

such as cyclic AMP and ADP, will simply not do. However, some other well established enzymes, notably the DNA polymerases and the RNA and DNA ligases, are also known to be capable of catalyzing this exchange reaction.

Evidence from other labs likewise reinforces the progesterone receptor's putative enzymatic role. For instance, the receptor is closely associated with the synthesis of RNA and is able to bind to polynucleotides, the stuff from which nucleic acids are

made. Nucleic acid synthesis from polynucleotides depends on the presence of ATP or other high-energy molecules. Further studies, of course, are needed to determine exactly how the receptor might interact with ATP in order to influence nucleic acid synthesis, how these various interactions mesh with the receptor's interface with progesterone in the cell cytoplasm or nucleus and whether the receptor is an enzyme, an enzyme subunit or a precursor of an enzyme. □

Technology transfer: Toward a redirection

In search of new markets and armed with many good intentions, American government and industry have spent years selling or giving modern technology to underdeveloped countries. Individual successes have been spectacular, but many unfortunate side effects have also resulted. Farm machinery has increased food production, but richer farmers have sometimes benefited more than poor. Irrigation schemes have led to epidemics in some areas, and misdirected industrialization has swollen many Third World cities with slums.

To find less disruptive methods of technology transfer, the United Nations will convene an international Conference on Science and Technology for Development in 1979. In preparation for this conference, the U.S. State Department has scheduled a series of meetings involving government, business and academic leaders, to formulate an official American position. The first such meeting was held last week in Washington, and a lively interchange suggested that the course of American science and technology, as well as foreign policy, may be approaching an important watershed.

Secretary of State Henry Kissinger underscored the importance of the issue: "The problem of world order is the dominant problem of our time. We have talked a great deal about its military component, and we have an understanding of its political component. But in the decades ahead it is very probable that the social and economic aspects of international order will dominate our concerns."

If developing countries are to provide a better life for their people through modern science and technology, he said, they must look toward the industrial democracies, from whence come 90 percent of all transfers of capital. In return, Third World countries will need to stabilize primary commodity markets and offer foreign investors a business environment "free from harassment and unreasonable restraints."

The vital connection between money, technology and quality of life is generally, but only vaguely, understood. Daniel Parker, AID administrator, expressed it in particularly stark terms: "One-third to two-thirds of the world's population . . . is essentially a nonentity in economic

terms. Thus, they cannot consume." Landless, jobless and penniless, these people can only survive if they can increase their productivity. This, in turn, requires introduction of new technology, but technology carefully selected so it does more good than harm.

To accomplish this difficult task will require more research concentrated on the problems of the small farmer and rural industry, according to James P. Grant, president of the Overseas Development Council. Little of the world's research now addresses the problems of the majority of the world's people. Crop strains need to be bred that will raise the productivity of harvests, without requiring large machinery or inputs of fertilizer. Local, renewable sources of energy must be developed to serve remote villages long before massive rural electrification is feasible. Most of all, Grant said, more social science research is needed to foretell the effects of technology transfer and improve market and production systems to enhance orderly development.

Several speakers echoed one aspect of this systems-approach to development through technology transfer. In the words of Orville Freeman, president of Business International Corp., "Management is the most important type of technology." While many developing countries may request what might be called "naked" technology—a factory or a patent license free from integrated market arrangements or systems of management—the speakers generally agreed that this approach is self-defeating. Herbert Fusfeld of Kennecott Copper Corp. pointed out that, ironically, even the Soviet Union is experimenting with Western-style business "complexes" (the equivalent of individual private companies, but without the profit motive) in key segments of its advanced technology industry. The implication is that Western technology cannot be entirely separated from Western institutions, though these institutions may have to be adapted.

Then came the shocker. Even the best conferences tend to drag after 6 hours and even people as accustomed to sustaining or feigning attention as these 900 invited guests tend to nod or fidget. But not after William W. Winpisinger of the Machin-

ists and Aerospace Workers union shattered the calm aura of consensus that was slowly settling over the meeting. When talk turns to technology transfer, he stormed, "it's time for the American worker to put his hand over his wallet." American technology was developed largely at taxpayers' expense, it is a commodity with a high market value, and it belongs to the American people as a whole, he asserted.

While technical know-how may not be able to be kept corked up, he said, "we don't have to cut our own throats by exporting American jobs." The government, he warned, must make a closer accounting of what the domestic impact will be when an American company builds a plant or sells a license to some developing nation with cheap labor, whose products will soon flow back to the United States at low prices.

It was a hard act to follow. Only Orville Freeman tried. While admitting there are few statistics on just what effect technology transfer as a whole has on unemployment at home, he said in some instances it can actually help. From 1960 to 1974, for example, American companies with the highest proportion of investment outside the United States have shown the fastest growth of jobs in their U.S. plants, he said.

The conference moderator, Assistant Secretary of State Frederick Irving, called the session a "town meeting approach" toward developing a coherent foreign policy on an important issue. An equally apt analogy might be that of a circus holding a shake-down performance in its home town before hitting the road. Future engagements include a series of national and international encounters (an official U.S. National Conference will be held next October) with side-shows likely in Congress and in various private forums. If successful, these may prove to be a unique new exercise of democracy, whose ultimate implications for American science and technology cannot now even be estimated. □

What went wrong? Anatomy of failures

The course of science and technology is littered with the residue of failure. False starts, wrong turns, sudden pitfalls all hinder the path toward successful technological innovation. Some attempts make it, some don't. Everyone knows that, or should, but nevertheless the problems and failures along the way often get swept into the closet and forgotten. It's the glowing successes we remember. That's understandable, for failure is uncomfortable to be around.

In the express hope that out of failure important lessons can be learned, the editors of IEEE SPECTRUM have devoted almost an entire issue of their publication