
SCIENCE & TECHNOLOGY

Lest We Forget

"Is Human Memory Obsolete?" by W. K. Estes, in *American Scientist* (Jan.-Feb. 1980), 345 Whitney Ave., New Haven, Conn. 06511.

Able to store millions of bits of data and retrieve them in microseconds, computers put human "short-term memory"—which handles new information and problem-solving—to shame. Technological advances are bound to make small computers as common as typewriters. Will humans soon be able to leave all short-term memory tasks to electronics?

No, says Estes, a Harvard psychologist. Granted, short-term human memories can store only the equivalent of half a dozen words or digits (e.g., a telephone number), while short-term computer (core) memories can store several million. And where human brains normally need between 0.5 and 1 second to accurately recall the simplest information, computers need only one-millionth of a second.

Such comparisons are misleading. Computer memories store information as discrete items in coded form. No connections are made. Electronic memory banks are thus little more than huge lists, or storerooms. Experiments indicate that human memory retains items in the form of pictures of events and their attributes, not as units. When a human brain memorizes a word, it also memorizes a large amount of rather vague information about the word's properties—sound, length, visual appearance, uses—rather than a simple coded symbol. Though a human's short-term memory capacity for storing discrete bits is small, no computer can match its ability to store and use this less precise data.

Human memory, writes Estes, sacrifices "high fidelity" for flexibility. The brain can continually reorganize information to cope with new but comprehensible experiences. Man's surroundings change constantly. No conceivable machine could guide him through life's frequent adventures.

*Quasar
Mysteries*

"Quasars Confirmed" by Stephen P. Maran, in *Natural History* (Feb. 1980), Membership Services, P.O. Box 6000, Des Moines, Iowa 50340.

The discovery of quasars in 1961 challenged both common sense and the cosmological theory of the universe's origin. If, as scientists' measurements indicated, these cosmic sources of radio waves were further from the Earth than most known galaxies, they had to be unimaginably powerful energy sources.

The cosmological theory holds that all objects in space are rushing away from one another, with the furthest receding the fastest. Spectrographic photographs that reveal the elements from which stars and galaxies are made allow astronomers to measure speed and distance. The faster an object travels, the more its elements' readings cluster at the red end of the light spectrum—a phenomenon called "red shift."