

2 A Kaleidoscopic World

An astounding two-thirds of our approximately 25,000 genes are expressed in the brain. Because genes can be transcribed in a variety of ways and further influenced by external forces (called “epigenetic”), synesthesia occurs in an amazing array of combinations. Having one type of synesthesia gives you a 50% chance of having a second or third type, meaning that the gene is active in a number of different brain areas simultaneously. We call individuals with multiple kinds of synesthesia “polymodal.”

Table 2.1 lists how relatively common different types of synesthesia are. The tabulation of frequencies was compiled by Sean Day, an American linguist who is himself synesthetic. He also moderates an online community called The Synesthesia List that brings together synesthetes, researchers, and curious individuals.¹ Because the table’s data rely on self-identified synesthetes rather than random sampling, it is biased in the same way surveys are as we discussed in the previous chapter. For example, Sean Day’s sampling found a female-to-male sex ratio of 2.5 to 1 and found that grapheme → color is the most common manifestation—neither of which has held to be true after Julia Simner and her colleagues studied random slices of the population.² They showed a roughly equal number of women and men and that the most common synesthesia type is colored days of the week. Still, the table is useful so long as we keep this caveat in mind.

On inspecting table 2.1 two observations stand out. First, some combinations are far more common than others. Look in retrospect at how rare Michael Watson’s tasting shapes was: only half a percent. It is equally obvious that color is overwhelmingly the most common synesthetic response, whereas graphemes, time units (such as days of the week), and sounds are the most common synesthetic triggers. Second, notice that synesthesia usually goes only in one direction, such as sound → vision but

Table 2.1

Relative frequency of different types of synesthesia

Type	Frequency (%)
Graphemes → colors	66.50
Time units → colors	22.80
Musical sounds → colors	18.50
General sounds → colors	14.50
Phonemes → colors	9.90
Musical notes → colors	9.60
Smells → colors	6.80
Tastes → colors	6.60
Sound → tastes	6.20
Pain → colors	5.80
Personalities → colors	5.50
Touch → colors	4.00
Sound → touch	4.00
Temperatures → colors	2.40
Vision → tastes	2.10
Sounds → smells	1.80
Vision → sounds	1.50
Orgasm → colors	1.00
Emotions → colors	1.00
Vision → smells	1.00
Vision → touch	1.00
Smells → touch	0.60
Touch → tastes	0.60
Smells → sounds	0.50
Sounds → kinetics	0.50
Sound → temperatures	0.50
Tastes → touch	0.50
Kinetics → sounds	0.40
Personalities → smells	0.40
Touch → sounds	0.40
Touch → smell	0.30
Vision → temperatures	0.30
Musical notes → tastes	0.10
Personalities → touch	0.10
Smells → tastes	0.10
Smells → temperatures	0.10
Tastes → sounds	0.10
Tastes → temperatures	0.10
Temperatures → sounds	0.10
Touch → temperatures	0.10

Note. Comparative frequencies of different kinds of synesthesia. Data are based on Sean Day's tabulation of 738 self-reported cases from a nonrandom sample. In Day's sample, 72% were female and 28% were male. (Data are reproduced with permission from <http://home.comcast.net/~sean.day/html/types.htm>.)

hardly ever vision → sound. This should have been another clue to skeptics that synesthesia was real, because neural circuits are known to be directional whereas made-up stories would have no reason to be. Lastly, while we usually refer to synesthesia as cross-sensory pairings, the table makes clear that a wide variety of nonsensory cognitive traits (such as personality) can couple with various aspects of sensation. This makes the phenomenon all the more intriguing.

Recently, David’s laboratory rigorously verified grapheme → color synesthesia in 1,067 subjects (chapter 3 gives details of the testing). Additional types of synesthesia reported by members of this group appear in figure 2.1. Weekday → color and month → color synesthesias, listed as time units → colors in table 2.1, are the most common co-occurring synesthesias. This is not surprising given the high prevalence of these forms in general. Musical sounds → color and spatial sequences are tied for being the next most common types, while almost half of grapheme → color synesthetes seem to have one or both of these. Note that spatial sequence synesthesia, discussed below and in chapter 5, are not included in Day’s survey. Also note that with the exception of spatial sequence synesthesia, the other most common forms of co-occurring synesthesia all involve color, while those involving touch, taste, sound, and smell are comparatively rare. Forty-five of the 203 synesthetes (22%) report having no other

