

Thinking inside the box – how the brain puts the world in order

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The world around is complex and changing constantly. To put it in order, we devise categories into which we sort new concepts. To do this we apply different strategies. A team of researchers at the Ruhr University Bochum (RUB) led by Prof. Dr. Boris Suchan, department of neuropsychology, and Prof. Dr. Onur Güntürkün, department of biopsychology, wanted to find out which areas of the brain regulate these strategies.

The results of their study using [magnetic resonance imaging](#) (MRI) show that there are indeed particular brain areas, which become active when a certain strategy of categorisation is applied.

When we categorise objects by comparing it to a prototype, the left fusiform gyrus is activated. This is an area, which is responsible for recognising abstract images. On the other hand, when we compare things to particular examples of a category, there is an activation of the left hippocampus. This field plays an important role for the storage or retrieval of memories.

Categories reduce information load

Thinking in categories or pigeonholing helps our brain in bringing order into a constantly changing world and it reduces the information load. Cognitive scientists differentiate between two main strategies which achieve this: the exemplar strategy and the prototype strategy.

When we want to find out, whether a certain animal fits into the category "bird" we would at first apply the prototype strategy and compare it to an abstract general "bird". This prototype has the defining features of the class, like a beak, feathers or the ability to fly. But when we encounter outliers or exceptions like an emu or a penguin, this strategy may be of no use. Then we apply the exemplar strategy and compare the animal to many different known examples of the category. This helps us find the right category, even for "distant relations".

Complex interaction

To find out where our brain is activated, when it is ordering the world, the neuroscientists in Bochum performed an MRI scan, while volunteers were completing a categorisation task. The functional imaging data showed that both strategies are triggered by different areas of the brain.

The scientists believe that there is a complex interaction between both learning patterns. "The results implicate that both [strategies](#) originate from distinct [brain](#) areas. We also observed that, during the learning process, the rhythm of activation in the two areas synchronised. This shows that both cognitive processes cannot be neatly separated," explains Boris Suchan. Further modelling and research must now clarify this interaction.

More information: Robert K. Lech et al. An interplay of fusiform gyrus and hippocampus enables prototype- and exemplar-based category learning, *Behavioural Brain Research* (2016). [DOI: 10.1016/j.bbr.2016.05.049](https://doi.org/10.1016/j.bbr.2016.05.049)

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