Keynotes’ Abstracts

Abstract Concepts:
Structure, Processing and Modeling

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The emotions of abstract words: 
A distributional semantic analysis

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Recent psycholinguistic and neuroscientific research has emphasized the crucial role of emotions for abstract words. Affective experience would in fact provide the necessary grounding for abstracts, instead of sensory-motor experience (Kousta et al. 2011, Vigliocco et al. 2014). The hypothesis of the affective embodiment of abstracts has been proposed as an alternative to the idea that abstract words are linguistically coded and that linguistic processing plays a key role in their acquisition and processing (cf. Paivio 2007). In this talk I will argue that the affective content of words, and of abstract ones in particular, is also crucially determined by their linguistic distribution. Evidence from distributional semantic models is used to explore the complex interplay between linguistic and affective information in the representation of abstracts.


Knowing the meaning of a word by the linguistic and perceptual company it keeps

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Even though the debate about embodied versus symbolic views of cognition and language comprehension has been presented these views as mutually exclusive, these views are mutually complementary. In what we have dubbed the Symbol Interdependency Hypothesis language processes rely on both perceptual simulation and language statistics. We have shown that language statistics encode perceptual information, so that even with limited symbol grounding language users can bootstrap meaningful information through statistical linguistic patterns. The extent to which cognitive processes are relatively more symbolic or perceptual depends on a variety of factors including the stimulus, the cognitive task and individual differences. This talk gives an overview of the Symbol Interdependency Hypothesis, showing that language statistics can explain conceptual and numerical processing and that the effect sizes for language statistics oftentimes outperform those for perceptual factors. We will argue that the structure and processing of concepts can be explained by both language statistics and perceptual simulation, for concrete concepts and abstract concepts alike.
A common observation is that abstract concepts like learn differ from concrete concepts such as chair or apple. In fact, they are often defined by this difference in terms of being “entities that are neither purely physical nor spatially constrained” (Barsalou & Wiemer-Hastings, 2005). Due to their lack of obvious physical or perceptual referents, the semantic representation of abstract concepts is thought to be formed predominantly through linguistic co-occurrence or word association (Crutch & Warrington, 2005). In contrast, I will argue that abstract concepts are not devoid of perceptual information because knowledge of real-world situations is an important component of learning and using many abstract concepts. That is, although the relationship between perceptual information and abstract concepts is not as straightforward as it is for concrete concepts, situation-based perceptual knowledge is part of many abstract concepts. I will discuss data supporting this view, keeping in mind the fact that the domain of abstract concepts is large and heterogeneous.
Curb your embodiment

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To explain how abstract concepts are grounded in sensory-motor experiences, several theories have been proposed. I will discuss two of these proposals, Conceptual Metaphor Theory and Situated Cognition, and why they do not fully explain grounding. A central idea in Conceptual Metaphor Theory is that image schemas ground abstract concepts in concrete experiences. Image schemas might themselves be abstractions, however, and therefore do not solve the grounding problem. Moreover, image schemas are too simple to explain the full richness of abstract concepts. Situated cognition might provide such richness. Research in our lab, however, has shown that even for concrete concepts sensory-motor grounding is task dependent. Therefore, it is questionable whether abstract concepts can be grounded in sensory-motor processing.
Concrete mechanisms for abstract meaning

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The human brain can process abstract meaning. Word such as “love”, “peace” and “not” can be understood without problems and even the abstract sense of concrete word sequences can be easily grasped (“She caught the sun”). However, whereas some concrete neuronal mechanisms have been offered for concrete word understanding, few such descriptions are available for aspects of concrete meaning (1-4). Accounts in terms of abstract semantic features seem to fail, because abstract meaning is ‘explained’ by abstract semantic features and it remains unclear, how the latter are explainable (2). Distributional word co-occurrence approaches can map the degree of semantic relationship between symbols, but the mechanistic basis for co-occurrence mapping is unclear. This talk will focus on typical examples of abstract symbolic meaning and ask whether established neuroscience principles of correlation learning can contribute to their explanation and learning (3).

The examples will range for abstract emotion words such as “joy” and “love”, which have their natural expression in inborn bodily action and in patterns of acquired social-interactive behaviour, to abstract object- (“beauty”) and action-related concepts (“to free”). Linguistic semantic distinctions, such as telicity, will also be addressed, along with logical concepts such as that of negation. Rather than leaving it at abstract statements, concrete neuronal circuit solutions will be offered for different abstraction mechanisms.

The proposed mechanisms for the “brain embodiment” of abstract meaning will be contrasted with one version of a classic symbolic model of concepts. The obvious conclusion is that the latter may profit from some concetrisation and the former offer a pathway towards better understanding and indeed explanation of conceptual abstraction – although only experimental data can prove them right or wrong.

The place of metaphors in the order of things

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Can different theoretical positions appropriate the same empirical phenomenon by embedding it in somewhat different analytic frameworks? The experimental data that will be presented reveals that the marking of gender as an abstract concept is based on sensory structuring by darkness and brightness. The alignment of female–male with the bipolar dimension of light–dark is most likely due to sexual dimorphism in skin pigmentation that is the result of evolutionarily adaptive, universal differences in skin color between males and females due to natural selection. Yet, different theoretical representations, uninformed by the evolutionarily adaptive nature of this physical phenomenon, can ‘elevate’ it to supposedly different and independent levels of theoretical discourse, embedding it into the psychology of prejudice or stereotypes, to schemata models, or conceptual metaphors, among others.
Learning and processing abstract words and concepts: Insights from typical and atypical development

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I will present an overview of our work on the representation and learning of abstract concepts and words. It is generally assumed that abstract concepts are linguistically coded, in line with imaging evidence of greater engagement of the left perisylvian language network for abstract than concrete words. During development learning of abstract words (e.g., mental states) is also taken to be based primarily on linguistic information (e.g., children would learn the meaning of abstract words making inferences from the meaning of co-occurring words). Our behavioural, imaging and developmental work, however, indicates that this is not the whole story as emotional associations also play a critical role. In particular, abstract words tend to be emotionally valenced and therefore engage emotion networks in their processing. Moreover, we have found that 6-9 years old children process abstract emotion words better than abstract words without emotional associations (whereas such a difference disappears after 9 years of age). Finally, we have shown that children with specific language impairments do not show greater difficulties with abstract words. On the basis of these findings, we have argued against views in which abstract words and concepts would be solely linguistically coded.
How concrete can you get with language description of events

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Will reading different stories about the same event in the world result in a similar image of the world or be similar proxy for experiencing the event? The answer is no because language is abstract by definition and relies on our episodic experience to turn a story into a colorful mental movie. Since our episodic knowledge differs, also the movie will be different.

Language leaves out colorful details and this becomes specifically clear when building machines that read different texts to identity the events being mentioned and establishing event relations across these mentions, such as causality, sub-events, scripts, timelines and storylines. There is a lot of information and knowledge on the event that is not in the text.

In my presentation, I will report on experiments to automatically model event descriptions and instances across different news articles. I will show that the event information is scattered over the text but also varies a lot in the degree it abstracts from details, which makes establishing event identity and relations extremely difficult. The variation in granularity of event descriptions seems to vary with pragmatic communicative strategies.