

BEYOND BALANCE AND CONTRAST: APPLICATIONS OF OTHER GRAPHIC DESIGN PRINCIPLES IN CARTOGRAPHY

MCCLEARY G.

University of Kansas, LAWRENCE, UNITED STATES

BACKGROUND AND OBJECTIVES

When, in 1952, Arthur Robinson discussed in *The Look of Maps* the issues involved in “Map Structure” and “Map Design,” he explored briefly (in ten pages) “design principles and elements”: contrast, visual importance, size, shape, complexity (shape), eye movement (direction), emphasis, balance, proportion, unity, format, and harmony. “Until such time as logic and objective research concerning the relative efficiency of the various possibilities is undertaken, the cartographer can but rely on the experience and direction of the artist” (70). If one examines the six editions of *The Elements of Cartography* (1953-1995), as well as other cartographic textbooks published since 1952, many of these elements and principles will be found to have been the subject of significant research. *How Maps Work*, by Alan M. MacEachren (published in 1995) is a good status report, and answers thoroughly questions about many of the map design issues listed by Robinson.

The “elements” of graphic design (line, shape/volume, pattern and texture, illusion of space, illusion of motion, value, and color) have undergone in cartographic studies extended discussion and research ... the principal document for understanding these elements ... the visual variables ... is Bertin’s *Semiology of Graphics*. What receive scant attention are the principles of graphic design: unity, emphasis and focal point, scale and proportion, balance, and rhythm (Lauer and Pentak 2008). For example, in the final edition of *Elements of Cartography* (Robinson et al., 1995), the list of principles include legibility, visual contrast, figure-ground organization, hierarchical organization, and (under “Composition”) balance. Other cartography textbooks will cover relatively few of the principles at a reasonable depth ... most provide very little example and explanation.

What are the principles and elements that are used in graphic design and how do the texts in graphic design organize them? What are their roles in the processes employed to create graphic displays?

APPROACHES IN GRAPHIC DESIGN

Graphic designers do not all use the same organization and list of principles. For Dondis, *A Primer of Visual Literacy* (1973), design principles are embedded in a broader set of issues, including “Composition: The Syntactical Guidelines for Visual Literacy,” *The Basic Elements of Visual Communication*,” “*The Anatomy of a Visual Message*,” “*The Dynamics of Contrast*,” and “*Visual Techniques: The Communication Strategies*.” Balance and stress, accompanied by discussions of leveling and sharpening, are the key components of “Composition.” “Basic elements” are the visual variables, all discussed with simple diagrams. “Anatomy” includes representation, symbolism, and abstraction. The many facets of contrast are illustrated simply. Strategies involve a series of “modifiers” (polarities) that extend the notion of contrast in a variety of design dimensions.

In the fifth edition of her *Graphic Design Basics* (2007), Amy Arntson covers these principles (and more) in four chapters: “Perception,” “Toward a Dynamic Balance,” “Good Gestalt,” and “Layout.” Combining psychology with production processes she illustrates with focused examples the fundamentals of the design principles. Here, as in most “Basics” volumes, the role of psychology in the design process is elaborated. The chapters on perception and Gestalt are tightly written and heavily illustrated, providing a solid perspective on the figure-ground relationship and grouping.

Visual Language for Designers: Principles for Creating Graphics that People Understand (Connie Malamed, 2009) begins with a 25-page chapter on “Getting Graphics: An explanation of how we process visual information.” Profusely illustrated, this introductory chapter draws upon fifteen references, nine of which are books. The subsequent chapters begin with “Principle 1: Organize for Perception,” and move from the basic to the complex (“Principle 6: Charge It Up” considers emotional salience, visual metaphors, as well as novelty and humor). Maps are used to provide examples for all six principles, but most heavily for “Principle 4: Make the Abstract Concrete.” When one compares Malamed with the prices of other books on graphic design, this volume is unbelievably inexpensive! It is, as well, an outstanding treatment of the many aspects of design in the context of their psychological underpinnings.

