The PREVIOUS Computer


I still remember the first computer that I ever owned. It was a TRS-80 with 4K primary memory and a cassette tape recorder for secondary storage. It had BASIC built into the system. A few months after I bought the machine, an upgrade to 16K of memory became available. 16K seemed like a lot of memory at the time.

At about the same time there were a variety of other pre-assembled microcomputers coming to market. The 8K PET from Commodore was quite popular with many people, as was the 16K (and later, 48K) Apple. But that was a long time ago—nearly a dozen years. Recently the world of computing was hit by a media blitz orchestrated by Steve Jobs, unveiling the NeXT computer. Jobs was one of the founders of the Apple Corporation. A few years ago he left Apple and started a new company called NeXT. Their first computer is aimed at the college market and carries a price tag of $6,500.

It is amusing to compare the NeXT computer with some of the previous computers mentioned above. The NeXT computer comes with an eight megabyte memory, which is 2048 times the memory of my original TRS-80, or 1024 times the memory of the 8K PET. Quite a change in just a dozen years.

But that is just a small part of the change. The NeXT computer has a 32-bit CPU, versus the 8-bit CPU in the earlier machines. It also has a math co-processor which does floating point arithmetic operations quite rapidly. It is not easy to precisely compare the speeds of different computers. However, I estimate that the NeXT computer is effectively about a thousand times as fast as the early microcomputers mentioned above.

Secondary storage using a cassette tape recorder was common on the early microcomputers. It was a pain in the neck. Performance was often unreliable, and saving or loading a program could take several minutes. The development and introduction of floppy disk systems was a major breakthrough, although a pair of floppy disk drives initially cost about the same as all the rest of a microcomputer system. I remember being quite impressed by the ability to store about 100K bytes on a floppy disk; a program could be reliably saved or loaded in a few seconds.

The NeXT computer uses an optical storage disk system for secondary storage. It has a storage capacity of about 250 megabytes, and access time of a small fraction of a second. An optical disk cartridge, which is somewhat smaller than a pocket paperback, retails for about $50, and stores the equivalent of several hundred pocket books. As compared to cassette tape recorders and the early floppy disk systems, the gain in capacity is more than a factor of 1,000.

For an extra $2,000 one can purchase a 400 dots-per-inch laser printer to go along with the NeXT computer. (The laser printers that currently dominate the market are 300 dots per inch.) A dozen years ago a 10 character per second, upper case only, impact printer with essentially no graphic capabilities retailed for about $3,000.

It would be easy to continue the comparison. The high-resolution graphics display, high fidelity sound reproduction, the audio input digitizer, and the operating system are all noteworthy when compared to the previous computers. Steve Jobs even assures us that voice input to his new
computer will eventually be available. I find such comparisons both exciting and depressing. It is wonderful that such a powerful computer will soon become available to some college students and university faculty. But, meanwhile, our precollege educational system will continue to make do with slight upgrades of the previous computers, even continuing to buy many more of these machines. The gap between the state of the art and what is available to most precollege students is rapidly widening.

It would be easy to call for governmental action to solve the problem of the growing technological gap between precollege schools and the state of the art. Unfortunately, most legislatures seem to be turning a deaf ear to such requests. Most likely, schools can expect only a modest rate of growth in their computer facilities over the next few years.

But the situation is far from hopeless. Many schools now have enough computer facilities to begin to make a significant difference in the education of their students. Students can learn to use computers in writing (word processor), storing and accessing information (database), manipulating information (spreadsheet and many other programs), representing information (graphics), and communication (telecommunication). They can learn the concept of procedural thinking, and the general capabilities and limitations of computers as an aid to problem solving. They can become functionally computer literate.

I believe the basic issue is not that of the NeXT computer versus the previous computers. Rather, the issue is curriculum reform and staff development versus status quo. Individual teachers have the ability to make significant changes in what they teach and how they teach it. A teacher does not need access to the latest and greatest computer facilities in order to place increased emphasis on inquiry, hypothesis formulation and testing, problem solving, and higher-order cognitive skills. Library research techniques, and building on the collective knowledge of the human race, can be taught even in situations where there are no computer facilities. Students can become independent, life long learners, if they are properly taught and properly motivated.

In my mind, the crucial factors are the capabilities, motivation, and drive of individual teachers and school administrators. Our society and educational system has made a tremendous investment in teachers and school administrators. Yearly expenditures for staff development and curriculum development are quite large in most school districts, especially when compared to expenditures for computer facilities. Every teacher and school administrator devotes some time to learning new things and trying out new ideas. We need to foster and focus these energies. Doing so will lead to substantial improvements in our school system, independently of whether we have the NeXT or the previous computers available.