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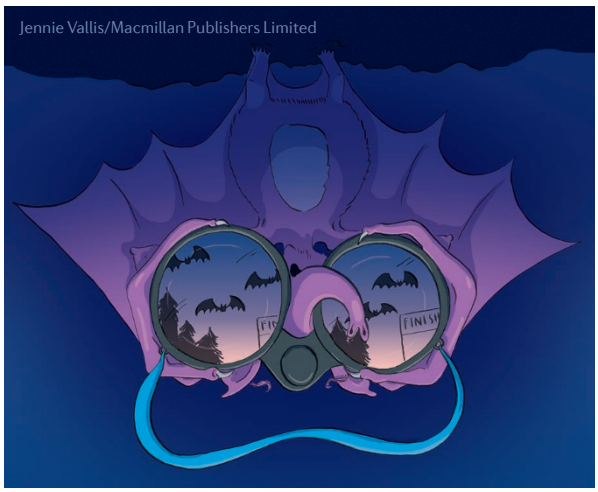
SPATIAL PROCESSING

An 'other' kind of place cell

> some dCA1 neurons exhibited place fields that represented the position of the demonstrator animals

For social animals, such as bats and rats, tracking the position of a conspecific is important for social interactions such as observational learning. Much previous research has described how hippocampal place cells encode one's own spatial location; however, the neuronal basis for encoding the position of 'another' is unknown. Two new papers identify so-called 'social place cells': neurons in the dorsal CA1 region (dCA1) of the hippocampus in bats and in rats that encode the position of an observed conspecific.

Danjo *et al.* placed two rats in a T maze and allowed one (the demonstrator) to turn left or right at the end of the maze as the observer rat watched. Subsequently, the observer had to turn the opposite way to, or the same way as, the demonstrator rat, depending on the version of the task — the 'opposite side' version or the 'same side' version, respectively — to receive a reward. In the other study, Omer *et al.* used a similar set-up, but with Egyptian fruit bats. They trained observer bats to wait on a start ball and to watch demonstrator bats fly from the start ball to one of two other balls and back again; the observer bat then had to fly to the same ball in order to be rewarded.



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In both studies, the authors plotted the recorded activity of dCA1 neurons to create separate firing-rate maps corresponding to the observer's position or the demonstrator's position. This approach revealed that, strikingly, some dCA1 neurons exhibited place fields that represented the position of the demonstrator animals. The researchers classified individual units as place cells or as social place cells that were selective for the demonstrator. In both studies, there was an enhanced propensity for neurons to fire when either the observer or the demonstrator was in a particular place.

One possible interpretation of these findings might be that the activity of 'social place cells' instead reflects planning of the observer animal's future trajectory. By comparing the responses of each unit in the opposite-side and same-side versions of the T-maze task, Danjo *et al.* statistically defined neurons as either goal-preferring or other-preferring. In addition, Omer *et al.* found that the maps were the same for correct and incorrect trials, and also demonstrated that removing trials that included sharp-wave–ripples (which often contain place-cell firing sequences that represent future trajectories) from their analyses did not affect the place fields of social place cells. Thus, these studies demonstrate that the social place-cell activity was not the result of the observer animal planning its future or goal trajectory.

Last, Omer *et al.* investigated whether social place cells would also track the position of inanimate objects. Indeed, some neurons in observer bats had place fields that encoded the position of an inanimate object that was moved from the start ball and back again. However, the representation of objects was very different from that of the other bat, both in the spatial position of the neuron's firing and in the location within dCA1 where these neurons were found. This demonstrates that, in the bat, the social place cells are indeed social.

Together, these studies present evidence for social place cells that track the position of conspecifics, as well as inanimate objects. Omer *et al.* propose that such cells may have remained undetected in previous studies because there was not a similarly high incentive to attend to another animal's position.

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ORIGINAL ARTICLES Danjo, T., Toyoizumi, T. & Fujisawa, S. Spatial representations of self and other in hippocampus. *Science* **359**, 213–218 (2018) | Omer, D. *et al.* Social place-cells in the bat hippocampus. *Science* **359**, 218–224 (2018)