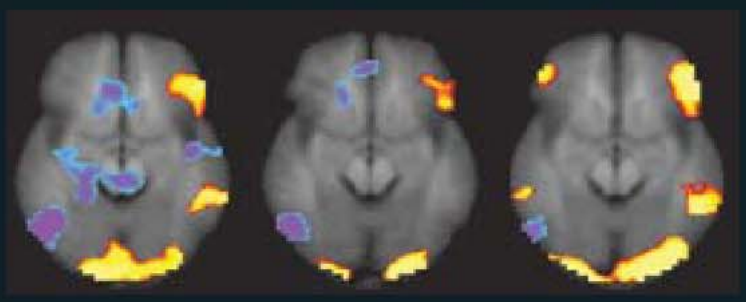
Phonics Could Prevent Dyslexia

A recent brain imaging study may provide good news for dyslexics and debate fodder for certain educators. Using functional magnetic resonance imaging, Yale University professor Sally E. Shaywitz and her colleagues have identified what appear to be two distinct types of dyslexia-related reading disorders, one of which may result from ineffective reading instruction early in life.

Shaywitz studied the neural activity of 27 normal readers, 19 "accuracy-improved readers" who have learned to read more accurately by going at a slow pace, and 24 "persistently poor readers" who struggle with both speed and comprehension. Images showed that the slow but accurate readers did not activate the same brain regions when reading as the normal subjects, suggesting that they lacked some standard neural circuitry but their brains had compensated with other pathways.

More surprising, though, was the discovery that persistently poor readers showed brain activity in some of the same regions as normal readers. "It tells us that the system is there for reading but that it hasn't been properly activated," Shaywitz says. The poor readers also showed activity in a brain region associated with memory retrieval. She concludes that poor readers, instead of translating letters into words as normal readers do, were trying to identify words by rote memory.

If true, her view could further inform the debate over how best to teach reading to elementary school children. Advocates of phonics—a rigorous study of the relation between letters and sounds—maintain that this approach is more effective than the "whole language" method, which is based on the belief that children naturally learn to recognize words through reading and writing. Many schools now use both approaches, although some experts say that children in general, and especially those who may have some level of dyslexia, need stronger phonics work. J. Thomas Viall, executive director of the International Dyslexia Association, hopes that studies such as Shaywitz's will convince educators to favor phonics. "For the most part we've failed miserably in translating research into practice," he says. *—Daniel Cho*



Slow readers (*center*) lack standard brain circuitry (*yellow*), but oddly, poor (*right*) and normal (*left*) readers use similar regions.

Half a Brain More

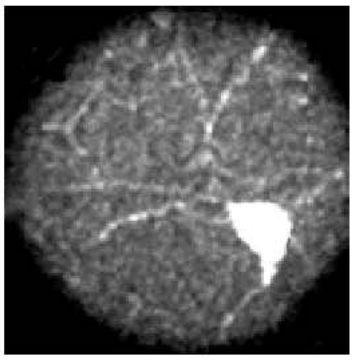
The basic model of brain function has been established for years: nerve cells (neurons) communicate across tiny gaps (synapses) and establish networks of connections that allow us to think, remember and jump for joy. That understanding could change dramatically if new findings about the role of glial cells—long considered to do little more than maintain a healthy environment for neurons—prove out.

The brain has even more glial cells than neurons. In the past several years, sensitive imaging tests have shown that glia communicate with neurons. And in November neuroscientist R. Douglas Fields and graduate student Beth Stevens of the National Institute of Child Health and Human Development presented evidence at a Society for Neuroscience meeting that glia also communicate among themselves, in a separate but parallel network to the brain's neural network. The glia use chemical messaging, mediated by calcium, whereas neurons use electrical messaging via neurotransmitters.

Fields and others are beginning to show that by communicating, glia regulate the formation of synapses and even which connections get stronger or weaker over time—the essence of learning and storing long-term memories. If this role can be confirmed, it would mean that glial cells greatly influence how well the human brain performs. Experts are cautious about assigning new prominence to glia too quickly, yet they are excited. "Cellular neuroscientists are beginning to feel as though half the brain has gone largely unexplored," Fields says. *—Mark Fischetti*

Single Neuron Spied

For years, researchers have wanted to look at individual neurons in living brains. Now they can, thanks to a new, incredibly small endoscope. Mark Schnitzer developed the stiff fiber-optic instrument, which has lenses as small as 350 microns in diameter, while at Lucent Technologies's Bell Labs. After fluorescent dye is injected into the tissue, the scope's laser sends photons to illuminate the neurons. Detectors in the lens capture the fluorescence, and software constructs the image. The instrument, used in lab animals so far, can resolve objects that are only several microns in size—small enough to see individual cells and their long, thin dendrites. Schnitzer, who is now an assistant professor at Stanford University, says that researchers are already using the tool to study how animals store long-term memories and that it could someday help detect brain cancers and blood clots, reducing the need for surgical test procedures. *—Daniel Cho*



Individual neuron (*white*) from a zebra finch brain.

COURTESY OF SALLY E. SHAYWITZ (*top*); COURTESY OF MARK SCHNITZER (*bottom*)