COLOR

Color is the quality of an object perceived when wavelengths within the visible spectrum of light interact with receptors in the human eye. It is defined by three main attributes: hue, value, and saturation. Hue is the dominant wavelength in the color—for example, red, blue, green, yellow, etc. Value refers to how light or dark the color is. Saturation describes how intense the color is, ranging from the pure hue to gray.

Color is a primary means through which designers establish contrast and character in design. It often distinguishes elements among those that have many other attributes in common (Figure 3.17). In doing so, it can direct attention to specific elements within larger structures, thus establishing relationships that would not be apparent were all elements the same hue, value, or saturation.

Part science, part alchemy, and part emotion, color has been described in many ways. We process it physiologically, cognitively, psychologically, and culturally, forming our interpretations through unpredictable applications of these various perspectives. We perceive red and green of similar value and saturation, for example, as vibrating when used in equal amounts, but they are also culturally linked to Christmas. Many people feel serene in cool-colored rooms, while warm-colored interiors are cheery and thought to stimulate conversation. Red signifies danger in one culture and good fortune in another. To complicate matters, context influences color. We perceive color as the color *of something*, in a setting, and never in its pure state. We might be comfortable wearing a pink shirt but not driving a pink car. And flowers look one way in a sunlit field and another in a vase in the shade.

Figure 3.17

***The Fifty State Strategy*. Poster for Barack Obama's 2008 Presidential campaign Michael Bierut/Pentagram Design**

Bierut's poster separates tightly spaced names by color. Because the colors are equal in value and saturation, no single state dominates another in the alphabetical listing.

Despite these complexities, there are some facts about which we agree. In one sense, things in the world do not really have color; what we perceive are differences in light, either reflected off the surface of objects (such as a printed poster) or emitted from a light source itself (such as a computer monitor). Software systems express color in three ways: CMYK, RGB, and PMS (Figures 3.18–3.20). Reflected or *subtractive color*, as produced in offset or inkjet printing, results from CMYK (standing for cyan, magenta, yellow, and black, the process pigments through which other colors are made by overlapping printed screens of the four colors at various percentages). Projected or *additive color*, as displayed in computer monitors or through LCD projectors, results from RGB (standing for red, green, and blue, the primary color wavelengths that produce white light). A third system, *Pantone Matching System* (PMS), mixes pigments or inks other than the CMYK process colors used in printing reflected color. There are hundreds of PMS colors, each with an individual color formula.

