ANTINOMIES OF SEMIOTICS IN GRAPHIC DESIGN PETER STORKERSON

ABSTRACT

The following paper assesses the roles played by semiotics in graphic design and in graphic design education, which both reflects and shapes practice. It identifies a series of factors; graphic design education methods and culture; semiotic theories themselves and their application to graphic design; the two wings of Peircian semiotics and Saussurian semiology and their incompatibilities; semiology's linguocentrism, its affinity to cultural criticism and its seminal role in cultural and social anthropology, structuralism, poststructuralism and deconstruction. It examines the uses and criticisms of semiotics and semiology in design, their use in graphic design education, and their operationalization within technical communication and human factors as paths that might be applied to graphic design.

INTRODUCTION

This paper reflects an effort to understand semiotics within graphic design and graphic design education and its apparent lack of broad visibility. There are many possible reasons including defects in the theories, difficulty in understanding them or their obscure terminology, difficulty in applying them, or it could be that graphic designers are averse to semiotic theories or theories in general.

The history of semiotics in design indicates that there is no one underlying problem, but a series of antinomies or contradictions. Semiotics is a young field and not well worked out. Semiotic theories have been separated into the two schools of Peirce and Saussure. Saussure's is a theory based on language, not visual or sensory communication. Peirce can be applied to the broad range of communication, but it is difficult to understand, having a strange vocabulary. One might like to combine them, but there are some thorny incompatibilities between them. Peircian semiotics also needs a bridge to graphic design, but there is not the critical mass of people within graphic design to build it, and no one can build it for them. Graphic designers are largely averse to theory and the scholarly publications that could establish and develop a semiotics that would be appropriate to graphic design.

Semiotics and semiology are very much alive and used elsewhere. Semiology was a part of graphic design for much of the last century. It has provided a continuing critical base for social theory, deconstruction and "the interpretive turn" in the humanities. Semiotics is used in technical communication and semiotic concepts are used in human factors to decompose and analyze interpretation. Semiotics can serve as a framework to unify quickly developing but scattered literatures in naturalistic thinking as they are relevant to design. The semiotic model of diagrammatic thinking has made possible a comprehensive understanding not only of diagrams, but the principles behind visual and spatial thinking. It demonstrates the profound importance of graphical communication in the human leap from experiences in the world to the ability to think about those experiences in abstract terms: to make order of what is and imagine what could be (Stjernfeld, 2007).

THE CULTURE OF GRAPHIC DESIGN EDUCATION

Graphic design has a longstanding and close relationship to the visual fine arts and the studio/atelier tradition of instruction by apprenticeship as practiced eighty years ago at the Bauhaus and at the Schüle für Gestaltung Basel, now the Basel School of Design, which until recently functioned as a "vocational level school" (Maier, 1977; Visual Communication Institute, 2009). Vocational and atelier models share a non-intellectual approach to education, in which the knowledge acquired is largely tacit and not available for examination, even by the knower (Polanyi, 1966). As Dietmar Winkler has chronicled, the Bauhaus worked to rationalize formal aspects of design to be more in tune with industrial society, but in their own practice and teaching they were traditional.

> *Hans Meyer in 1928 and Mies van der Rohe in 1930, had been steeped in the trade school tradition, which saw non-applied research and intellectual pursuit as the dilettante activity of the rich and aristocratic. Unfortunately, the Bauhaus faculty did not recognize the restrictions of their own straightjacket. (Winkler, 1997, 131)*

Their design culture also "naively" perpetuated traditional class structure through their pedagogical style and their paternalistic social outlook, which increasingly made them out of touch with the users of their designs.

> *Although the school wanted to be perceived as having a democratic view of society, in fact, it imposed its ideology without consultation with or concern for those who had to live with its experiments (Winkler, 1997, 131).*

The Bauhaus became particularly influential in the US, establishing its distinctive design aesthetics and culture as many of its faculty immigrated to teach at Yale, Illinois Institute of Technology, Harvard and elsewhere.

Graphic design is still sometimes taught outside of academia, in dedicated art schools, as well as in universities. Particularly in the United States, the large majority of graphic design programs are within larger visual fine art departments or schools of art within universities. The design/fine art institutional relationship has steered graphic design education toward the academic fine arts pedagogy and culture, which itself is studio based and non-academic (Storkerson, 2008). Terminal degrees have in design historically been at the Masters or Masters of Fine Arts level. The disparities between MFA and PhD degrees within academia are now being resolved by the necessity that design educators also have PhD degrees (Bonsiepe, 2004, 28). Particularly in the UK, there is a movement toward establishing a "practice based" PhD, which has proven controversial, because it does not conform to accepted standards of scholarly knowledge, which is explicit and discursive, rather than tacit. Advocates of the practice based PhD have argued that scholarship and knowledge should be redefined to accommodate it (Candlin, 2000). A particular issue is tacit knowledge, (Polanyi, 1966; Rust, 2007) which cannot be explicitly expressed or defined. Explicit, discursive knowledge is defined, communicable, open to examination and supports integrated systems of knowledge with breadth and depth. It is not surprising that there is resistance to PhD dissertations in which knowledge is considered contained implicitly within an object.

Fine arts programs have greatest contact with traditional scholarship in art history in art history and aesthetics, both of which are squarely on the humanist and interpretive side of CP Snow's two cultures. Academic fine arts cultures are often both humanist and decidedly anti-science. Here is one educator's reaction not only to semiotics, but to theory in general.

> Semiotics is academic and abstract. I would venture that for many studio instructors, theory is simply beside the point. Better to discuss successful graphic design or the art canon with students and let them get to work (Crisp, 2004).

Professional graphic designers are often similarly inclined. Information design is an exception, where user testing, experiments (Frascara, 1997) and benchmarking are used, but not even everyone who practices information design, does so in this way. For example, the American Institute of Graphic Arts' Design for Democracy project was begun after the US election debacle of 2000, where, in a very close presidential election, one of the major factors deciding the election was so-called voter error, in which many voters were unable to decipher confusing ballots. The project aimed at improving ballot design and redesigning of election materials and the graphic standards that specified them (Lausen, 2007). The project leader described the opposing forces within the project as creativity and decoration versus clear communication:

> *What we're trying to do with information design has to do with legibility versus creativity, and it certainly does take creative professionals to create better ballots, but that issues are not [just] decoration (Lausen, 2009).*

The only empirical evidence for the efficacy of the graphic redesigns appeared by chance: I met a fellow at UIC [University of Illinois, Chicago] who was doing [his] PhD on retention elections, and he brought me this diagram and said to me, "…you know you should have this so you can toot your own horn.…proof that this redesigned ballot increased participation" (Lausen, 2009).

