizing network that sustains the bardas de baile as a craft, facilitates an affordable form of advertising for events with high social value in their communities and most importantly, builds a social network where the forces of regulation, design, and the local community are in balance.

As Jeffrey Hou states, "Insurgent public spaces are those created or initiated by citizens and communities, often outside or at the border of regulatory and legal domains. Insurgent public spaces — which might include guerrilla gardens, flash mobs, "third places," street vending, street theater and protests — are created by those who appropriate, reclaim or occupy a particular

space to gather, express opinions and engage in various cultural practices. Indeed, the very idea of insurgent public space argues that the making of public space is not the exclusive domain of institutions; it can involve a broader range of actors — and thus reinforce the fact that "public" is not just an adjective but more broadly an active body of citizens." (Hou, 2012)

Through the use of bardas de baile to advertise music-related events, the local authority, the sign painters, and the public blur the distinction between the public and the private by reshaping, re-purposing, and collectively owning them.

CONCLUSION

In examining the culture and process behind bardas de baile, it is evident that a rich and complex social network operates behind the use of the private and public spaces that facilitate the existence of this medium and of the rotulistas and their craft. While these wall paintings address basic commercial communication needs, they are also shaped and owned by the needs and aspirations of the local people, thus collaboratively defining visual representation, functionality and use of spaces for their dissemination. In addition to their audience's participatory nature, we can clearly see in bardas de baile how local visual culture has managed to survive and operate on the margins of mainstream design, digital lettering technology, and digital forms of communication.

This case study demonstrates that public spaces are flexible by nature and that their intended uses are best recognized by users when they are allowed to freely satisfy their needs and thus define them. It shows that when a local network is allowed to manifest itself, the identity and culture of a place flourish. This research and documentation advocate for a participatory framework in environmental communication that allows participants to configure texts, symbols, and materials in ways that keep spaces open for interaction, and propose that such a framework is conducive to creating public spaces that provide breathing space, life, spontaneity, and cultural vitality.

Because designers are taught to focus on visual style over social function, we often overlook the relation of design to institutions of power (Lupton and Miller, 1996, p. 166). The informal appropriation and modification of public and private spaces by sign painters shows a permissive attitude towards the use of public and private spaces that allows for the development of a network that sustains the bardas de baile as a craft, facilitates an affordable form of advertising for events with high social value in their communities, and most importantly, establishes balance between the forces of regulation, design, and the local community.

How can we translate the values and operating modes from this form of environmental design into tangible lessons for designers?

We, as designers, frame a view of the world through the artifacts and representations we produce, and this worldview will be formed and interpreted differently on the basis of cultural experience (Davis, 2012, p. 190). The research on bardas de baile aims to demonstrate that, in order to renew their cultural view of contemporary life, designers need to find a place to speak from within culture and not position themselves outside and above it (Lupton and Miller, 1996, 157). This study proposes the creation of collaborative and communal platforms that permit a more participatory and open use of public spaces where the social amalgam of forces define their use and shape their physical aspects. In doing so, this study also advocates for designers to act as agents for social change with the potential to create frameworks that facilitate broad-based practices, strengthen social networks, and enhance local engagement.

Some concrete ways in which designers can foster the flexible and participatory use of public spaces follow:

- → Loosen the conventional contexts by establishing new standards of acceptability for the use of public space
- → Capitalize and work with what has already spontaneously appeared, with what is already there
- → Learn to work with the messy appearances that are often the product of a strong underlying social order
- → Develop spatial conditions that inspire people to act and contribute towards collective solutions
- → Work with possibility, diversity, controlled anarchy as much as with certainty, homogeneity, and order
- → Allow for re-purposing, appropriating, recuperating, and adapting.

Meeting the social challenges of our era will require design practices that are sensitive to vernacular manifestations that operate and solve problems effectively and which represent the aspirations of the people before being aesthetically or formalistically attractive (Venturi, Scott Brown, and Izenour, 1977, p. 161). Disarray, deterioration, and chaos are common scenarios in which designers need to tread more slowly, listen better, and act as facilitators and as agents of social change over formal and functional control. It is the making and mobilization of the public as an actively engaged citizenry that will enable a public space to serve as a vehicle for environmental communication and as a building block of our participatory democracy.

AUTHOR BIO

Patricia Cué is a graphic designer whose life and work oscillates between the U.S. and Mexico. She completed her graphic design studies at the Universidad Iberoamericana in Mexico and at the Basel School of Design in Switzerland. Cué is associate professor at San Diego State University where she teaches primarily branding and environmental graphic design. Through her work, she explores the ways in which design defines the use and the cultural identity of public spaces and is inspired by the tradition, colors, and textures in vernacular forms of design. Her work has been featured in Voice AIGA Cross-Cultural Design, Fahrenheit Contemporary Art, TM Typographische Monatsblätter, and more recently in the TV documentary series Sensacional de Diseño Mexicano produced and broadcasted by Once TV Mexico. Her book Mexican Wall Painting: Bardas de Baile was published in August 2013 by Ghost & Company.

REFERENCES

Franck, Karen A., and Quentin Stevens. 2007. *Loose Space*. New York: Routledge

Hall, Stuart. 1997. *Representation: Cultural Representation and Signifying Practices*. London: Sage Publications LTD.

Heller, Steven. 2010. POP: How Graphic Design Shapes Popular Culture. New York: Allworth Press.

Hou, Jeffrey. 2012. "Beyond Zuccotti Park: Making the Public." *Design Observer*, September 24. http://places.designobserver.com/feature/beyond-zuccotti-park-making-the-public/35658/

Lupton, Ellen, and Abbot Miller. 1996. *Design Writing Research*. New York: Phaidon Press Inc.

Davis, Meredith. 2012. *Graphic Design Theory*. New York: Thames & Hudson.

Poynor, Rick. 2004. "Stephen Gill: Behind the Billboard." *Design Observer*, January 11. http://observatory.designobserver.com/entry.html?entry=1807

Venturi, Robert, Denisse Scott Brown, and Steven Izenour. 1977. *Learning from Las Vegas*. Cambridge, Massachusetts: The MIT Press.

BIBLIOGRAPHY

Armstrong, Hellen, and Zvezdana Stojmirovic. 2011. *Participate: Designing with User-Generated Content*. New York: Princeton Architectural Press.

Evans, Jessica, and Stuart Hall. 1999. *Visual Culture: The Reader*. London: Sage Publications LTD.

Heller, Steven, and Mirko Ilic. 2004. Handwritten: Expressive Lettering in the Digital Age. New York: Thames & Hudson.

Overview:
Visual theorist and design historian Johanna Drucker, in *SpecLab: Digital Aesthetics and Projects in Speculative Computing*, defines the digital humanities as "the study of ways of thinking differently about how we know what we know and how the interpretative task of the humanist is redefined in these changed conditions"[1]. Design and the digital humanities connect through critical making practices, centering on human experience and advancing the prevailing expectations of their respective disciplines.

At the convergence of conceptual and material practices[2], the ongoing development of a framework for critical making offers a means to understand complex relationships between research, scholarship and production. In design, emphasis is placed on innovative notions of what criticism or authorship can be within the context of design-making; in the digital humanities, focus is on innovative notions of what "making" can be as a form of interpretation within the context of conventional scholarly dissemination. The intersection of these two areas presents opportunities to bring form and content together in ways that are practical and theoretical, rhetorical and physical.

Critical making in design is aligned with practices that facilitate innovation and exploration related to technology, materiality and communities. In graphic design — a discipline, a medium, a practice and a tool[3] — "critical practice" has been used to describe a range of activities that position the designer as author, producer, scholar, curator or programmer[4]. These endeavors, whether individual or collaborative, may involve humanistic or scientific inquiry, and move beyond the traditional structure of client-based relationships. From a pedagogical perspective, key components of critical making include "hands-on practice, the processing of enhanced seeing and perception, and contextualized understanding"[5].

In the digital humanities, critical making distinguishes its practices from traditional forms of humanities scholarship. With an emphasis on tool building, information visualization and digital archiving, the digital humanities merge two seemingly opposing modes of scholarship: reading and making. Critical making dichotomies of thinking/making, knowing/doing and cognition/embodiment permeate current digital humanities discourse[6] and projects demonstrate a desired interest in building through existing design and development processes. *The Critical Making Zine*[7] uses physical production to publish and distribute a series of essays on technology, society and DIY culture. *Speaking in Code*, an NEH-funded symposium hosted at the Scholar's Lab in 2013, addressed questions related to "DH code-craft": tacit knowledge as it relates to the design and development of digital humanities projects[8].