“*Design Basics* is an introductory text for studio classes in two-dimensional design. It presents the fundamental elements and principles of design – as they relate to drawing, painting, and the graphic arts –

in a flexible format that lends itself to many different teaching approaches. ... Instructors generally recognize the importance of a course in basic design as the foundation for all [of] a student's future work in art. Many students, however, have difficulty with this course and feel the need for a textbook, an overall reference guide, to give them a framework in which to learn. It was to fulfill this need for my own students that Design Basics was originally conceived. ... It is customary in "art appreciation" courses to present the elements first. But for a studio class, this is backward. The student is actually creating design projects immediately, so the principles of organization are more fundamental than the particular element involved. [Lauer 1979, v]

The "extremes" in the discussions of principles seem to extend from Mayall (1979) to Lidwell, Holden and Butler (2003). For Mayall in his *Principles in Design*, the perspective is taken from all aspects of design: "Design conceives and defines all the means we employ to satisfy our many and increasingly intricate needs. It covers our cities, factories, hospitals, schools and houses, together with all those products we use within them. It embraces the complex systems that provide us with energy and materials. It spans the ways in which we transport ourselves on land, sea and in the air. It stretches over our other means of communication, whether by speech, writing or illustration. It includes the instruments we use to discover more about our universe and about ourselves. It extends to the artifacts we have developed to help us express our thoughts and emotions in the fields of literature, art, music and drama. ... In all these areas, design is concerned with how our needs are identified, related and, in some cases, stimulated. It affects the ways in which our materials, energy and other resources are employed to satisfy these needs. And to satisfy them fully, it calls upon enterprise and enthusiasm, inventiveness and ingenuity, scientific discovery and technical knowledge, powers of visualization and spatial awareness, together with knowledge of human capabilities and aesthetic sensibilities. ... [9]

Mayall's ten principles are totality, time, value, resources, synthesis, iteration, change, relationships, competence and service. Each is a broad-based principle. For example, Totality: "All design requirements are always interrelated and must always be treated as such throughout the design task" [42]. Synthesis: "All features of a product must combine to satisfy all the characteristics we expect it to possess with an acceptable relative importance for as long as we wish, bearing in mind the resources available to make and use it" [90].

In contrast, in *Universal Principles of Design*, William Lidwell, Kritina Holden and Jill Butler deal with "125 Ways to Enhance Usability, Influence Perception, Increase Appeal, Make Better Design Decisions, and Teach through Design." Designers have, because of the complexity of the knowledge involved in the design of "artifacts," become more specialized. Cross-disciplinary design knowledge has become harder to obtain. The principles "consist of laws, guidelines, human biases, and general design considerations" [12]. "Sound design is not only within the reach of a small set of uniquely talented individuals ,, The use of well-established design principles increases the probability that a design will be successful" [13].

The ten principles of Mayall are not in the list of *Universal Principles*; neither are the principles or the elements (except Color) discussed by Lauer and Pentak. "Affordance" and "Alignment" are at the beginning, with "Wayfinding" and "Weakest Link" at the end, each discussed in a two-page format: Definition, description, guidelines for use, and references on one page are accompanied with examples and related graphics. "Mapping" is "a relationship between controls and their movements or effects" [152]. "Contour bias" does not relate to land-surface elevation; "Normal Distribution" describes the statistical function. One can see direct cartographic application for "Scaling Fallacy" and "Performance Versus Preference." Simple small-scale maps are used to exemplify "Layering;" the "Wayfinding" discussion uses a tourist map of the Pittsburgh Zoo ... these are the only maps in the volume. Nevertheless, there is a great deal of information (with references to guide the user to more).

Zelanski and Fisher, in their *Design Principles and Problems* [1996] approach design principles in their chapter on "Unifying Principles of Design." Examining unity, "The artist selects, isolates, and manipulates elements at will so that they have a certain visual coherence. If all the parts are working together well, the whole will seem to be more than the sum of its parts" [34]. This Gestalt relationship is then examined considering harmony ("orderly, pleasing relationships between parts of the whole" [34]), repetition ("creates predictable patterns" [36]), variety ("either as slight variations repeating a central theme or as strong contrasts" [38]), rhythm, balance, emphasis (involving scale), and economy (not only elimination - cropping, but also the use of processes from abstract and semi-abstract art). The twenty pages working with the principles are followed with 250 pages exploring the elements (line, shape and form, space, etc.).

The extensive discussion of "Gestalt" which introduces *Design Concepts and Applications* [Cheatham, Cheatham and Owens, 1987] yields to a short discussion of Composition before intensive examination of

design elements: shape and volume, space, line, color, as well as time, change and motion, and contrast, and a sequence of chapters dealing with communication, idea, and content (emotional and intellectual).

"Principle" is not part of the vocabulary used in *Design Fundamentals* [1951] of Robert Gillam Scott. As "a fundamental human discipline, [design is] one of the basic techniques of our civilization" [vii] "Designing means creative action that fulfills its purpose" [1]. "The relative importance of function and expression varies from one need to another" [3]. Starting with contrast ("the brick and mortar of form"), Scott begins with visual perception, exploring the structure of the visual field, particularly the figure-ground relationship. The discussion throughout the book is based, heavily, on the work of Gestalt psychologists. Most important are "the relationships and interdependencies of the four causal essentials, the purpose, and the formal, the material, and the technical causes. ... [There is] the parallel connection of formal and structural relations ... the unity of designing is indeed organic. It is so much a unity that no elements can really be segregated without doing violence both to it and to the process as a whole" [192-193].