Presumably, voters had found the older ballots so confusing that they were discouraged from participating, so the new ballots were an improvement on that level, but that does not demonstrate improved voter accuracy, which was the initiating goal. There was no indication of which attributes of the redesign were responsible for the improvement, which were unnecessary and which could still be improved. Under this sort of régime, the client is expected to defer to presumed expertise which is the tacit, proprietary knowledge /talent of the creative professional. How much more effective and persuasive would graphic designers be if they made a habit of testing and measuring to optimize their designs and back-up their claims?

The lack of intellectual preparation among graphic design students and the lack of intellectual content within design programs are well known. In 1969, *Print magazine* published an article evaluating the then current state of design education that began as follows:

> *Students, professionals and educators are convinced that it is time to take a new, hard look at US design schools. What are they doing wrong? What, if anything are they doing right. And is it enough to meet the needs of the 1970s? (Dreyfus, 1969, 18)*

Thus, there has long been, within graphic design and graphic design education, a tension between the desire to develop an intellectual grounding for the field and resistance to doing so. In some senses, cultural criticism has been offered as a substitute, but its critique ends, not with constructive competence. Within graphic design the meanings and methods are not directly defined, but glossed over and treated implicitly as formal decisions that "work better" or "resolve" the design.

SEMIOTICS/SEMIOLOGY

Given the importance of "meaning" to design and to the issues to be addressed here, it is important to clarify what is meant by it. The terms "meaning" and "meaning making" are often used here because they are familiar, but they are not precise. "Signification" and "interpretation" would be more specific, but there is no adequate single term to use. Instead, these terms emphasize different aspects of the same phenomenon. "Signification" emphasizes how things point to other things the way a picture of one's mother points to her, or a broken twig points to someone having recently walked the trail. "Interpretation" emphasizes that the signification is not within the object but the person interpreting: to someone who doesn't know the mother, the picture is about a woman, or middle age, or her hat (Barthes, 1982) and the twig is interpreted by a tracker as an indicator of someone he is to capture or rescue. The term "meaning" is commonly used in language, to refer to significations of words and texts, and of the interpretive possibilities they allow. In its popular use, "meaning" applies to all of these, so it will be used in general, but more precise terms will be used when they are needed.

Designers create meaning by visual, spatial and temporal means. The hope for semiotic theory (semiotics and semiology) has been, as a theory of signification that might connect design moves to the meanings they communicate.

> *Semiotics is the explicit heart of graphic design theory, just as it is the implicit (subconscious) engine in graphic design practice. The central role of semiotics is therefore clear, as, from this perspective, every graphic designer is a semiotician (Skaggs, 1997, 5).*

But sign theory has presented dilemmas. One is its bifurcation into two somewhat incompatible branches: Peirce's semiotics and Saussure's semiology. Semiotics is a general theory of meaning construction based on cognition. It is a philosophical theory of logic that is somewhat difficult to understand and lacks research methods.

> *Charles Sanders Peirce's semiotics is a way of understanding how meaning making, in all of its aspects, works in the mind. It can be applied to all types of communication including behavior, but, it is a philosophical system, not a research tool. "Semiotics provides not a method but a point of view…. Semiotic arises from the attempt to make thematic [the] ground that is common to all methods and sustains them" (Deely, 1990, 10).*

Fernand de Saussure's semiology, in his *Course in General Linguistics* (1920), intended to develop a researchable science of language. It is a theory of language, not related to visual, spatial or temporal aspects of design. The two also use different sign theories, Peirce's three part theory and Saussure's two part theory, so semiology is not merely a subset of semiotics, but a somewhat different formulation.

<u>Peirce</u>

Peirce (1839-1914) was a mathematician, chemist, scientist and a philosopher of analytical bent. He was the founder of modern pragmatism: the view that things are what they do; they are known to people by how they affect people and how people can affect them. In short if something cannot be sensed, and has no detectable effects on the things that can be sensed, there is no way to know it exists. Experience comes about through interaction, and all knowledge is ultimately based in concrete experience. Lakoff and Johnson (1999) demonstrate the ubiquity and necessity of experiential metaphors in language, Gestalt psychology demonstrates basic visual concepts, and Peirce's semiotics argues that this is a fundamental cognitive principle underlying experience and thought.

> *Pragmatism or pragmaticism...was thus Peirce's way of insisting that abstractions must give an account of themselves and must do it in terms of concrete experience (Peirce, 1934, V).*

Experiences and objects, like a tree or a dollar as experienced are representations or mental interpretations, objects not literally as they are, since there are no trees or dollars in the head, but mental objects signified by initial sensory signals and dependent on how the sensory signals are interpreted. Peirce described this semiosis as a three-part relationship of representamen, object and intepretant. The "representamen," also called a "sign vehicle" or "signal" is what comes to the eye. The object or referent is what it is perceived or pointed to, such as "dollar" and the "interpretant," "significance" or "meaning" in the vernacular, is the notion of what a dollar is.

Peirce constructed a taxonomy of signs, starting with symbols, indices and icons. Symbols are "arbitrary signs" in which the form of the sign is not related to its signification and the signification is assigned by convention. A stop sign is a symbol: a set of marks which have been assigned a significance, in this case, "stop here" also signifies. A stop sign can range in size, or even be painted on a wall, as long as its forms are recognizable. Words and street signs are examples of symbols. Indices are indicators—the angle of the sun, the shadows it projects can be used as a clock. A train can be used as a clock if one knows its schedule. These are indices or natural signs. They reflect causal observations such as the movement of shadows. Icons function by having a similarity of resemblance or analogy. In a line chart, the line that rises as it goes to the right is an iconic signification of "rising prices." A religious icon is not a good example, because it is actually a collection of symbols, like the halo, and codes of color, pose, clothing and so forth, which have been assigned or encoded as signals to signify the Virgin Mary.