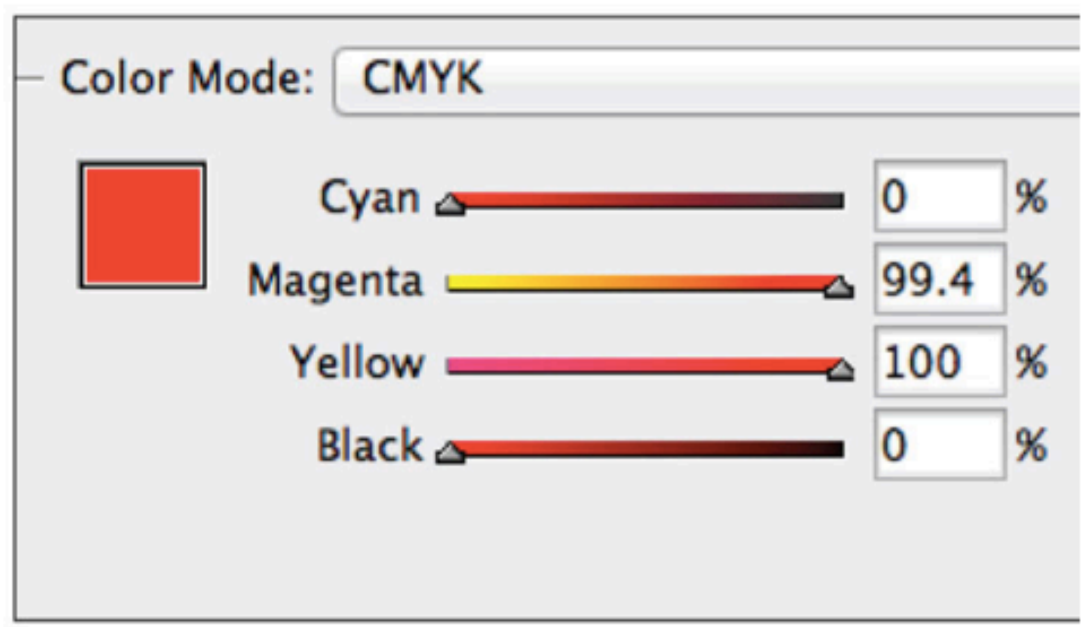


Figure 3.18
CMYK process color
In offset printing, color is achieved through four-color process inks: cyan, magenta, yellow, and black (CMYK). Color photographs are separated into varying percentages of these colors and printed in a rosette pattern of dots. Non-photographic areas of color are also built from CMYK screens.

Hue is the named color in its purest state (red, blue, yellow, green, etc.) and depends on its dominant wavelength. The purest hue is produced by only one wavelength. *Value* is the lightness or darkness of a color. Variations in value are sometimes called *tints* (light) and *shades* (dark) of the hue. When mixing colors in pigment, value is controlled by adding white or black to the pure hue. In printing, changes in value can be achieved by using different ink colors (PMS), by screening the color to reveal the white paper beneath the ink, or by overlaying the color with a dot screen of black. In digital screen-based work, value depends on the level of illumination and is expressed in percentages.

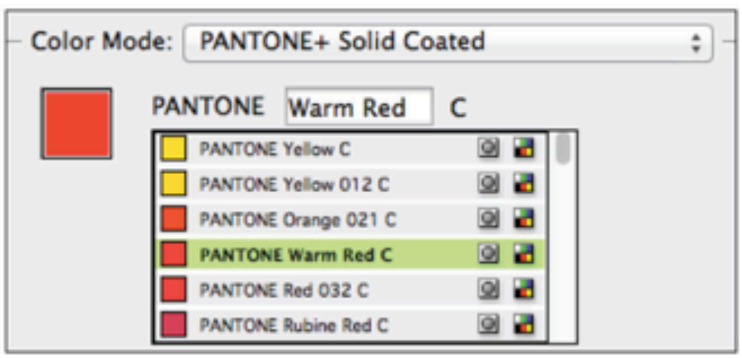


Figure 3.19
Pantone Matching System (PMS) color
In offset printing, individual ink colors mixed according to specific formulas are an alternative to CMYK process colors. There are hundreds of PMS colors and they can be printed in solids and tints. PMS color may be simulated in CMYK, but it is not used to produce natural looking color in photographs. Laser output converts PMS colors to CMYK for printing.

Saturation is the brightness or dullness of a color along a continuum from the pure hue to gray. It is sometimes called *intensity* and depends on the presence of another color in the hue. In pigments, we control saturation by adding the opposite of the hue on the color wheel. Blue added to orange or red added to green, for example, dulls or grays the intensity of the original hue. Four-color (CMYK) printing simulates these pigment mixtures by overlapping dot screens of the primary colors of cyan, magenta, and yellow. We "mix" these colors through our eyes and brain. In digital screen-based work, saturation depends on how much of the light is distributed across different wavelengths.

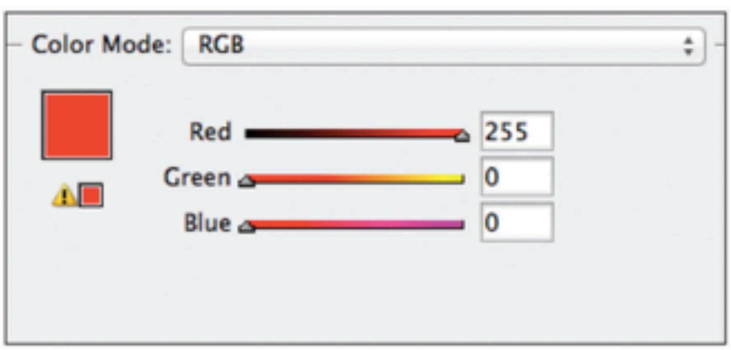


Figure 3.20
RGB color

In light, the primary colors are red, green, and blue. When combined in equal amounts, they produce white light. RGB color is used for screen-based or projected light.

