You don't mess with extremes: how a real world space is populated with cognitive categories

A cognitive category is the cognitive item that is correlated to some real world (i.e. occurring beyond the skin) item. Thus the wave length between about 620 and 750 nanometers is correlated to what people (in Western cultures) call "red". The same goes for real word items that enter our body by the four other senses (hearing, smell, taste, touch). The human cognitive system (and thus the brain) stores these correlations in a look-up table: each cognitive drawer contains the corresponding real world item.

Real world items come in a continuum that is measured in units: seconds, Hertz, nanometers etc. The real world space that the cognitive system needs to transform into discrete units (the drawers) is typically defined by physiological limitations: the colour spectrum visible for the human eye ranges from about 380 to 750 nm, the hearing range of humans due the design of the middle ear is about 31 Hz - 19 kHz (while dogs hear 64 Hz - 44 kHz, and bats up to 200 kHz), etc.

Thus suppose a given real world perceptual space defined by human physiology. This talk pursues the question how this space is populated by cognitive categories. Are cognitive categories placed at arbitrary points in the space? Are cognitive categories placed at systematic intervals?

Vowel systems are typically, but not always, symmetrical: the textbook systems have 3, 5 or 7 vowels. The smallest inventory populates the extremes of the space: i, a, u. Larger inventories add on to that. This is called vowel dispersion (e.g. Liljencrants & Lindblom 1972, Schwartz et al. 1997).

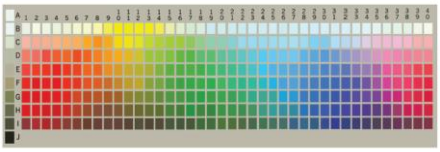
The World Color Survey (Kay et al. 2009) studies colour naming in 110 languages (of non-industrialized societies) based on 330 different color chips (1a), asking participants what the word is in their language for talking about each one. Many languages only have three color terms (1b): dark (Western "black"), light (Western "white") and a third term "neither of these" (red under 1b). Languages with four color terms (1c) add another term in the center of the spectrum which bites on the three others. Languages with five (1d) and six (1e) color terms follow the same path: additional items are added in the middle of the spectrum – never at the edges. The relevant literature concludes that dispersion is the general rule, obeyed by all systems (maximize similarity within categories, minimize similarity across categories), but which allows for some slack due namely to cultural specifics: "color naming and categorization is shaped by both panhuman cognitive universals and socio-cultural evolutionary processes. […] categories are shaped by universal cognitive constructs and culturally salient features of color." (Jameson 2005: 293).

The way the perceptual space is populated in the case of vowels and colors thus appears to follow the same rule: first extremes are occupied, then the remaining space is progressively populated. The talk also discusses phonological sonority (cognitive) representing aperture (real world), which is argued to abide by the same mechanism.

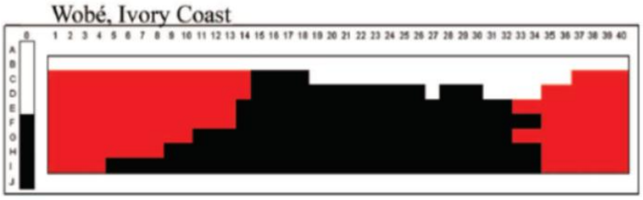
Word count: 489

Diagrams

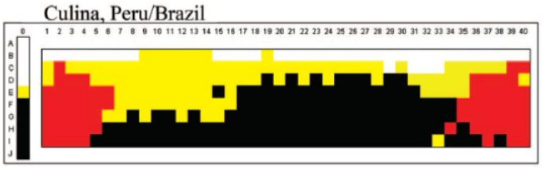
(1) a. 330 color chips



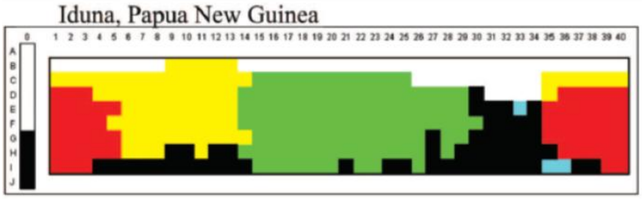
b. n = 3



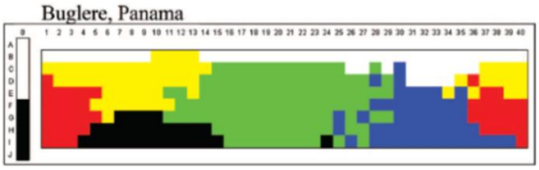
c. n = 4



d. n = 5



e. n = 6



References

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Kay, Paul, Brent Berlin, Luisa Maffi, William R. Merrifield & Richard Cook 2009. The World Color Survey. Stanford, Cal.: CSLI.

Liljencrants, Johan & Björn Lindblom 1972. Numerical simulations of vowel quality systems: the role of perceptual contrast. Language 48: 839-862.

Schwartz, Jean-Luc, Louis-Jean Boë, Nathalie Vallée & Christian Abry 1997. Major trends in vowel system inventories. Journal of Phonetics 25: 233-253.