Natural signs—indices and icons—very often point to cultural meanings, such as getting to work on time, but they are cognitive rather than cultural in the sense that the initial significations are inferred rather than assigned by convention, as when the hour is inferred by the angle of the sun, rather than read from a digital clock. They present the individual as interpreting for him or herself, making use of the environment in a particular context. Recent psychology studies have demonstrated the extent to which iconicities, too, are innately cognitive and not learned through language. For example, Ramachandran (2004, 2006) describes studies in which given two shapes, one "bulbous and amoeboid" and the other like "a jagged piece of glass," and two words for them "kiki" and "booba," that the vast majority of people across different cultures intuitively expect the bulbous shape to be a "booba" and the jagged shape to be a "kiki." This is a cross-modal iconicity linking sight and sound.

> *Look at the kiki and look at the sound kiki. They both share one property, the kiki visual shape has a sharp inflexion and the sound kiki represented in your auditory cortex, in the hearing centres in the brain also has a sharp sudden inflexion of the sound, and the brain performs a cross-modal synesthetic abstraction saying the only thing they have in common is the property of jaggedness. Let me extract that property, that's why they're both kiki"* (Ramachandran, 2003).

Not only that, it is possible to isolate the cognitive architecture behind such "cross modal" iconicity. The abstraction of sharpness takes place in a distinct site in the brain, and if that site is damaged, persons *"cannot do this cross-modal associations even though they're fluent in conversation, they're intelligent, they seem normal in other respects"* (Ramachandran, 2003). Thus, these iconicities do not come from language or culture but wiring, and they are formed intuitively, below consciousness. The appearance of iconicity, here sharpness as an independent third element, demonstrates Peirce's idea that the emergence of a signification as something new and independent, that can be considered in its own right, makes possible the emergence of abstract thought. It is an important finding for anyone who communicates using sensory, experiential modes. Such cognitive and neural studies also hint at how semiotics can be made researchable and useful.

Saussure

Saussure's semiology has been enormously influential in linguistics, philosophy and humanist thought in general including social, cultural and political thought. By concentrating on language systems as primary constituents of cultural meanings, it enabled language to be viewed as the primary source of meaning, rather than just a carrier, and through that, it helped to shape twentieth-century philosophy, hermeneutics, anthropology, sociology, cultural studies and, enabled structuralism, post structuralism, deconstruction and the "linguistic turn."

> As the medieval philosophers would have it, the way things are (ordo essendi) shapes the way we perceive things (ordo cogitandi) and this gets expressed in the way we speak (ordo loquendi). Especially since the 'linguistic turn' in philosophy and social science, this has been more or less reversed. It is now language, the way we speak, that is considered to shape what things we see and how we see them (Crotty, 1998, 88).

Saussure's semiology uses a two part model in which a mark, object or sound is a signal that is assigned a meaning, unrelated to its physical attributes. Words are prime examples, except where they are onomatopoetic (Saussure, 1986, 69). While signs are the atoms and molecules of language, it is the language as a system, its grammar and syntax, that dominates and determines their meaning. Barthes calls this system a language, or "langue," "language without speech" (Barthes, 1967, 14), a value system that expresses itself in what can and cannot be said. A language is a "collective contract." Between langue and signs are paroles (words), which are the things that are expressed within the language's sanctioned possibilities.

In short, within semiology reality reflects language. The language is a collective object that encapsulates culture. This primacy of language and the lack of signification as an independent entity, largely bypass cognitive function and the individual as actor. In Peirce's semiotics meaning can be determined by individuals. Within semiology, the emphasis and power to determine meaning are invested in the collective. The differences between Peirce and Saussure reflect the different interests of logicians and linguists, and they also reflect different political cultures. Peirce's semiotics projects an autonomous individual who thinks for him or her self, while in Saussurian semiology power is collective and systemic, and the individual is surrounded by and integral to the culture and its values as operationalized in systems of rules. The history of semiology's association with culture theory and criticism suggests that some of its persuasiveness is derived from its social and political affinities that gave humanities new political relevance (Flyvberg, 2001).

Later developments

The term "semiotic" is often used to cover both semiotics and semiology and to hybridize them in a way that semiotics is invoked to claim a rational grounding, for a semiological content, without fully recognizing the differences between the two models. For example, Umberto Eco (1979) described semiotics and semiology as a division of labor. In his watergate model, Eco described a system for regulating water flow in which a series of lights serve as arbitrary signs indicating the flow and level of water according a code. He demonstrated that given such a code, it is possible to infer meanings outside of those defined by the code. The indexical sign, like the train that is used as a clock, is wrapped around the coded arbitrary signs. Eco uses the same method in reverse order to describe recognizing a cat.

Suppose I am crossing a dark street and glimpse an imprecise shape on the sidewalk. Until I recognize it, I will wonder "what is it?" But this '"what is it?" may be (and indeed sometimes is) translated as "what does it mean?" When my attention is better adjusted, and the sensory data have been better evaluated, I finally recognize that it is a cat. I recognize it because I have already seen other cats. Thus I apply to an imprecise field of sensory stimuli the cultural unit «cat». I can even translate the experience into a verbal interpretant (/I saw a cat/) (Eco, 1979, 165).

Peirce's model is used in perception as semiosis, seeing the shape as a cat, while once we get to the signification, "cat" is a cultural/linguistic object, under the purview of semiology and the collective institution of language. This combining created a host of confusions and contradictions, as noted by Tomas Maldonado (1970, 119-123). More recently, Skaggs and Shank (1997) began work on a more useful, analytical approach to integrating semiotics and semiology for design purposes.

Semiology presents obvious difficulties for graphic design as it lacks sensory dimensions, while images have distinct organizational characteristics, they do not correspond to the formal, systematic, syntactic structures of language, but to the visual and spatial aspects of experience. Moreover designers depend on intuitive, unconscious levels of reception, in addition to learned languages. Organizational devices (location, separation, contrast, clustering, openness, containment, etc.) for example, may be formulated as conventions, but are also rooted in cognition, as described by Gestalt theory (Wertheimer, 1923/1958; Koffka, 1935). In many respects, then, what distinguishes design as a field is its use of natural, experiential signs in addition to conventional ones to communicate and associate experience and concept. This has been particularly obvious in the design influenced by the Bauhaus, Ulm and Swiss modern designers, who have focused on abstraction, rather than descriptive illustration.

