

## **The Linguistic Relativity of Color**

by Dina Bseiso, December 2015

While color is a salient property of a multitude of resources, it is also a resource whose properties are defined contingently upon the lens in which color is being perceived through. Like many others, I benefit from being able to perceive a rainbow of colors, and even occasionally the lack of color, in my day-to-day living. Color is organized quite differently depending on the context in which it is being used, and for what purpose.

The lenses used to organize color in this report are grossly in language, and just touched upon as an artifact of being biological creatures with certain studied and known physiological phenomena. These lenses represent two contending perspectives of what is known as linguistic relativity of color — the relativist and universalist perspectives respectively. More specifically, the relativist view is that the language we know shapes how we view the world around us; so therefore, if there does not exist a specific color term for a particular hue, we do not know how else to refer to it other than through analogy<sup>8</sup>. A rather strict take on the relativist view is the Sapir-Whorf hypothesis, which asserts that people are incapable of perceiving differences between colors that do not have separate color categories in their language, which has been shown to be largely false, yet mildly supported by timed experiments of color distinction. To contrast, the universalist view states how we view color is already shaped prior to any language learning due to our shared vision neurophysiology — in our rods and cones, and prior to any hemispherical influences (i.e. colors viewed in our right visual field being ultimately processed in our left hemisphere, home to our language processing center).

### **What is being organized?**

In either perspective, “color” as a manifestation of light within the visual spectrum is the resource being organized into various “color categories.”

### **Why is it being organized?**

Color is often needing to be referred to in dialogue, the extent of which differs from language to language. Per the relativist perspective, color is organized through language in order to facilitate later identification of the resource in question. Through linguistic referral of color, interactions will only be facilitated by those who can understand the references made, while others will need some form of conversion or translation of this information in order to make sense of it. This limitation suggests that this organizing system satisfies social goals.

In a developing brain, communicability of color begins as a rather difficult task. The ability to distinguish between colors (understanding that they are different and that this realization is important) occurs as late as eighteen months old and was made apparent in various gazing tasks with infants. But being as salient a property as color is, it becomes apparent that color is important in information retrieval and communication, and so it is organized in the following way: colors that are more similar are more likely to be classified together, and so are less interesting than a color that is less similar and therefore classified separately<sup>3,8</sup>.

### How much is it being organized?

Two researchers at the University of California, Berkeley — Berlin and Kay — studied 20 industrious languages, then followed up by researchers at the University of California, Berkeley, and the University of Chicago — Cook, Kay, and Regier — in a study of 110 non-industrious languages to discern whether there were trends in how various languages categorized colors (this would become the World Color Survey)<sup>1,4</sup>. With only some variation, they were surprised to discover that colors were categorized in predictable ways across languages<sup>2</sup>.

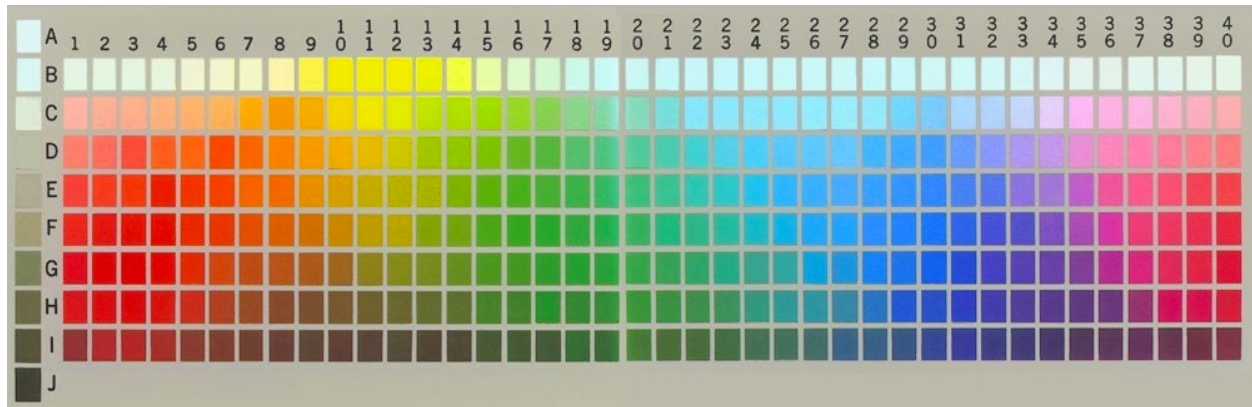


Figure 1. The above chart served as the original color palette in which natives of various industrial languages were asked to classify colors from (Berlin and Kay, 1969).

Some languages, such as the endangered Pomoan language to a Native Californian population (the Pomo people), have three focal categories for which colors are classified into — *tōtōk* (lights), *lūkōlkōkin* (darks), and *tantankin* (reds)<sup>6</sup>. Other languages, like Arabic, English, and Japanese, have a maximum amount of eleven focal color categories: white, black, red, yellow, green, blue, brown, pink, purple, orange, and grey. Languages which have fewer than eleven categories, but more than two categories, follow generally the same trend as showcased above when accounting for an additional color category. This lends support for the universalist perspective on color — in that there is a strong inclination for a linguistic color hierarchy to be exhibited — with some modulation by the relativist perspective — in that not all languages present with the same categories, or necessarily in the same strict delineations<sup>4</sup>.

### How, or by whom, or by what computational processes is it being organized?

Linguistically, colors are organized by the people who make use of the language, whether through speech or through literacy. It is a phenomena of language that certain words catch on and are later integrated into the grander vocabulary, while other words eventually make their way out of the modern vernacular. Therefore, it should be understood that there must be societal and/or cultural reasons behind why additional color categories have not been added to languages with fewer than eleven focal color categories, and why color categories have not been dropped from these more categorical languages.

