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Press Release

Out of sight, out of mind?
How the brain codes its surroundings beyond the field of view.

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Even when they are not directly in sight, we are aware of our surroundings: so it is that when our eyes are fixed on an interesting book, for example, we know that the door is to the right, the bookshelf is to the left and the window is behind us. However, research into the brain has so far concerned itself predominantly with how information from our field of vision is coded in the visual cortex. To date it has not been known how the brain codes our surroundings beyond the field of view from an egocentric perspective (that is, from the point of view of the observer).

In the latest issue of the renowned journal Current Biology Andreas Schindler und Andreas Bartels, scientists at the Werner Reichardt Centre for Integrative Neuroscience (CIN) of the University of Tübingen, present for the first time direct evidence of this kind of spatial information in the brain.

The participants in their study found themselves in the centre of a virtual octagonal room, with a unique object in each corner. As the brain's activity was monitored by means of functional magnetic resonance imaging, the participants stood in front of one corner and looked at its object. Now they were instructed to determine the position of a second randomly chosen object within the room relative to their current perspective (for example, the object is behind me). After a few trials the participant turned around so that the next object was brought into the field of view and the task was set up again. The whole procedure was repeated until every object had been looked at once.

The scientists discovered that patterns of activity in the parietal cortex code the participant's egocentric position, that is, the relative position to their surroundings. The spatial information discovered there showed itself to be independent of the particular object, its absolute position in the room or that of the observer – i.e. it encoded egocentric spatial information of the three-dimensional surroundings. This result turns out to be particularly interesting because damage to the brain in the parietal cortex can lead to serious disruption of egocentric spatial awareness. Hence it is difficult for

patients suffering from optical ataxia to carry out coordinated grasping movements. Lesions in the parietal cortex can also lead to a symptom called spatial neglect where patients have difficulties in perceiving their surroundings on the side opposite to the lesion. The brain areas identified in the present study coincided precisely with the areas of brain damage in such patients and provide for the first time insights regarding their function in the healthy brain.

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