INFLUENCES OF SEMIOLOGY AND SEMIOTICS

Despite its linguocentrism, semiology was highly influential in twentieth-century design and became integral to the graphic designer's identity as it was applied metaphorically to graphic design. In 1986, Abraham Moles summed this up, he described the graphic designer as one who gives "legibility" to an artificial, man-created world, in which the natural relationships of human to environment have to be deliberately created, which is to say engineered.

> *Thus, we can anticipate the promotion of the role played by the graphic designer, into that of a sign engineer who precisely designates the symbolic aspects of the environment to prepare us for real actions. It is this application to the universe of that general principle of graphic design which allows us to achieve correspondence of the world of signs with personal lifestyle—to connect the symbolic aspects of successive landscapes or ideoscenarios, which form part of each individual's vital trajectory toward a temporary destination within the project pursued (Moles, 1986, 44).*

Within the artificial but "real" spaces of the human built environment and the virtual spaces of the page, the designer is charged with *"assembling signs into symbols and…symbols into space [to create] an ecology of signs"* (Moles, 1986, 45). In this artificial environment, the designer engineers information, propaganda, social consciousness, consonance of actions with goals and an autodidactic function, though *"the graphic designer is not responsible for the content of a message, which is always imposed by others, but, rather, for a style and its social consequences"* (Moles, 1986, 47).

The influence of semiology and semiotics can be seen in a number of areas:

- Application of "language" and linguistic concepts to visual communications; the use of rhetorical tropes within visual communication.
- Application of linguistic concepts to systematize the construction of sign systems and visual languages.
- Iconicity in logotype and symbol design: based not on object-to-object resemblance, but on semantic iconicity, which is often cross-modal.

Some of the influences were direct, as, for example, Moles, Bonsiepe, Maldonado and other colleagues at the Ulm School of Design, in the 1960s, were investigating semiotic theories and working to apply discursive knowledge to design. But, many graphic designers seem to have had little or no interest in theory per se, so semiotic or semiological ideas influenced them indirectly as the ideas were popularized and gained prominence in the social culture, and as designers observed each other's work. Used metaphorically these ideas could point at what could be done, leaving the designer to resolve how to do it by familiar methods.

Modernist design

In the twentieth century, first in Europe, then in America, graphic design turned away from illustration, to a more abstract method of communication. As an ideal type, within illustration, a class or concept is signified by a member, drawn in such a way that many individual aspects are taken as unimportant (summer is a sun bather on the sand), while in design the tendency has been to indicate the concept or class without reference to individuals (summer as bright yellow, blue and white). Exercises of the latter sort have been a staple of foundation studies in graphic design (Maier, 1977, 323-354). It was applied to abstract forms such as logos, in which the sign is iconic, not as a pictogram, resembling its referent, but by embodying largely semantic characteristics that the viewer will impute to the referent. For example, Frutiger describes his AP logo for the Aeroport of Paris as follows:

> The main image is…that of the initials AP. In deciding the choice, the legibility of the letters is the main argument. The shape of the A recalls the protective roof of a house, but at the same time an arrow pointing taking flight. P for Paris is like an abbreviated recollection of the town (Frutiger, 1980, 100).

The semantic suggestions of protection and taking flight is an oblique method of communication, in which the initials "AP" are a conventional sign or symbol signifying Aeroport Paris as its referent or object, while the semantic inflections of form iconically signify an interpretant, so that Aeroport Paris, signifies safety and flight. While this mode of communication was based on notions of semiotics and semiology, it also remained firmly within the aesthetic practice of graphic design and could be approached by the designer in a non-theoretical way.

SIGN SYSTEMS AND VISUAL LANGUAGES

The development of visual sign systems was encouraged by internationalization, and the increasing use of technological systems, leading to the need for standardized visual sign systems. Martin Krampen (1965) traces road-warning signs to 1909 (well before Saussure's semiology) and four pictographic signs that were adopted at an international congress in Paris.

Otto Neurath's Isotype, designed by Gerd Arntz and Erwin Bernath, is the first well known modern example of a language based on pictograms. Neurath was a member of the Vienna Circle of positivist philosophers who had some contact with semiotician Charles Morris (1938), but Isotype was designed without the apparent influence of sign theory. It was not designed as a "visual language" so much as a specialized tool for communicating propaganda: to educate populations about their societies. According to Marie Neurath:

> From the very beginning it was clear to Otto Neurath that what he wanted to create and introduce was not a new international language of the type of the Chinese script, but an educational tool to make selective statements. He did not want to get rid of the usual printed text, but wanted an auxiliary tool for better communication (Neurath, 1974, 145-146).

The visual aspects of Isotype reflect the influences of German expressionism, constructivism and socialist realism rather than semiotics or semiology. The pictograms were simplified characterizations of social roles and situations rather than visualizations of concepts, and they were brought together in images that make brief narratives, such as a doctor taking notes, sitting across from a patient. Its language was editorial and expressive rather than cool.

Other systems were influenced by semiology, both directly and indirectly, as it provided tools for the development of systems of arbitrary and quasi-arbitrary signs or "glyphs" which became an increasing focus of graphic design up to the 1970s. These included both historical studies of glyphs (e.g., Frutiger, 1978/1989) and the systems of symbols used for purposes ranging from road warnings to wayfinding, and signs for specific areas of activity such as agriculture, religion and home economics (Dreyfus, 1984). The November-December 1969 issue of Print magazine was devoted to international signs and symbols, as a major initiative of ICOGRADA, the International Council of Graphic Design Associations. It included an article by Margaret Mead (1969) on the anthropological considerations of international glyphs or symbols, pointing out that there were no universal symbols, then offering a taxonomy of glyphs, their limitations in comparison to languages, and ways in which glyphic systems can be built.

| No vehicles | No entry | No parking | No stopping | No restrictions | No speed limit |

