POINTS OF VIEW

# Salience

In last month's column we explored ways to encode data that enhance 'accuracy' when readers decode information from graphs. This month, we will focus on salience as a way to differentiate graphical symbols and improve 'speed' when reading graphs.

Salience is a visual quality that sets an object apart from its surroundings. The intent is to create contrast. Incidentally, much of design is about balancing contrasting elements, a topic we will explore in another column. Certain graphical treatments make objects seemingly pop from the page, whereas others require focused attention to see the object. In **Figure 1a**, we can spot the 'A's immediately, but 'P's are more difficult to find. There is insufficient contrast in shape alone for us to quickly identify the individual letters without additional visual cues. Similarly, the pair of lines at a right angle to one another is easy to see, but the single oblique line takes longer to locate in a field of like objects (**Fig. 1a**).

The Nobel Prize–winning work of the neurophysiologists David Hubel and Torsten Wiesel helps us understand how the brain processes visual information. They discovered that individual neurons in the primary visual cortex are highly excitable by features of color, orientation, size and motion, but the neurons' response differs depending on the type of visual stimuli. Some neurons are rapidly excited when individuals are presented with lines at one angle, but other cells respond best to lines at another angle. Complex patterns are processed by later stages of the visual system.

There are several reasons why we might want to present information so that it can be immediately recognized. First, by decreasing the amount of time it takes our audience to see relevant patterns and trends, we lower their cognitive load. This is especially useful for slide- and poster-based presentations in which visual and aural information typically compete for attention. Second, helping our audience see certain features of the data rapidly allows the visual cortex to simultaneously make sense of additional visual features[1].

The design lesson is fairly straightforward. To make something easy to find, make it stand out by varying the object's primary visual feature. For example, give the object a color, size or orientation that is substantially different from that of the other objects on the page. Motion is a particularly potent differentiator; consider an animated GIF or bouncing icon's ability to command our attention. For this reason, we should temper our use of motion with the importance of the object being animated. Some basic visual features to create salience are shown in **Figure 1b**.

In reality, design problems are complex. Typically we want several parameters to be easily searchable at the same time. The solution is to use noncompeting visual features. However, there is a limit to how many features we can overlay onto one another because visual conjunctive search (that is, looking for a target based on two or more visual features) takes concentration, and it can be difficult to retain those objects in memory for pattern assembly. **Figure 2a** shows a real-world example that relies on many simultaneous visual features.

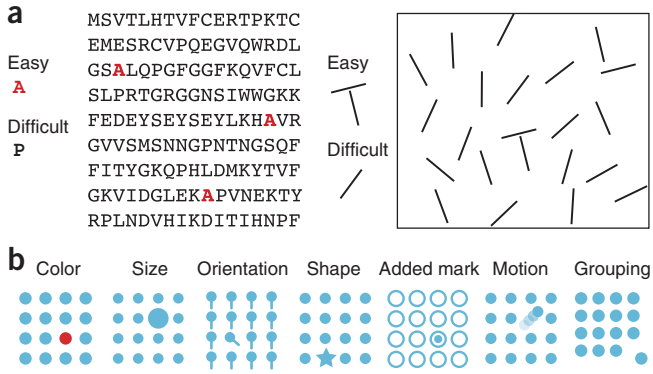


**Figure 1** | Salience through visual features. (**a**) Certain elements can be seen in a single glance, whereas others are difficult to find. (**b**) Examples of visual features that make objects distinct.

The amount of information presented should ideally match the question the researcher looking at the data is trying to answer. On the computer, analytical tools could allow users to customize data encodings and turn off unwanted layers of information. In print, authors can present multiple views of the same data with only certain parameters plotted to best communicate the message (**Fig. 2b**).

Creating salience will facilitate the audience's ability to quickly process information. This is particularly useful in talks and when multiple channels of communication are used at once. Also, knowing the different ways in which contrast is created helps avoid its inadvertent use.

We explored the elements of graphing data in the first three columns. We looked at how color and shape confer accurate and efficient reading of individual parts of graphs. Next month, I will introduce the 'Gestalt principles' that describe how we tend to organize multiple objects into patterns to make sense of them.

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1. Ware, C. *Visual Thinking for Design* (Morgan Kaufmann Publishers, Burlington Massachusetts, USA, 2008).

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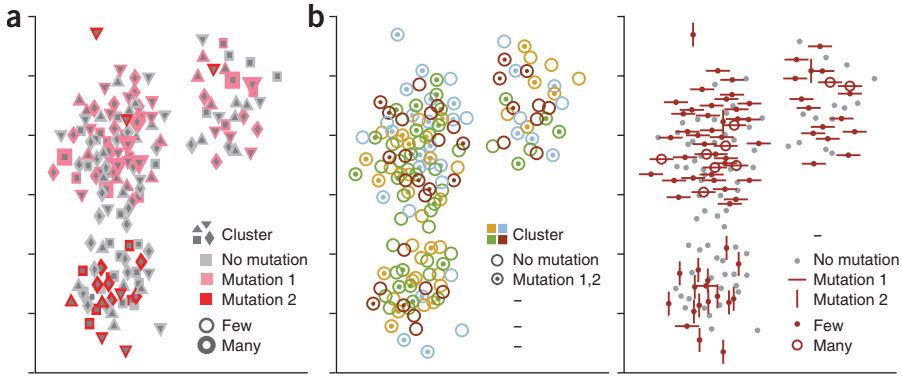


**Figure 2** | Visual conjunctions. (**a**) Simultaneous use of many graphical features can impede visual assembly of the data. (**b**) Multiple views of the same data with limited parameters plotted can better communicate specific relationships.



CORRECTED AFTER PRINT 15 DECEMBER 2010

# Erratum: Salience

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In the version of this article initially published, a portion of Figure 1 was missing. The error has been corrected in the HTML and PDF versions of the article.