Language is shaped for social interactions, as well as by the brain

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Abstract: Language learning is not primarily driven by a motivation to describe invariant features of the world, but rather by a strong force to

be a part of the social group, which by definition is not invariant. It is not sufficient for language to be fit for the speaker's perceptual motor system. It must also be fit for social interactions.

Christiansen & Chater's (C&C's) target article is a clear and thought-provoking presentation of the many inconsistencies within and between various versions of the Universal Grammar (UG) theory. One of the clearest examples of such inconsistencies, which is not directly touched upon in this article, is the question of what happened to the original "poverty of the stimulus" argument (Chomsky 1980), claiming that language simply cannot be learned with the ease and speed observed in children without help from a genetic source. This argument is crucial for upholding any kind of theory about a UG. Without it, the pressure for a genetic component in language disappears. However, cleverly avoiding many of the earlier inconsistencies, the Minimalist Program (e.g., Hauser et al. 2002) only maintains that rules for recursion are innate, thereby leaving at least 99.9% of all language content to be learned. This is paradoxical. Why is this rule impossible to learn, if the rest can be learned, and vice versa?

We therefore welcome a theory of language which emphasises the close relationship between linguistic utterances and the content that they represent (e.g., along the lines of Talmy 2000). The pairing of language and meaning in the brain, in the most simple case of direct referencing, probably happens through synchronous firing of auditory and visual cortices (Hebb 1949). Without prior knowledge to guide understanding, these activations will probably spread throughout association cortices along the major fibre pathways; and wherever these two "streams" of information meet, an association is likely to be encoded. This means that linguistic representations are likely to be stored in regions overlapping with or contiguous to perceptuo-motor processing regions (Shallice 1988). Evidence for this line of thinking has been brought forward in relation to action words in premotor cortex (e.g., Hauk et al. 2004) and/or temporal cortex contiguous to V5/MT, a region selective for visual motion perception (Noppeney 2004; Wallentin et al. 2005), spatial relations in posterior parietal cortex (Mellet et al. 1996; 2002; Wallentin et al. 2006; in press), and perspective taking in the frontal eye fields (Wallentin et al. 2008).

With this said, it remains an open question the extent to which the "cognitive system" is a stable unit, or whether it is also open to the influence of language/culture. Even language tied to the most "basic" cognitive operations, such as spatial processing (Levinson 2003) and colour detection, shows a wide spectrum of variation across cultures.

This is not to say that the cognitive system does not constrain language learning at all, but that cognitive processes are themselves subject to the effects of learning. Effectively, what we see is that both language and the cognitive system adapt to each other to a certain degree, even in the case of spatial processing (e.g., Levinson 2003) and colour categorisation (e.g., Gilbert et al. 2006; Winawer et al. 2007). What results in the case of colour categories are "near-optimal divisions" of colour space (Regier et al. 2007). But why not an optimal division? Given the speed of language evolution and the strong innate bias towards certain focal colours, due to the anatomy of the colour-sensitive photoreceptors in the retina (e.g., Bear et al. 2001), why would there be any variation at all? The answer to this question points towards something crucial in language learning, namely, that the motivation to learn a language is probably not primarily driven by a motivation to learn about invariant features of the world, but rather by a strong force to be a part of the social group/society, which by definition is not invariant.

When thinking about language as a system that adapts to constraints imposed by the brain, it is probably important, therefore, to distinguish between language evolution directed towards enhancing fitness in the face of the learner's perceptuo-motor system and language evolution directed towards enhancing language fitness in relation to social dynamics. Where the former is driven by an optimisation of "rational" perceptual/linguistic referencing of the exterior world, the social optimisation will mainly be based on social reinforcement markers. These markers may be proto-linguistic signs, such as facial expressions, or they may themselves be linguistic utterances, giving room for a "run-away" effect, known from sexual selection (Fisher 1999). In other words, socially endowed linguistic changes may happen very fast and to a certain extent be orthogonal to those imposed by the perceptual/linguistic referencing system.

Authors' Response