Figure 1
International road signs

The glyphic systems designers created, whether arbitrary or quasi-pictographic, also made use of Saussurian notions of grammar, and of phonemes (fundamental units of sound) and morphemes (fundamental units of meaning such as root, prefix and suffix), by using strokes and simple forms in an analogous way. Compared to Isotype, these systems are more language like. Their forms tend to be visualizations of concepts rather than abstracted characterizations, they are cool and informative, largely without editorial content, and where needed, there were systematic ways to combine signs. The language LoCos, invented by Yukio Ota in 1964, for example, uses a dot to indicate now, a dot followed by a dash to indicate the past and a dash followed by a dot to indicate future. It uses a circle open at the top to indicate a man, which, with a dot in its center, means "me," with an airplane or envelope inscribed becomes pilot or mailman (http://www.tamabi.ac.jp/Soumu/gai/hojo/seika/2002/kyoudou-ota.pdf). LoCos is currently being investigated as a possible visual language for cell phone "texting" (Marcus, 2007).
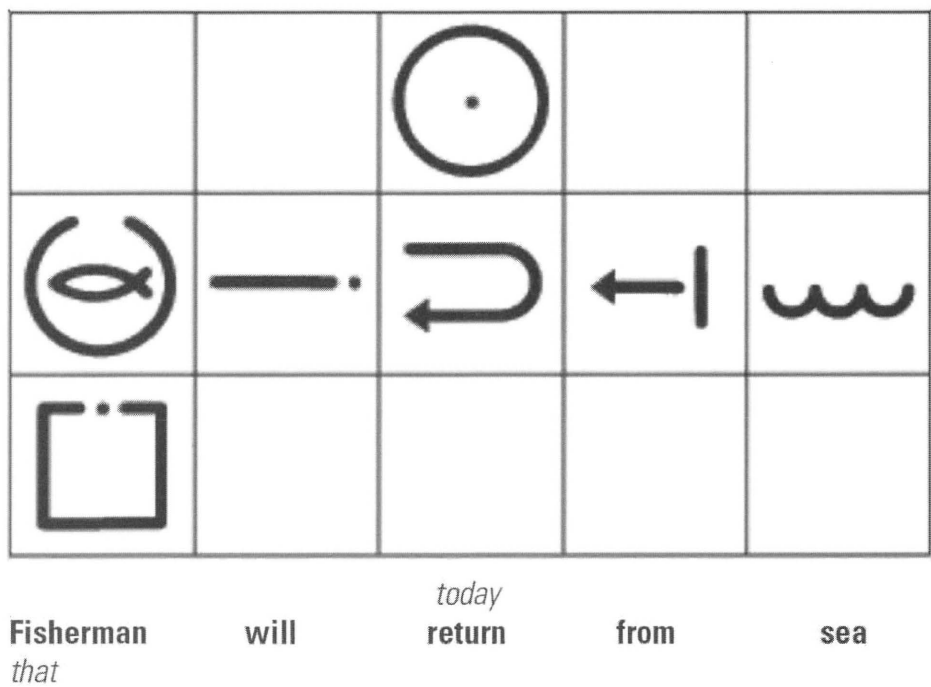

Figure 2
LoCos: That fisherman will return today from the sea.

Sign theory is also credited with the development of the notion of "visual rhetoric," the application of rhetorical principles and tropes with origins in oral to visual representation. At HfG Ulm, Bonsiepe (1965) systematically analyzed visual semantics and rhetoric, particularly in advertising (Ulm, 14/15/16). His rhetorical figures included visual/verbal comparison ("sharp ideas" depicted by sharp pencils), visual/verbal analogy ("refueling" depicted by hummingbird feeding on a flower), visual/verbal metonymy ("precise" depicted as a caliper measuring the globe), verbal specification (image with title), visual substitution (computer "greedy collar" depicted as a punch card curved and folded to resemble a collar), visual/verbal parallelism (abundance of air indicated by an area of light gray) and associative mediation ("Take a holiday from everyday drinks!" with sunset and a calm sea viewed through a porthole).

While Bonsiepe's examples were largely of text-image juxtapositions, Hanno Ehses demonstrated the use of rhetoric as a teaching method to generate graphic images (Ehses, 1984). Students could be assigned to utilize different tropes to produce a variety of solutions. A series of student posters on Shakespeare's Macbeth show different tropes: metaphor (a lion-like rendering of Macbeth's face), antithesis (Macbeth's face and crown split in half to show loyalty and malignancy), irony (Macbeth and Lady Macbeth as stylish and "amiable"), personification (bleeding armor), metonymy (crown and blood for king and carnage), synecdoche (eyes for man), periphrases (the baited trap facing Macbeth), pun (three witches pictured on the diadem of his crown), and hyperbole (a tiny king staggering under the weight of a huge crown) .

A recurrent theme in the examples from pictograms to artificial languages and visual rhetoric is the catalytic role of sign theory in creating or promoting ways of approaching communication. Once those ways of approaching communication are established, they can develop independent of the underlying theory. For example, while classical rhetoric is based on oratory, an instructor needs only to present the tropes and examples to demonstrate their meaning. As visual rhetoric itself demonstrates, the tropes reflect underlying cross-modal iconicities that can link language with image. Similarly, the application of linguistic terms such as phoneme and morpheme to graphic gestures of stroke and shape, can be fit into a logical puzzling out of how to modularize the construction of abstract signs and languages.

In 1979, Thomas Ockerse and Hans van Dijk described a system of instruction based on Peirce, in use at the Rhode Island School of Design (Ockerse, 1979). It decomposed sign production into the Peircian triad of sign vehicle, object and interpretant (significance) and the larger categories of syntactics or grammar of form (e.g., gestalt principles), semantics (representation of object and interpretant) and pragmatics (the relation to user and sender). Ockerse and van Dijk, described a number of exercises in which these variables were discretely manipulated.

> *Some of the projects deal with equivalencies at the structural or semantical level as influenced by processes of substitution. In other projects, contextual manipulation determined degrees of significance. Some projects (such as the score) mainly concerned with sign-object relations and rules of logical formation in the end become supersigns [with multiple simultaneous interpretants] (Ockerse and van Dijk, 1979, 363).*

The approach taken by Ockerse and van Dijk is explicit in its integration of semiotic concepts and principles into the making of graphic objects ranging from pictographic and abstract wayfinding signs to word-image communications and visual scores representing complex sequences or actions. This method, like that of Hanno Ehses, attempts to link the tacit knowledge of making with discursive metaknowledge, to enlarge the designer's creative scope. The Ockerse-van Dijk method, further locates the discursive knowledge in a general framework that is relevant to graphic design as a whole.

