a fetus has long been the chief suspect. Such asphyxia could result in brain injury in which motor coordination is lost.

But earlier research led Wu and her colleagues to suspect that inflammation plays a role as well. Those studies turned up high concentrations of inflammatory molecules called cytokines in the blood of infants later diagnosed with cerebral palsy (SN: 10/17/98, p. 244).

The inscrutable origin of cerebral palsy suggests that a combination of factors is at work, says Karin B. Nelson, a pediatric neurologist at the National Institute of Neurological Disorders and Stroke in Bethesda, Md. “Things that cause rip-roaring infections are usually not what cause cerebral palsy,” or we’d have known it by now,” she says. But a subtle infection, together with a clotting abnormality or a period of low oxygen in the womb, “could zap a fetus that might have been robust enough to withstand any one of these,” she says.

Indeed, inflammatory proteins might interact with clotting factors—which are abundant in pregnant women—in some way that leads to brain damage, Wu and her colleagues hypothesize. Magnetic resonance imaging in the new study showed that many babies with cerebral palsy had brain damage similar to that seen after strokes, Wu notes.

This and the previous work should change how doctors treat pregnant women who show warning signs of inflammation in the womb, says Larry C. Gilstrap, an obstetric gynecologist at the University of Texas Health Science Center at Houston. Any pregnant woman with an infection of the fetal membrane or uterus, or whose “water breaks”—meaning the membrane has ruptured—should be treated promptly with antibiotics or induced to deliver if she is close to term, he says. —N. SEPPA

COLORFUL CHARACTERS Although the terra-cotta warriors excavated so far have lost their original color coats, a novel restoration technique could preserve the paint layer (inset) on the thousands of warriors that remain in the ground.

The March of History
Terra-cotta warriors show their true colors

The terra-cotta warriors buried near the tomb of the first Chinese emperor, Qin Shihuangdi, present a fierce challenge—to modern-day chemists. Since the site’s discovery near Xi’an, China, in 1974, archaeologists have unearthed more than 1,500 of the life-size figures. But once the warriors see the light of day after more than 2,200 years of burial, their paint disappears, sometimes within minutes of exposure.

With an estimated 8,000 more figures still buried, scientists have been looking for ways to lock the paint in place. Now, a group of chemists in Germany has a technique that just might work.

The warriors were originally coated with polychrome—a material consisting of a lacquer base topped by a layer of pigment, explains Heinz Langhals at the University of Munich. Because water-saturated soil at the site has altered the lacquer, he says, the coating cracks and peels off once the warriors are removed from their soil encasements. Researchers have tried different polymer-based materials to strengthen the polychrome and secure it to the terra-cotta surface, but the polymer molecules have been too big to penetrate the coating.

Langhals and his colleagues decided to use hydroxyethyl methacrylate—an organic monomer used to make many plastics. The researchers studied cotton compresses with the monomer and a polymerization agent and applied the preparation to terra-cotta fragments from a broken warrior. The water-soluble monomer diffused through the lacquer coat, partially replacing the water in the coat’s tiny pores.

Then, using an electron accelerator, the researchers irradiated the fragments with electron beams. The electrons activated the polymerization agent, which stitched the monomers together into polymers, consolidating the polychrome. The researchers describe the restoration technique in the Dec. 1 Angewandte Chemie.

Lake Retreat
African river valley once hosted big lake

The valley of the White Nile, one of two main tributaries of Africa’s longest river, may long ago have held a shallow lake that sprawled 70 kilometers across and stretched more than 500 km along the river.

Satellite images clearly show a continuous string of arc-shaped features that extends about 280 km southward from Esh Shalal, Sudan, along the eastern margin of the White Nile valley. Previous ground surveys found that the elevations of those landforms vary by no more than 2 meters, says
This Won’t Hurt...
Tiny needles deliver drugs painlessly

Microscopic needles may one day join hypodermic needles and drug-loaded patches as a way to get medicines into the bloodstream. Whereas syringes hurt and patches work only for small molecules, painless microneedles could deliver medicinal proteins and other large molecules through the skin, say developers of the technology.

Mark R. Prausnitz of the Georgia Institute of Technology in Atlanta and his colleagues describe new methods for making arrays of both solid and hollow microneedles, as well as the first proof of the efficacy of hollow microneedles. They report their findings in the Nov. 25 Proceedings of the National Academy of Sciences.

The solid needle would work by riddling the skin with tiny holes, allowing drugs from an overlying patch or on the needles themselves to seep into the body.

To make it to the clinic, however, microneedles will need to be mass-producible and cheap, says Prausnitz. His team used microfabrication and etching techniques to create molds hosting up to 1,000 solid microneedles in a thumbnail-size piece of silicon, metal, or polymer. Filling the forms with metals or polymers resulted in hair-thin needles no longer than 4 millimeters, which the company hopes to market in 2 to 5 years. —K. RAMSAYER

Protein Portal
Enzyme acts as door for the SARS virus

A year ago, a mystery virus began to kill people in China. Causing an illness dubbed severe acute respiratory syndrome (SARS), the virus quickly spread beyond Asia and for a few months stirred fears of a worldwide epidemic.

With stunning speed, scientists identified the virus and decoded its genetic sequence (SN: 4/20/03, p. 262). Now, a research team has claimed victory in the race to identify the cellular receptor—the protein to which the virus attaches when it infects cells—for the SARS virus. Since the protein turned out to be a well-known one that had previously been implicated in heart disease, drugs that target the receptor are already under development. Some of those same compounds might serve as antiviral medications for SARS patients, say researchers.

Michael Farzan of Brigham and Women’s Hospital in Boston and his colleagues went fishing for the receptor with a lure made of the protein on the surface of the SARS virus that docks with the cell’s receptor. They burst monkey-kidney cells, which the virus easily infects, and then cast the viral-surface molecule into the resulting debris.

The SARS-receptor molecule latched on to three proteins, but only one of these, angiotensin-converting enzyme 2 (ACE2), is typically found on the surface of mammalian cells.

Several subsequent experiments, reported in the Nov. 27 Nature, make the case that the human form of ACE2 is a SARS-virus receptor. First, human-kidney cells engineered to produce ACE2 fuse with cells engineered to make the SARS virus’ surface molecule. Second, cells engineered to mass-produce ACE2 were more readily infected by the SARS virus than were normal cells. Third, an antibody to ACE2 slowed the replication of the virus in cells bearing the enzyme.

“We nailed it. It’s lock-solid” that ACE2 is a receptor for the SARS virus, says Farzan.

Another virologist trying to identify the receptor agrees. The results are “very convincing,” says Dimitr S. Dimitrov of the National Cancer Institute in Frederick,