CONCLUSIONS ... LOOKING AHEAD

Given this extraordinary set of resource materials, the literature and practice of graphic design, with its extensive and varietal history, when, where, why, and how can we as cartographers take advantage of all or some of this to improve our products? Where do we begin ... there is much to consider.

First, we need to be holistically, totally, and unified in our approach. Consider Scott: First, there are "the relationships and interdependencies of the four causal essentials, the purpose, and the formal, the material, and the technical causes. ... [There is] the parallel connection of the formal (visual and more general) and the wholly concrete and specific characteristics of the structural relationships ... the unity of designing is indeed organic. It is so much a unity that no elements can really be segregated without doing violence both to it and to the process as a whole."

For those of us working in the academies, there are the problems of helping the beginners, the novices, learn how to look. In the complexity of degree programs there is little time for this ... but there is a need for even the most unlikely pre-professional to learn how to become a sound critic. Feldman, in his *Varieties of Visual Experience* [1992], discusses "The Critical Performance." There are four stages: Description, Formal Analysis, Interpretation, and Judgment. If a cartographer learns how to become a good critic, then the process of creating maps should be enhanced. Note that Interpretation is "a process of finding the overall meaning of a work" [478]. It involves explanation of a work ... for the critic this involves looking not only at the artwork, but also the context of the display. For the map maker, dealing with a new map, all of the contextual relationships should be clear. Attention then focuses on the Description, an inventory of "what is [to be] immediately visible." The Formal Analysis goes "beyond the descriptive inventory" ... for a painting one examines the "organization as shapes, colors and textures – as forms with particular locations in space." In cartographic practice, the Inventory and the Formal Analysis become the list of features to be included on the map, and the characteristics of the representations of these features ... description and inventory operating in concert in the development of the design of the map: rough sketches, worksheets, and beyond.

While maps (and other environmental graphics) seldom made an impact in the histories of graphic design, the advent of information design brought a great amount of attention to maps. In historical studies of graphic design, only three map events generated notice: the London Underground map of 1933, the World Geo-Graphic Atlas (1953), and the Unigrid system for the National Park Service.

For Meggs and Purvis in the *History of Graphic Design*, "the prototype for the modern map [was a] trial printing of a new subway system map in 1933. Draftsman Henry C. Beck (1903-1974) submitted an unsolicited design proposal that replaced geographic fidelity with a diagrammatic interpretation. ... the public found the new map extremely functional ... [It was] a significant contribution to the visual presentation of diagrams and networks, for his discoveries inspired many variations around the world. [Meggs and Purvis, 327-28]

The Container Corporation of America supported the publication of the World Geo-Graphic Atlas in 1953. The graphic designer Herbert Bayer worked for five years on the 368-page work, which included 120 full-page maps and 1,200 charts, diagrams, and other graphics [Meggs and Purvis 352].

The Unigrid system was developed in 1977 by the National Park Service and (Massimo) Vignelli Associates. Hundreds of informational folders used at national parks are now produced using a coordinated design system. Typographic information along with pictorial and cartographic displays are integrated into standard formats created under the Federal Design Improvement Program.

For the information designer, wayfinding and signage systems, are major tasks [Visocky O'Grady 2008]. So, too, are subway maps [Mijksenaar 1997]. Infographics often merge with maps to portray complex sets of statistical data and relationships [Wilbur 1989 and Jacobson 1999]. Frascara [1997] broadens the information design perspective into visual communication design and a role in addressing social problems. There is no shortage of ideas ... in addition to the elements and principles ... of graphic design that are available for the cartographic designer. "The modern movement did not gain an early foothold in the United States ... [there was] public rejection of modern art and design. ... American graphic design during the 1920s and 1930s was dominated by traditional illustration" [Meggs 336]. "Tschichold's new typography and the Dada movement's random organization, intuitive placement of elements, and the use of chance in the creative process" [337] emerged in American design very slowly. In a world where post-modernist graphics are abundant, can cartography move from its almost total reliance on Classical traditions into the modern era?

For beginners, as was noted before, there is a need to attain a reasonable level of graphic literacy. Then it seems most helpful to promoted procedures (and maybe even develop methods) that will help those who are willing to recognize that cartographic ... indeed, any form of map ... communication will be improved if the author is articulate.

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