Perspectives:
This special issue of Visible Language investigates critical making at the intersection of design and the digital humanities, which is a site for expanding the role(s) of divergent scholarly and creative work. We invite submissions that address one or more of the following questions:

- What are the theoretical or pragmatic ways to frame critical making in design and/or the digital humanities? Where are the similarities, differences and challenges? How are these advantageous?
- In what ways might design authors and producers connect with the digital humanities? Where or how are digital humanists' experiences of critical making intersecting with designers? How do these crossover 'ways of seeing' impact our scholarly and creative work — and future hybrid practices?
- How might forms of understanding such as speculative design, prototyping or hacking play a role in critical making, and in what ways are these influencing the scope of work in both areas?
- In what ways might design and the digital humanities collaboration be fostered in the studio or classroom? What are some examples of pedagogical approaches to teaching critical making?
- What are the forms these arguments might take as part of this special issue?

Visible Language is a journal that invites evidence-based research. For this issue, we encourage exploratory, creative works that incorporate evidence-based research through critical commentary, traditional analysis, audience responses or participant feedback.

REFERENCES

[1] Johanna Drucker. SpecLab: Digital Aesthetics and Projects in Speculative Computing (Chicago: University of Chicago Press, 2009), xii.

[2] Mark Ratto, "Critical Making" in Open Design Now: Why Design Cannot Remain Exclusive, Bas van Abel et al. (The Netherlands: BIS Publishers, 2011), 202.

Proposal due: January 15, 2015
Abstract **acceptance/rejection:** March 15, 2015
Full papers / works due: June 15, 2015
Review period: June 15 – August 1, 2015
Review feedback: August 1, 2015
Final paper submission: September 15, 2015
Anticipated publication: October 2015

Submissions:
In keeping with the theme of merging form and content, the traditional printed journal will be expanded to include a corresponding online space for interactive and digital work. We invite dialogue on what defines scholarly works in regard to non-traditional forms of writing and disciplinary crossovers. Submissions may include, but are not limited to, case studies, interactive reading experiences, audial and visual works.

Proposals should include a 300-word written abstract and a brief outline to show the structure of your argument. A corresponding visual abstract is strongly encouraged. For digital work, please include a URL or screenshots. Final articles can range from approximately 3–5,000 words.

Please send proposals through January 15, 2015 to Jessica Barness, jbarness@kent.edu

Open Peer-Review Process:
Submissions will be reviewed through an open peer-review process. An open peer-review process makes available the submission author's name to the peer-reviewer. Reviewer names and reviews will be published on the Visible Language journal website. Proposals will undergo review; a selection will be shortlisted for development into full-length papers / works and these will also be peer-reviewed prior to publication.

Interested in serving as a peer-reviewer?

Peer-reviewers will be responsible for providing feedback about abstracts and/ or final submissions between January – August 2015. If you are interested in serving as a peer-reviewer, please get in touch.

Guest Editors:
Jessica Barness is an Assistant Professor in the School of Visual Communication Design at Kent State University, where she teaches graphic and interaction design. She holds an MFA in Design from the University of Minnesota with a minor in Writing Studies, and an MA and a BA in Art from the University of Northern Iowa. Barness' research through design investigates theories in social issues, language and interactive technologies. Her work has been exhibited at venues such as Hebei Normal Museum, China and FILE Electronic Language Festival, Brazil, and published in Communication & Place and Currents in Electronic Literacy. She has also presented research at the International Committee for Design History and Design Studies Conference (2014), SEGD Academic Summit (2014), AIGA Design Educators Conference (2013) and HASTAC (2013), among others.

Amy Papaelias is an Assistant Professor in the Graphic Design program at SUNY New Paltz, teaching courses in web and interaction design, as well as 2D design and visual communication. She holds an MFA in Intermedia Design from SUNY New Paltz and a BA in Cultural Studies from McGill University. Her creative research lies at the intersection of design, culture and technology with specific interests in interactive typography and the digital humanities. She has presented her design work and pedagogy at Theorizing the Web 2014, AIGA Design Educators Conference (2007, 2013), TypeCon (2005, 2007, 2012), UCDA Education Summit (2011) among others. In 2013, she was selected to participate in One Week One Tool, an NEH-funded Institute for Advanced Topics in the Digital Humanities, hosted at the Center for History and New Media at George Mason University and co-authored a long paper on the experience that was presented at Digital Humanities 2014.

[3] Andrew Blauvelt, "Graphic Design: Discipline, Medium, Practice, Tool, or Other" (paper presented at counter/point: The 2013 D-Crit Conference, School of Visual Arts, New York, NY, May 11, 2013.

[4] Albinson, Ian and Rob Giampietro. Graphic Design: Now in Production (Minneapolis: Walker Art Center, 2011).

[5] Rosanne Somerson. "The Art of Critical Making: An Introduction" in The Art of Critical Making: Rhode Island School of Design on Creative Practice, ed. Somerson, R. and Hermano, M. (Wiley, 2013), 19.

[6] "Critical Making in the Digital Humanities: an MLA 2014 Special Session Proposal" by Roger T. Whitson, accessed on March 3, 2014. http://www.rogerwhitson.net/?p=2026

[7] Critical Making Zine by Garnet Hertz, accessed on March 3, 2014, http://www.conceptlab.com/criticalmaking/

[8] Speaking in Code, accessed on June 9, 2014. http://codespeak.scholarslab.org/

Design for Information: An Introduction to the Histories, Theories, & Best Practices Behind Effective Information Visualizations

Isabel Meirelles

Beverly, MA: Rockport Publishers, 2013.

For a complementary perspective of this book, please refer to the review written by Aaron Marcus in the *Information Design Journal* 20(3), 296–297

The book is a thorough representation of both the field of information visualization and the research interests of the author, whose focus is on "the theoretical and experimental examination of the fundamentals underlying how information is structured, represented and communicated in different media."

Beginning by the "big picture," the book includes an amazing collection of examples, the most thorough I have seen to date in a volume. The author organizes the content according to several categories represented by the titles of the chapters: 1) Hierarchical structures: trees; 2) Relational structures: networks; 3) Temporal structures: timelines and flows; 4) Spatial structures: maps; 5) Spatio-temporal structures; and 6) Textual structures. An appendix, notes, bibliography, contributors list, and index, complete the apparatus of the book.

Design for information is an extensive taxonomy of data visualization types, and is "a must" for anybody interested in the work done in the area. Each one of the hundreds of examples is explained and discussed, forming a kind of encyclopedia on the subject. It seems that nothing escaped from the through gathering of examples that Meirelles got involved in. The discussions and explanations normally focus on what information is represented and how it is represented.

It is interesting to see as well how many different professional fields use today diagrams to organize and represent information: basic science, applied science, education, engineering, medicine, technologies, etc. The value of the book is centered on the inclusion of examples of how many different problems are today being confronted by data visualizations, how many historical efforts preceded whatsoever is done today, and how the advent of the computers have allowed the field to explode, handling large data sets as well as dynamic representations.

At the end of the examination of the 224-page volume one becomes curious as to how might these diagrams have performed with the users they were intended for in terms of ease of comprehension; what conclusions could one arrive at from an evaluation of the examples included regarding perceptual and cognitive human factors; or how could a complementary book contribute to the development of best practices. I would not expect that one volume could be so extensive as this one and also cover the field critically. One, however, has to wonder how the super-complex visualizations permitted by computer programs today would perform regarding comprehension, memorization, and use of the information presented. The discussion on perception and cognition is very brief, and it might leave some readers wondering about the assertions made: they are proposed as principles without them being discussed. This topic, as well as Gestalt theory, are not considered during the description of examples. The size of some reproductions is too small to assess their quality as data visualizations, they appear as samples of problems dealt with but not as information in themselves. To compensate for this, the book includes valuable URLs for people interested in seeing in better detail many of the diagrams shown.

While the above could be perceived as a weakness, the strength of the book is its truly amazing array of examples and the rare historical diagrams it offers. It also displays an uncommon erudition, and includes an extensive and useful bibliography. One does not know how long Meirelles took to complete the manuscript, but it feels like a life-time project. These assets, coupled by an excellent production, make it an indispensable publication for whoever can be interested in information visualization.

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48.2 Visible Language

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48.2 Design Research Journal

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Before there was reading there was seeing. Visible Language has been concerned with ideas that help define the unique role and properties of visual communication. A basic premise of the journal has been that created visual form is an autonomous system of expression that must be defined and explored on its own terms. Today more than ever people navigate the world and probe life's meaning through visual language. This journal is devoted to enhancing people's experience through the advancement of research and practice of visual communication.

If you are involved in creating or understanding visual communication in any field, we invite your participation in *Visible Language*. While our scope is broad, our disciplinary application is primarily design. Because sensory experience is foundational in design, research in design is often research in the experience of visual form: how it is made, why it is beautiful, how it functions to help people form meaning. Research from many disciplines sheds light on this experience: neuroscience, cognition, perception, psychology, education, communication, informatics, computer science, library science, linguistics. We welcome articles from these disciplines and more.

