Behavior

Emotional judgments seek respect

Like milk left out in the midday sun, judgment curdles when exposed to the heat of emotions, according to folk wisdom. A new study, however, concludes that a brain structure deeply enmeshed in emotion lends insight to risky decisions.

The results support a theory that emotions incited by the rewarding or punishing outcomes of risky decisions generate physiological responses—such as a racing heart beat and a queasy gut—that then act as cues for making future choices.

Decision making relies on the amygdala—an inner-brain area that helps regulate emotion—and a separate frontal-brain region, says a team of neuroscientists led by Antoine Bechara of the University of Iowa College of Medicine in Iowa City.

"Our findings suggest that the amygdala is a critical structure in a neural system necessary for . . . implementing advantageous decisions," Bechara's group concludes in the July 1 JOURNAL OF NEUROSCIENCE.

The scientists studied 13 healthy adults, 5 patients with extensive amygdala damage, and 5 patients with frontal-brain damage that disrupts decision making (SN: 3/22/97, p. 183).

All participants completed a task in which they turned over cards from four decks, one card at a time, to find those bearing cash rewards and to avoid those carrying cash penalties. The researchers arranged two decks to yield an overall profit and two decks to generate a financial loss.

Although all participants had normal IQ scores, both groups of brain-damaged patients lost money on this task, while most healthy volunteers picked cards that produced a profit. Moreover, healthy volunteers displayed lowered skin resistance to a mild electric shock—a sign of physiological arousal—as they considered picking from riskier decks. The healthy participants thus may have used emotion-related bodily responses as decision guides, the scientists argue.

Frontal-lobe patients did, however, show signs of physiological arousal after selections, but amygdala patients did not.

Amygdala damage may disconnect emotionally charged bodily states from specific experiences, the researchers hold. As a result, they say, these patients may walk into oncoming traffic or act in other potentially dangerous ways. Destruction of the frontal-lobe area makes it hard to integrate related physiological responses, such as those experienced during card selection, they theorize.

Edmund T. Rolls of the University of Oxford, England, challenges this proposed anatomy of decision making. He argues that the amygdala and related frontal-brain regions mediate conscious feelings, but other neural areas that have little to do with judgment handle bodily responses to emotions.

Physiological states may sometimes steer risky decisions, comments Elizabeth A. Phelps of Yale University. But patients with amygdala damage often exhibit no serious decision-making problems, she says, raising doubts about whether that structure plays a pivotal role in judgment. —*B.B.*

Drug deaths by the week

The number of recorded deaths in the United States regularly rises in the first week of each month, a pattern largely due to deaths involving substance abuse, report sociologist David P. Phillips of the University of California, San Diego and his colleagues. Federal benefits distributed at the start of the month may, in some cases, fund drug or alcohol purchases that raise the likelihood of lethal outcomes, the scientists assert in the July 8 NEW ENGLAND JOURNAL OF MEDICINE.

Phillips' group examined data from all U.S. death certificates between 1973 and 1988. From 1983 to 1988, the number of deaths involving substance abuse and external factors, such as homicide, were markedly higher in the first week of each month than in the last week of the preceding month. —*B.B.*

Biology

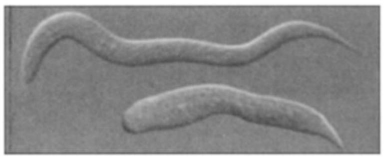
From Charlottesville, Va., at the annual meeting of the Society for Developmental Biology

The long and short of worm development

"How do you take a round ball of cells and turn it into a long, thin worm?" wonders Judith Austin of the University of Chicago. That's what *Caenorhabditis elegans* does midway through its development. Within an hour or two, the worm more than triples its length, without adding any new cells.

To answer Austin's question, imagine squeezing a ball of pizza dough into a thinner shape. The same phenomenon explains the rapid elongation of *C. elegans*, says Austin.

She and her colleagues hit upon this answer when they found a mutant strain of the worm that turns out much shorter than normal. They tracked down the mutant gene responsible and determined that it produces a protein unable to help reorder the meshwork of fibers that forms a skeleton within worm cells.


Austin

Normal (top) and mutant (bottom) worm.

In normal worms, the protein, dubbed SMA-1 for small-1, aids in rearranging these fibers into long, parallel bundles. Since these fibers connect to the cell surface, the process changes the shape of individual cells from spherical to elongated. Presto, one long worm. —*J.T.*

What's DNA got to do with it?

Sperm are the ultimate smart missiles. Each contains half the genetic information required to transform a single cell, the egg, into an organism composed of thousands to trillions of cells. Yet, a fertilized egg usually doesn't employ its genes, including the half donated by the sperm, until after a few cell divisions. Does a sperm's DNA have any function before then?

Diane C. Shakes of the College of William and Mary in Williamsburg, Va., answered that question, at least in the worm *C. elegans*. She and her colleagues identified mutant worms whose sperm precursor cells lacked nuclei and the DNA they would normally contain. Surprisingly, these round cells mature into elongated cells that crawl like normal worm sperm cells. Moreover, when the mutant male worms breed with females, the DNA-bereft sperm still crawl to the oviduct and penetrate egg cells.

Each fertilized egg cell even establishes two distinct halves, along what is called the anterior-posterior axis. Scientists knew that the sperm's point of entry helped determine this axis, but this finding shows that the sperm's DNA plays no role in the process, says Shakes. —*J.T.*

One, two, ... 20,000 slime mold cells

The next time proud parents go on about how their young child has learned to count, point out that a single-cell organism, *Dictyostelium discoideum,* can do the same or better. If starved, *D. discoideum* cells aggregate into mushroomlike structures. The top part, the fruiting body, then floats away in search of a more nutrient-rich environment. This survival strategy depends on accurate counting, notes Richard H. Gomer of the Howard Hughes Institute at Rice University in Houston.

If an aggregate contains many fewer than 20,000 cells, its stalk won't be high enough for the fruiting body to fly very far. If the aggregate contains too many cells, the stalk buckles. Gomer's team found that *D. discoideum* secretes a small protein, countin, that helps cells sense how many relatives are around them. When the cells can't make countin, they can't gauge the number of cells in the starvation-induced aggregate. The mushroomlike structure gets too big and collapses. —*J.T.*