Behavior

Factual brains, uneventful lives

Beth, Jon, and Kate lose track of their lives every day. Since childhood, each of them—now age 14, 19, and 22, respectively—has found it nearly impossible to remember what just happened. School buildings and other familiar places always look new and prove easy to get lost in; the youngsters need frequent reminders of the times of class meetings, scheduled appointments, and even major holidays; and each day's telephone conversations, messages, and visitors drain quickly into a well of forgotten incidents.

Everyday memory losses such as these make life so difficult and potentially dangerous that Beth, Jon, and Kate's parents must provide them with constant supervision.

But there's a kicker: The three memory-deprived young people have attended mainstream schools, where they attained good speech and language skills, read and spelled as well as most of their peers, and acquired loads of factual knowledge.

A study of these unusual individuals in the July 18 SCIENCE indicates that fact (or semantic) memory and event (or episodic) memory derive largely from separate areas of the brain. The hippocampus, a small brain structure that has long been tied to memory, regulates recall of personal experiences but plays only a minor role in the accumulation of factual knowledge, concludes a research team headed by neuroscientist Faraneh Vargha-Khadem of University College London Medical School.

Severe brain seizures afflicted Beth shortly after birth, Jon by age 4, and Kate at age 9. Brain scans show that each of them has incurred extensive damage to the hippocampus, with surrounding regions having been spared, the scientists report.

Hippocampal destruction in monkeys stifles memory in ways similar to the episodic evaporation noted in humans, they add. After such damage, for example, monkeys lose their way in familiar surroundings but recognize experimental stimuli that yielded rewards in prior training sessions.

Parts of the brain's outer layer, or cortex, may formulate contextfree semantic memories, Vargha-Khadem and her coworkers theorize. Context-rich, episodic memories require additional interventions by the hippocampus and adjacent neural tissue, they suggest. —*B.B.*

Heading out of the hippocampus

Despite the hippocampus' powerful influence on episodic memory, other brain areas may independently gather and retrieve information that animals use to orient themselves in a new setting, according to a report in the July 8 PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES.

This surprising finding is compatible with the notion that parts of the cortex can facilitate some facets of spatial memory, even without an intact hippocampus, hold Edward J. Golob and Jeffrey S. Taube, both psychologists at Dartmouth College in Hanover, N.H.

Golob and Taube trained seven rats to search for food pellets placed at random in variously shaped enclosures by first orienting themselves with respect to a colored cue card taped to the wall; the card served as a constant reference point. Most or all of each rat's hippocampus was then removed.

Afterwards, when the rats searched for food in unfamiliar enclosures, brain cells at sites outside the hippocampus emitted electrical discharges keyed to the animals' head directions, just as they did before the hippocampal damage. Over several days of testing, a particular test space evoked the same neural response pattern at those brain sites.

Cortical structures related to vision may absorb information about the spatial features of new surroundings, the researchers suggest. Animals may then retrieve that information on return trips and use it to gauge the direction in which they're facing. —*B.B.*

Earth Science

El Niño gathers steam in the Pacific

Ocean temperatures along the west coast of South America have climbed so quickly in recent months that they have taken climate experts by surprise. The warming, called El Niño, has already altered weather in the Pacific and promises to disrupt North America's winter, according to forecasters.

"We've got some excitement. The warm episode is galloping along at a pretty good pace. Since it's getting so warm so fast, the question is now whether we've got another record breaker," says Chester F. Ropelewski of the National Oceanic and Atmospheric Administration (NOAA) in Camp Springs, Md.

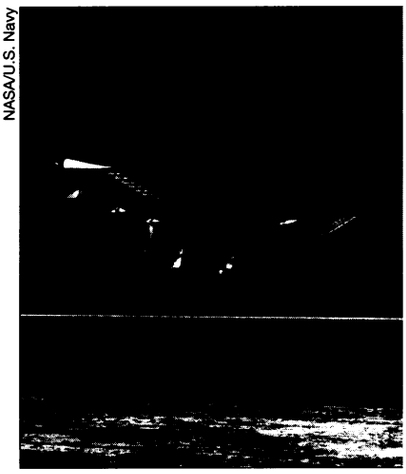
El Niño, an irregularly recurring phenomenon, shifts warmth from the western equatorial Pacific to the central and eastern parts of the ocean. Thunderstorms move eastward at the same time, and atmospheric winds follow abnormal patterns, skewing weather around much of the globe. Climate researchers first detected signs of the current El Niño this spring (SN: 5/24/97, p. 316).

In July, sea surface temperatures off Peru registered more than 4°C above normal, and a broad tongue of warmth reached along the equator toward the International Date Line, according to a July 15 NOAA advisory. In certain regions, the anomalies—the difference between current and average temperatures—ranked second only to those witnessed during the El Niño of 1982–1983, considered the strongest this century.

The rapid warming has some researchers wondering whether the current El Niño will set any new records. Computer climate models have it persisting through the first half of 1998. Meteorologists are building the Pacific conditions into their forecasts for winter, when El Niño traditionally exerts its strongest grip on U.S. weather. The winter forecast from NOAA's Climate Prediction Center calls for above average temperatures across the northern United States and through California, Nevada, and Arizona. The forecast also predicts above-average precipitation in the Southwest and along the Gulf Coast and Southeast coast. —*R.M.*

Flying on sunlight

A solar-powered, unmanned plane soared to 71,500 feet above Hawaii this month, breaking the altitude record for propeller-driven aircraft, reports NASA.



NASA/U.S. Navy

Solar-powered Pathfinder takes off on record flight.

Called Pathfinder, the craft has a 99-foot-long wing covered with black solar panels that power the plane's six electric motors. Pathfinder also carries backup batteries that generate electricity after dark.

NASA is developing remotely piloted planes to provide scientists with new options for carrying instruments into the atmosphere. In theory, solar-powered robotic planes could remain aloft for days or weeks, observing ocean storms, volcanoes, croplands, Arctic ice, and other items of interest.

In its recent Hawaiian flight, Pathfinder carried only an anemometer, to measure winds. Engineers are now outfitting the craft with a digital camera and other instruments. In upcoming flights, the plane will measure sediment and algae in coastal waters and assess the health of reefs, says Jeffrey E. Bauer of NASA's Dryden Flight Research Center in Edwards, Calif. —*R.M.*

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