Published continuously since 1967, *Visible Language* maintains its policy of having no formal editorial affiliation with any professional organization – this requires the continuing, active cooperation of key investigators and practitioners in all of the disciplines that impinge on the journal's mission as stated above.

cover photography: Patricia Cué

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EXPLORE PGH
THE JOY OF LIFE
The Joy of Life
By Gary Rotstein
Pittsburgh Post-Gazette
Virgil D. Cantini once said he didn't believe art should be reserved for Sunday afternoon museum visits. Instead, Dr. Cantini spent the 1950s to 1980s creating some of the best-known public art in Pittsburgh. His metal sculptures are highly visible in Oakland, East Liberty, Downtown and elsewhere, whether on the outside of buildings or inside skyscrapers and churches. And yes, his work is also inside museums. One of the region's most-acclaimed artists of the middle 20th century, Dr. Cantini was also a longtime professor at the University of Pittsburgh. He taught there for 38 years and helped create the Department of Studio Arts, for which he served as chairman.
These men with their arms locked together [represent] the strong and the weak; the affluent and the poor; the educated and the underprivileged; this is one society, one community. It's made out of Cor-Ten steel that rusts to form a protective layer – it's the same material that the USX tower is made of.
Source:
Valley

Rebuilding Perceptions:

Using Experiential Graphic Design to Reconnect Neighborhoods to the Greater City Population

Andrew T. Schwanbeck

This project explores the value that environmental graphic design elements can create to help promote and improve the perceptions of a neighborhood within a segregated urban landscape. Urban segregation occurs when a city's diversities create perceived barriers around concentrated clusters of social groups. When these divisions are extreme enough, communities become shut off from the rest of the city and often fall into a perpetual cycle struggle and degradation. Research has shown that the success of a neighborhood relies in its ability to connect with other neighborhoods and economies throughout a city. It also demonstrates that cross-participation enhances the overall capacity of a community to operate both socially and economically. In a segregated city, there is an opportunity to use environmental graphic design elements to help improve the perceptions of a divided neighborhood and reconnect it back to the greater city population. During this research, a case-study project was developed with the neighborhood East Liberty, located in Pittsburgh, Pennsylvania. Historically a thriving neighborhood, East Liberty has been plagued by over two decades of neglect and failed renewal efforts. Despite recent development efforts, many locals still avoid this area. This case study uses a combination of research tactics and design prototypes to produce elements that attempt to improve the experience of East Liberty and create more positive perceptions surrounding this area.

When we set out to explore a new place, we encounter a range of emotions from excitement and curiosity to anxiety and apprehensiveness. The ability to experience these emotions and form our own judgments based on them allows us to create preference over one place to the next. Certainly some spaces will relate to us better than others, and this study does not intend on convincing the reader that he or she must be willing to appreciate and participate in every public space that exists. Instead, this research begins the conversation about how preconceived perceptions, especially negative ones, can give us a faulty bias when we consider how we feel toward a new place.

In almost every city in the world, there is a certain level of geographic segregation between the different cultural groups who occupy it. It's a natural phenomenon that's rooted in the history of how our cities were first formed. Normally, such diversity enhances the overall quality of life for those living in a city. Different social groups discover how to operate together rather than independently, leading to a more celebrated and diverse urban identity. However in other cases, such diversity can lead to a negative separation between neighborhoods. Invisible barriers are built by the perceived cultural and economic differences between different social groups. When these barriers become extreme enough, these groups lose the ability to function as part of the urban community; their economics start to plunge, and their neighborhoods begin to decay. Research has shown that the more cross-participation a city has between its communities, the better it will be able to operate both socially and economically (Stern and Seifert, 2008, p.2). This suggests that in order for cities to collectively progress into the future, their segregated neighborhoods must find ways to become reengaged with the rest of the city.

There are many factors to consider as potential solutions for this problem. Infrastructure improvements are likely top on the list. However, changing the way a place looks does not cure the problem entirely, nor is it a good thing to displace the existing group of residents in order to bring in a different group with different commercialization that is deemed more acceptable to the greater city population. Somewhere in the process, the perceptions of a place must be addressed. This study examines the beneficial effects that experiential graphic design can provide to such a place. The discipline of experiential graphic design defines the act of implementing signs, orientation maps, information panels, or any other visual element that helps describe or identify a physical space. Elements such as these greatly affect the accessibility and "sense of place" given to a public location. The goal of this inquiry is focused on understanding what happens because of this improved accessibility. Do the perceptions of a place change when it has been given a

comfortable structure to navigate? In his book, The Art of Placemaking, Robert Fleming describes environmental graphics as being capable "of humanizing the essential elements of a cityscape" (2007, p. 21). This concept of humanizing expresses the great potential in experiential graphic design to influence the feeling, image, and perception that a place portrays to its viewer.

This research constructs a case study that includes a framework for producing design elements which attempt to promote the cultural, historical, and economical connectivity of such a neighborhood. It explores storytelling, interpretive visuals, and placemaking tools as means to give a purposeful identity to a neighborhood. Along with physical objects, it also considers how digital design components can be connected to the experience of a place. It asks if a place becomes more comfortable and if visitors can connect it to a time when it was special and begin to form new ideas about it, will that spark a unified revitalization?

This research is based on a portion of the city of Pittsburgh. Pittsburgh currently ranks amongst the top twenty most segregated cities within the United States (United States, 2010). It possesses conditions similar to many other cities that face similar revitalization and segregation issues. The intent of the case study is to prove validation for a deeper investigation into not only Pittsburgh city neighborhoods, but also other cities facing these same important issues.

EXPERIENTIAL GRAPHIC DESIGN: DIRECTS, INTERPRETS, IDENTIFIES

Cities are filled with signals, both architectural and other, that help inform communication between the environment and those who interact with it. Signs and maps help to direct people to nearby destinations, while address numbers and storefronts work to identify buildings in a larger urban framework. Public art communicates the unique characteristics of a place, and other pageantry elements pave the way for distinct neighborhood identifications. These visuals, along with many others, make up the field of Experiential Graphic Design. Experiential Graphic Design, or EGD as it is commonly referred to, concerns itself with three specific components of a place: *identification* in order to distinguish it from other places, *navigation* so that each place can be found in the context of its surroundings, and *interpretation* to share information about the environment that describes its context in the broader scope of society. These components work together to enhance the environmental image of a place and evoke a "sense of home" that helps achieve a positive feeling of emotional security (Lynch, 1960, p.4).

In order to convey a "sense of home" to a place, much care must be given to understanding the specific and unique qualities it possesses. All too often a one-size-fits-all design approach is considered when planning a revitalization effort. This approach can create a blanketed feeling of anonymity. Instead of this, well planned design components have the potential to celebrate what makes a place different and communicate that back to an audience in a way that is comfortable, exciting, and engaging. In order for this to happen, extended efforts must be made throughout the design process to research and engage with the community. Ruedi Baur exclaims, "In a world where everything is tending towards resemblance, the extraordinary — or at least the appropriately different — is acquiring great value. Creating places that are unique, unreplicable, and therefore contextualized could be the great challenge for towns and cities of our times" (Mollerup, 2005, p.304). But designers cannot do this sitting alone in their office or simply looking at past examples of success. They must understand the place which they are designing from a deeper ethnographic point of view.

Recently, new strategies have been implemented into design that have enabled designers of all disciplines to take a more human-centered approach with their work. Instead of looking at the product of design, the focus has shifted to understanding the experiences that the product provides. Andrew Blauvelt of Design Observer writes,

→ *Lately, I've sensed that we're in a third phase of modern design, what I sometimes call its 'ethnographic turn.' We've seen periods of great formal experimentation, exploding the visual vocabulary of modernism. We've seen periods focused on the meaning-making of design, its content, symbolism, and narrative potential. For me, this new phase is preoccupied with designs effects, beyond its status as an object, and beyond the "authorship" or intentions of designers.* (2007).

The notion of ethnography in design refers to a "research method based on observing people in their natural environment rather than in a formal research setting" (Blauvelt, 2007). The objective is to understand a phenomenon through the perspective of the actual community being studied. This type of research tends to be qualitative and encourages the researcher to build empathy for the community being studied. The core objective therefore is not to quantify data as market research does but more so to discover the reasons why a problem exists. For example, to understand why a neighborhood has become segregated from the rest of the city, a researcher would need to understand the culture of the people who live in the area. Factors such as the physical infrastructure, the beliefs of those who live in it as opposed to those who do not, its history and its range of citizens, would be just a few of the key elements to realize. The information then gathered

from this type of investigation can inform all aspects of the design process: everything from understanding the appropriate construction materials for a sign element to realizing the ability to create effective systems of communication to solve more than just navigational problems.

PROJECT CASE STUDY: RESEARCH STRATEGY

To assume that Pittsburgh is a segregated city and that this segregation is hurting its neighborhoods and therefore the city overall, would have been a very poor way to begin this study. Beginning any design process by way of uninformed assumptions is the first step in producing irrelevant design solutions. In order to properly begin this project, some simple first hand observations needed to be made.