In the methods of Ehses and Ockerse-van Dijk, explicit concepts are used in the content of instruction to link tacit knowledge to discursive knowledge, developing the designer's ability to conceptualize and to apply concepts across media and modes of communication. These are just examples. There have been and there are certainly others working in this area. It is not possible to know how many, because design educators do not generally publish their syllabi and teaching techniques. That reticence does not bode well for the transmission of such pedagogy. It is more consistent with the loss of content over time as past exercises are repeated while the pedagogical content is forgotten.

RECEPTION OF THEORIES

Whatever influence semiotics and semiology have had in practice, they have been viewed as problematical theories for design. In contrast to the Bauhaus, the faculty of the HfG Ulm took a strong interest in theory and the application of knowledge to design but they were also aware of the limits of rationalization. They looked for a middle road:

> *Hence, on the one hand, the Ulm methodology – or what is considered to be the Ulm methodology – has given rise to a resistance which even reinforces the romantic attitude towards design. On the other hand, it has brought about an altogether indiscriminate, and often unfounded hope in design under the scientific aegis" (Maldonado and Bonsiepe, 1964, 11).*

They looked within discursive knowledge for new ways to think and stressed that techniques should be seen pragmatically, according to "their instrumental value." (19). Klauss Krippendorff called this "science for design" (Krippendorff, 2006, 73-74) Distinct from science of design or design science, science for design operates within practice as a way to creatively make use of knowledge.

Maldonado and Krippendorff, both criticized semiotics in a number of ways. Maldonado argued that:

> *The attempt to make use of a semiotic set of ideas to describe communicative (and even aesthetic) phenomena in the fields of architecture, urbanistics, and "industrial design" have not yielded the results that many expected, for many reasons, but above all for the lack of maturity in the semiotic itself" (Maldonado, 1970/1972, 119).*

This "lack of maturity" was reflected in the semiotics-semiology split and the differing interpretations of Peirce by later theorists, but particularly, the problem of operationally applying semiotics:

> *The semiotics (or the semiology) of architecture still remains at the metaphorical level. It would seem that, up to now, all efforts have been directed exclusively toward a substitution of the terminology of another, and little more (Maldonado, 1970/1972, 123).*

In Britain, Robin Kinross argued on traditional grounds that the theorist or critic's formulation of ideas is fundamentally different from the designer's making of images: *"Theory becomes manifest in books and journals, in lecture and seminar rooms—and splits off from the practice of the design office or workshop"* (Kinross, 1986, 192). Kinross criticized semiotics on a number of counts: that semiotics is a method of critique rather than construction; that semiotics does not offer new insights; that language based analysis is inappropriate to images because they do not have structures parallel to language; that it reduces objects to mere signs.

> *Physical objects, whose meanings the semiotician lays claim to, have a substance and a presence that discussion limited to 'significance' and 'structure' (mental, abstract structure) cannot begin to touch (Kinross, 1986, 195).*

However one could respond to any of these criticisms—as valid or misguided—they reflect semiotics and semiology as they developed and as they were regarded: the muddle of semiotics and semiology and semiology's tendency to reduce everything to language, as well as the tendency in graphic design to divorce theory from practice.

USES OF SEMIOTICS OUTSIDE OF DESIGN

While within design (with few exceptions) semiotics was usable only metaphorically, it has been directly applied in technical communication. While design is covalent with the visual fine arts, technical communication bonds with information. Its practitioners do not think about their works as "physical objects" or artifacts, but as methods for communication. Technical communication also has a more clearly delineated understanding of communicative goals and tools, so that performance characteristics and communicative goals can be directly related to graphic design choices.

Technical communication

Manning and Amare (2006) approach communication through Peirce's three pragmatic categories: decoratives, (an unfortunate term) which evoke feelings, indicatives which direct receivers in some way and informatives which enable understanding. Decoratives would include semantic values of presentation such as color or type style. Indicatives include bullets or arrows: "Bulleted lists, for example, specifically move an audience to the actions of separating,

dividing, and contrasting otherwise undivided statements in the flow of information" (Manning and Amare, 2006, 195). Informatives promote understanding by the presentation of information such that its significance can be understood.
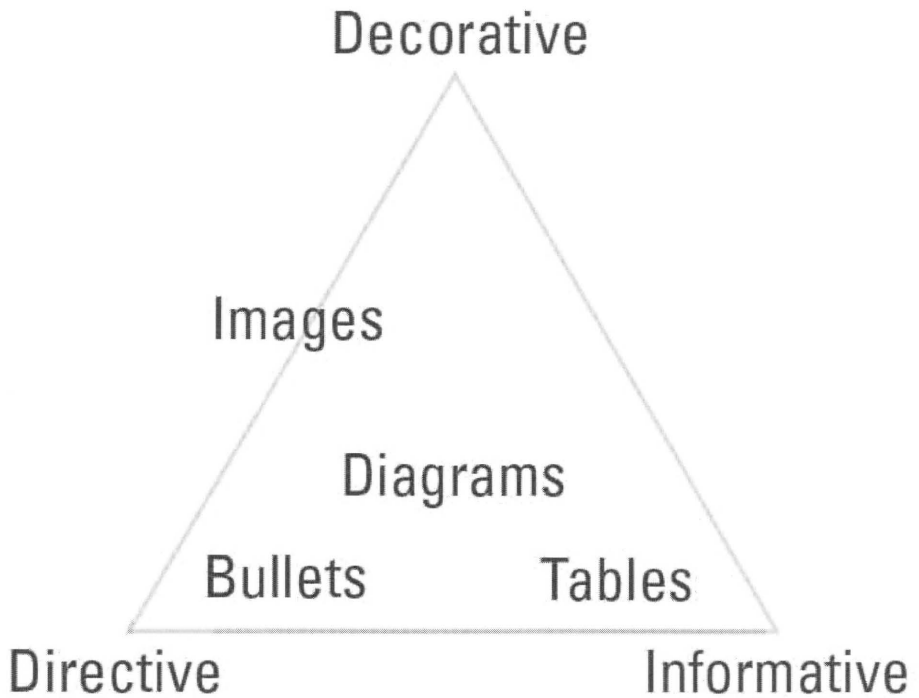
Decorative

Images

Diagrams

Bullets   Tables

Directive   Informative

Figure 3
Decoratives, directives, informatives (after Manning and Amare)

Visuals can be classified according to this taxonomy. Images are on an axis with directives (pointing at what they show) at one end and decoratives (evoking emotions) at the other. Icons, such as, diagrams, charts and tables can be placed in the field according to an orthogonal axis with image at one end and informative language at the other, tables being the most language like. Images "lack 1) clear contrasts, 2) filters for detail and 3) reliable generalizations" while diagrams, which are closer to informative language provide all of these.

