COMMENTARY/

by Bernard Dixon

IN PURSUIT OF "APPROPRIATE" TECHNOLOGY

If, by chance, I happened to believe in a metaphysical dimension to coincidences, I would discern unreasonable significance in the simultaneous arrival of two documents on my desk recently. One was "occasional paper" number 40, issued by the European Economic Community's FAST (Forecasting and Assessment in Science and Technology) program. Carrying a wealth of reactions to a draft document on the proposed European strategy for biotechnology, it is edited by Mark Cantley and Ken Sargeant, who recently outlined that strategy in BIO/TECHNOLOGY (1983, **1**:526). The other document was a copy of a report about Unilever's latest triumphs in the horrendously difficult task of cloning oil palms, contributed by L. H. Jones to the *Biologist* (1983, **30**:181).

I am not, in fact, superstitious. But I do see a link between these two pieces of work—one that should be of concern to all involved in the development of industrial biology. The link centers on the judicious application of advanced technology, not in Europe or the United States, but in nations of the Third World.

Take the FAST paper first. Last year, Cantley and Sargeant decided to circulate for comment a memorandum reviewing the long-term development and potential applications of biotechnology, as part of their efforts to evolve a specifically European approach. It covered issues ranging from land use to education, from fine chemicals to biomass, and many of the observations received from researchers and administrators found their way into the FAST report described in this journal. Some of the strongest responses merit special attention, however, because they were provoked by sections of the memorandum concerning technology transfer and the potentially explosive relationship between the economies of North and South.

"Grow up before this area strikes back....This is the area that began with biotechnology and lived on it before your supersalesmen convinced us that petrochemical technology was best," writes one of the less restrained contributors, Basil Rossi, president of the Asian Recycling Association, located in the Philippines. "Our lands have been raped only since chemical fertilizer was introduced to improve crops for your benefit, doubling crop size but reducing the nutrient value by half and then gradually reducing yield as the salts poisoned the soils and killed the microorganisms needed to sustain growth. Now we import food."

An over-reaction, perhaps, or understandable bitterness towards a region of the planet that, having rediscovered the wheel, seems anxious to foist its latest version of high tech on less developed areas that are still suffering ill effects from a previous wave of industrialization? Other respondents suggest that the answer lies somewhere in the middle, but all agree that the problem is one of profound significance and sensitivity. Thus M. Kuenzi from CIBA-Geigy points out that by helping countries to become independent via biotechnology, "the positive effect on peace and well-being could be of the utmost importance for Europe." However, replying on behalf of Imperial Chemical Industries, S. P. S. Andrew warns: "The Third World is a key factor and offers both an opportunity and a threat. The World does not forgive those who are naive and it certainly does not rescue them from their folly." Another development specialist, Raymond Crotty, goes further. He quite bluntly identifies the unthinking transfer of technology to less privileged countries as one of the major causes of economic backwardness.

Now to examine the experience of Unilever, a company that has shown both realism and responsibility in pioneering a specific area of applied biology that involves cooperation between laboratories in Britain and Malaysia and a plantation in Jahore. By using tissue culture to clone the oil palm—a plant lacking any conventional method of vegetative propagation—Unilever scientists have taken a spectacular step towards improving the crop responsible for no less than 14 percent of the world's supply of vegetable oil. The company has established a partnership to couple its expertise in tissue culture with the use of high quality germ plasm from another firm, Harrisons and Crosfield. Immediate benefits will come in the production of clones for the large Malaysian market. The long-term global goal is to propagate plants from a range of germ plasm, acquired wherever palm is grown, and to set up field trials in different countries so that the most suitable clones are selected for the areas concerned. Truly appropriate technology is the aim.

Unilever's project is being masterminded by Tony James, head of biosciences in the company's laboratory at Colworth House, Bedford. He uses auxin-type growth regulators to induce the development of a disorganized callus, which is subcultured until "embryoids" appear. This usually requires regular transfers over a period of a year or so. The embryoids can then be placed in a medium that favors mass proliferation, generating tissue to be exploited in the large-scale multiplication of plants. Some of the very first clones, planted in Malaysia between 1976 and 1979, are now bearing fruit, and those derived from high-yielding elite palms are expected to give 30 percent more oil than was usual in the past.

This scientific success story has two broader features that should reassure those who look with apprehension upon large corporations operating in the Third World. First, as L. H. Jones observes in his *Biologist* review, there are

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- **FEATURE:** New strategies for immunization.
- **TECHNOLOGY REPORTS:** The choice of chromatographic gel media for large scale protein purification; an analysis of the current problems surrounding the UNIDO biotechnology center. Meeting reports from around the world.
- **NEWS:** U.S. biotech reaps federal grants; update on enzyme engineering in Japan; how the biotechnology industry is responding to lawsuits blocking commercialization; reports on an amylase which functions with stability at high temperatures; the BIO/TECHNOLOGY index of specialty firms.

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the trade-offs against price reductions consequent upon higher yields. Land released from palm growing can be turned over to other food crops, and the rate of erosion of tropical rain forest can be reduced. Second, today's "average" oil may be replaced by a range of oils for different purposes—a development serving the interests of both profitability and diversity.

Contributors to the FAST paper are right to remind us about crass errors perpetrated even in the recent past by mindless technocrats. But as Unilever's achievement shows, it *is* possible to proceed with due sensitivity in furthering frontier science in the Third World. Indeed, this should come as no surprise when we recall that the family soap business established almost exactly a century ago by the Lever brothers, William and James, was famed for its progressiveness and partnership. Those qualities were extraordinary then. Today they are mandatory, especially for technology-based commerce functioning in the impoverished South.

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es attention on the technical resources of which many potential industrial users were once unaware. Now the question is, what impact will all this have on the state economy? Only time will tell, but the first steps all have been in the right direction.