To begin, initial visits were made to various areas throughout Pittsburgh. Neighborhoods were selected based on the highly concentrated segments of the city that census data identified as either racially or economically divided. Six neighborhoods overall in two main clusters were observed. Because neighborhood characteristics may possibly change depending on time and day, three separate visits were made to each: one during a weekday, one at night, and one on a weekend. Simple field notes were taken to capture the details of these places. Through this process, primary areas of interest were determined based on neighborhood characteristics. Some areas were dismissed for being too residential, with little enticements to offer an outsider. Other areas were underdeveloped, lacking infrastructure that would support an increased amount of outsiders. In contrast, other neighborhood areas showed signs of potential: whether it was via street art, diverse retail, historically significant architecture, or simple neighborhood charm. Those areas of interest were highlighted, re-visited and further observed through photo documentation (*figure 1*). Photo documentation served as a way to visually record differences between these neighborhoods while also providing record of the structure of each place. Using Kevin Lynch's five elements of the city (path, node, landmark, edge, district), maps were constructed to diagram physical structure and environmental characteristics of these neighborhoods (*figure 2*, next page). This initial research was used to identify neighborhoods whose qualities validated signs of segregation.
It also helped to establish areas of interest that outside pedestrians may be drawn into.

Figure 1
Overview of the visual characteristics of interest neighborhoods in Pittsburgh

Friendship | Bloomfield | East Liberty | Garfield

Figure 2
East Liberty map featuring main paths, nodes, edges, landmarks and districts

Another early step in the research process was to distribute a survey throughout the greater Pittsburgh area. The content for this survey was developed to validate the assumption that Pittsburghers feel disconnected with certain areas of the city. An online survey making tool called Qualtrics was used to construct and circulate the survey digitally via email blasts. Survey content was developed to first learn basic demographic information from a participant, then probe deeper for information like how often they visited certain areas of the city and for what reasons. An additional question asked participants to rank in order neighborhoods that they felt most positive towards. Two different demographics were questioned with separate surveys, city residents and suburban residents. Having two distinct survey populations provided a valuable platform to compare and contrast answers from both groups and realize if living location had any influence on the populations perceptions (*figure 3*). From a total of 150 surveys sent, 43 city residents and 41 suburban residents responded. When reviewing the responses, one neighborhood emerged as having a poor reputation with more than two thirds of respondents from both groups. Interestingly, this realization showed some conflict with the early research done in this neighborhood. East Liberty appeared on the surface to be a typical segregated

neighborhood in Pittsburgh. There was evidence of a concentrated population of a single race, vacant storefronts, and signs of decay such as graffiti and damaged property. But with closer analysis, research highlighted small areas of racial diversity, evidence of history in its architecture, grandeur in its avenues and broad sidewalks, culture with a theater and small eateries, and even current revitalization efforts beautifying sections of the area. This conflict seemed to validate the issue of negative perceptions and that East Liberty was in need of an improved perception throughout the majority of area residents. Therefore East Liberty became the focus of the project case study.

Figure 3
Early survey results from both city residents and suburb residents

East Liberty has a rather unique and unfortunate story in the history of Pittsburgh. In the golden era of the 1940's and 1950's, East Liberty was a vibrant commercial neighborhood. Often dubbed as Pittsburgh's second downtown, it hosted multiple movie houses and department stores and was backed by a tight-knit affluent community. In the late 1950's the draw of suburbia began to have a negative impact on this area. The dream to have a space to call home (with a car, backyard, driveway, and easily accessible amenities) began to lure many people away from the city. During that time, East Liberty lost many of its residents to this migration. The changing landscape in the neighborhood spawned a massive urban renewal project that ultimately lead to East Liberty's demise (East Liberty Development Inc. Community Plan, 2010, p.6.). In an attempt to mimic the landscape of suburban development, community leaders devised a plan that leveled blocks of houses and commercial property to make way for a large access road that circled the entire commercial district. The streets inside Penn Circle were closed off to vehicular traffic and converted into a pedestrian mall. More than 1,000 apartment units were placed at the perimeter of the circle, ending a long-standing tradition of home ownership in the area (East Liberty Development Inc. Community Plan, 2010, p.6).

Over the course of the next decade, general disruption brought on from constant construction and the ever-changing landscape of the neighborhood destroyed the retail and commercial culture of the area. The new traffic patterns sent people around the core business district instead of into it, causing businesses to quickly lose customers. The decline of East Liberty was only worsened by the fact that the newly-formed government-subsidized housing fell into decay and spawned the development of a subculture where crime flourished. As the apparent decline of East Liberty was evident to the rest of the city, the neighborhood became a forgotten place and fell into two decades of decay.

Since the early 1990's various efforts have begun to restore East Liberty. The commercial district was reopened to vehicular traffic, crime has been reduced by removing many of the areas of housing that supported it, and business development such as Home Depot and Target have started to interject new life into the neighborhood. East Liberty Development Inc. has led the charge on many of these efforts, forming two crucial community plans to serve as road maps for the neighborhood's future. The first community plan in 1999 focused on bringing in large development anchors and creating employment opportunities for locals. Among many improvements, it succeeded in opening the first ever Home Depot to be located within a city. East Liberty Development Inc. have since moved on to an additional community plan in 2010 that highlights its ongoing effort to continue to improve the neighborhood.

There are growing concerns amount how this development will affect locals. Many East Liberty residents remain pessimistic for their future as the neighborhood gradually changes to attract more income and value. "We're more concerned about us not being a part of the community when it's revitalized and what are they going to bring into this community? We want to be a part of it also... We are concerned people that live here. Even though we are low income, we are worried about what's going to happen to us and where we're going to go" (Page-Jacobs, 2012). As development proceeds, it will be crucial to create an environment where the old culture of East Liberty can co-exist with the new development.

To expand on the understanding of history and current conditions in East Liberty, the research strategy for this case study was created to include a mix of both primary and secondary research techniques (*figure 4*). Procedures were chosen based on a general understanding of the outcomes (or type of information) they typically produce. For instance, a literature review demonstrated the most potential to understand more about Pittsburgh's history, the number of issues surrounding segregation, and the precedent for what existing design projects could bring to this problem. The study also needed

more direct information about why the existing perceptions of East Liberty were very negative. Two techniques were considered to get this information. First, another survey featuring more targeted questions was developed to probe deeper into the perceptions and opinions of this neighborhood. However the problem with a survey is that it can be difficult to gain qualitative information from a survey responses. Also, it typically takes at least a month to distribute and then receive replies. The second technique discussed was to conduct a number of interviews with residents within and outside of East Liberty. Interviewing has more potential to get the level of information needed to begin to understand how and why people may feel they way they do. An interview can allow participants to build on their thoughts and also elaborate and explain much more than selecting a predetermined survey answer. In addition, self-observation and photo documentation were used for further analysis of the existing environment in East Liberty (*figure 5*, next page). Careful consideration was given to choose a variety of sources and engage participants with various tactics to ensure as much triangulation to the research as possible.

Figure 4
Research strategy, sources of information, tactics used to get information, and expected outcomes

SOURCES	TACTICS	OUTCOMES
Residents of East Liberty **City Residents** **Suburb Residents**	Questionnaire/Survey Interviews Participatory Engagement	Perceptions of East Liberty Identity of East Liberty
Development Corporations	Interviews	Process City view towards Development of East Liberty
Designers	Interviews Literature Review	Design Process and Community Engagement
Public Artists	Interviews Literature Review	Design Process and Narrative Development
Exhibit Designer	Interviews Literature Review	Local Neighborhood History
Historian (Pittsburgh Local)	Interview	General Info on segregation, art, civic engagement, design precedent, process...
Secondary Research	Literature Review - Historical, Design Case Studies, Design Principles and Practice...	Understanding of Segregation
Online Social Networking	Secondary Review	Building an Environmental profile for East Liberty
Physical Environment	Visual Anthropology Observational Research	

Figure 5
Summary of findings made through environmental observations in East Liberty

1 Landscape
2 Current Development
3 Retail
4 Public Art
5 Urban Decay
6 Cultural


1


2


3


4


5


6

Setting up interviews requires a certain amount of trust and resources from the group being researched. For a small study such as this, it was difficult to find participants. Approaching residents at random (be it on the street or in local businesses, asking them to sign a wavier, and talk about where they live) yielded very little success. Residents of East Liberty are reluctant to speak to others. Over the years of failed revitalization efforts, insiders have become weary of people wanting to "help" their neighborhood. The best success came from working with trusted community organizations. East Liberty Development Inc. had many great stories to share about its personal development efforts within the neighborhood. It helped to solidify the local culture and pride that residents have for where they live. Area churches were also contacted and shepherded many successful connections with residents who were willing to participate in an interview. Memorable interview findings were as follows:

→ When asked, "How do you think the rest of Pittsburgh views East Liberty," the participant answered, *"I know that they look at it as a downtrodden section. But they hear a lot of up-and-coming things about it. My step-mom is from a small town 45 minutes from here. She knew it as trashy, and the reason why is that there was a huge section 8 complex. That's why it was perceived that way and thats how she still thinks of it. And the people who don't experience it day-to-day, that's how they still think of it. But you know you can't judge a neighborhood by who's standing at the bus stops when you drive past, and again that's a huge perception issue with East Liberty."*

→ *"I've always heard it was a bad neighborhood in the city. I've never really been to it, but just based on what I've heard, I probably won't. Not until I hear more positive things anyway, there's just no point. There's plenty of other nice places in the city to visit."*

→ *"I really don't have any problem with it. I mean, I go to a bunch of restaurants there often. I get that it's kind of unsafe, but so are a lot of other places. If you're smart about what you do and stay in the areas that feel comfortable, then you're fine. But if you make bad decisions, if you walk into the residential area late at night, then maybe something could happen to you. But you know, that's just common sense. You're never gonna remove crime and violence completely."*

The findings of the research phase were then synthesized through a few different information frameworks. Information frameworks helped to distill the large and complex amount of information into concise actionable points. Personas were created for residents both within and outside the neighborhood. They worked to summarize and build educated assumptions about the thoughts and actions of the diverse population being studied. For instance, if the persona Beth were introduced to a map, she may feel more comfortable to walk beyond the main avenue area. The 5 E's experience model, developed by Conifer Research, broke down the experience of interacting with the neighborhood into five stages: entice, enter, engage, exit, and extend. These subcategories helped to define the successes and weaknesses of the neighborhood as it is experienced by an outsider. (*figure 6*, next page). Upon analyzing trends in the information gathered, a list of ideas was created to help define the project and guide the design process. The generated criteria from the research were as follows:

→ Engage visitors beyond the typical destinations of restaurants and commercial retail

→ Create a narrative that can break down perceptions of inequality—racial, economic, and cultural

→ Create a welcoming identity that entices visitors to enter and explore

→ Celebrate neighborhood differences while creating a feeling of connection to the rest of the city

→ Create a variety of ways for different personalities to form their own attachments through open ended storytelling and a diverse range of experiences

→ Bridge the culture of old to the culture of new

→ Specify the history of the neighborhood and help inform visitors about where they live and its significance in shaping the city of Pittsburgh

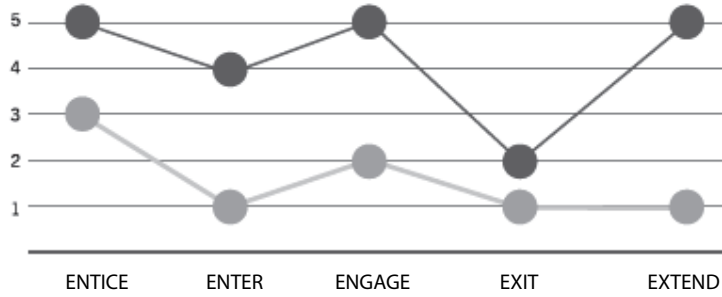


Figure 6
5E's assessment of East Liberty, highlighting largest areas of opportunity

	Existing	Potential
ENTICE	Local small businesses and restaurants as well as big box retailers: Target, Whole Foods, and Home Depot	Use existing channels of communication to increase the overall positive communication about the environment
ENTER	No visuals or sense of community pride upon entering. Sporadic murals without strong community message	Create a welcoming identity that puts forth the image of the neighborhood and encourages exploration
ENGAGE	Retail engagement is plentiful and growing to reach a broader audience. There's also a carnegie library	Create a more diverse range of experiences that can engage audiences in meaningful ways and impact their overall feelings of the neighborhood more
EXIT	No sense of exit from neighborhood	Adjacent neighborhoods can create a connected system that is visually related thus creating more of a universal feeling
EXTEND	Lasting memories of neighborhood are negative, either due to the overall feeling of transition in the neighborhood or the boarded up businesses and still troubled landscape. Only lasting impressions made through retail experiences	Creating a more memorable and engaging experience through interpretive visuals can increase the extended experience of the neighborhood

Largest Areas of Opportunity

The prototype test for this research was developed to provide a way to measure and demonstrate success. In order to do this, an experience was created where participants with different backgrounds and viewpoints could engage with East Liberty through the aid of various design elements, and then respond whether or not those elements, had any impact on their perceptions. If successful, validation would be integral to articulating the need for further exploration of this theory. If not, questioning the research and design of the experiment could also lead to other explorations attempting validation. Or it could prove the ineffectiveness of this theory and stop someone else from investing time and resources in it. Either way, this testing was crucial to provide closure to this study.

The test for this project was framed around the idea of a self-guided neighborhood walk. A self-guided walk was speculated as the best method for this because it provided an open framework for various communication tools to be integrated into. A city walk or tour is also a common experience in an urban environment that was determined to yield the most unbiased results.

Participants were able to visit the neighborhood and feel free to experience it in any way that felt natural for them. The idea was to build a sense of familiarity with the neighborhood and allow people to be comfortable enough to want to discover more on their own (*figure 7*). Various design elements were created for the neighborhood walk. Using the 5E's experience model, entice, experience, and extend were addressed in small ways for this first exploration. Enter and exit were left out because they depend highly on having a prominent neighborhood identity to describe these steps. Due to the large amount of time and energy needed to create an identity, this stage of development was pushed out of the scope of this project.

Figure 7
Project Identity and Walking Tour Path with Destinations and Landmarks (detail).

EXPLORE PGH
EAST LIBERTY
PEOPLE - GEOGRAPHY - HISTORY

ENTICE PROTOTYPES

A website was established to help entice potential participants to come to East Liberty. Urban dwellers often communicate and become informed about events, businesses, and general information about a city through the online digital world. 63% of the people surveyed in the research phase of this study confirmed this. So using a form of digital communication became an important tool in breaking down some of the early misconceptions about the neighborhood and attracting research participants. The website also became a helpful tool to speak more about this study. The About Section pointed out information relevant to the research, such as what it was trying to do and why participation was important. The main blog offered a venue to speak about the interesting qualities of East Liberty through the "You might not have known" posts. Here, various bits about the history and current interests of East Liberty were leaked out prior to the event in order to increase excitement for visiting the neighborhood and begin to break down some of the negative perceptions facing this place (*figure 8*).

Figure 8
Project Website - "You might not have known" facts about East Liberty

ENGAGE PROTOTYPES

Multiple components were created to foster a more memorable engagement with East Liberty. A basic sign family was designed to provide directional orientation and additional interpretive information about the environment. These signs helped to establish the route of the walking tour and provide a sense of accessibility that would hopefully encourage further exploration. Careful planning and consideration were given to the walking loop path. The path visited multiple historical and cultural destinations while also showcasing some of the current businesses that might appeal to a broad audience. The commercial corridor of East Liberty still has many examples of its former success, and so showcasing these signals became an important goal of this project.

The decision to feature five primary destinations with additional interpretive markers was made based on their interest and proximity to the downtown corridor. The remaining destinations were identified on the directional signage and wayfinding map. An orientation sign provided the primary way-finding for participants (*figure 9*, page 104). Many of the principles evolved by Joel Katz in the Walk Philadelphia sign system were used to develop this map. The design was simplified as much as possible in order to be easily and quickly understood. It also utilizes a heads-up orientation and a rolling map feature to provide for an optimal user interaction. These signs were placed at decision making points and throughout the loop to provide the necessary navigation.

The bulk of this experience relied on an effective system of interpretive sign elements. These elements carried the responsibility of engaging visitors and informing them of the unique and positive character of East Liberty. A system of different markers was designed to point out landmarks and share information about the neighborhood. Secondary research was used to extract the content for these signs. The primary interpretive marker was designed to give site-specific information about five specific landmarks. Its layout features a contextual photograph that enhanced the main story, along with a sidebar area to provide additional written information. The final design also featured a small directional map at the bottom to reinforce the walking route (*figure 10*, page 104). A second more pictorial sign was also developed to provide a quicker interaction. This sign, called the Now and Then sign, was designed to show the historic view of the area where the sign was located. This created a different type of interaction, providing participants with a sense of what the area was like in its golden age (*figure 11*, page 105). The history of East Liberty was shared through a timeline graphic. The purpose of the timeline was to provide an overview of the incredible changes the neighborhood has gone through in its storied past (*figure 12*, page 104). The timeline was located in a local coffee shop to allow participants to engage with the information for a longer period of time. The last interpretive element designed was an infographic. This sign served as the identity for the neighborhood. Because there was no visual representation of East Liberty for visitors to connect with, this graphic was made to communicate the positive qualities of the neighborhood and act as an identification sign for this experiment. The final design featured the messages about East Liberty's connections, diversity and positive changes (*figure 13*, page 105).

