This Week in The Journal

● Cellular/Molecular

A Discriminating Butterfly Eye

Kentaro Arikawa, Motohiro Wakakuwa, Xudong Qiu, Masumi Kurasawa, and Doekele G. Stavenga
(see pages 5935–5942)

This week Arikawa et al. find that in the small white butterfly, the sexes actually see the world differently. The authors compared the male and female eyes of *Pieris rapae crucivora* that are equipped with three classes of photoreceptors sensitive to short-wavelength light. In both sexes, the authors detected mRNAs for three novel opsins, one per type of photoreceptor. Intracellular recordings from female photoreceptors revealed spectral sensitivity peaks in the ultraviolet (UV), violet (V), and blue (B) wavelengths. Male short-wavelength photoreceptors likewise fell into three classes, but in place of violet they had a double-peaked blue (dB) sensitivity. The male dB spectral sensitivity results from a fluorescent protein, excited by blue and UV light, that acts as a selective filter. The authors speculate that the male's high sensitivity in the blue range helps discriminate between the colors of the male and female wings.

▲ Development/Plasticity/Repair

Fasciclin II, APP, and Synapse Development

James Ashley, Mary Packard, Bulent Ataman, and Vivian Budnik
(see pages 5943–5955)

This week, the amyloid precursor protein (APP) protein escapes from the pages of the Neurobiology of Disease section of the *Journal* to make a case for itself at the fly neuromuscular junction (NMJ). Ashley et al. address a possible signaling role of the IgG homophilic cell adhesion molecule Fasciclin II (FasII) in synaptic bouton formation. Previous studies have shown that FasII constrains synapse formation at the *Drosophila* larval NMJ. The authors report that this function of FasII required presynaptic expression of the *Drosophila* homolog of APP, APPL, and depended on a balance between presynaptic and postsynaptic expression levels of FasII. When FasII was overexpressed on only one side of the synapse, bouton production fell. However, increasing FasII in both presynaptic and postsynaptic cells dramatically increased synaptic boutons. The effect appeared to arise from a signaling complex including the intracellular domain of FasII APPL and the PDZ (postsynaptic density-95/Discs large/zona occludens-1)-containing adaptor protein dX11.

■ Behavioral/Systems/Cognitive

Fictive Quadrupedal Walking

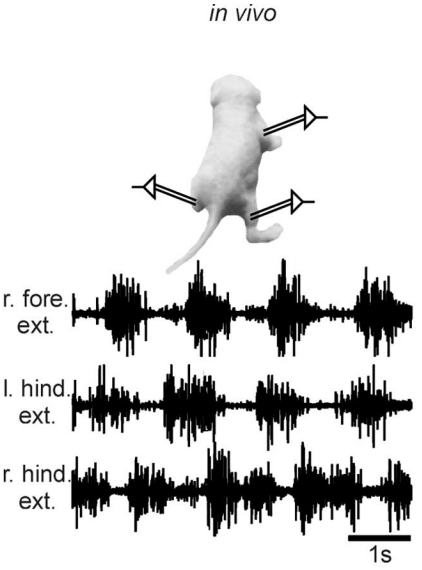
Laurent Juvin, John Simmers, and Didier Morin
(see pages 6025–6035)

It seems to come naturally and early for four-legged animals. Coordinated locomotion in quadrupedal animals develops shortly after birth, controlled by spinal central pattern generators. This week, Juvin et al. use a neonatal *in vitro* rat spinal cord preparation to explore not only the "half-center" modules that control limb movement but also the interlimb coordination that produces gait. Electromyograms in freely moving neonatal rats were compared with *in vitro* measurements. A mixture of serotonin, NMDA, and dopamine *in vitro* produced coordinated rhythmic activity in cervical and lumbar ventral roots. The alternating firing patterns corresponded to those controlling forelimb and hindlimb activity, producing "fictive" movements. The patterns suggested extensive propriospinal connections between the cervical and lumbar generators. Functional disconnection of cervical and lumbar segments revealed that neither generator acted as a pacemaker but that each had intrinsic rhythmic properties. A caudorostral excitability gradient emerged in gait control. Rats have rear-wheel drive it seems.

♦ Neurobiology of Disease

Headache Relief for the Rat

Michael Jochen Marco Fischer, Stanislav Koulchitsky, and Karl Messlinger
(see pages 5877–5883)



Electromyographic recordings of extensor muscles (ext.) of the right forelimb (r. fore.) and bilateral hindlimbs [left hindlimb (l. hind.) and right hindlimb (r. hind.)] during locomotion. See the article by Juvin et al. for details.

Endogenous neuropeptides act as powerful neuromodulators both centrally and peripherally. One of these, calcitonin gene-related peptide (CGRP), is expressed by primary nociceptors, and its release has been linked to increased thermal and mechanical nociception, neurogenic inflammation, and migraine headaches. This week, Fischer et al. tackle headache-related pain in a rat model. The first nonpeptide antagonist of the CGRP receptor, BIBN4096BS, has been shown in initial clinical trials to reduce migraine pain, and it quiets central trigeminal neuron activity. Here the authors recorded from neurons of the spinal trigeminal nucleus (STN) that receives afferent nociceptive input from the parietal dura mater. They exposed the dura to heat and cold stimuli. Intravenous, but not topical, application of BIBN4096BS significantly reduced spontaneous STN activity, suggesting antagonism of CGRP at central trigeminal afferents. When the dura was thermally stimulated to 44°C, neuronal firing greatly increased and was attenuated by intravenous CGRP antagonist.