

THE LAST WORD

by Daniel J. Goldstein

BIOTECHNOLOGY IN UNDERDEVELOPMENT

The assessment of the viability of biotechnology in any country must be made in the context of its biological sciences and their relationships with the productive sector. A review of these two parameters in the underdeveloped world (with the exception of the special cases of China, Cuba, and Israel) draws a dismal picture.

Biotechnology thrives on new knowledge generated by molecular biology, genetics, and microbiology, but these disciplines are weak, often nonexistent, in the underdeveloped world. Biotechnology springs from universities and other research institutions, centers that generate the basic knowledge needed to solve practical problems posed by society. But the universities of the underdeveloped world are not research centers. Centuries of dependency could hardly produce such institutions. And the few creative research groups operate in a social vacuum; their results might be useful abroad, but are not locally. At the same time, biotechnological opportunities can only be detected and assimilated by innovative industries, and there are few of these in the underdeveloped world. Biotechnology needs dynamic interactions among the relevant industries. These interactions, however, are weak in countries in which science is perceived as an ornament, not as a necessity. Biotechnology is structurally fluid: driving forces oscillate between academy and industry. Rigidity, poor accountability, and conservatism mark underdevelopment. Biotechnology requires many highly skilled professionals, because its raw materials are knowledge and skilled intelligence. Underdeveloped nations lack sufficient people well trained in the pertinent disciplines. Economic scarcity and political discrimination induce professionals and graduate students to emigrate or abandon science altogether.

What can be done? First of all, underdeveloped countries must understand that they need to reform their universities, so that they can turn out people trained to solve problems, seek breakthroughs, and invent. They must recognize that molecular biology is not just another branch of biology, but the one and only tool available for understanding biological structure and function, the first step towards the appropriation and transformation of Nature. Success in biotechnology depends on the conquest and consolidation of the moving frontiers of cell biology and medicine. The history of biotechnology shows how intimate must be the interplay between academy and industry to maintain the competitive edge, to generate new products, and to expand its scope, its profitability, and its social impact. Training some people in the (by now routine) technologies of recombinant DNA could eventually lead to the substitution of certain imports. But we know that the import-substitution policies are self-limiting and but a weak palliative to the real problems. The new, strategic products of the agrobiomedical market will continue to be imported.

The international agencies should be careful when

allocating their scant resources for biotechnology. Training programs in routine technologies and short courses on general topics do not constitute acceptable remedies for the lack of research-oriented, high-quality universities. An exaggerated stress on rapid applicability and industrial development projects, in societies that are not used to generating innovative technology and lack a critical mass of creative scientists, may be self-defeating. Noncompetitive enterprises are condemned to rapid obsolescence. Those involved (the industrialized world, which pays a big chunk of the agencies' bills, the agency administrators, and the underdeveloped countries that also pay their share to support the system) cannot absorb many more experiments of this kind. There is now a definite requirement for the real thing, and it will become increasingly difficult to make anyone swallow the usual reports on questionable achievements.

Why should the industrialized nations care about the biotechnology of underdeveloped nations? After all, until now they have grown richer by extracting from and selling to the periphery. But now the real modernization of the underdeveloped world is vital to the economic stability of the whole world. The conventional strategies of development have failed, and a realistic solution of the foreign debt problem depends on the economic growth of debtor countries. The only way to achieve this is by applying science and technology to their exportable commodities—leading to world-competitive, high-value-added products. A significant, original science in the debtor countries could generate opportunities for all. Take as an index the quality and economic impact of the work of expatriate scientists of just one such nation, Argentina, in the U.S.A., U.K., and France.

It is rather obvious that developing the scientific capabilities of the debtor countries could make joint ventures attractive and profitable. Investments in research, technology, and in their industrial spin-offs would be natural. This would lead to a new type of relationship between the center and the periphery. Instead of the present explosive situation, which closely resembles forced labor, a community of partners could emerge. Relations among partners can become strained, but, as a rule, the potential conflicts are vastly less dangerous and the possibilities of accommodation much greater. Science and high technology, for once, could be constructive tools for reducing tensions and contribute to peace. The alternatives are gory.

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