peoples could relate, keeping in mind the fact that many viewers were illiterate. An agricultural program used "fist width" as the measurement to describe the most suitable distance between plants. A program on dental hygiene described how the thin branches of certain trees could be woven into rough-and-ready toothbrushes.

The advantages SITE demonstrated from the beginning were speed, and the possibility of extensive coverage. Given the necessary backup services and support, a satellite can cover the entire country as soon as it is operational. Satellite communication, however, does not come cheap, and a recurring argument against its use is that it requires enormous amounts of money that could be better spent. India's SITE group has examined this objection closely, and a comment made by SITE's Professor E.V. Chitnis is worth noting. He said: "Many people ask us whether it would be better to provide tube wells and drinking water instead. However, what one is attempting to do through SITE is not to give television sets to villages, but to make them self-reliant and to get them new information which will enable them to do something worthwhile for themselves — to learn to work together and acquire new skills, including those required for digging wells".

Another important aspect of SITE was that it was conducted in a country with a high degree of industrial skill. There is grinding poverty in India, to be sure, but there is also advanced industry. Industrial production in India increased by 13 percent in the first half of 1976. In fact, India is an exporter of industrial know-how. Its electronics sector had the expertise necessary to turn out the hardware for the experiment. Equally, India was able to produce a range of instructional programs for the experiment.

SITE also paid attention to the effectiveness of interpersonal communication. One can stimulate traditional peoples with images, music and words, to change their attitudes. But experience has shown that changes brought about in this manner — however scientifically sound, however economically benign — will run into problems if the people directly affected by change are thought of only as "targets" and not as participants.

That is why the application of satellite communications to development has to be part of a wider system of communications, integrating old techniques with the new technology. This is a field in which some research has been done, and in which much more remains to be done. The best scientific and economic policies that man can produce will be of little relevance unless and until they are disseminated, understood, modified if need be and, above all, wholeheartedly accepted.

---

Tropical diseases
THE ENEMY WITHIN

Alexander Dorozynski

Top: Egyptian researcher examines snails from the Nile Delta that carry schistosomiasis parasites. Above: These fertile fields in Afghanistan were until recently useless swamp land, a breeding ground for malarial mosquitoes.
war is being fought in the tropical regions of the world. It is a war in which mankind has been on the losing side for too long. A war whose cost in human lives and suffering, and in economic terms, is incalculable. A war in which, until now, the forces of mankind have been woefully under-manned and poorly supplied. A war against some of the lowest forms of life on earth: parasites, carriers of tropical disease—the enemy within.

Parasites—protozoa or worms—are the cause of the major diseases such as malaria, sleeping sickness, river blindness, and other diseases that affect several hundred million people and can eventually blind, maim or kill their victims. Yet, according to Professor Christian de Duve, a Nobel-Prize-winner in medicine, “They are puny enemies indeed. The pathogenic parasites certainly occupy the bottom of the scale. They really have major weaknesses and must be quite vulnerable.

Why is it, then, that in spite of all the miracles of modern medicine these ‘puny enemies’ remain a major obstacle to development in much of the Third World? Simply because tropical disease research has hardly benefited from the explosion of knowledge in bio-medical sciences that has taken place in the developed world. In the words of Professor G.J.V. Nossal, Director of the Walter and Eliza Hall Institute of Medical Research in Melbourne, Australia, it is “in no sense an indictment of the professional researchers in this field, rather it is the result of disordered global priorities in health research which have limited the supply of such researchers.”

The World Health Organization (WHO) estimates the global annual investment in tropical disease research at about $30 million, which is a mere pittance in comparison to the huge budgets devoted to other areas of bio-medical research.

Says Professor de Duve, “My strategic recommendation, therefore, is that the forces of the new biology be enlisted for a detailed analysis, at the cellular, subcellular and molecular level, of the various parasites that infest man, and of their relationships with their human and animal hosts. I have no doubt that out of such a study, powerful new preventive and curative means will emerge.”

In the past year the WHO began mounting just such an attack on these diseases. With the support of the IDRC and other agencies, it drew up a Special Program of Research and Training on Tropical Diseases. Professor Nossal, who is also a consultant to the WHO program, sees it as a “giant step” towards correcting the imbalance in research priorities.

