**NEUROBIOLOGY**

**Immune Molecules Prune Synapses In Developing Brain**

The complement cascade is part of the body’s innate immune defense: a protein work crew whose duties include tagging bacteria and other bad guys for elimination. A new study suggests that complement proteins may have a surprising yet analogous function in the developing brain, tagging unwanted synapses for removal. The work also hints that these proteins may promote synapse loss in early stages of neurodegenerative disease.

“It’s a pretty provocative finding,” says Greg Lemke, a neurobiologist at the Salk Institute for Biological Studies in San Diego, California. “This is part of a growing body of evidence that many molecules of the immune system have a second set of jobs in the brain,” says Lisa Boulanger, a neurobiologist at the University of California, San Diego.

**PHYSICS**

**Simple Scheme Stores Light by Converting It Into Vibration and Back**

A few years ago, physicists slowed light to a crawl and then stopped it entirely (Science, 26 January 2001, p. 566). To do that, they exploited strange quantum-mechanical interactions between light and atoms in a gas, converting a pulse of light into a subtle arrangement of spinning atoms. On page 1748, three physicists report a simpler way to hit the brakes: They convert light into an optical fiber and then back into light.

“This has the enormous advantage of simplicity,” says Stephen Harris, an applied physicist at Stanford University in Palo Alto, California, and a pioneer of the atomic techniques.

“Conversely, it can’t do some things that the other techniques can.”

To store a pulse of laser light in a cloud of atoms, researchers shine a second laser into the cloud at the same time. The overlapping light fields interact with the atoms in a way that greatly decreases the light’s speed. The light also nudges each atom into a strange quantum-mechanical condition in which it spins in two different directions at once. The precise spin mixture varies from point to point in the cloud, effectively freezing the light pulse into the atoms when the reference laser is turned off and holding it until the laser comes back on. Others have managed to store light by shunting it into tiny optical “resonators” for a fraction of a nanosecond.

To find another way, Zhaoming Zhu and Daniel Gauthier of Duke University in Durham, North Carolina, and Robert Boyd of the University of Rochester, New York, opted for an optical fiber. They fed a “data” pulse in one end and a short, intense “write” pulse in the other. When the two collided, the data pulse disappeared and was replaced by a vibration crawling along at just 1/40,000 the speed of light in a fiber. To convert the vibration, which was fixed by the properties of the fiber, the researchers showed they could store a train of three 2-nanosecond pulses and retrieve it as much as 12 nanoseconds later.

The new technique works for any frequency of light that will pass through the fiber, Gauthier says. The atomic and resonator techniques generally work at one frequency.

The conversion doesn’t depend on quantum mechanics, notes Lene Hau, a physicist at Harvard University and one of the first to stop light. That should make the effect more robust but rules out truly bizarre embellishments. For example, Hau and colleagues have encoded a light pulse in one cloud of atoms and revived it in another cloud by letting a few atoms drift between the two, as they reported 8 February in Nature. Such a feat would be impossible with the fiber technique. Still, Hau says, “it’s very important to try different systems.”

The atomic systems might someday provide the memory for quantum computers, Harris says. Gauthier sees more immediate uses for the fiber-optic approach. For example, it might be used to measure the correlations between signals in optical networks. But first researchers must increase the storage time and reduce the power in the read and write pulse from a walloping 100 watts. That’s enough to shake up anybody.

—ADRIAN CHO