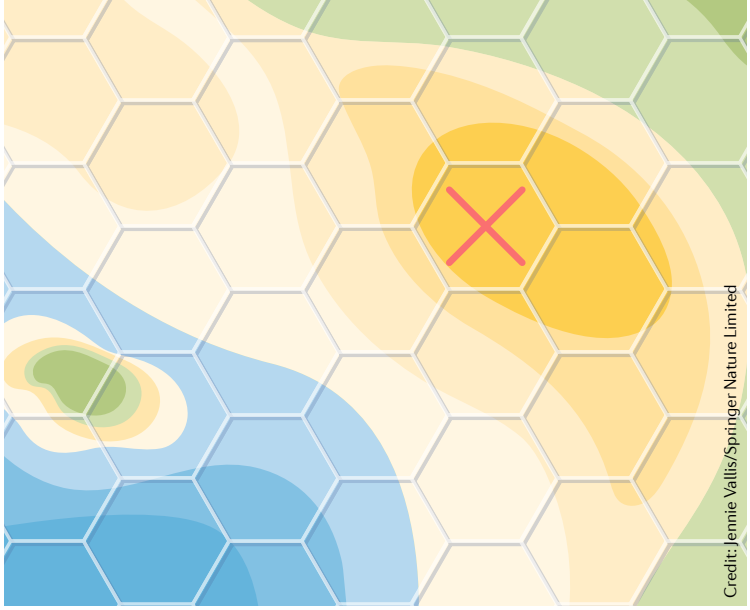

longer-lasting: MEC changes, but not CA1 changes, were still observable in the pre-probe phase the next day. Moreover, over the course of the learning phase, the MEC assemblies did not seem to encode intermediate representations of the goal locations; instead, the authors observed rapid 'flickering' back and forth between the pre-probe and post-probe representations. These observations imply that multiple mappings can be stored by MEC neurons.

Together, these studies show that reward location can distort the spatial tuning of grid cells. Thus, an animal's representation of physical space can be altered by cognitive information relating to the non-spatial features of the context. Moreover, the long-lasting changes observed in MEC firing patterns suggest that the MEC could have a role in memory.

Natasha Bray

ORIGINAL ARTICLES Boccara, C. N. et al. The entorhinal cognitive map is attracted to goals. *Science* **363**, 1443–1447 (2019) | Butler, W. N. et al. Remembered reward locations restructure entorhinal spatial maps. *Science* **363**, 1447–1452 (2019)

monkey watched a partner choose an object, the changes in amygdala neuron activity occurred before the partner received the reward. These findings suggest that some amygdala neurons track object value learned by personal experience or via observation of another's choices.

In value-based decision making, after comparing values for different objects, a choice is made. The authors found amygdala neurons in recorded monkeys that dynamically coded this comparison and signalled a choice before they selected an image. Interestingly, different individual amygdala neurons showed similar patterns of activity when the recorded monkey watched a social partner before it made a choice, suggesting that these neurons simulated the other monkey's decision process.

The authors also detected amygdala neurons that showed increased activity when the recorded monkey was performing the task and others that showed higher activity when the recorded monkey watched a partner perform it. These responses were unrelated to object value or the choices made by the animals. Indeed, these data led the authors to hypothesize that two decision systems exist in the amygdala: one for making an animal's own choices and one for simulating another's decisions.

To test this hypothesis, the authors developed an attractor neural-network model in which the two decision systems receive inputs from object-specific value neurons and neurons that differentiate 'self' from 'other'. By biasing the strength of the self or other neurons, the model generated choice only in the 'self' system or the 'other' system (that is, a simulation), respectively, in line with the author's other findings.

These findings provide insight into how, at a circuit level, a monkey may learn through social observation. The study has also uncovered a means by which a monkey may gain an understanding of which decisions another will make.

Darran Yates

ORIGINAL ARTICLE Grabenhorst, F. et al. Primate amygdala neurons simulate decision processes of social partners. *Cell*. https://doi.org/10.1016/j.cell.2019.02.042 (2019)

IN BRIEF

LEARNING AND MEMORY

Where to eat?

How mechanisms that regulate energy balance are integrated with environmental cues such as food location is poorly understood. Dysfunction of the hippocampus, a structure important for episodic memory and encoding spatial location, can alter feeding behaviour. Here, the presence of food triggered the activation of neurons in the mouse lateral entorhinal cortex, which in turn activated dopamine D2 receptor-expressing neurons in the hippocampus (hD2R neurons). Optogenetic activation of hD2R neurons projecting to the septal area disrupted the encoding of food location memory and decreased food intake.

ORIGINAL ARTICLE Azevedo, E. P. et al. A role of Drd2 hippocampal neurons in context-dependent food intake. *Neuron* https://doi.org/10.1016/j.neuron.2019.03.011 (2019)

NAVIGATION

Putting objects in their place

Information about discrete objects in the environment is encoded by neurons of the lateral entorhinal cortex using vector information of the objects in relation to other items or boundaries. The neurons encoding the space between objects are unknown. Here, neurons in the medial entorhinal cortex, termed 'object vector cells', were found to encode distances and directions from discrete objects, that is, they use allocentric vector coding to represent items in the test arena. These findings provide a cellular basis for position mapping in the space between objects.

ORIGINAL ARTICLE Høydal, Ø. A. et al. Object-vector coding in the medial entorhinal cortex. *Nature* https://doi.org/10.1038/s41586-019-1077-7 (2019)

NEURODEGENERATIVE DISORDERS

Targeting senescence

The tissue surrounding amyloid-β (Aβ) plaques, which are characteristic of Alzheimers disease (AD), shows local inflammation and neuritic degeneration. Here, Aβ-containing brain tissue from a mouse model of AD and from humans with AD were shown to contain OLIG2- and NG2-expressing oligodendrocyte precursor cells (OPCs) that showed upregulation of senescence-associated proteins. Administration of a cocktail of dasatinib and quercetin (drugs that trigger apoptosis in senescent cells) in mice reduced the numbers of senescent OPCs and activated microglia. Such treatment might have therapeutic potential in humans with AD.

ORIGINAL ARTICLE Zhang, P. et al. Senolytic therapy alleviates Aβ-associated oligodendrocyte progenitor cell senescence and cognitive deficits in an Alzheimer's disease model. *Nat. Neurosci.* https://doi.org/10.1038/s41593-019-0372-9 (2019)

NEUROGENESIS

New for old

Whether neurogenesis occurs in the adult human hippocampus remains controversial. Using sophisticated tissue preservation methods and highly specific tissue-processing methods (involving optimized fixation time and neuropathological examination of tissue samples), thousands of immature neurons (identified by the marker doublecortin) at various stages of differentiation were found in the dentate gyrus of heathy people, including adults in their eighties. By contrast, the number of these immature neurons declined with advancing Alzheimer disease, a change that might be involved in the memory deficits associated with the disorder.

ORIGINAL ARTICLE Moreno-Jiménez, E. P. et al. Adult hippocampal neurogenesis is abundant in neurologically healthy subjects and drops sharply in patients with Alzheimer's disease. *Nat. Med.* **25**, 554–560 (2019)