Behavior

Out-of-order memories

Repression has long been regarded as a kind of motivated forgetting of highly emotional or threatening memories. More recently, critics of recovered memories of childhood sexual abuse have attacked repression as a concept bereft of scientific support.

A new study suggests that at least one form of repression does exist but that it stems from rearranged remembrances rather than buried memories. Attempts at suppressing thoughts about an event may slice a unified memory into static snapshots that often get recalled out of sequence, assert psychologist Daniel M. Wegner of the University of Virginia in Charlottesville and his coworkers. As a result, the snapshots lose their meaning as a story of what happened and fade from memory, the researchers theorize.

"It appears that people can consciously produce effects that look like memory repression," Wegner contends.

If further work confirms these findings, it will provide a new way to think about memories of traumatic events, the Virginia researcher holds. Trauma researchers have proposed that such experiences are imprinted on the brain as sensations or feeling states, which cannot be integrated into a verbal story of what happened. Amnesia or intrusive flashbacks of these "memories beyond words" then occur.

Another possibility, Wegner now suggests, is that efforts to avoid thinking about a traumatic encounter create a disorganized jumble of memory snapshots. Then either recall of the event dissolves completely, or a few particularly horrible scenes remain to haunt the individual, he argues.

Similar disruptions of memory may occur outside the realm of trauma, Wegner adds, as when people try not to think about embarrassing events or information that must be kept secret.

In a pair of experiments conducted by Wegner's group, 227 college students watched a 35-minute clip from one of two feature films. Each clip contained a coherent, nontraumatic story with a beginning, climax, and end.

Some participants leaving the lab were given no instructions about the film; others were told either not to think about the film or to think about it constantly.

Five hours later, volunteers who had tried to suppress all thoughts of a film committed substantially more errors than the others in recalling the sequence of cinematic events, the researchers report in the October JOURNAL OF PERSONALITY AND SOCIAL PSYCHOLOGY. These participants were also more likely to describe their memories as resembling snapshots than a moving film.

Memory of specific events from the films was comparable in the three groups, the psychologists assert.

Anatomy of apprehension

Fear gnaws at the amygdala, an almond-shaped lump of tissue located near the center of the brain. Moreover, the sight of frightened faces selectively sets off neural activity in this structure, indicating that it specializes in tracking signs of threat and danger in the social world, a new investigation finds.

Earlier studies of monkeys and people had shown that damage to the amygdala makes it difficult to learn to fear potentially painful stimuli and to recognize fear in others' faces.

Raymond J. Dolan of the Wellcome Department of Cognitive Neurology in London and his colleagues took positron emission tomography (PET) brain scans of five adults as they viewed photographs showing fearful or happy faces of varying emotional intensity. The left side of the amygdala showed much more activity, as signified by increased blood flow, in response to fear than to happiness. As the fear perceived in the photos grew in intensity, so did neural activity in the amygdala, Dolan's team asserts in the Oct. 31 NATURE.

Biochemistry

Molasses recruits bacteria for cleanup

From the 1940s to the 1960s, workers at U.S. Army bases that manufactured 2,4,6-trinitrotoluene, or TNT, for weapons routinely flushed out the plants to reduce the risk of accidental explosions. Although that practice ensured worker safety, the wastewater left a legacy of TNT-contaminated soil.

To correct this problem, scientists are now using a sweet, gooey incentive to recruit another army—of bacteria. Mixing molasses into vats of soil encourages the bacteria naturally present to multiply. As the microbes munch on the molasses, they simultaneously break down the TNT into harmless molecules.

In a pilot study, researchers at Argonne (Ill.) National Laboratory treated 12,000 pounds of TNT-laced soil from the nearby Joliet Army Ammunition Plant. They mixed 300-gallon batches of soil and water in bioreactors and added a few kilograms of molasses each week. In a matter of weeks, the TNT concentration plummeted from a high of 7,000 milligrams per kilogram of soil to just 20 mg per kg.

A threshold level of bacterial activity must be reached for significant TNT degradation to begin, says Mark L. Hampton of the Army Environmental Center in Aberdeen, Md., which sponsored the study. Unrefined, agricultural-grade molasses is a great bacterial food source, says John Manning of Argonne's Environmental Research Division. "It has lots of sugars, proteins, and amino acids. A little goes a long way."

Although scientists aren't sure which bacteria are doing the work, this remediation process is attractive because it doesn't introduce any foreign microbes to the soil, says Hampton. In addition, bacterial activity seems to return to normal levels once the molasses is completely consumed.

This bioreactor process joins incineration and composting as Army-approved methods for cleaning up contamination. In many cases, cost determines the choice of method, Hampton says. The bioreactor process compares well to composting, which costs about half as much as incineration. The researchers are exploring the even cheaper possibility of adding molasses directly to the contaminated ground.

The method can be used to clean up other kinds of contamination too, including chlorinated solvents, wood-preserving chemicals, and petroleum (SN: 4/14/90, p. 236). "Explosives are tougher compounds to degrade than others," Hampton says, so most likely the technique will work for other contaminants.

Magnetic bacteria probe for proteins

Bacteria that fabricate magnetic particles use them as compasses to orient themselves to Earth's magnetic field (SN: 6/8/91, p. 367). Now, scientists are trying to use these bacterial magnets too—to separate proteins from a solution.

Researchers at the Tokyo University of Agriculture and Technology have demonstrated a way to harvest magnetic particles from bacteria and attach them to antibodies that bind the mouse protein immunoglobulin G. After letting the particles attach to the protein in solution, the researchers use a magnet to pull the complex to the side of the container. Then, the scientists make the complex luminescent so they can identify it easily. They describe their work in the Oct. 15 ANALYTICAL CHEMISTRY.

Magnetic particles are already being manufactured for these separation techniques, says Jim Richey of PerSeptive Biosystems in Framingham, Mass. For example, researchers have used manufactured particles to find fetal cells in maternal blood (SN: 11/2/96, p. 276).

Researchers have yet to synthesize particles as small as the ones bacteria make, however, manufactured particles are about 1 micrometer in diameter; bacterial particles are about one-tenth that size and therefore remain dispersed in a solution longer, says report coauthor Tadashi Matsunaga.