Artists and designers manipulate hue, saturation, and value to produce different perceptual effects. As a result, color is *relational*. Our perception of any single color and its attention-getting qualities are influenced by its properties in juxtaposition with the other colors surrounding it. Bauhaus artist Josef Albers demonstrated the relational qualities of color in a series of experiments summarized in his book, *Interaction of Color*. In one famous example, Albers illustrated that one color can appear as two, depending on its background (Figure 3.21).

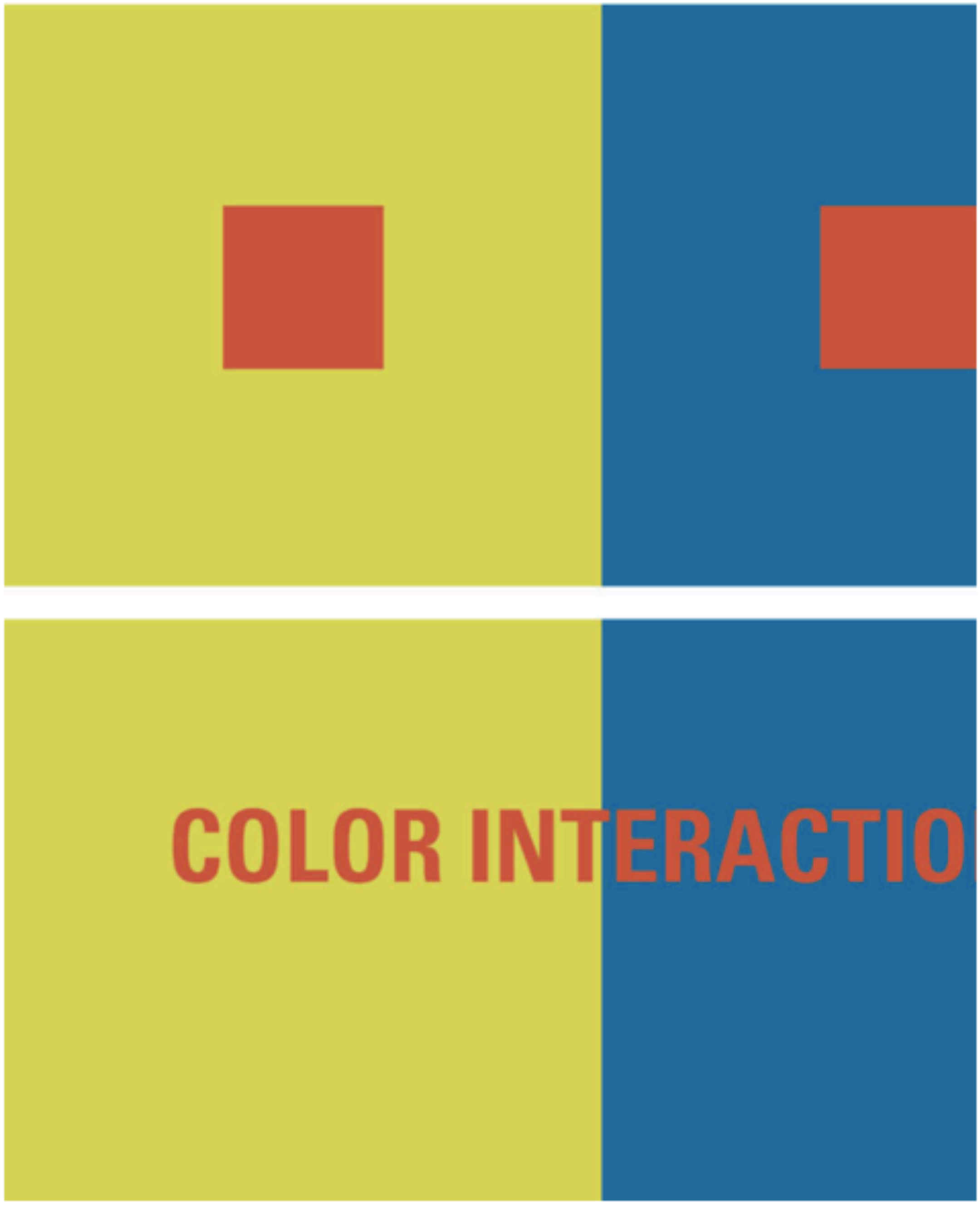


Figure 3.21

***Interaction of Color* Based on studies by Josef Albers**

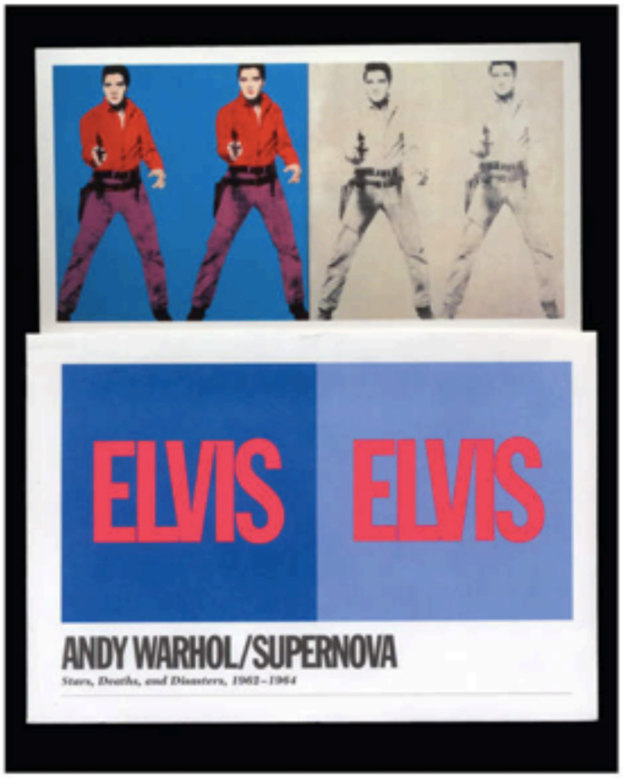
Albers's Bauhaus color studies are memorialized in a book titled Interaction of Color. The orange squares are identical but appear different, depending on the background color. Differences are less apparent in the thin strokes of typography, with the orange type also vibrating on its blue complement.

Figure 3.22
Advancing and receding color
The compositions on the top use colors of equal value and saturation, flattening space. The compositions on the bottom

use contrasting values, deepening the illusion of space. The pattern on the bottom is identical to the one on the top, however, the choice and placement of color changes the perception of the structure.

Color effects make some elements appear to advance and others to recede (Figure 3.22), determining what messages grab our attention in a given context and the order in which we see or assign importance to certain elements within the message. A bulletin board announcement printed on colored paper is most likely to earn our attention if all of the