Figure 9—13
See pages 104—105

A printed brochure was made for the participants to use during the experience. The brochure featured a overall map of East Liberty with step-by-step instructions to follow the walking tour. In addition, the map highlighted a complete list of local destinations to allow participants to set off on their

own exploration. It also provided a brief summary of the history of the neighborhood, along with the neighborhood scavenger hunt. The concept for the brochure was to add an additional level of comfort to the experience by providing the users another element to help them navigate the tour and feel more at ease with the area. The scavenger hunt gave visitors another way to discover East Liberty and to form a more unique memory of the neighborhood (*figure 14*).

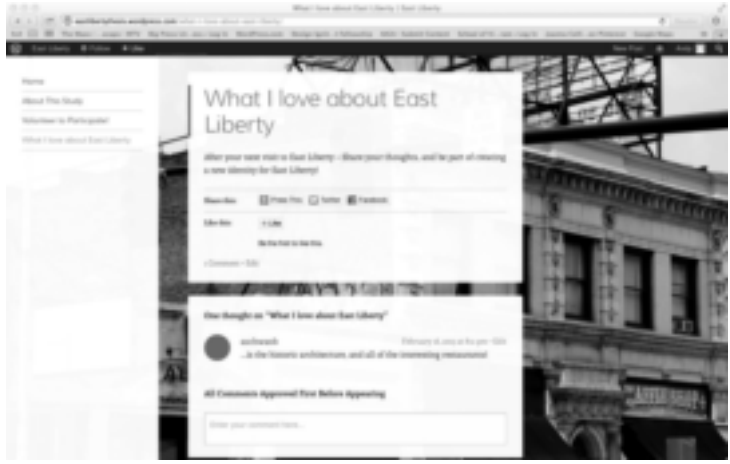
Figure 14
Scavenger Hunt, participants noticing the "man posing as a door handle."

A local coffee shop, Zeke's, agreed to help participate in this study. Adding a business to the walking tour gave visitors a comfortable spot to take a break from the experience and get something warm to drink. Zeke's became a destination on the tour when they agreed to allow the timeline element to be hung in their shop. Here, users stepped in from outside, had a drink, and found themselves in a comfortable setting to engage with the timeline. Zeke's also contributed coupons to participants for discounted coffee and contributed a good bit of neighborhood character to the experience.

EXTEND

After finishing the tour, users were asked to return to the project website and add a response to the "What I Love about East Liberty" page. This section was designed to encourage participants of the experiment to say something positive about East Liberty (*figure 15*). Having this element online was crucial. It allowed for an extended amount of time for the participants to reflect on their experience and share it. It also offered a great platform to share that information with people throughout the city and surrounding area. Having this online database of positivity helped entice new people to visit the neighborhood and might have helped recruit further participants for future research. A secondary benefit of this information collected is that it began to spark ideas about how people viewed the neighborhood through a positive lens. As a neighborhood with hardly any identity left, these comments showed great potential to begin the conversation about how insiders and outsiders view East Liberty and potentially fuel the creation of a new neighborhood identity.

Figure 15
Project Website
Extension of East Liberty
"What I Love"



TEST RESULTS: VALIDATION FOR FURTHER RESEARCH

When the participants returned, they were asked to fill out the second portion of their survey discussing any change in their feelings toward the neighborhood. Small conversations about the experience also provided additional insights. Most participants were eager to share their varied comments: "I don't really care about how nice the neighborhood was, if it's crap now, then I'm not going feel like it's worthwhile," and "That was fun! It was really interesting to learn about the history of the area. It definitely made me want to come back again." The test results provided an overall support for the statements in this study validating the argument for further exploration. Overall, 65% of the participants answered that their experience in the project improved their overall perceptions of East Liberty. That statistic became even more significant when observing that nearly 70% of participants rated their overall opinion of East Liberty before this experience to be somewhere between very poor and just OK. In addition, 50% of the participants replied that they would be likely or very likely to return to East Liberty again. All of the elements in the design concepts were rated valuable to the experience. The interpretive signage received the most support, but many also noted that they enjoyed the opportunity to engage with a local business. Other comments that followed the survey were, "Seeing the before and after images helped to influence my opinion on how much potential the area has," and "The news gives a negative view of the area. Walking around today was great. There are lots of new businesses and things to check out. I would love to come back more."

The research presented in this paper demonstrated support for the theory that experiential graphic design, along with other visual communication elements, can be used to improve the perceptions of a developing neighborhood. The results in this study depicted a 65% improvement in the perception of East Liberty. Furthermore they articulated the value in pursuing this research further in both East Liberty and other similar neighborhoods across the country. In spite of that, there was a bias to these results. If the label of a "research experiment" was removed from this study, and no participants were actively recruited for testing, would these tools yield the same results? Could they entice random people to go to a neighborhood they viewed as bad? How would someone rate the experience if they didn't know what was being tested? These will be crucial answers to seek in future iterations of this research.

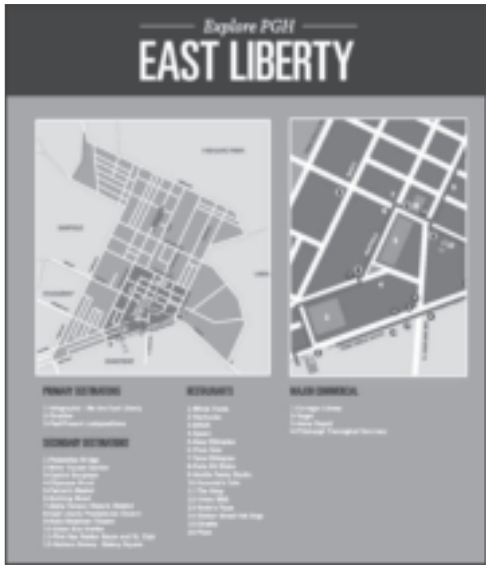
It can be said with certainty that the prototypes in this project did not achieve success alone. Much of the redevelopment in East Liberty also created a positive impact on this experience. Looking to the future, this development will also play an important role in attracting more people to the neighborhood. As East Liberty continues to reinvent itself, there is a strong opportunity to use these concepts along side other development efforts to continue to improve the perception of the neighborhood.

It remains to be seen what the long-term effects of improving a neighborhood's perception will be. The design solutions presented in this study have shown the potential to break down perceived barriers to a place, thereby making the neighborhood inherently more integrated with the rest of the city. But where does that integration lead to? Sern and Seifert argue in their paper, From Creative Economy to Creative Society, that an increase in cross-community participation will lead to a more economic and culturally inclusive society. Their research declares that "cultural engagement fosters the collective capacity of people, especially in low-wealth communities" (2008, p.5). It is also unknown if an improved perception of a place can lead to a better appreciation for its current people and culture. If so, can that impact redevelopment efforts to work harder at preservation and integration over purely replacement?

This test was one small experiment designed to validate further exploration. In the future, it is suggested that the following measures are taken to continue to develop these ideas:

- → Design a more integrated communication system that crafts specific narratives directed to the personas developed in this case-study. Conduct multiple prototype tests that allow these elements to circulate for longer durations of time in order to understand whether or not they can randomly entice individuals to explore the neighborhood further. These tests should feel more natural, removing as much of the previously discussed bias as possible and embody a larger amount of participants.
- → Develop a measurement for how effective these elements are in encouraging deeper exploration of local commercial areas and analyze the positive effects they have on the long-term qualities and development of a neighborhood.
- → Develop implementation plans that work to determine what characteristics an environment should have in order for these tools to be present.
- → Design a full neighborhood system that works to connect a larger area.
- → Consider neighborhood identities along with the vast array of digital solutions such as apps, mapping devices, and so on that could help entice more people to think differently.
- → Produce additional case studies that continue to communicate the value of this research to other segregated cities.

In conclusion, it is in the opinion of this research that much promise lies ahead in future explorations of this theory. Simple foam-backed paper signs along with a basic walking tour and a cup of coffee created a 65% improvement in the perception of East Liberty. That alone shows promise for future research. Additional tests must be developed to remove some of the previously noted bias and help to support this theory further. It is the belief of the researcher that if this study is continued to be explored, the positive change demonstrated here will be amplified and supported even more with additional research.