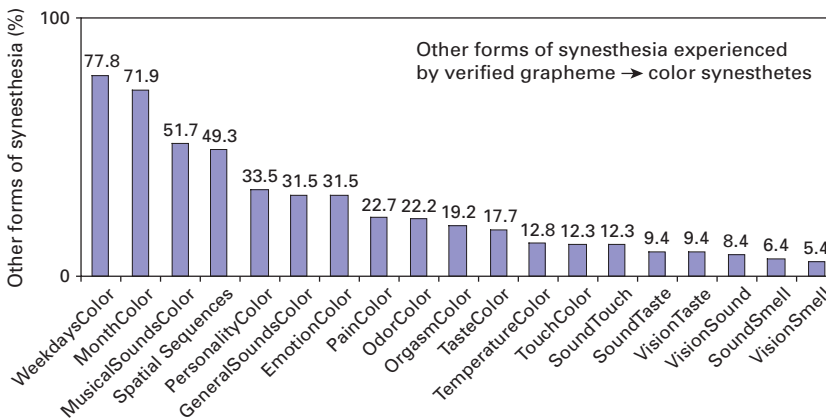


Figure 2.1 Other types of synesthesia reported by 1,067 verified grapheme → color synesthetes. Data are from David Eagleman’s Synesthesia Battery.

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form of synesthesia. Which synesthesias tend to co-occur, and why, is revisited in chapters 9 and 10.

Common Synesthesia Types

To introduce the broad array of synesthesia types, we will begin by briefly elaborating five common types of synesthesia: number forms, colored letters (both written and spoken), tasted words, colored hearing, and the personification of letters and numbers.

Number Forms

The coupling of color, perspective, and spatial configuration with concepts involving sequence, or ordinality, was noted more than a century ago.³ To those who “see” number forms (also called “spatial sequence synesthesia”), numbers or other ordered concepts typically lie on a path that twists and zigzags in all manner of shapes. Often it loops around and encircles the body as it executes a variety of angles, bends, and curves (see figure 2.2). Such patterns differ in different persons. Figure 2.3 shows several simple forms that Galton illustrated in 1883:⁴

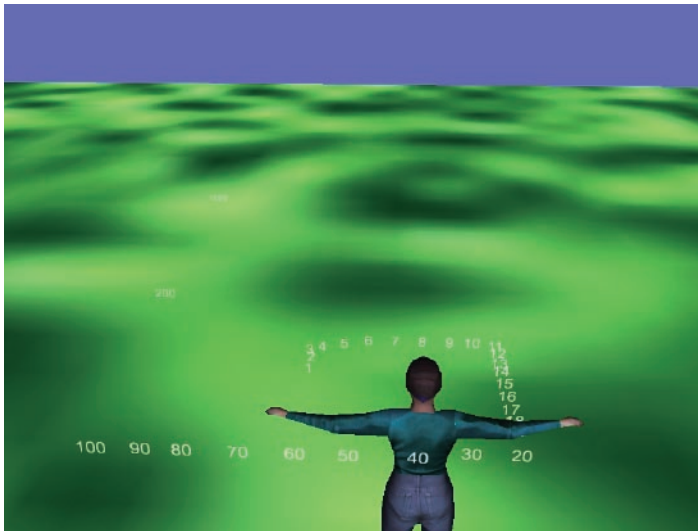


Figure 2.2

A clockwise number form with right angles that encircles the body.

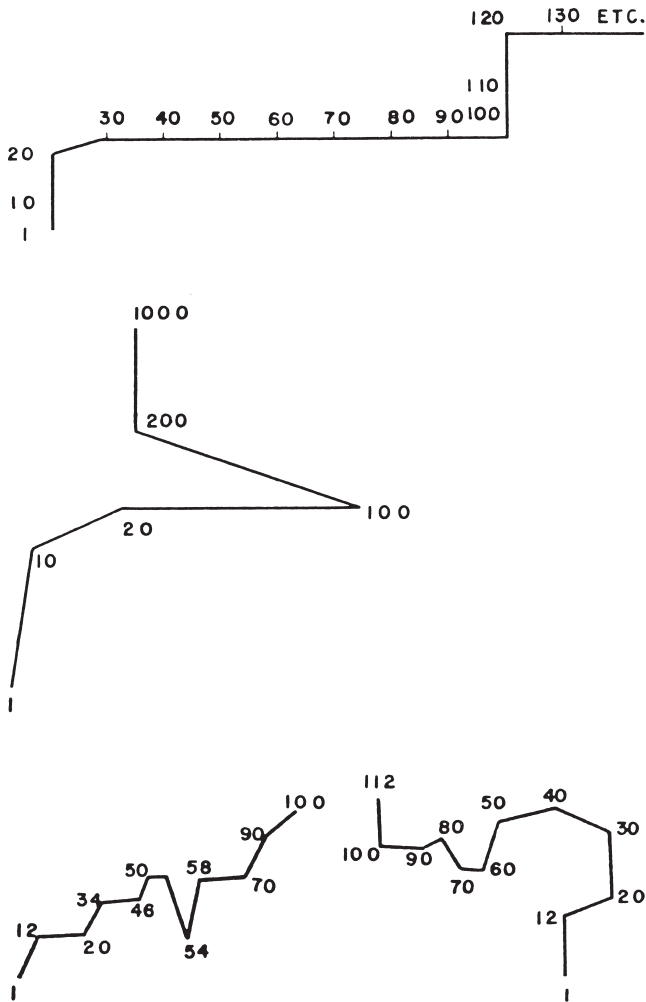


Figure 2.3
Number forms reported by Sir Francis Galton, 1883.