others are printed on white bond. In a composition of mostly neutral colors (grays, black, and white) our attention typically goes to the colored element, over and above the attention-getting properties of other elements (for example, size or complexity). Like the previous example of the breakfast cereal aisle in the supermarket, however, complex color schemes—with too many colors of similar value or saturation—often reduce our perception of hierarchy among the elements.

Design professor Dennis Puhalla studied the role of color in readers' assignment of importance among groupings of textual information in PowerPoint presentations. Controlling the effect of other variables —such as the size and location of type and the content of the message—Puhalla found that hue had little or no influence on what readers thought was the most important information in the display (Puhalla, 2005). The only exception was the color red, which carried strong cultural connotations—such as “danger” and “emergency”—that interfered with purely perceptual decisions. Instead, contrast in value and saturation (between the element and its background and between the element and other elements) determined which information readers assigned the most importance.


ELVIS
ELVIS
ANDY WARHOL/SUPERNOVA
Stars, Deaths, and Disasters, 1962–1964


Andy Warhol
SUPERNOVA
STARS, DEATHS, AND DISASTERS
1962–1964

Figure 3.23

Andy Warhol/Supernova: Stars, Death, and Disaster 1962–1964

Walker Art Center Studio, Scott Ponik

This catalog for an exhibition of work by Andy Warhol has six different variations that reflect the colors of the artist's multiple silk-screen prints. The complementary color combinations vibrate because they are equal in saturation.