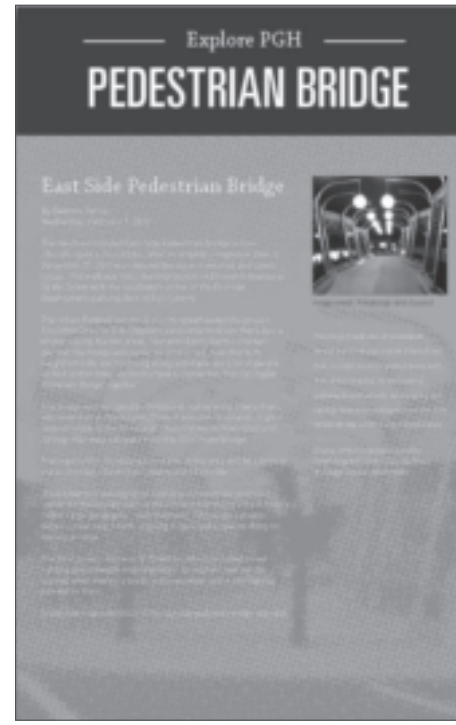


Figure 9 *top left*
Orientation map

Figure 10 *top lright*
Primary Interpretive Marker

Figure 12 *below*
Easy Liberty Timeline

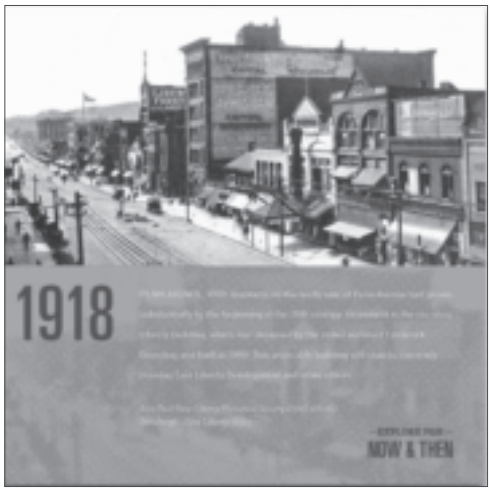


Figure 11 *top left*
Secondary Interpretive Marker (Now & Then)'

Figure 13 *top right*
Infographic/Identity for East Liberty

Figure 16 *below*
Various sign elements being viewed by research participants during the case study experiment

AUTHOR BIO

Andy Schwanbeck's wide-ranging education background has enabled him to have a diverse career in design. In his ten-year career he has worked in a variety of design disciplines. Upon earning his degree in industrial design, he began his professional experience as a product designer for a small firm in Lyon, France. His ongoing interest in graphic design led him to his career in environmental graphic design. Most recently, he earned his MFA in Visual Communication Design from Kent State University. His current work has taken on a strategic research-based approach where he explores the role of design to solve various social issues.

Andy has served as an adjunct faculty member for American University and Kent State University. Currently he teaches as an Assistant Professor of Media Art + Design at Westminster College near Pittsburgh, PA.

In addition, Andy also enjoys success as a co-owner of a small letterpress printing business, Big Press Little Press. He is a member of SEGD and AIGA. Outside of his professional practice, he also enjoys pin-striping and hand-lettering.

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REFERENCES

"Battery Point Sculpture Trail." Environmental Graphics Magazine, 2012, no. 2: 43.

Berger, Craig., Wayfinding: Designing and Implementing Graphic Navigational Systems. Switzerland: RotoVision, 2005.

Blauvelt, Andrew., "Design's Ethnographic Turn." Design Observer. May, 2007. Assessed on January 2013. http://observatory.designobserver.com/entry.html?entry=5467

Bodnar, J., Simon, R., Weber, M., Lives of Their Own: Blacks, Italians, and Poles in Pittsburgh, 1900-1960. Chicago: Board of Trustees of the University of Illinois, 1982.

Braudy, Leo., The Hollywood Sign: Fantasy and Reality of an American Icon. Yale University Press: 2012. Extract Assessed on January 2013. http://yalebooks.wordpress. com/2012/03/19/sign-of-the-times-extract-from-the-hollywood-sign-by-leo-braudy/

Chang, Candy. Carnegie Mellon University, Pittsburgh. 27 March. 2012.

C&G Partners., "Shared Memories/Nuestros Vecindarious Y Sus Memorias." AIGA Case Study 2012. Assessed on November 2012. http://www.aiga.org/justified-2012--case-study--neighborhoods-and-shared-memories/

"Downtown Los Angeles Walks." SEGD Magazine, 2007, no. 17: 75.

East End/East Liberty Historical Society., Pittsburgh's East Liberty Valley. Chicago: Arcadia., 2008.

East Liberty Development Inc., 2010 Community Plan. Assessed on July 2012. http://www.eastliberty.org/community-planning/plans-and-studies/2010-community-plan

Ellard, Colin., You Are Here: Why We Can Find Our Way to the Moon, but Get Lost in the Mall. New York: Anchor Books., 2010.

Fleming, Ronald L., The Art of Placemaking: Interpreting Community Through Public Art and Urban Design. London: Merrell., 2007.

Frankel, David, and Volij O., "Measuring Segregation." February 18, 2005. Assessed December 2012. http://www.ec.bgu.ac.il/monaster/admin/papers/0703.pdf

Gibson, David., The Wayfinding Handbook: Information Design for Public Spaces. New York: Princeton Architectural Press., 2009.

Hollywood Sign Trust. Assessed on December 2012. http://www.hollywoodsign.org/the-history-of-the-sign/

Holsten, David., The Strategic Designer. Cincinnatti: How Books., 2011.

Lexus A., (2011, August 11). Citydata.com, "Pittsburgh Segregated and Racist?." [Web Blog Post}. Assessed September 2012. http://www.city-data.com/forum/pittsburgh/133844-pittsburgh-segregated-racist.html

Lynch, Kevin., The Image of the City. Boston: The MIT Press., 1960.

Miller, Beth, and Woodward, T., eds. Leverage: Strengthening Neighborhoods Through Design. New York: D.A.P., 2011.

Mollerup, Per., Wayshowing: A Guide to Environmental Signage Principles and Practices. Italy: Lars Muller., 2005.

Moscardo, G., Ballantyne, R., Hughes, K., Designing Interpretive Signs: Principles in Practice. Colorado: Fulcrum Publishing., 2007.

Page-Jacobs, Larkin., "Residents and Business Owners Relect on East Liberty's Latest Transformation." 90.5 WESA. October, 2012. Assessed on November 2012. http://www.newpittsburghcourieronline.com/index.php/featured-news/metro/8265-residents-and-business-owners-reflect-on-east-libertys-latest-transformation

Reich, Bryony., "Culture, Community and Segregation." Assessed December 2012. http://www.econ.cam.ac.uk/postgrad/br284/

Rybcynski, Witold., Makeshift Metropolis: Ideas About Cities. New York:Scribner., 2010

Sooke, Alastair., "Milton Glaser: His Heart was in the Right Place." The Telegraph. February 2011. Assessed on January 2013. http://www.telegraph.co.uk/culture/art/art-features/8303867/Milton-Glaser-his-heart-was-in-the-right-place.html

Stern, M. and Seifert, S. From Creative Economy to Creative Society. Creativity & Change. (The Rockefeller Foundation, January 2008), 1-16.

Unity Consultants., "Focus Group Report 2001: Yesterday, Today and Tomorrow." Assessed on July 2012. http://www.sustainablepittsburgh.org/pdf/DCE_Focus_Group_Report_Final.pdf

The Freedom Trail. Assessed on January 2013. http://www.thefreedomtrail.org/freedom-trail/

United States., Bureau of the Census. City of Pittsburgh Neighborhood Profiles. Census 2010 Summary File 1 (SF1) Data. University of Pittsburgh, 2011.

Urbanized. Dir. Gary Hustwit. A Swiss Dots Production, 2011.

Visocky O'Grady, Jenn and Ken., A Designer's Research Manual. Massachusetts: Rockport., 2006.

Overview:
Visual theorist and design historian Johanna Drucker, in *SpecLab: Digital Aesthetics and Projects in Speculative Computing*, defines the digital humanities as "the study of ways of thinking differently about how we know what we know and how the interpretative task of the humanist is redefined in these changed conditions"[1]. Design and the digital humanities connect through critical making practices, centering on human experience and advancing the prevailing expectations of their respective disciplines.

At the convergence of conceptual and material practices[2], the ongoing development of a framework for critical making offers a means to understand complex relationships between research, scholarship and production. In design, emphasis is placed on innovative notions of what criticism or authorship can be within the context of design-making; in the digital humanities, focus is on innovative notions of what "making" can be as a form of interpretation within the context of conventional scholarly dissemination. The intersection of these two areas presents opportunities to bring form and content together in ways that are practical and theoretical, rhetorical and physical.

Critical making in design is aligned with practices that facilitate innovation and exploration related to technology, materiality and communities. In graphic design — a discipline, a medium, a practice and a tool[3] — "critical practice" has been used to describe a range of activities that position the designer as author, producer, scholar, curator or programmer[4]. These endeavors, whether individual or collaborative, may involve humanistic or scientific inquiry, and move beyond the traditional structure of client-based relationships. From a pedagogical perspective, key components of critical making include "hands-on practice, the processing of enhanced seeing and perception, and contextualized understanding"[5].

