

# This Week in The Journal

## ● Cellular/Molecular

### *Complement and Neonatal Brain Ischemia*

Complement Activation Contributes to Hypoxic–Ischemic Brain Injury in Neonatal Rats

Rita M. Cowell, Jennifer M. Plane, and Faye S. Silverstein  
(see pages 9459–9468)

Complement can be thought of as the “enforcer” of the innate and humoral immune system. Complement is triggered by injured tissue components such as phosphatidylserine, mitochondria, or naked DNA. Components of the complement cascade act as inflammatory mediators, tag cells for phagocytosis by macrophages, and form the ominous-sounding, lethal membrane attack complexes. Although the cascade certainly contributes to neuronal damage in CNS disorders, there is conflicting evidence for its role in hypoxia–ischemia. Cowell et al. readdressed the issue using a neonatal rat model of focal cerebral hypoxia. They detected complement by Western blot as soon as 8 hr after injury, and immunofluorescence revealed the C3 and C9 components on endothelial cells and dying neurons. Pretreatment with cobra venom factor (CVF), a homolog of the recognition factor C3b that depletes systemic complement, reduced infarct size. However, complement could still be detected in lesioned brain, suggesting that there was also local production of complement, probably by microglia. Interestingly, C3 immunoreactivity was present in neonatal but not adult brain, suggesting that the immature brain may be more susceptible to the actions of complement.

## ▲ Development/Plasticity/Repair

### *Patterning of a Sensory Epithelium*

Planar and Vertical Signals Control Cellular Differentiation and Patterning in the Mammalian Cochlea

Mireille Montcouquiol and Matthew W. Kelley  
(see pages 9469–9478)

The organ of Corti is an unusually complex sensory epithelium with cells arranged in a distinctive mosaic pattern that is crucial for hearing: a single row of inner hair cells, a row of pillar heads, and at least three rows of outer hair cells. The development of the organ, with its characteristic one and a half turns, begins at embryonic day 11.5 and progresses over the next week in a wave-like manner from base to apex. The factors responsible for this developmental patterning are not clear, particularly regarding whether the signals are intrinsic or extrinsic to the cochlea. Montcouquiol and Kelley make a case for factors originating in the plane of the epithelium (planar signals) and from the underlying mesenchyme (vertical signals). They used whole, basal, or apical pieces of cochlea cultured *in vitro*. Apical pieces failed to differentiate or form cell patterns correctly and did not express the transcription factor *Math-1*, which is necessary for hair cell development. However, whole cochlea formed normally even without its associated mesenchymal tissue. Thus the main signals required for development originate within the cochlea, possibly as diffusible messengers but more likely arising from cell–cell interactions.

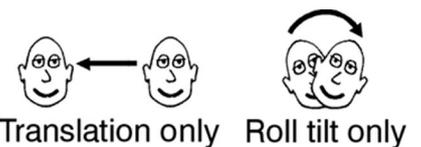
## ■ Behavioral/Systems/Cognitive

### *Keeping the Eyes on the Prize*

Resolution of Sensory Ambiguities for Gaze Stabilization Requires a Second Neural Integrator

Andrea M. Green and Dora E. Angelaki  
(see pages 9265–9275)

The vestibulo-ocular reflex (VOR) allows us to maintain a stable image of the world as we move through it, our heads tilting, turning, and moving with us. The reflex is managed by various sensory afferents: semicircular canal signals are thought to mediate the rotational VOR elicited by a head tilt resulting in ocular torsion; otolith afferents are responsible for stabilization of lateral head movements with a translational VOR resulting in horizontal compensatory eye movements. The problem is that otolith afferents are activated similarly during translation or tilt, but the behavioral responses are appropriately different. How does the vestibulo-ocular system distinguish between them? Green and Angelaki examined four movements in monkeys: tilt, translation, or combined in the same or opposite directions. Because otolith afferents respond to both types of movement, the combined movements resulted in either a doubling or canceling of these afferent responses, confirming that extra-otolith signals are required. Accordingly, the authors incorporate an additional neural integrator element into their model, which they propose may represent a “velocity storage integrator.”



Examples of translational and rotational motion stimuli used by Green and Angelaki.