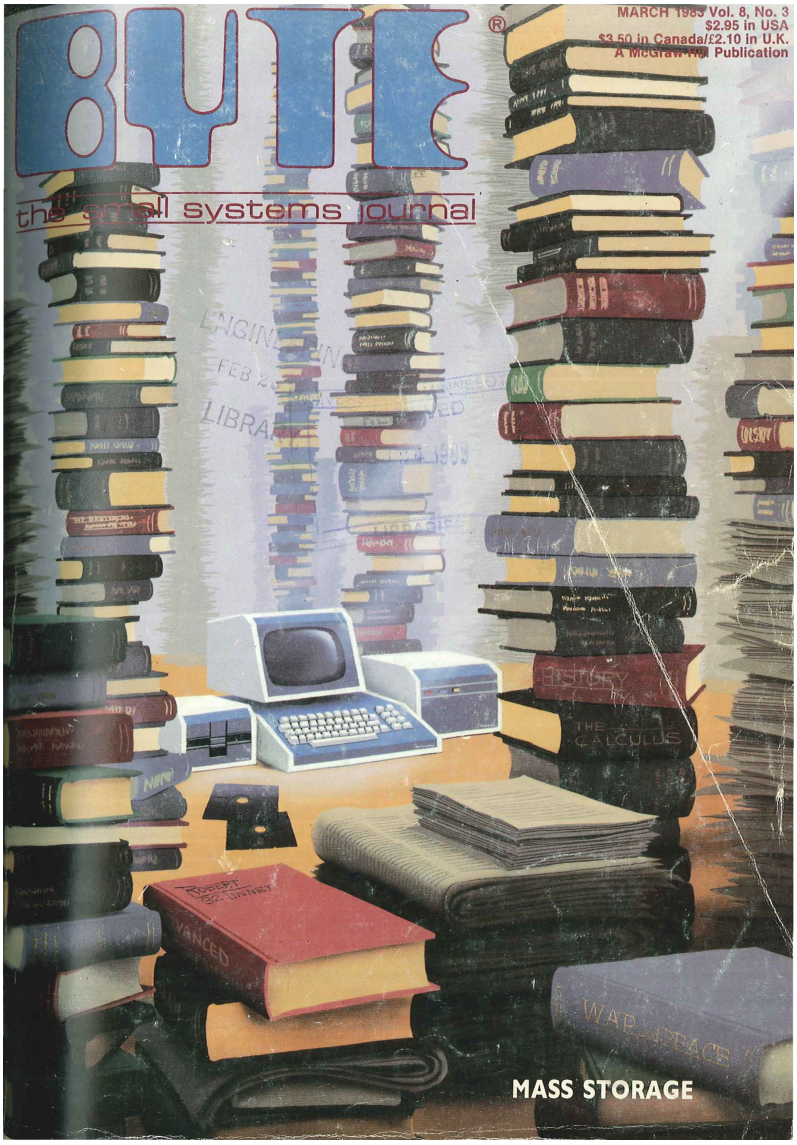

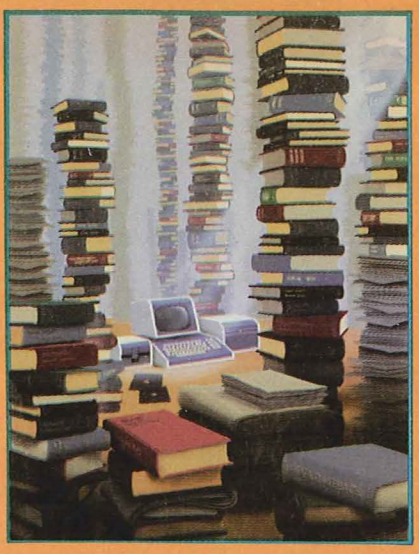

In This Issue

Sophisticated new operating systems and multitasking software promise to alter significantly the way we use personal computers. Because of the large memory requirements of the new software, we're sure to see changes for the better in the nature of external storage devices. New technologies for mass storage will become even more critical as the software revolution continues to escalate. As Robert Tinney's cover suggests, personal computers will need a large quantity of high-speed mass storage to hold all the software and other data that we'll generate. Our theme articles address the latest developments in mass storage. Clark E. Johnson Jr. discusses "The Promise of Perpendicular Magnetic Recording," Tom Moran looks at "New Developments in Floppy Disks," Edward Rothchild writes about "Optical-Memory Media," Larry Sarisky explores the question "Will Removable Hard Disks Replace the Floppy?" Jim Toreson concentrates on "The Winchester Odyssey," and in the first of a three-part series Andrew C. Cruce and Scott A. Alexander discuss "Building a Hard-Disk Interface for an S-100 Bus System." Plus we have part 2 of "NAPLPS, A New Standard for Text and Graphics," the second installment in the VIC-20 series, "Adding a 3K-Byte Memory Board," a review of MP/M II from Digital Research, and BYTE's Game Grid. Steve Ciarcia tells you how to "Build the ECM-103, an Originate/Answer Modem," and more.