Ethics represents operationalization, that is, the relationships between specific choices of means (whether to use an image, diagram or text) and goals (how a communication is understood). The authors invoke Peirce's concept of ethics as deliberate action with respect to a goal.

> *Ethics is the study of what ends of action we are deliberately prepared to adopt. That is right action which is in conformity to ends which we are prepared deliberately to adopt (Peirce, 1933).*

The technical communicator has ethical obligations to the audience to provide *"truthful and accurate communications"* (STC, 1998). This requires a *"correct identification of communicative goals shared by presenter and audience alike"* (STC, 1998, 197).

> *Technical communicators are ethically obliged to be aware of which information-design strategies are effective and which are not, and under what circumstances (STC, 1998, 207) and Those who use cluttered and complicated graphics simply because they like cluttered and complicated graphics may commit an ethical breach... if their goal to satisfy themselves does not take into account the audience goal of complete understanding.*

Honest communication requires that decoratives, indicatives and informatives be controlled to promote comprehension, representing the informational content and directing the audience toward that content rather than away from it. "No visual is inherently ethical or nonethical. Rhetorical ethics is always determined in matching the authorial goals to audience goals" (STC, 1998, 208).

This example illustrates both how Peirce's semiotics can be applied to the design of graphics, and how the application of theory can clarify a field in ways that are useful in both practice and instruction. Such analytical tools would be very helpful to designers in enabling them, on a project-by-project basis, to better specify their goals and the methods.

Semiotics as a framework for research in psychology: the lens model

Finally, Peircian semiotics can serve as a framework within which to make use of cognitive research for design purposes. There is an increasing literature in psychology on experiential thinking, which does not have a good framework in psychology to make it usable. Egon Brunswik's lens theory shows a way to analyze interpretation that fits well within a semiotic frame and can link it to the construction of designs. It does not provide a set of rules for how to design, but supports research that can provide knowledge that is applicable to graphic construction.

Brunswik's frame is pragmatic. The organism (a human or any other creature that acts in the world) seeks to act appropriately with the environment for the furtherance of its goals (Tolman, 1951, 13). This is the objective level at which the organism succeeds or fails—it stops at the cliff or falls off. To succeed and survive, it needs an internal representation of its environment that functionally corresponds to that environment. The organism's cognitive job is to use "proximate" sensory information as indices, signifying objects and events comprising the "distal" environment to make that environment predictable. This is difficult in natural environments, because a cause in the environment can have a number of effects and an effect can have had any of many causes. The organism receives sensory information in different modes (sight, sound, touch) and from different organs (eyes, ears, skin). There is often redundancy between sensory inputs (seeing and hearing the hammer hit the nail) and the organism integrates and weighs those various indicators in order to come up with a reliable picture of what is happening to what. Put simply, by weighing many sensory signals, any of which can be in error, a very high degree of reliability is possible. People rely on their senses to perceive their environments, and their senses are generally highly reliable.

Brunswik' crystalized this approach in his "lens model" of perception, below. It models the functional correspondence between the environment and the organism's representation of the environment. The initial focal variable, which is the distal object, is available to the organism through a series of mediating sensory signals or signs, which Brunswik calls "cues" along with spurious noise and errors. The organism's achievement of a "stable relationship" or functional correspondence of the terminal focal variable with respect to the environment, is effected through "vicarious processing," in which the organism decides which signals to pay attention to and what they signify. What this means is that we human beings, for example, do not actually experience the proximal light on our retinas (the initial focal variable). We see the distal scene

of objects around us (final focal variable), and we see them as the same objects ("stable relationship") under widely differing conditions of light, distance and angle. This is an achievement of perceptual interpretation, in which many different "cues" are weighed, so that we spontaneously see the clock on a distant church tower as bigger than the alarm clock on the night table next to us.
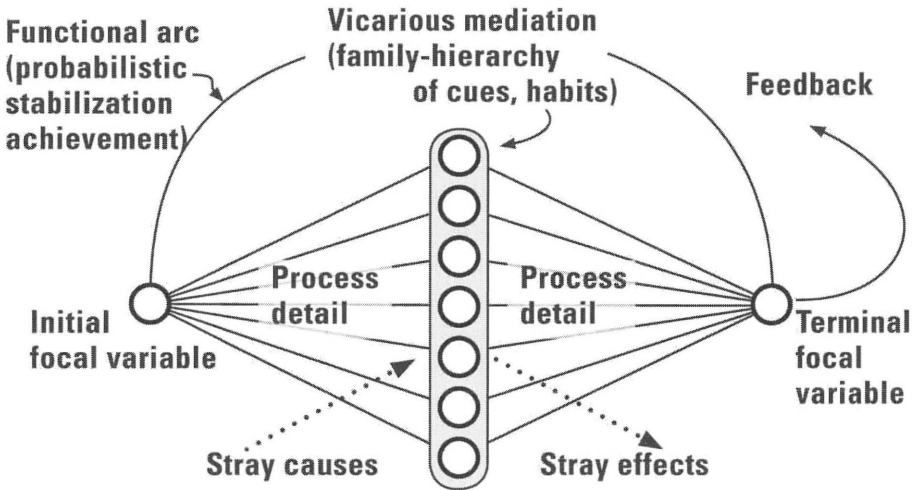

Figure 4
The Lens model: composite picture of the functional unit of behavior.
In E. Brunswik's The Conceptual Framework of Psychology 1952, 20.
© 1952, University of Chicago Press. Adapted with permission.

The lens model can be scaled, elaborated and extended for situations of varying complexity, and for action as well as perception. It addresses how humans process proximal signs, to make judgments about the distal environment. It analyzes how judgments functions in practice, in ways that are helpful to designers.

Application of the lens model

Stewart and Lusk (1990) adapted and applied the lens model in an experiment studying judgment in weather forecasting of microbursts, rapidly occurring strong downdrafts, that pose a serious threat to aviation.

