**Curves are attractive**

Membrane-bending proteins can attract each other when the curves they create overlap, according to a computer simulation by Benedict Reynwar, Markus Deserno, and colleagues (Max Planck Institute, Mainz, Germany).

The energy required for membrane reshaping—as needed for endocytosis, vesiculation, etc.—is too great for one membrane-bending protein alone to achieve, so cooperation is essential. How cooperation occurs, however, has been a bit of a mystery.

Part of the mystery stems from previous theoretical calculations that predicted that curves induced by a membrane-bending protein repel other proteins of its kind. Experimental systems, on the other hand, suggested that membrane curving might be enough to aggregate the responsible proteins. Ruling out other specific protein–protein interactions is difficult, however.

Now, in silico simulations by Reynwar et al. show that, as suggested by experimentation, curves can be enough to pull together membrane benders. The team created computerized proteins that induced a membrane curve geometry similar to that of a real membrane-bending protein called BAR domain. In a simulated lipid bilayer in which the proteins freely diffused, the induced deformed regions encircling the proteins soon overlapped. The proteins did not then diffuse away but instead aggregated such that the area of deformation grew, eventually leading to vesiculation.

The ease with which the simulated proteins aggregated and promoted vesiculation—within just milliseconds—suggests that real cells must keep a tight leash on their benders. **JCB**

Reference: Reynwar, B.J., et al. 2007. Nature. 447:461–464.

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**Steps to STIMulation**

When ER calcium levels plummet, an ER membrane calcium sensor called STIM1 directly activates plasma membrane (PM) channels to top up the cell’s calcium. Jen Liou, Tobias Meyer, and colleagues (Stanford University Medical School, Stanford, CA) have now uncovered the molecular steps of STIM1’s pathway to the PM and show that those steps don’t take STIM1 very far.

STIM1 sits in the ER membrane holding a calcium molecule in its luminal domain. When the ER loses calcium, STIM1 translocates along the ER membrane, ultimately aggregating at junctions between the PM and the ER. The details of these steps were unknown.

Using live cell imaging of fluorescent STIM1 fusion proteins, Liou et al. now show that, when ER calcium levels drop, STIM1’s first step is to rapidly form oligomers. These oligomers then translocate and form visible aggregates. Aggregation, but not oligomerization, requires STIM1’s polybasic tail—most likely for direct binding to the PM.

Formation of these aggregates was rapid, but STIM1 oligomers’ translocation speed through the ER membrane was very slow. Therefore, the distance traveled to ER–PM junctions must be short. Reports have shown that STIM1 promotes calcium influx in localized regions of the PM. This is thought to spatially restrict activation of calcium-sensitive targets. STIM1’s slow pace thus explains how this local action is achieved. **JCB**

Reference: Liou, N., et al. 2007. Proc. Natl. Acad. Sci. USA. doi:10.1073/pnas.0702866104.

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**New neurons’ fleeting flexibility**

New neurons are constantly being produced in the adult brain, but their ability to fine tune connections may be short lived, report Shaoyu Ge, Hongjun Song (JHMI, Baltimore, MD), and colleagues. This short window of plasticity could explain why learning continues throughout life, yet the stability of neuronal circuits is maintained.

Learning and memory require a balance of neuronal plasticity and stability. Too much plasticity and we’d constantly have to learn the same things over and over. Too much stability and we’d have little chance of learning at all. Plasticity peaks in the juvenile brain. By adulthood, however, plasticity is limited.

One area that maintains plasticity is the hippocampus, a region of the brain involved in learning and memory. By labeling adult-born mouse hippocampal neurons and then measuring their electrical activity at regular age increments, Ge et al. found that new neurons are not permanently highly plastic. Instead, plasticity peaks when neurons are one to one-and-a-half months old.

This peak in plasticity was coupled with synaptic expression of a type of glutamate receptor called NR2B, which is involved in developmental plasticity (such as that seen in the juvenile brain). Inhibition of NR2B almost completely abolished the telltale electrical patterns of plasticity in 1-month-old neurons but had no effect on mature neurons.

Limiting the period of NR2B-dependent plasticity could enable adult-born neurons to establish and then stabilize new connections in response to experience. The team now plans to inhibit this critical period of plasticity in adult animals to see whether learning is indeed impaired. **JCB**

Reference: Ge, S., et al. 2007. Neuron. 54:559–566.