The drawings, however, fail in giving the idea of the apparent size to those who see them; they usually occupy a wider range than the mental eye can take in at a single glance, and compel it to wander. Sometimes they are nearly panoramic.

These forms . . . are stated in all cases to have been in existence, so far as the earlier numbers in the Form are concerned, as long back as the memory extends; they come “into view quite independently” of the will, and their shape and position . . . are nearly invariable.⁵

Like other kinds of synesthetic perception, number forms have a dynamic quality as well—recall the student who complained to her math teacher of digits that “kept going up to their places.” In the classroom, Nobel physicist Richard Feynman saw colored equations floating in space in front of him:⁶ “As I’m talking, I see vague pictures of Bessel functions . . . with light tan j’s, slightly violet-bluish n’s and dark brown x’s flying around. And I wonder what the hell it must look like to students.”

Synesthetes possessing number forms express amazement that not everyone “sees” numbers as they do or that anyone finds such spatial configurations odd. As grapheme synesthete Marti Pike puts it, “It never occurred to me that it might be unnatural to visualize the whole alphabet or numbers.” People like her describe the forms vividly, matter-of-factly and in the present tense.

Number forms do not indicate high mathematical ability or deficiency, nor do they seem to be correlated with any specific intellectual talent or mental dullness. However, the automatic positioning of integers can interfere with more complex mathematics, such as algebra or calculus, as in the wayward numbers of the student cited above. “For one thing,” notes Marti, “they are not evenly or consistently spaced. There is also some fluid or jelly-like movement to them.” Magnitude can also be problematic because, for Marti, 6 is physically the highest number in her visual representation. Therefore, 6 and numbers containing 6 have the highest degree of magnitude. In other words it does not “make sense” to her that 11 is “larger than” 6 or that 234 is “greater than” 66. To her, magnitude comparisons are literally physical: when she thinks of someone older than herself, she looks “up,” whereas younger people are seen not “down” but “in back” of herself.

Alphabet, time, and calendar forms are especially common. In the latter, it is usual for the months to take up unequal space, and the topmost month is by no means necessarily January (see figure 2.4).

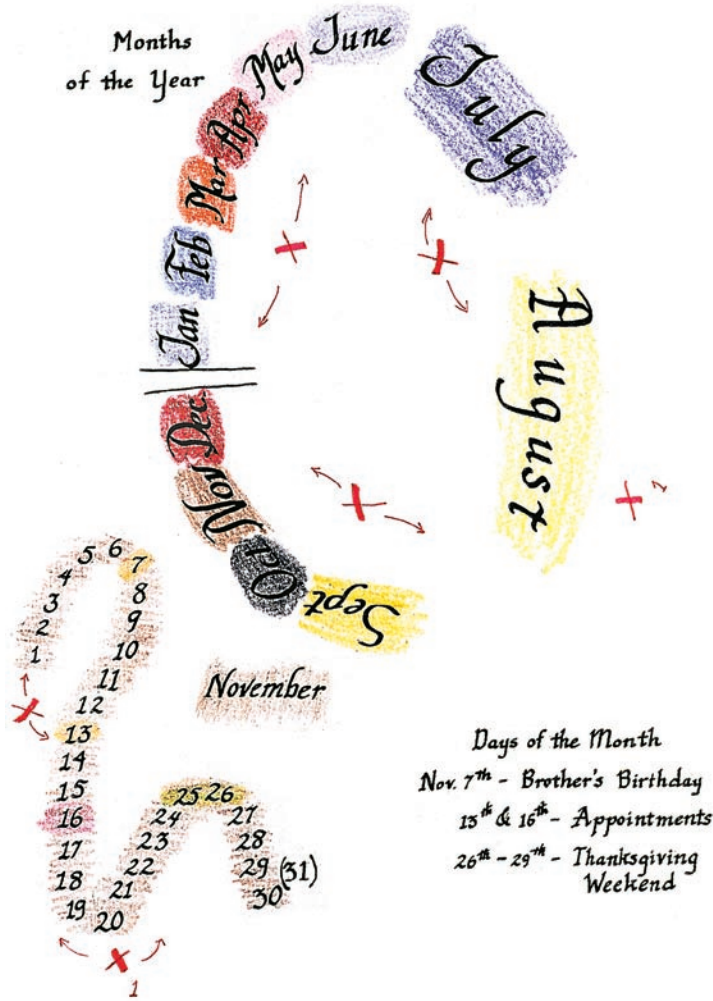


Figure 2.4

Calendar and month forms for Marti Pike. Note that June is topmost and that July, August, and September take up more space than other months. Brown-colored November gives way to a brown serpentine form for days of that month. "Highlighted" days mark appointments, birthdays, and special occasions, aiding her memory.