The lens model shows the phases of forecasting. The experiment concerns phases C through F, that involve forecasters. At each step there are judgments in which what is presented is interpreted, and that interpretation serves as a sign or "cue" for the next step:

A) Visual signals from the displays that are meant as cues to signify the data that signifies the current state of the weather.
B) The forecaster's perception of the displays is what the forecaster takes visual signals to signify.
C) The forecaster must "vicariously process" his or her interpretation of what the displays signify as cues indicating "precursor cues," that are predictive of a developing microburst.
D) The forecaster processes the precursor cues in making a final prediction of the likelihood of a microburst.
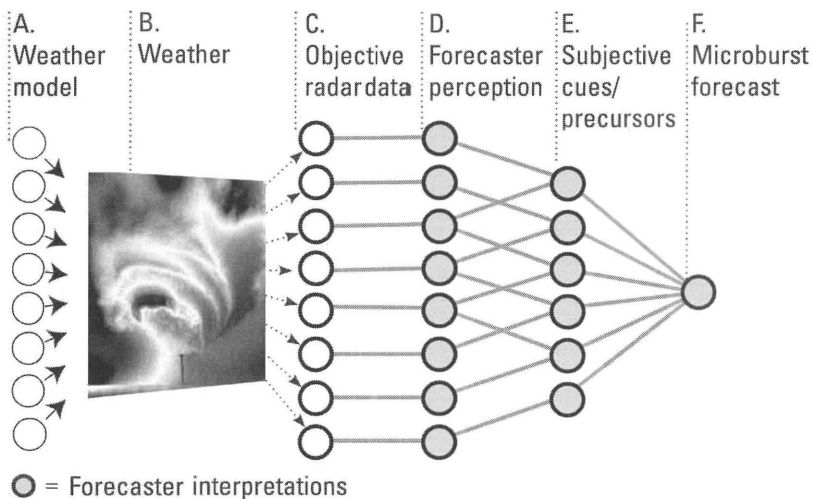

O = Forecaster interpretations

Figure 5
5 Sequence of phases in microburst forecasting. In Lusk et al. Judgment and Decision Making in Dynamic Tasks: The Case of Forecasting the Microburst. © 1990, American Meterological Society.

There can be problems at each step.

    C) The visual signals may show incorrect or out of date data.

    D) The forecaster may not be able to see the screens properly
       or may misread them because they are illegible or ambiguous.

    E) The forecaster may interpret cues differently especially when making a qualitative
       interpretation, based on quantitative information.

    F) The interpretation of "precursor cues" to make the final prediction are affected
       by all the previous steps, and the forecaster's vicarious processing of all of the
       precursor cues.

This processing reflects forecaster variables (e.g., bias toward predicting a high or low likelihood) of a microburst.

Thus, from the standpoint of the forecasters, the process can be decomposed into three sets of interpretations, each involving vicarious processing of sensory input (signs) and or judgments based on those inputs to interpret a remote distal environment. At each step, signs can be experimentally changed so that the vicarious processing can be detected as the relative weight and significance assigned to cues in different situations. Forecasters can be compared as indicators of different training methods and other human variables. Using historical data, it would be possible to measure the actual throughput accuracy of the forecasting including the theoretical weather model and methods of measurement, corresponding to the "objective" level of forecast-environment correspondence.

CONCLUSION

This paper has outlined issues in the relationships between semiology, semiotics and graphic design that have affected the use and usefulness of semiotics and semiology within graphic design. There is no simple way to account for or evaluate the current low visibility and application of semiotics and semiology within graphic design.

Semiology in particular has been highly influential directly, through its concepts, and indirectly through its effects on culture including structuralism, post structuralism and critical theory. In design that influence seems to have waned, as early hopes for visual languages were unfulfilled, pictographic and quasi arbitrary sign systems became established and routine, as modernist universalism gave way to postmodern interest in cultural difference and as abstracted forms such as logos lost some of their stylishness.

There are significant theoretical problems within semiotics and semiology that are indicative of the youth of the field. These include two quasi-compatible schools, difficulties in understanding semiotics in particular and numerous differences among theorists as noted by Maldonado (1970/72). Peircian semiotics, in particular was written as a philosophical frame for understanding, which needs middle range theories and methodologies to make it applicable in a generative way.

Semiotics and semiology are used in other fields and there are design educators who have applied them pedagogically, but the cultures of graphic design practice and education are themselves barriers to the understanding, acceptance and development of a semiotics that is useful to design. When a field truly assimilates knowledge, it develops its own theoretical and methodological expressions to create knowledge that is apposite to it. Graphic design has shown a willingness to borrow knowledge from other fields such as Gestalt psychology, but it has not shown an interest in developing such knowledge into generative tools for graphic design.

Technical communication demonstrates how Peirce's thinking on the level of the pragmatics of communication can be used to create tools for analyzing both goals and methods. It enables that field to better specify its goals and develop generative, knowledge-based guidelines regarding what methods to use. It achieves a level of clarity that one does not find in graphic design, where the problems may be more complicated, but need not be ill defined.

Brunswik's lens model provides an empirical research method for studying signs, objects and significations as they operate within the everyday, natural and pragmatic interaction of human experience and judgment. It provides not guidelines for design, but tools for research into the many variables that affect the ability to make interpretations and the interpretations that are made. While various theories, structuralist or otherwise, make claims as to what interpretations should be made, empirical studies can investigate what interpretations are made and why they serve as a basis for designs.

As Bonsiepe noted, there has been an "uneasy relationship between design and design research" (Bonsiepe, 2008). Bonsiepe described the fundamental dilemma that while design is not science, it needs science. "We can hardly get to the roots of design using art-theoretical concepts. Design is an independent category" (Bonsiepe, 2008, 31). This is a serious problem for graphic design and graphic design education. Given its history, one is not sanguine about the future. As a practical matter, graphic design can probably continue for some time as it is, but with its scope and creativity increasingly circumscribed, as the field of communication grows and new areas of communication are occupied by others—it is at risk. Particularly where information is visualized, computer interaction is involved or where clients are outside of the range of typical design clients, human factors and human computer interaction are able to apply a broad set of methodologies (including Brunswik's lens theory) that enable them to parse communication problems, design and evaluate solutions and demonstrate the value of their work in ways that are beyond the dreams of graphic designers. This is an opportunity for those who are willing to address it.

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