Colors with little contrast appear to reside at the same depth in space. Brighter or lighter colors on dull or dark backgrounds appear closer, regardless of other spatial cues, such as overlapping forms or high versus low placement in the visual field (Figure 3.23). When shapes share boundaries and are similar in their saturation they compete for attention, exhibiting some of the aspect shifting mentioned in the discussion of figure-ground. Obvious differences between the values or saturation of the two colors reduce this instability. In the art direction of photography, for example, choices about surrounding color can emphasize qualities of the objects being photographed (Figure 3.24).

Color can also signify some meaningful relationship among elements. Wayfinding systems identify buildings or rooms in vastly different locations through signs of the same color, thus marking them as belonging to the same organization. We navigate by looking for the identifying color as a contrast to other kinds of signs. It is generally understood, however, that people have little memory for complex color-coding systems—for example, that yellow signs in an art museum lead to contemporary British works, while blue signs direct visitors to objects from the ancient world—and that signage should reinforce color designations with language.

Figure 3.24

***Heston Blumenthal at Home*, 2011 Art Direction and Design: Graphic Thought Facility Photography: Angela Moore**

Color is important in the art direction of photography. The color in the background of these cookbook photographs provides a strong contrast to the food. The color of the cookware complements the natural ingredients that are the subject of photography.