The approach was novel, and the outlook promising. There remained only one major element of uncertainty: would there be enough money forth-
"task forces," or scientific working groups have been formed by the WHO to pursue specific goals. These consist of top scientists in various disciplines.

One group, for instance, is concerned with immunology of malaria. Its ultimate goal is to develop reliable, long-acting vaccines, which would undoubtedly revolutionize the control of malaria. Professor William Trager of the Rockefeller University in New York, a member of the group, has succeeded in maintaining a continuous laboratory culture of Plasmodium falciparum for three months — a significant step towards the development of a vaccine.

The harvest of a large number of Mycobacterium leprae is also possible since researchers in Louisiana found in 1971 that injection into nine-banded armadillos causes massive infection of the animals. Previously, infection had been achieved only in mouse footpads, and was very limited.

The WHO's scientific working group on immunology of leprosy has already engaged in antigen preparation and purification, and three promising antigens have been isolated, one in Venezuela, one in the United Kingdom, and one in the USA. As with other task forces, the specialists from several countries meet periodically to coordinate their efforts. There is good hope that a practical vaccine can be developed, and a tentative schedule has already been established. If all goes well, field trials should start in four or five years.

Less is known of the immunological aspects of schistosomiasis, filariasis, trypanosomiasis and leishmaniasis, but there is, nevertheless, hope that vaccines can also be developed against at least some of these diseases.

Other participants in the Special Program are exploring the possibility of entirely new approaches, relying on recent bio-medical knowledge. Professor de Duve, for instance, is attempting to apply "lysosome therapy" to some of the tropical diseases. "Lysosomes," he says, "are essentially miniature stomachs, which occur in all cells. One of their principal functions is to serve in the digestion of food 'eaten' by the cells by a special capture process. As with humans, cells may be greedy or frugal, and they may exhibit a wide variety of tastes. Our purpose is to take advantage of these differences to kill certain cells selectively by poisoning their favourite food. To do this, we bind the poison to a carrier molecule in such a way that it will be released when it gets in the lysosome, that is, in the stomach of the cells that have eaten this poisoned food."

Experiments on mice carried out at the International Institute of Cellular and Molecular Pathology in Brussels, where Professor de Duve is director, have shown that such "selective poisoning" can be effective against at least one Trypanosoma parasite. A similar approach can be tried for the treatment of diseases such as schistosomiasis or onchocerciasis, caused by worms with very tough skins, whose weak points may be their "stomachs".

Enzyme therapy is another possible approach and interference with the parasites' nervous system could also be explored.

Vector control, likewise, can benefit from applied research, notably in the area of biological vector control. Such a project to control blackfly has been underway for several years in Upper Volta with IDRC support.

These are "high technology" approaches, that require the commitment of skilled manpower and adequate budgets. Their goal is the development of remedies on the basis of knowledge of parasite function and biology, rather than through often empirical, large-scale screening, such as has been widely used until now in anti-parasitic drug research.

The purpose of the Special Program is not, however, limited to such research, much of which must be carried out in institutes, universities, and pharmaceutical laboratories in the developed world. The countries most affected by tropical diseases will be associated with the program.

At the beginning, the focus will be on Africa, which has the highest prevalence of the six diseases and where multiple infection is almost the rule. Several African countries have agreed to participate in and contribute to the program, and Zambia has offered laboratories in the large Ndola hospital complex for the creation of a multi-disciplinary research centre bringing under the same roof different aspects of laboratory research and clinical medicine. Strengthening of existing laboratories, creation of new ones if necessary, and training of additional indigenous personnel, are planned as part of the program to promote self-reliance in the very parts of the world where tropical diseases are prevalent.

The war, then, has been joined on several fronts. It will be a quiet campaign, but if it succeeds its impact on the developing countries and their peoples will be enormous.

Compared to "conventional" warfare, it will also be a very inexpensive campaign. $30 million is about the cost of two modern jet fighters.

This man is blind — a victim of onchocerciasis carried by the blackfly.

Researcher with a schistosomiasis control project in Brazil collects snails for laboratory tests.