Behavior

The brain's memory helpers

Individuals routinely call to mind memories of events they have experienced, but scientists are just beginning to understand how the brain makes this possible. A new study suggests that separate brain systems store and recall incidents in one's life; moreover, each of these systems relies on its own helper areas that specialize in what happened, where it occurred, or when it took place.

The findings, published in the Oct. 1 PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES, support earlier evidence that the left side of the prefrontal cortex always participates in the acquisition of novel information, whereas the right prefrontal cortex consistently aids in remembering that material later on (SN: 7/6/96, p. 5). Each prefrontal area belongs to a general memory network that receives dispatches from hard-bitten neural correspondents interested only in the contents, location, or time of various events, assert psychologist Lars Nyberg of Umeå University in Sweden and his colleagues.

Twelve volunteers age 19 to 40 completed trials in which they read two series of words presented individually on a computer screen. Words appeared randomly on the left and right sides of the screen. Positron emission tomography (PET) scans were taken during three pairs of tasks: Participants studied the words and later tried to pick them out of a longer list; they memorized the left or right placement of words and later attempted to remember those positionings; and they studied which words appeared in the first and second series and later tried to divvy words into the correct lists.

Increased blood flow, signifying greater brain activity, appeared in the left prefrontal cortex during the three learning trials and in the right prefrontal cortex during the three memory trials. Each task also boosted activity in specific cerebral spots. For instance, the learning of word locations was accompanied by blood-flow surges in right brain tissue toward the back of the head, an area that has been implicated in the coordination of spatial knowledge.

"It's exciting that scientists are starting to locate brain areas involved in specific aspects of event memories," remarks neuroscientist Randy L. Buckner of the Massachusetts General Hospital-Nuclear Magnetic Resonance Center in Charlestown. "We'll be seeing much more of this type of research."

Baby talk: From hand to mouth

When mothers speak to their infants with the slowed cadence, exaggerated emotion, and simple words typical of baby talk, the tots pay far more attention than when their moms talk to them as they would to an adult. When deaf mothers communicate with their deaf babies, the same pattern emerges—the infants show more interest in the baby talk version of sign language than in adult-oriented maternal signing, reports psychologist Nobuo Masataka of Kyoto University in Japan.

"Human infants may have an equal capacity to attend to [baby talk] characteristics in speech or sign," Masataka contends in the September DEVELOPMENTAL PSYCHOLOGY.

Mothers' signed baby talk consists of a slowed presentation of individual signs, exaggerated hand and arm movements, and frequent repeating of signs, he notes. Masataka showed videotapes of deaf mothers employing signed baby talk or adult-directed signs to a dozen 6-month-old, deaf babies of other deaf mothers. Signed baby talk evoked longer glances and indications of a more positive emotional state, according to two independent observers.

The ability of infants to focus preferentially on their mother's baby talk may provide them with the perceptual building blocks for babbling, a major step toward language use, Masataka suggests. Babbling, with voice or hands, emerges by around 10 months of age in both hearing and deaf babies (SN: 3/30/91, p. 205).

Science & Society

Foreign aid's grainy dividends

To improve wheat and rice crops in developing nations, the United States contributed $134 million between 1970 and 1993 to the Consultative Group on International Agricultural Research (CGIAR), a global network of 16 research centers and other organizations. Though offered as humanitarian aid to help alleviate hunger, this foreign investment has reaped enormous domestic dividends, according to a new analysis by one of CGIAR's member organizations, the International Food Policy Research Institute (IFPRI) in Washington, D.C.

Currently, the United States produces about 12 percent of the world's wheat—some 65 million metric tons a year valued at $7.7 billion. Its rice harvests, worth $1.3 billion annually, represent almost one-fifth of this cereal traded internationally.

Many of the high-yield strains planted in the United States today are derived from varieties developed at CGIAR's wheat improvement center in Mexico and its rice research institute in the Philippines. Chief among these high performers are semidwarf varieties: shorter plants that direct an unusually high proportion of their energy into producing grain rather than stalks and leaves. Roughly 60 percent of U.S. wheat comes from semidwarf plants, as does 75 percent of domestic rice.

Philip G. Pardey of IFPRI and his colleagues tracked the number of acres planted in grains from CGIAR lines since 1970. They then compared old yields to new ones and tallied the market value of the difference. New rice breeds increased the value of U.S. harvests by at least $30 million and perhaps by as much as $1 billion. Improved wheat yields netted the U.S. economy an extra $3.4 billion to $13.7 billion.

Overall, new wheat and rice breeds developed by CGIAR's centers "have allowed us to feed an additional 1.5 billion people over the last 2 decades," Pardey observes. They have also "reduced the production costs of U.S. wheat and rice farming, making bread, pasta, and a host of other products cheaper for the consumer."

Getting rid of chemical weapons

On Sept. 18, for the second time in its first full month of operation, a chemical weapons incinerator at the U.S. Army's Tooele (Utah) Depot was shut down to fix internal leaks. Tooele, the first full-scale facility to eliminate deadly nerve and mustard agents, has been a source of controversy since it was first proposed (SN: 12/10/94, p. 394; 8/31/96, p. 135).

Hoping to head off similar problems with other stockpiled chemical weapons, the Army commissioned the National Research Council to evaluate five disposal alternatives to burning the chemicals now stored at two of seven sites—one holds a cache of mustard agent and the other contains nerve agent VX. All five technologies showed promise, notes Richard S. Magee, a mechanical engineer at the New Jersey Institute of Technology in Newark and chairman of NRC's evaluation panel. However, he notes, only two had been tested on a large scale with actual weapons agents.

These two "neutralization" technologies also met more of the Army's criteria than the others did, including the ability to destroy agents almost completely, to work at low temperatures and pressures, and to be ready for scaling up within a couple of years. In a Sept. 24 report, Magee's panel recommends testing the two methods further.

To neutralize mustard agent, scientists mix it with water at 90°C. A chemical reaction leaves behind thiodiglycol and a small amount of hydrochloric acid. Adding sodium hydroxide limits the production of unwanted by-products. The resulting solution can be broken down further—perhaps with detoxifying bacteria. A similar technology that uses liquid sodium hydroxide instead of water destroys the nerve agent VX.