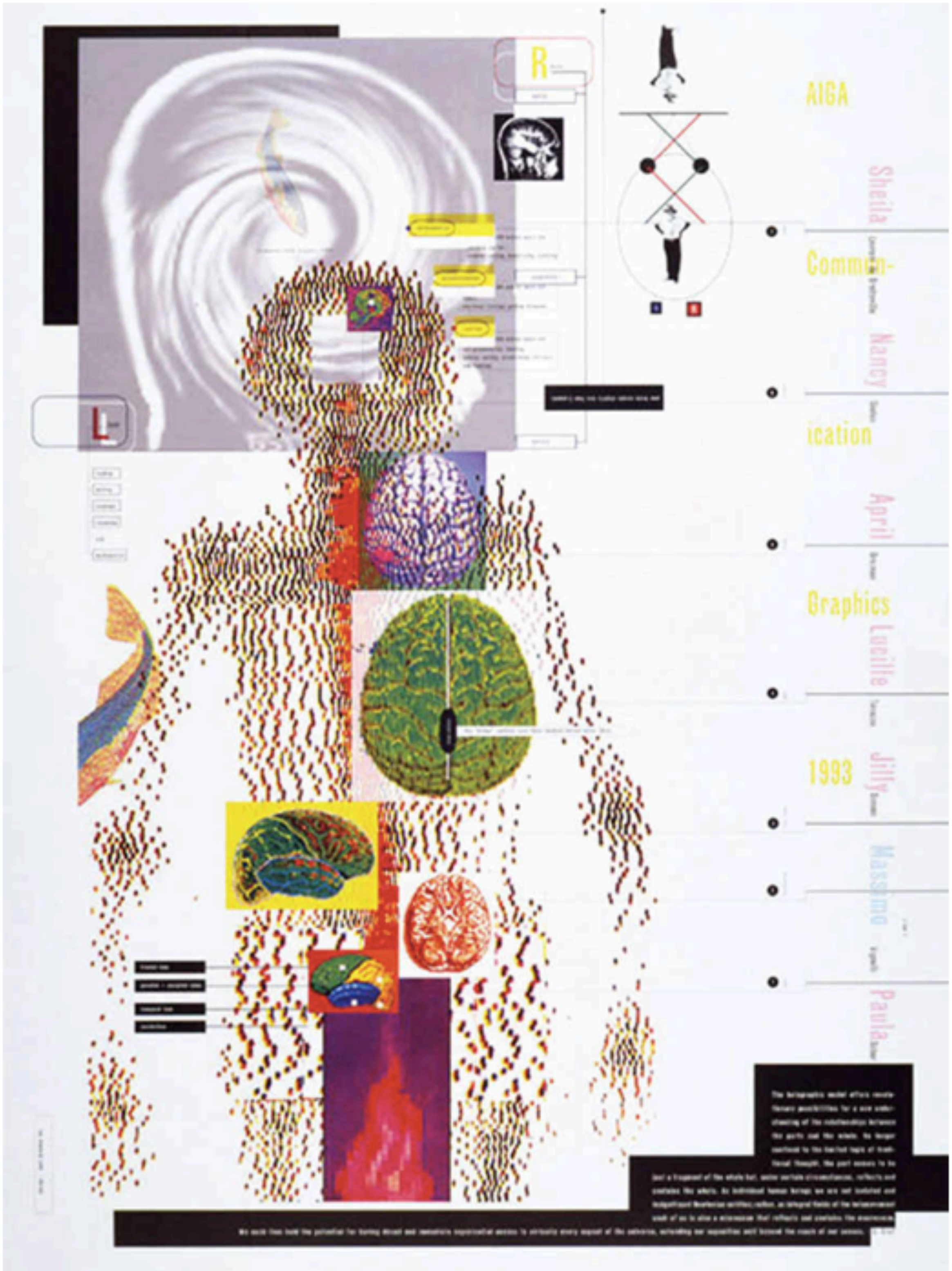

AIGA
Sheila
Commun-
Nancy
ication
April
Graphics
Lucille
1993
Jilly
Massimo
Paula

Figure 3.25

AIGA communication graphics poster, 1993 April Greiman

Greiman's poster uses color to designate the gender of speakers (in the column on the right). In general, male designers dominated in professional design presentations and conferences of the time, despite the large number of women in the field. Greiman foregrounds the presence of women as speakers.

Likewise, we presume that elements of the same color in a single message have some relationship not shared with other elements in the composition. In April Greiman's poster for AIGA, all but one of the speakers listed on the right are women (Figure 3.25). Contrasting color (pink and blue) groups women and men, and foregrounds gender participation at a time when women were a small minority of the organization's membership. Had Greiman printed the names of all speakers in the same color, the issue of gender would have been absent from the message.

Typography presents particular challenges for the use of color and contrast. Swatches of color read differently from the alternating strokes and spaces of type. Because the background surrounds thin lines of type, the color is less assertive than in broader areas of color (Figure 3.21). Dark colored text type, for example, tends to appear even darker on a white background than in a swatch. Contrast is maintained, but with a less distinct color presence than if shown in a more expansive shape. Accordingly, the color in light type weights will be less noticeable than color in bold type weights, which have more surface area exposed. Type in a color complementary to its background color (for example, red on green) tends to vibrate unless the levels of contrast in value and saturation are carefully controlled. Type that exhibits extreme contrast with its background tends to advance, while low contrast type recedes, often even in the presence of contradictory spatial cues such as overlapping form. These qualities determine which among various typographic elements command our attention.

Iona Inglesby is interested in the intersection between design and science. Her Dot One project takes DNA profiling out of the lab and into the world of design. An algorithm translates an individual's unique genetic DNA into one-of-a-kind color patterns, which Inglesby applies to a variety of formats (Figure 3.26). The author's DNA generated the color pattern on the cover of this book. Inglesby's application of technology is consistent with current interest in data-driven form in both art and science.

Adobe maintains an internet application called *Adobe Color*, formerly called *Kuler*, through which participants name and share favorite color schemes. Each color scheme is composed of five colors and many show examples in application. The system allows users to manipulate values and saturation to see effects (see http://kuler.adobe.com). Regardless of the software, exploring the same composition in different color combinations—with different results for the hierarchy among elements—is a useful strategy when developing ideas.

Color is often one of the most powerful attention-getting attributes of visual communication. It can define the location of elements in space, signal the importance of some elements over others, and express emotion.

Figure 3.26
DNA personalized prints DNA personalized scarf Dot One, 2015
An algorithm converts the 0.1 percent of human DNA that is unique to individuals to color patterns that are then applied

to textiles and other surfaces (including the cover of this book). Dot One provides DNA kits and returns printed items to customers. This strategy reflects increasing interest in the generation of visual form from data.