THE SUBTLE INTERPLAY BETWEEN LANGUAGE AND CATEGORY ACQUISITION AND HOW IT EXPLAINS THE UNIVERSALITY OF COLOUR CATEGORIES

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When studying natural language, one inevitably needs to explain how linguistic signs and constructions map onto semantic concepts. Among concepts, perceptual categories form a special class in the sense that an insight into how they are acquired will have an important impact on theories of linguistic relativism. Linguistic relativism, also known as the Sapir-Whorf hypothesis, suggests an interplay between language and cognition, whereby language and concept acquisition influence each other. Among perceptual categories, colour categories are without doubt the best studied and still their origins and nature are controversial. Stakes are high; as Deacon writing on colour categories puts it "...this may at first appear to be a comparatively trivial example of some minor aspect of language, but the implications for other aspects of language evolution are truly staggering." (p. 120, 1997)

Berlin and Kay (1969) first reported the *universality of colour categories*: the fact that the foci of colour categories show a high degree of similarity across cultures. Their findings have recently been reconfirmed in a large-scale World Color Survey (Kay & Regier, 2003). Although the universal character of colour categories has been disputed (for a recent view see Roberson, 2005), many have accepted it and have put forward hypotheses about the processes underlying it. The most prominent hypothesis holds that colour categories are the result of the expression of innate constraints on colour perception and cognition. A second hypothesis puts forward that colour categories reflect the structure of human ecology. And a third hypothesis suggests that colour categories are culturally learned and puts somewhat less stress on their universal character. Combinations of these three views have received interest as well (for an overview see Steels & Belpaeme, 2005). However, most theories accounting for universalism are rhetorical and therefore never quiet satisfactory. We on the contrary aim to explain the universal character using a computational simulation which draws on a psychological model of colour perception and a model of lexicon acquisition.

In our simulations we study populations of individuals which autonomously learn and adapt categories and linguistic labels for those categories. This enables the individuals to (a) distinguish between perceptual stimuli and (b) communicate with each other about perceptual stimuli. The essential ingredient of our model is an interaction between two agents, whereby one agent tries to linguistically convey the meaning of a colour to a second agent. In order for this to succeed both agents need to know the same colour terms, but more importantly, the colour categories of both agents need to be coordinated. Our simulations differ from previously presented work in that we now present data of a large-scale experiment.

As a yardstick to compare the model to, we use the data from the World Color Survey (Kay & Regier, 2003). The WCS contains data and an analysis of colour terms and their referents of 110 remote and non-industrialised societies. Our simulations contain 110 populations, which can be seen as 110 isolated societies. An analysis of the categories of the artificial societies reveals a structure showing the same typology as observed in the WCS. However, comparing two populations leaves the impression that colour categories are arbitrary, the universal structure only reveals itself when analysing the categories of a larger number of populations. This suggests that even if the genetic and ecological constraints are rather weak, on a macroscopic scale a certain structure will be observed: the universal structure of colour categories. We argue that the universality of colour categories can be explained through a linguistic acquisition process on top of genetic and ecological constraints. These constraints are formed by the nature of human colour perception and to a lesser extent by the chromatic environment.

References

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