BEHAVIOR

Monkey see, monkey remember

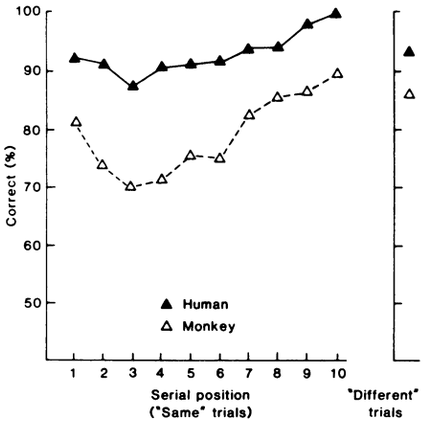
A monkey sits facing two screens as photos of 10 distinctly different items (fruits, flowers, animals, people, etc.) are flashed on the upper screen for one second each. Then a probe item is shown on the lower screen, and the animal has two seconds to push a lever that indicates "same" or "different," depending on whether or not the probe is a member of the original series of items. Correct responses earn the monkey a squirt of orange juice, a banana pellet or some apple sauce. This procedure, which is used in experimental studies of short-term memory, is called the serial probe recognition (SPR) task.

A young woman sits in the same room and participates in the same experiment (without the benefit of banana pellets or other edible rewards). Her responses are compared with those of the monkey, and the results are reported in the Aug. 22 SCIENCE by Stephen F. Sands of the University of Texas at El Paso and Anthony A. Wright of the University of Texas Health Science Center in Houston.

While the animal didn't exactly make a monkey of its human counterpart, it did do surprisingly well. Overall accuracy for the 5-year-old rhesus was 86 percent; for the woman, 93 percent. Two sessions of 140 10-item lists were conducted daily for a total of 840 trials with the monkey and 70 with the woman.

Thousands of training trials (beginning with such things as learning to respond "same" to pictures of similar objects) were needed to teach the monkey this game, but the results were much better than previous experiments would have predicted. "Our success with the monkey," explain the researchers, "was due to a procedure that minimized proactive interference (memory of earlier items adversely affecting performance on later ones)." Their procedure used a much larger pool of stimulus items (211) than had been used in experiments by most other researchers. The larger number of items minimized the chance of the animal responding "same" to an item in one series of 10 that had appeared in a previous series. Separate experiments using a smaller pool substantiate this. "The resulting good performance," say the researchers, "permits explorations of similarities and differences between human and animal memory, furthering our understanding of both."

And one of these similarities has been found already. On a test like the SPR, subjects almost always will identify correctly the probe item as "same" if it is the same as the 10th item in the series. The further back in the series the "same" item appears, however, the lower the chance of its being identified correctly—except for the first item in the series, which usually has a high retention value. Item three, for example, is the most often missed by both monkeys and humans. A graph showing the percentage of correct responses to each of the 10 items in the series yields a serial position curve. The researchers report a "striking correspondence" between human and monkey serial position curves and cite this as evidence that the mechanisms of human and primate memory systems are similar. "Thus," they conclude, "our procedure may allow us to model the human memory system with the rhesus monkey."



BIOLOGY

Sending proteins on their way

To scientists who envision bacterial cells as animal protein factories, purification of the product will be a challenge. It would be easier if the desired protein could be retrieved, properly trimmed and released from loading docks outside the plant, rather than in an unfinished form from the rubble after the whole factory has been destroyed.

Walter Gilbert and colleagues at Harvard University have demonstrated that bacterial cells can recognize the "secrete" signals attached to immature proteins of higher organisms, and bacteria can secrete and trim some animal proteins appropriately. In the July PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES, Karen Talmadge, Jim Kaufman and Gilbert say that the bacterial ability to secrete animal proteins "suggests the mechanism of secretion is both general and ancient." For proteins that are normally secreted, such as insulin, interferon and human growth hormone, the scientists suggest if the gene for the immature product can be inserted in an appropriate place in the bacterial DNA, the bacterium will excrete the mature protein, free of any bacterial sections.

The hypothesis that a tag of amino acids directs a protein's secretion from the cell has been championed by Günter Blobel of Rockefeller University (SN: 7/30/77, p. 73). This so-called "signal hypothesis," however, has recently come under fire as being incomplete.

A team led by Maxime Schwartz at the Institut Pasteur in Paris fused the gene of a bacterial protein that is normally secreted with the gene of a protein that is not secreted. The product, although it contains the complete 24-amino acid "signal," remains in the bacterial cell, Schwartz reports in the July 24 NATURE.

A report from the Massachusetts Institute of Technology also suggests that more than the signal sequence is involved. Douglas Koshland and David Botstein, looking at a different protein in a different bacterium, found that if the protein lacked 21 amino acids at the end opposite the signal sequence, it was not transported across the cell membrane. Koshland and Botstein conclude in the July CELL, "...the synthesis and removal of the signal sequence are not sufficient for secretion."

Deer go underground—safely

The first large-scale attempt at re-routing deer migration to avoid highway traffic has been declared a "tremendous success" by the U.S. Forest Service. Since interstate 80 opened ten years ago, along a 55-mile stretch west of Laramie, Wyo., more than 1,000 deer have been killed as they crossed between their winter and summer homes. Scientists at the Rocky Mountain Station's Forest, Range and Watershed Laboratory in Laramie counted deer tracks in the snow and found that 80 percent of the deer crossed the highway in a single 8-mile stretch. The Wyoming Highway and Game and Fish Departments constructed underpasses to the highway specifically for animal use. They then built an 8-foot high, 8-mile long deerproof fence along both sides of the road to funnel animals into the underpasses. In fall 1977 deer approaching the fence appeared apprehensive and paced up and down the fence for as long as three months before crossing, the Forest Service reports. In February of that year bait of alfalfa hay, apple pulp and vegetable cuttings lured stragglers into the underpasses. The baiting has not been necessary in subsequent years. And, according to the Forest Service, accidents along that stretch have been reduced from an average of 60 per year to near zero.

The biggest problems now are holes deliberately or accidentally cut in the fence and motorists who stop to photograph the animals and in doing so scare them away from the underpasses.