In the digital humanities, critical making distinguishes its practices from traditional forms of humanities scholarship. With an emphasis on tool building, information visualization and digital archiving, the digital humanities merge two seemingly opposing modes of scholarship: reading and making. Critical making dichotomies of thinking/making, knowing/doing and cognition/embodiment permeate current digital humanities discourse[6] and projects demonstrate a desired interest in building through existing design and development processes. *The Critical Making Zine*[7] uses physical production to publish and distribute a series of essays on technology, society and DIY culture. *Speaking in Code*, an NEH-funded symposium hosted at the Scholar's Lab in 2013, addressed questions related to "DH code-craft": tacit knowledge as it relates to the design and development of digital humanities projects[8].

Perspectives:
This special issue of Visible Language investigates critical making at the intersection of design and the digital humanities, which is a site for expanding the role(s) of divergent scholarly and creative work. We invite submissions that address one or more of the following questions:

- What are the theoretical or pragmatic ways to frame critical making in design and/or the digital humanities? Where are the similarities, differences and challenges? How are these advantageous?
- In what ways might design authors and producers connect with the digital humanities? Where or how are digital humanists' experiences of critical making intersecting with designers? How do these crossover 'ways of seeing' impact our scholarly and creative work — and future hybrid practices?
- How might forms of understanding such as speculative design, prototyping or hacking play a role in critical making, and in what ways are these influencing the scope of work in both areas?
- In what ways might design and the digital humanities collaboration be fostered in the studio or classroom? What are some examples of pedagogical approaches to teaching critical making?
- What are the forms these arguments might take as part of this special issue?

Visible Language is a journal that invites evidence-based research. For this issue, we encourage exploratory, creative works that incorporate evidence-based research through critical commentary, traditional analysis, audience responses or participant feedback.

REFERENCES

[1] Johanna Drucker. SpecLab: Digital Aesthetics and Projects in Speculative Computing (Chicago: University of Chicago Press, 2009), xii.

[2] Mark Ratto, "Critical Making" in Open Design Now: Why Design Cannot Remain Exclusive, Bas van Abel et al. (The Netherlands: BIS Publishers, 2011), 202.

Proposal due: January 15, 2015
Abstract **acceptance/rejection:** March 15, 2015
Full papers / works due: June 15, 2015
Review period: June 15 – August 1, 2015
Review feedback: August 1, 2015
Final paper submission: September 15, 2015
Anticipated publication: October 2015

Submissions:
In keeping with the theme of merging form and content, the traditional printed journal will be expanded to include a corresponding online space for interactive and digital work. We invite dialogue on what defines scholarly works in regard to non-traditional forms of writing and disciplinary crossovers. Submissions may include, but are not limited to, case studies, interactive reading experiences, audial and visual works.

Proposals should include a 300-word written abstract and a brief outline to show the structure of your argument. A corresponding visual abstract is strongly encouraged. For digital work, please include a URL or screenshots. Final articles can range from approximately 3–5,000 words.

Please send proposals through January 15, 2015 to Jessica Barness, jbarness@kent.edu

Open Peer-Review Process:
Submissions will be reviewed through an open peer-review process. An open peer-review process makes available the submission author's name to the peer-reviewer. Reviewer names and reviews will be published on the Visible Language journal website. Proposals will undergo review; a selection will be shortlisted for development into full-length papers / works and these will also be peer-reviewed prior to publication.

Interested in serving as a peer-reviewer?

Peer-reviewers will be responsible for providing feedback about abstracts and/ or final submissions between January – August 2015. If you are interested in serving as a peer-reviewer, please get in touch.

Guest Editors:
Jessica Barness is an Assistant Professor in the School of Visual Communication Design at Kent State University, where she teaches graphic and interaction design. She holds an MFA in Design from the University of Minnesota with a minor in Writing Studies, and an MA and a BA in Art from the University of Northern Iowa. Barness' research through design investigates theories in social issues, language and interactive technologies. Her work has been exhibited at venues such as Hebei Normal Museum, China and FILE Electronic Language Festival, Brazil, and published in Communication & Place and Currents in Electronic Literacy. She has also presented research at the International Committee for Design History and Design Studies Conference (2014), SEGD Academic Summit (2014), AIGA Design Educators Conference (2013) and HASTAC (2013), among others.

Amy Papaelias is an Assistant Professor in the Graphic Design program at SUNY New Paltz, teaching courses in web and interaction design, as well as 2D design and visual communication. She holds an MFA in Intermedia Design from SUNY New Paltz and a BA in Cultural Studies from McGill University. Her creative research lies at the intersection of design, culture and technology with specific interests in interactive typography and the digital humanities. She has presented her design work and pedagogy at Theorizing the Web 2014, AIGA Design Educators Conference (2007, 2013), TypeCon (2005, 2007, 2012), UCDA Education Summit (2011) among others. In 2013, she was selected to participate in One Week One Tool, an NEH-funded Institute for Advanced Topics in the Digital Humanities, hosted at the Center for History and New Media at George Mason University and co-authored a long paper on the experience that was presented at Digital Humanities 2014.

[3] Andrew Blauvelt, "Graphic Design: Discipline, Medium, Practice, Tool, or Other" (paper presented at counter/point: The 2013 D-Crit Conference, School of Visual Arts, New York, NY, May 11, 2013.

[4] Albinson, Ian and Rob Giampietro. Graphic Design: Now in Production (Minneapolis: Walker Art Center, 2011).

[5] Rosanne Somerson. "The Art of Critical Making: An Introduction" in The Art of Critical Making: Rhode Island School of Design on Creative Practice, ed. Somerson, R. and Hermano, M. (Wiley, 2013), 19.

[6] "Critical Making in the Digital Humanities: an MLA 2014 Special Session Proposal" by Roger T. Whitson, accessed on March 3, 2014. http://www.rogerwhitson.net/?p=2026

[7] Critical Making Zine by Garnet Hertz, accessed on March 3, 2014, http://www.conceptlab.com/criticalmaking/

[8] Speaking in Code, accessed on June 9, 2014. http://codespeak.scholarslab.org/

Design for Information: An Introduction to the Histories, Theories, & Best Practices Behind Effective Information Visualizations

Isabel Meirelles

Beverly, MA: Rockport Publishers, 2013.

For a complementary perspective of this book, please refer to the review written by Aaron Marcus in the *Information Design Journal* 20(3), 296–297

The book is a thorough representation of both the field of information visualization and the research interests of the author, whose focus is on "the theoretical and experimental examination of the fundamentals underlying how information is structured, represented and communicated in different media."

Beginning by the "big picture," the book includes an amazing collection of examples, the most thorough I have seen to date in a volume. The author organizes the content according to several categories represented by the titles of the chapters: 1) Hierarchical structures: trees; 2) Relational structures: networks; 3) Temporal structures: timelines and flows; 4) Spatial structures: maps; 5) Spatio-temporal structures; and 6) Textual structures. An appendix, notes, bibliography, contributors list, and index, complete the apparatus of the book.

Design for information is an extensive taxonomy of data visualization types, and is "a must" for anybody interested in the work done in the area. Each one of the hundreds of examples is explained and discussed, forming a kind of encyclopedia on the subject. It seems that nothing escaped from the through gathering of examples that Meirelles got involved in. The discussions and explanations normally focus on what information is represented and how it is represented.

It is interesting to see as well how many different professional fields use today diagrams to organize and represent information: basic science, applied science, education, engineering, medicine, technologies, etc. The value of the book is centered on the inclusion of examples of how many different problems are today being confronted by data visualizations, how many historical efforts preceded whatsoever is done today, and how the advent of the computers have allowed the field to explode, handling large data sets as well as dynamic representations.

At the end of the examination of the 224-page volume one becomes curious as to how might these diagrams have performed with the users they were intended for in terms of ease of comprehension; what conclusions could one arrive at from an evaluation of the examples included regarding perceptual and cognitive human factors; or how could a complementary book contribute to the development of best practices. I would not expect that one volume could be so extensive as this one and also cover the field critically. One, however, has to wonder how the super-complex visualizations permitted by computer programs today would perform regarding comprehension, memorization, and use of the information presented. The discussion on perception and cognition is very brief, and it might leave some readers wondering about the assertions made: they are proposed as principles without them being discussed. This topic, as well as Gestalt theory, are not considered during the description of examples. The size of some reproductions is too small to assess their quality as data visualizations, they appear as samples of problems dealt with but not as information in themselves. To compensate for this, the book includes valuable URLs for people interested in seeing in better detail many of the diagrams shown.

While the above could be perceived as a weakness, the strength of the book is its truly amazing array of examples and the rare historical diagrams it offers. It also displays an uncommon erudition, and includes an extensive and useful bibliography. One does not know how long Meirelles took to complete the manuscript, but it feels like a life-time project. These assets, coupled by an excellent production, make it an indispensable publication for whoever can be interested in information visualization.

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