Stress hormones hike emotional memories

Intense feelings triggered by a stressful or emotional event help preserve memories of that experience, in large part by activating a class of stress hormones responsible for storing emotionally charged information, according to a report in the Oct. 20 NATURE. Drugs widely used to combat high blood pressure and heart disease block these hormones and apparently worsen memories of emotional and exciting events, the study concludes.

These findings contrast with evidence that although people place great confidence in vivid recollections of thoughts, feelings, and activities at the time of learning of a startling event, these so-called flashbulb memories prove highly inaccurate (SN: 3/13/93, p.166).

"Memory is fallible in the real world, but stronger emotional experiences make for stronger, more reliable memories," contends James L. McGaugh, a psychologist at the University of California, Irvine. "We now have a laboratory example of this process and how it works biologically."

McGaugh collaborated with Irvine psychologist Larry Cahill and two cardiologists at the Long Beach (Calif.) Veterans Affairs Medical Center, Bruce Prins and Michael Weber.

They presented 19 women and 17 men with one of two recorded stories, each accompanied by 12 slides that portrayed the story. The emotionally neutral story described a boy's visit to a hospital and his observation of a surgical team performing a disaster drill. The emotionally arousing story told of a boy critically injured and rushed to a hospital for emergency surgery.

One hour before exposure to the stories, volunteers received either a placebo pill or propanolol, a drug that lowers blood pressure by blocking beta-adrenergic stress hormones. Earlier studies with animals had suggested that activation of these hormones enhances memories of stressful events.

One week after the story was presented, participants took a memory test. They reported everything they could remember about the story and then answered multiple-choice questions.

Participants given placebos displayed much better memory of emotional segments of the arousing story than of any part of the neutral story. Those who took propanolol remembered markedly less about the emotional story than their placebo counterparts did, but the drug did not harm their memory of the neutral story.

Emotional experiences spark the release of adrenergic hormones, which strengthen memories of those events, McGaugh theorizes. This process may foster the intrusive memories that haunt people afflicted with post-traumatic stress disorder, he adds.

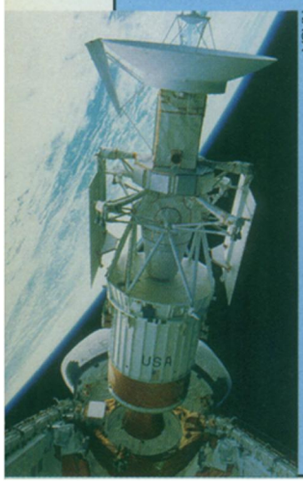
Studies that emphasize errors in flashbulb memories have looked at recall of events, such as the space shuttle explosion, that elicit great emotion in some volunteers and lesser responses in others, McGaugh says. By failing to distinguish between the two groups, these projects have failed to pick up the memory boost provided by emotional arousal, he argues. — *B. Bower*

Magellan's last gasps leave a puzzle

With the Magellan spacecraft nearly out of fuel, ground controllers last week commanded the craft to take a fatal plunge into Venus' thick atmosphere. The craft, which had orbited Venus for 4 years and used radar to image the cloud-bedecked planet, fell silent on Oct. 12 and probably crashed the following day.

But Magellan's swan song proved even more memorable than expected. The craft's last transmissions suggest that some sections of Venus' upper atmosphere may have a much different density distribution than predicted.

Magellan beamed down the puzzling data during experiments designed to measure atmospheric forces on the dying craft as it explored regions some 163 to 147 kilometers above Venus' surface.



NASA

Magellan's 1989 launch via the space shuttle.

"We're still trying to sort all this stuff out; [it may be] that the atmospheric density is not what we expected it to be," says Robert H. Tolson, a George Washington University researcher based at NASA's Langley Research Center in Hampton, Va.

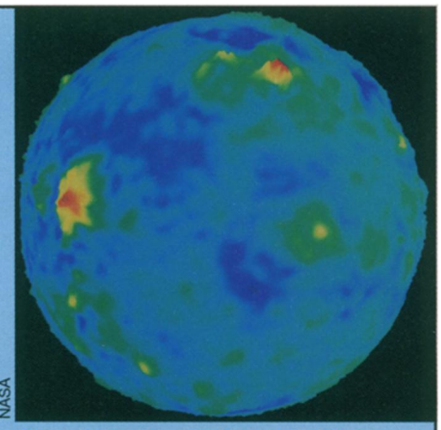
In the experiments, scientists oriented the craft's two wing-like solar panels to resemble a windmill's blades. The force required to keep the craft from rotating provided a measure of how atoms and molecules in the atmosphere interacted with the craft. The data may guide future planetary missions.

Tolson and his colleagues conducted windmill experiments last month at altitudes from 180 to 172 km above Venus. Atomic oxygen dominates this part of the planet's atmosphere, just as it does regions above Earth in which many satellites orbit. The effects of drag on the craft roughly matched predictions, Tolson notes.

Last week, Magellan descended to denser parts of the Venusian atmosphere, regions rich in carbon dioxide. Here, windmill experiments revealed that the craft had to fire its thrusters far less often than anticipated to keep the craft from spinning.

According to Tolson, the data have two possible explanations. Either the thrusters were more powerful than believed, a scenario he deems unlikely, or the densities of the atmosphere roughly 160 to 150 km above Venus are one-half the estimated values. Tolson notes that at about 138 km, the closest Magellan came to the planet while still transmitting data, the inferred density was about 1.5 times as large as predicted. This may indicate that the density rose rapidly between 147 and 138 km.

On Oct. 11, Magellan descended to 138 km in the early evening, local time on Venus. The planet's nightside is far more turbulent than its dayside; Tolson speculates that some of the turbulence may have disturbed the atmosphere encountered at twilight by Magellan.



NASA

Newest gravity map from Magellan shows that tallest features (red and yellow) sit above the densest (red) parts of Venus; dark blue is lowest density.

Such musings have more than academic interest. The Mars Global Surveyor, planned for launch in 1996, will encounter an atmosphere around the Red Planet also rich in carbon dioxide, though far more tenuous than Venus'. Some of the latest Magellan findings may apply to that mission. Last year, Magellan became the first craft to use a planet's atmospheric drag to lower its orbit, so that it could generate a high-resolution gravity map of Venus. The Surveyor craft also will employ "aerobraking" to study Mars. — *R. Cowen*