This Week in The Journal

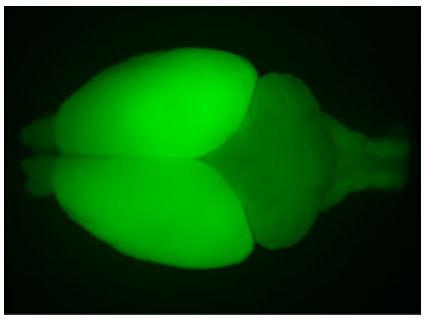
● Cellular/Molecular

A Look BAC at GLAST and GLT-1

Melissa R. Regan, Yanhua H. Huang, Yu Shin Kim, Margaret I. Dykes-Hoberg, Lin Jin, Andrew M. Watkins, Dwight E. Bergles, and Jeffrey D. Rothstein

(see pages 6607–6619)

In this week's *Journal*, Regan et al. used bacterial artificial chromosome (BAC) transgenes to visualize the expression pattern of two glutamate transporters in mice, glutamate–aspartate transporter (GLAST) and glutamate transporter-1 (GLT-1). These two transporters are primarily expressed in astroglia and do the heavy lifting in terms of glutamate uptake in the embryonic and adult brain, respectively. The BAC transgene containing the promoter sequence for GLAST encoded the red fluorescent protein Discosoma red, whereas the BAC containing GLT-1 encoded green fluorescent protein. The mice expressed endogenous transporters, and the fluorescent reporters revealed transporter expression patterns, allowing the authors to study endogenous transporter activity in cells of interest. GLAST promoter activity was widespread early in development but tapered off after birth, with some interesting exceptions such as radial glia and white matter oligodendrocytes. In contrast, GLT-1 promoter activity was present in virtually all astrocytes, but it was higher in forebrain than spinal cord. Most cell types expressed only one of these two transporters.



The image shows enhanced green fluorescent protein (eGFP) fluorescence of the brain of a GLT-1–EGFP BAC promoter report mouse. See the article by Regan et al. for details.

▲ Development/Plasticity/Repair

Slit/Robo Signaling and Axonal Branching

Le Ma and Marc Tessier-Lavigne

(see pages 6843–6851)

Signaling between secreted Slit proteins and their Robo receptors are known to affect axon branching and guidance. However, this week, Ma and Tessier-Lavigne show that how it works depends on the end of the cell at which you're looking. In the peripheral branches of trigeminal sensory neurons, arborizations were altered in the ophthalmic projection of mice lacking Slit2/Slit3 or Robo1/Robo2 . Although branches below the eye appeared normal, the arbor above the eye was significantly smaller, apparently due to loss of "positive" Slit–Robo signaling at that branch. Although central projections of sensory axons in the spinal cord bifurcated normally in mice lacking Slit1/Slit2 or Robo1/Robo2, one branch consistently overshot the dorsal entry zone (DRZ) and prematurely grew into the spinal cord. This defect apparently arose from loss of "negative" or repulsive signaling by DRZ-expressed Slit acting on Robo receptors on sensory neurons.

■ Behavioral/Systems/Cognitive

The Noise in Eye Movements

Javier F. Medina and Stephen G. Lisberger

(see pages 6832–6842)

The probabilistic nature of synaptic transmission and action potential firing produces variable (even "unreliable") neuronal responses to identical sensory stimuli, yet the motor response can be extremely precise. In this week's *Journal*, Medina and Lisberger focused on Purkinje cell (PC) activity in the cerebellar flocculus, an intermediate processing station in smooth-pursuit eye movements. During 200 presentations of the same moving visual stimulus, monkeys showed trial-to-trial variations in behavioral eye movements and in PC firing. This variability was low when eyes were fixed, and then increased during the pursuit phase. The variance in PC firing was predictive of trial-to-trial variance in behavioral responses at eye movement initiation. From their analysis, the authors surmised that noise from neurons downstream of PCs was minimal but probably contributed to variation during steady-state pursuit, whereas noise in the initiation phase arose from visual processing.

♦ Neurobiology of Disease

The NF1 Protein and Long-Term Memory in the Fly

Ivan Shun Ho, Frances Hannan, Hui-Fu Guo, Inessa Hakker, and Yi Zhong

(see pages 6852–6857)

Although neurofibromatosis is usually thought of primarily in terms of the disfiguring peripheral nervous system tumors, these patients often have learning disabilities as well. The protein encoded by *NF1* has at least two distinct molecular functions: it inhibits Ras activity via a GTPase-activating protein (GAP)-related domain (GRD), and it regulates cAMP by activation of adenylyl cyclase. This week, Ho et al. asked how loss of these functions affected learning and memory in flies. In a pavlovian olfactory conditioning paradigm, flies lacking *Nf1* exhibited immediate and long-term memory deficits that were rescued by expression of the human *Nf1* gene (hNF1). Flies expressing hNF1 with point mutations that disrupted the GRD signaling domain had compromised long-term memory. An hNF1 construct containing the C-terminal region, which is downstream of the GRD but involved in cAMP regulation, rescued immediate, but not long-term memory. Thus, these two Nf1 domains appear to have independent effects.