Limitations of Technology

The technologist in modern society is roughly in the same position as the witch doctor in a primitive environment (see David, Editorial, 28 May). Both are held in awe, both seem to produce miracles by magical means, and, most important, each is considered to have complete control of his craft. Thus, when in spite of the witch doctor's best efforts the chief's son dies, the witch doctor is held responsible. Today, when the environment is polluted with empty beer cans and automobile fumes, it is the technologist, not the beer drinker or the automobile user, who is held responsible. Both the witch doctor and the technologist are victims of the mistaken notion that they can achieve anything they wish—a notion propagated by those who do not understand the limitations of witchcraft, whether technological or otherwise. Naturally, when one deals with an all-powerful individual who can do everything, how can one accept a less-than-perfect result? The greater the hero, the greater the wrath when the hero fails.

It is not enough to say, "We're all in the same boat!" When the boat starts leaking, we, the technologists, will be the first ones to go overboard. We must both get away from the rail and try to prevent the boat from leaking. Most of the current proposals seem to be in the direction of moving the technologist further from the rail by making him aware of the consequences of his work. I readily admit that as an engineer my general education leaves much to be desired. A greater knowledge of history, philosophy, sociology, and so forth would certainly help. But, as in the case of the witch doctor of old, it is the chief who usually makes the major decisions. A clever witch doctor is just as dead as a stupid one when he cannot perform an impossible miracle for an ignorant chief.

We need more chiefs who understand the witch doctors' craft sufficiently so as not to ask for impossible miracles. In this, the technologists are greatly to blame. Our science teaching for nonscientists is terribly inadequate. Instead of teaching broad principles, methodology, philosophy, and the way of thinking of the scientist, we generally insist on having our future leaders concentrate on numerical problem solving. Basically, the major difference be-

tween physics teaching for future physicists and for nonphysicists is in the degree of difficulty of the problems. And, because the future nonphysicist never gets to the more sophisticated areas of the science, it all remains a vaguely disturbing, unpleasant memory. Broad-based science teaching does work, as I can attest from personal experience with an experimental endeavor called "Physics for Non-Physicists."

In the British Museum is displayed an ancient Egyptian papyrus entitled "Directions for Knowing All Dark Things." This document, written by the priestly scribe Ahmes before 1700 B.C., deals with fractions. It may not seem very mysterious today, but in a time when only the priests could perform these calculations, fractions may indeed have been "dark things." Today, the dark things are immeasurably more complex, and the technologists are the priests.

So long as technology is a dark thing; so long as those who make decisions do not understand its limitations; so long as the technologists are treated as priests with a direct line to God—the danger exists that the God of today will become the Devil of tomorrow, and the priests of today will be burned at the stake for witchcraft.

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May I take my place in the queue of persons waiting to point out to David that a perpetual motion machine is considered impossible because it violates the second law of thermodynamics. It need not, in principle, violate the first law, which is merely a statement of the conservation of energy.

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Fixed Combination Drugs

In his report (News and Comment, 4 June, p. 1013) on the Food and Drug Administration and combination drugs, Bazell's primary contention seems to be that the FDA intends to capitulate to commercial pressures by permitting combination drug products which may benefit a few but not most patients.

We suggest that the recognition of the true value of combinations is not an act of capitulation, but of medical and regulatory prudence. It is clearly not in the