THE NOVICE PARADOX

As the births of living creatures at first are ill-shapen, so are all innovations, which are the births of time.... Surely every medicine is an innovation; and he that will not apply new remedies must expect new evils; for time is the greatest innovator and if time of course alter things to the worse, and wisdom and counsel shall not alter them to the better, what shall be the end?
(Francis Bacon, *Essays*, "Of Innovation")

New remedy? Or new evil? The conundrum confronts biotechnology everywhere. In medicine and agriculture, in the labs of the United States and the refugee camps of the Sudan, in boardrooms and hearing rooms. The dilemma is familiar; in one form or another, it is a part of each individual's development.

There is the Employment Enigma: one needs experience to get a job, and a job to get experience.

There is Adelberg's Paradox. At June's symposium on "Engineered Organisms in the Environment: Scientific Issues" (see the month's *Dateline*), Edward Adelberg of Yale enunciated the quandary in its agricultural form. We can't, he said, release engineered organisms into the environment until we can predict their environmental effects; we can't predict environmental effects until we have released an engineered organism—to generate the information that will show us how to extrapolate greenhouse data into field performance.

There is the Gene Therapy Gap: Protocols for human gene-therapy experiments will not be approved, says W. French Anderson of the National Heart, Lung, and Blood Institute, until experimenters can predict how their subjects will respond; experimenters cannot make those predictions without investigating a model system—and for many inherited human diseases, there is no model in a lower animal. (Meanwhile, researchers must deal with near daily phone calls from clinicians and parents asking, "Now? Can we start treatments soon?")

American drug-makers may not sell their products abroad until they have won approval at home—even though there may be neither need, market, nor incentive for developing them in this country.

Everywhere, it seems, someone is looking askance at the proffered gifts of biotechnology—waiting for someone else to take the first step, trying to avoid the risk of failure or the thunder of public disapproval.

Ultimately, though, someone must take the responsibility. Someone must make a decision. Young workers do manage to get that first, low-level job because someone takes a chance on them. Thus, perhaps, Advanced Genetic Sciences will finally get to do a well-controlled experiment with a strain of *Pseudomonas* nearly everyone agrees is completely harmless. Gene therapists will be allowed to transplant some recombinant bone marrow into a young boy or girl who would probably die without it. The federal government may relax its rules for exporting drugs vitally needed in the third world.

This year, some 4 million people will die of malaria. Millions more will starve. A handful of children will live out the ends of tragically short lives separated from their families by a sterile bubble (or its emotional equivalent).

Bio/Technology has consistently urged caution and restraint. But we must also realize when caution becomes inertia and inertia becomes delay. In crossing that line, failure to make a decision is itself a decision—in this case, a heavy condemnation of those who *could* have been helped.

Time, it sometimes seems, is always altering things for the worse. We must exercise the wisdom of caution, heed the counsel of humanity, and look to the medicine of innovation. Otherwise, what shall be the end?

—**Douglas McCormick**