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Science and the Atari Generation

Is it necessary to be an electrical engineering or computer science major to participate in the computer revolution? This generation of students must believe so, judged by the bulging enrollment in EE/CS programs compared to enrollments in science, in liberal arts, and even in other engineering fields. Massachusetts Institute of Technology provides a laboratory in which to observe this phenomenon. The students in its freshman class are admitted without regard to intended major and have a free choice of majors in the natural and social sciences, engineering, management, architecture, planning, and the humanities. From 1973 to 1983 at MIT the course preference of new undergraduate students for physics declined from 19 to 8 percent, for mathematics from 18 to 6 percent, and for chemistry from 8 to 2 percent, while preference for EE/CS increased from 14 to 32 percent and for other engineering fields or engineering with field undecided from 16 to 35 percent. Whereas in 1973, 38 percent of the students were engineering majors, today nearly 75 percent are, with about 35 percent in EE/CS. In addition, the students who do not choose science are among the best. Here and at other universities, ways to improve the balance of enrollments across departments are being considered.

Of course, enrollments in engineering are traditionally cyclic, responding to demand. However, most observers believe that the present situation is the result of a combination of cyclic change and a more permanent component of change caused by the computer, which is revolutionizing work in all fields of science and engineering and in the professions and society at large. What are the implications of this revolution for science education at the undergraduate level? What message is being conveyed to prospective science majors about the value of the B.S. degree, and will this message remain valid as the computer revolution continues?

Those in the natural sciences have not warmly embraced the computer as an essential component of their field. It is an important, sometimes necessary, and sometimes welcome adjunct to a research program. But not having been essential to the discovery of any new physical laws, it has not generally come to be viewed as a full partner or a subject for study in its own right. The computer belongs to the man-made world rather than to the natural world, and thus is more an object of study for engineers than for scientists. What are the implications of an undergraduate program in science devoid of serious intellectual involvement with the computer?

An undergraduate science degree is not considered a final degree but rather a preparation for something else. What this something may be is a crucial issue today. It is unquestionably a preparation for graduate study in science, the Ph.D. being the final degree. But not all students who receive the B.S. will continue to the Ph.D. With the costs of education at private schools exceeding \$14,000 a year, the total cost of the Ph.D. degree in science will probably exceed \$100,000—an amount not likely to be justified by future job prospects. In the past, a B.S. was considered basic technical preparation for a wide variety of professions. Will this continue to be true if science departments do not enthusiastically use the computer to enhance their undergraduate educational program? While some efforts to do this are under way, science faculties still seem reluctant to consider the computer an important part of undergraduate education.

It is likely that the intensity of the current enrollment shifts will moderate somewhat. But this generation of students must be met on its own ground, and that is very likely to be in front of a cathode-ray tube display. Once experienced, the expansion of personal intellectual power made available by the computer is not easily given up; it must have an important place in the teaching of science. Given the present state of the computer revolution, it is difficult to say that the students are making a mistake in wanting to be a part of the action.—SHEILA WIDNALL, *Chairman, Faculty Committee on Undergraduate Admissions and Financial Aid, Massachusetts Institute of Technology, Cambridge 02139*