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Features

Reviews

Nucleus

Will Removable Hard Disks Replace the Floppy?

Improved data-storage technologies may eventually eliminate floppy disks.

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The floppy-disk drive has been the method of choice for data storage for several years now. But like all de facto standards, its dominance is being challenged, in this case by the development of a new storage medium—the removable hard-disk cartridge.

The cartridge appears to offer all the advantages of the floppy disk as well as increased storage capacity and access speed. But before describing this new method of data storage, let's take a look at how and why floppy disks were developed.

When IBM introduced the System/360 computers, their low-level microcode programs were stored in read-only memory (ROM). By the time the IBM 370 was developed, however, semiconductor technology had advanced so far that microcode storage could be implemented in semiconductor memory. This memory was volatile, so a microcode loading-and-storage device was necessary. Magnetic tape was considered, but the need for loading diagnostic programs as well as microcode presented a problem. So and drive that provided the random-access speed needed for diagnostic-program loading. This low-cost, flexible disk gave IBM an economical random-access program-loading device. And once such a device was available, it was easy to add a write capability for data storage. Semiconductor technology and the IBM 370 had set the stage for the floppy disk, the data-storage medium that helped launch the small-computer revolution.

Newer microprocessors can make use of virtual storage only with the faster access speeds offered by hard disks.

The revolution, however, was spearheaded not by IBM but by independent manufacturers of floppy disks such as Shugart Associates and Memorex, who saw the value of low-cost, random-access storage for smaller computers. By 1975, 27 independent suppliers were producing 8-inch floppy-disk drives.

The new medium for storage

About the Author
Larry Sarisky is the vice-president of sales and marketing for Syquest Technology. He has more than 12 years' experience in marketing

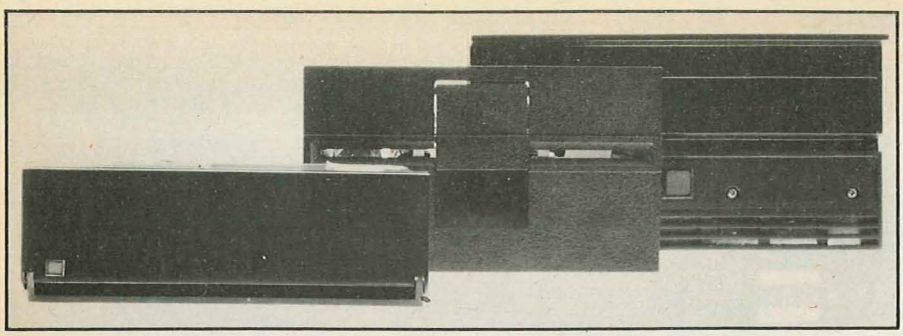

Photo 1: *A size comparison of the 3.9-inch removable hard-disk cartridge drive with standard 5¼- and 8-inch floppy-disk drives. The cartridge drive is 1.625 by 4.8 by 8 inches.*

Business Week reported in a May 17, 1976, article, "Each standard disk (floppy) has the data-storage capacity of 3000 punched cards. The disks are also reusable, easier to store and mail, and inexpensive." The article also predicted that "a new market segment is opening up thanks to the development of the cheapest of computers—the microprocessor or computer-on-a-chip."

As these prophetic words were written, Shugart Associates was developing a lower-cost 5¼-inch flexible-disk drive. It was this drive that signaled the decline of cassette tape. The 5¼-inch floppy-disk drives and media cost less than comparable cassette-based storage. They offered an average access time of about half a second compared to the cassette's 20 seconds. And their error rate was two orders of magnitude better than that of cassettes.

The Winchester Disk

While lower-cost 5¼-inch floppy disks gained most of the attention in 1976, Memorex saw another IBM-developed storage technology that could be used in small computers. Its Model 601 hard disk was the first small Winchester system to be available from a source other than IBM. By protecting the read/write heads and disk platters in a sealed environment, the Winchester could deliver higher data-storage capacities, faster access, and greater reliability at a lower cost per byte. While the 601's disk diameter was a hefty 14 inches, successive Winchester-technology disk drives reduced it to 8 inches and then 5¼ inches.

The history of disk storage has been a tale of increasing compactness. The first 14-inch Winchester-type drives paralleled established storage-module devices. The 8-inch Winchester followed the 8-inch floppy disk. The 5¼-inch drive was compatible in size with its corresponding

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