nitrogen-fixing bacteria. A microorganism cannot be manipulated too dramatically or its effect on the plant will be minimal. On the other hand, it is not necessary that every member of the population of the added microorganism disappear from the site within a short period after the beneficial effect has been obtained. There are many cases in which *Rhizobium* strains were added to fields as long as a decade ago, and still can be found in the soil in small numbers. This is probably true for most of the commercial and experimental soil inoculants added to our environment over the past century. Problems have not occurred. In many cases, the microorganisms were genetically altered. If a foreign gene is added to such organisms, it is difficult to imagine how the chance for a problem will increase.

Colwell *et al.* state that the article made "little mention of the potential of engineered microorganisms to transfer plasmids containing novel genes to other microorganisms in the environment." In fact, it was stated that "microorganisms intentionally and unintentionally added to the environment have naturally exchanged genes with other microorganisms." To elaborate further, however, there is increasing evidence that a tremendous amount of gene transfer occurs naturally, not only among related genera, but also between unrelated microorganisms and even between kingdoms. In rare cases, a new phenotype predominates because of certain selective conditions. This is evolution. What scientists create through genetic engineering is minuscule and ecologically insignificant compared to what occurs continually and randomly in nature.

The negative response of regulatory agencies to requests by academic and commercial researchers who wish to release recombinant organisms for small-scale field testing has been frustrating, but a major benefit is evolving. Disciplines that normally have not been interacting are debating issues of common scientific interest. This can only aid science and the public's perception of science. Meaningful evaluation of the potential for problems associated with the use of recombinant organisms requires a balanced perspective and appreciation of practices that have been used in agriculture for decades or centuries. Field testing is the only way to prove that recombinant organisms are safe, and it is "extremely unlikely" that such tests would cause serious health or environmental problems.

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Reusable Oil Plants?

Philip H. Abelson is correct in observing that "current trends of increased energy efficiency and of [oil] substitution" are encouraging (Editorial, 3 May, p. 531). However, a closer examination reveals information that may temper excessive optimism.

The statistical picture since 1978 (1979 to 1984) shows that coal provided 54 percent, nuclear 20 percent, oil 12 percent, hydro 11 percent, and everything else about 2 percent of the 4 quads of domestic energy production increases. Combined with improving national energy efficiency (measured as a 16 percent decline in total energy needed per constant dollar of gross national product), the trends are in the right direction.

It is also important to note that utilities are directly responsible for reducing total U.S. oil consumption by one-third since 1978, while increasing total electric output. Unlike oil reductions in the transportation sector, in which efficiency improvements for new vehicles are the driving force, utility oil savings have come about because of the addition of new non-oil generation (primarily coal and nuclear, which account for over 60 percent and 25 percent, respectively, of all capacity installed since 1978). There is a dangerous energy wild card here. Unlike the transportation sector, where the guzzlers have been replaced, most of that oil capacity remains in place. There is about 100,000 megawatts electric of oil capacity now unused, comprising virtually all of the excess capacity on the grid. Using only half of this capacity would increase oil imports by over 1 million barrels per day. In the current climate these power plants represent the most likely source of significant new electric power. They involve no capital risk, public controversy, or regulatory uncertainty, as do large coal and nuclear plants. It is highly improbable that this much generation in the form of small-hydro, wind, and wood can be built in the next two decades.

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Erratum: In the article "Hughes Institute poised for growth" by Barbara J. Culliton (News and Comment, 7 June, p. 1178), Raymond Gesteland's name was spelled incorrectly.