

# This Week in The Journal

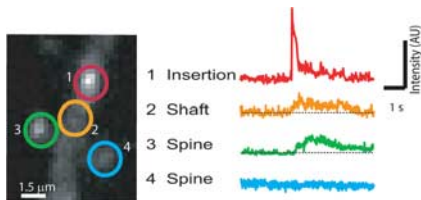
## ● Cellular/Molecular

### *Watching the Insertion of AMPA Receptors*

Guillermo A. Yudowski, Manojkumar A. Puthenveedu, Dmitri Leonoudakis, Sandip Panicker, Kurt S. Thorn, Eric C. Beattie, and Mark von Zastrow

(see pages 11112–11121)

This week Yudowski et al. give a new definition to “AMPA receptor minis.” Instead of monitoring the response of postsynaptic receptors to packets of transmitter release (the usual definition of a “mini”), the authors monitored packets of postsynaptic receptors as they were inserted into the postsynaptic membrane. The authors tagged receptor subunits with a pH-sensitive fluorescent label that was activated when the acidic vesicular interior met the neutral extracellular media. Once in the membrane, AMPA receptors moved at two distinct rates; some dissipated within hundreds of milliseconds, whereas other spots stayed clustered for 5–10 s before drifting apart. Chemical stimulation of release increased insertion. Both the transient and persistent insertion events occurred throughout the length of dendrites but never within dendritic spines. Rather, labeled AMPA receptors appeared to reach nearby spines by lateral diffusion from the transient exocytotic insertions.



The panels show the insertion of AMPA receptors into a dendritic membrane (red circle, left panel) and then lateral dispersion to adjacent spines and dendritic shaft (green, blue, and orange, respectively). See the article by Yudowski et al. for details.

## ▲ Development/Plasticity/Repair

### *Fate Mapping Cortical Interneurons*

Matthew Fogarty, Matthew Grist, Diego Gelman, Oscar Marín, Vassilis Pachnis, and Nicoletta Kessaris

(see pages 10935–10946)

Cortical interneurons march to their own drummer when it comes to their path to the cortex. In this issue, Fogarty et al. used fate mapping to examine the origin of interneurons from subsets of precursor cells in the subpallial neuroepithelium. Using Cre-lox technology in transgenic mice, the authors took advantage of region-specific expression of homeobox transcription factors. Cells expressing Nkx2.1 in the medial ganglionic eminence (MGE) gave rise to interneurons expressing mainly calbindin, parvalbumin, and somatostatin (SST). Calretinin (CR) and SST-expressing Martinotti cells arose from precursors in the dorsal MGE that expressed Nkx6.2 and Lhx6, as did some neuropeptide Y (NPY) cells. Most CR and NPY interneurons began as precursor cells in the lateral/caudal ganglionic eminence (LGE/CGE) that expressed Gsh2. Now if you can remember all those acronyms, you can find the birthplace of your favorite interneuron.

## ■ Behavioral/Systems/Cognitive

### *The Control of Human Locomotion*

Yuri P. Ivanenko, Germana Cappellini, Nadia Dominici, Richard E. Poppele, and Francesco Lacquaniti

(see pages 11149–11161)

This week, Ivanenko et al. looked for universal control elements in different forms of human locomotion. Subjects walked, ran, and hopped over the ground, on a treadmill, even in the air suspended from a harness. Sounds like fun, eh? Video data were collected from infrared markers placed along the body from the pelvis to the foot and from a force plate under the “ground” surface. Subjects were also asked to walk with crouched knees, with knees locked, and to step over an obstacle, in order to isolate kinematic variables. Not surprisingly, walking and running gaits differed fundamentally, even at the same speeds. The walking leg acts as a rigid strut, but during running it compresses like a spring. Hopping contained

elements of both gaits. Each gait could be defined by two whole-limb components, namely limb axis length and orientation. The authors contend that to simplify control of locomotion, the brain employs a modular strategy, coordinating whole limbs rather than their individual components.

## ◆ Neurobiology of Disease

### *The Many Faces of SCN1A Mutants*

Raffaella Rusconi, Paolo Scalmani, Rita Restano Cassulini, Giulia Giunti, Antonio Gambardella, Silvana Franceschetti, Grazia Annesi, Enzo Wanke, and Massimo Mantegazza

(see pages 11037–11046)

Franck Kalume, Frank H. Yu, Ruth E. Westenbroek, Todd Scheuer, and William A. Catterall

(see pages 11065–11074)

Even the same mutation in genes encoding voltage-gated sodium channel subunits can cause different types of seizures, confounding efforts to match a genotype with an epileptic phenotype. Two papers this week make strides towards understanding the mutant genotype of the devastating Severe Myoclonic Epilepsy in Infancy (SMEI) phenotype. Kalume et al. studied a mouse with a loss-of-function mutation in  $Na_v1.1$  that mimics SMEI, including severe ataxia. The authors traced the poor coordination, tremor, and hypotonia in these mice to a reduction in excitability of Purkinje neurons. Mice heterozygous for the mutation displayed milder ataxia. Rusconi et al. looked at another  $Na_v1.1$  loss-of-function mutation in the C-terminal cytoplasmic domain, M1841T. This mutation causes familial epilepsy with a range of phenotypes. Co-expression of the  $\beta 1$  accessory subunit partially rescued lost sodium currents in cells transfected with this mutant  $Na_v1.1$  without altering the functional channel properties. Sodium currents were also temperature sensitive, indicating that the M1841T mutation causes a trafficking defect.