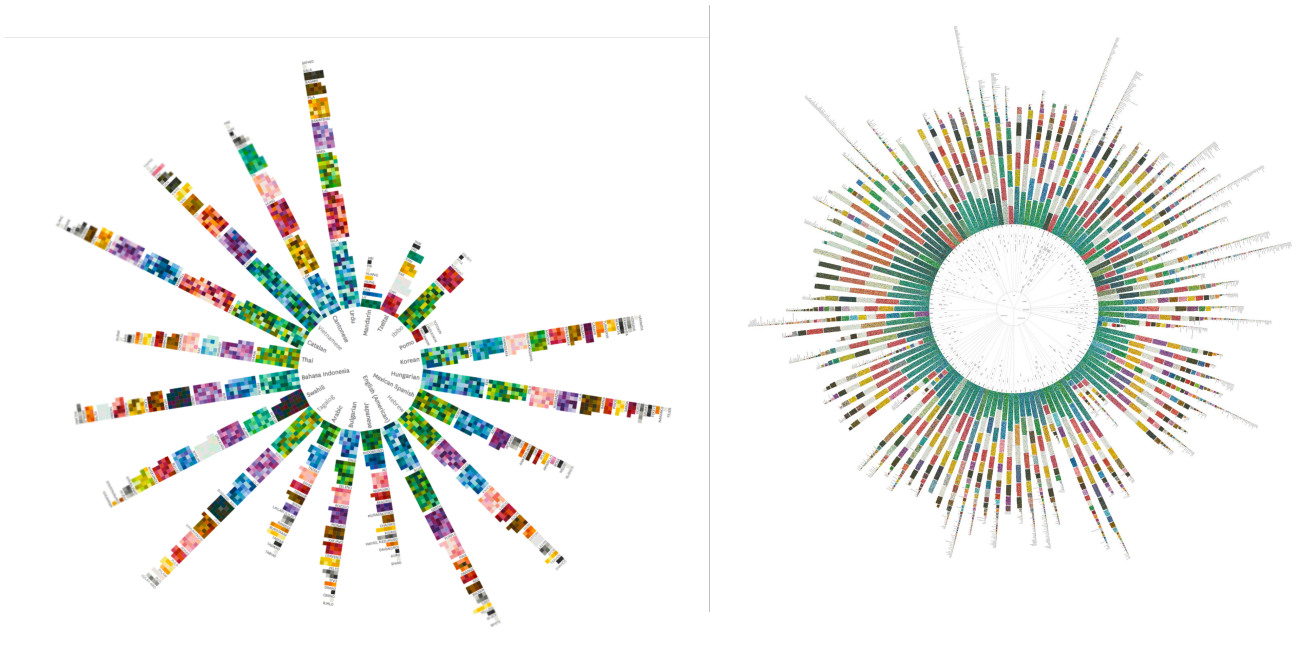


Figure 2. A visualization of the original 20 industrial languages Berlin and Kay studied for color categorizations (left), and a visualization of the 110 unwritten, non-industrial languages surveyed by Berlin, Collier, and Kay (right). An interactive version of these visualizations can be found in the citations below (see Citation 6).

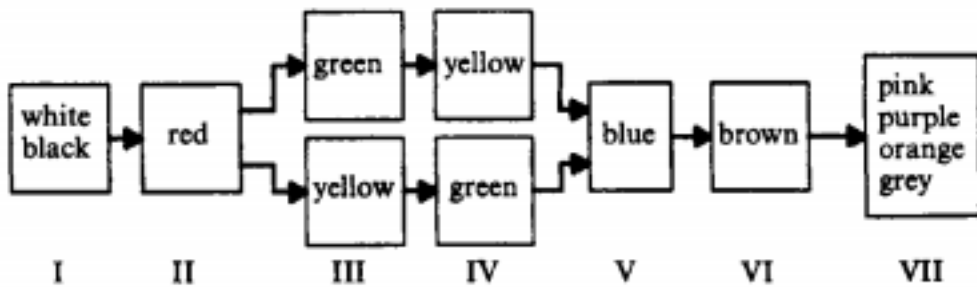


Figure 3. The above flow chart showcases the discovered hierarchy of basic color categories found to be represented amongst a majority of industrial and non-industrial languages. Given that a certain category level is represented in a language, it is true that all preceding levels are also represented in the language.

### When is it being organized?

As the need for referring to a particular color in a more specific way arises, a new category label may be lexicalized for classifying that color. Likewise, categories can be broadened as the need to refer to certain colors diminishes, becomes less important, or logically generalized with other colors.

**Other Considerations.** The universalist versus relativist debate persists, even as the literature on the language of color is fleshed out further. While there is evidence to support both sides of the debate, it is often challenged whether the findings were due to some experimental artifact or truly

due to behaviors intrinsic to native speakers of certain languages, or intrinsic to pre-linguistic brains (as one study showed a difference between recognition of color differences in different visual fields; adults recognized more swiftly color differences when presented in their right visual field, eventually processed by the left hemisphere of their brain, where the language processing center is; infants, i.e. pre-linguistic creatures, more quickly recognized color differences when presented in their left visual field)<sup>3,5,8</sup>. This suggests, although needs further exploration, that there is a hemispheric shift in where colors are categorized within the brain prior to and post-language. It is also important to note that due to discrepancies when referring to colors and color-matching, various color systems have risen to tackle this vocabulary problem: Munsell's Color System as well as Pantone are a couple examples that refer to colors not by lexicalized names, but by codes.

### Citations

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