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."

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Quasars' huge red shifts suggest that many are 1 billion light years away. But the notion of objects 1/30,000th the size of Earth's Milky Way Galaxy generating 1,000 times its total energy seemed impossible to many scientists.

Recent findings, however, by a University of Hawaii astronomer confirm the cosmological origin of quasars, reports Maran, a NASA staff scientist.

Astronomers had previously devised a theoretical "proof" of quasars' cosmological origins, pegged to the accepted belief that the red shift of galaxies resulted from the universe's expansion. If it could be determined that quasars characteristically occurred within the remotest, faintly visible groups of galaxies and displayed similar red shifts, then the common origin of these shifts would be undeniable.

Alan Stockton of the University of Hawaii was the first to systematically search the vicinity of large numbers of known quasars for evidence of these galaxy groups. Of the 27 quasars Stockton surveyed in the late 1970s, 17 were located near a total of 29 faint galaxies. When he measured the red shifts of 25 of these galaxies, he found that 13 corresponded to readings from the "nearby" quasars. Stockton calculated the odds against this being coincidence at 1.5 million to 1. In his view, the 12 galaxies that differ in speed from their local quasars are foreground objects much nearer to Earth than their photographs indicate.

Stockton's findings, says Maran, remind scientists how little they know of deep space by showing the universe to be filled with objects defying human comprehension.

RESOURCES & ENVIRONMENT

Get the Lead Out

"Lead in Albacore: Guide to Lead Pollution in Americans" by Dorothy M. Settle and Clair C. Patterson, in *Science* (Mar. 14, 1980), 1515 Massachusetts Ave. N.W., Washington, D.C. 20005.

Scientists have seriously misgauged the amount of poisonous industrial lead that has gotten into American and foreign diets, contend Settle and Patterson of the California Institute of Technology's Division of Geological Sciences. Reason: Researchers have consistently overestimated the normal ("naturally occurring") lead levels in the Earth's air and water.

The authors write that world lead production has risen from about 160 tons annually in 3000 B.C. (when smelting was developed) to 3 million tons today. Lead pollution is so pervasive now that even the seemingly low lead concentrations in the cleanest environments are