

## TECHNOLOGY FOR THE 21ST CENTURY

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President Banks, Dr. Thanat Khoman, Members of the AIT Faculty,  
Distinguished Guests, Ladies and Gentlemen -- and most particularly on  
this occasion -- Honoured Graduates.

I am most gratified and pleased to have been asked to take place  
in these commencement ceremonies. Let me first extend my warmest  
congratulations and best wishes to you young men and women who are  
receiving your degrees here today. This is very much your day. You  
have won the recognition which AIT grants you today after much hard  
work and study and you deserve all our admiration and gratitude. I  
hope in the years ahead that you can look back on this day as one of  
true commencement on a fulfilling and rewarding career in the service  
of your fellow Asians.

The decisions which we are going to make in the next few decades  
will shape the 21st century and define the chances of all societies  
to survive. As your professional careers advance, you will be called  
upon increasingly to take part in those decisions. I for one welcome  
that prospect for it has been said that it is not possible for  
civilization to flow backward while there is youth in the world.

Certainly this complicated and turbulent modern world can make  
good use of your young talent and new perspectives. It is a world in

a state of vast and unprecedented transition -- very much flowing, indeed rushing, forward at a swift pace of change and one that will be chiefly yours, not those of us of older generations to shape and remake for the better.

I fear that those of us whose lives stretch back to the earlier years of this century are bequeathing you not a healthy globe, but a perilous, fragile and insecure one whose limits we are only beginning to recognize.

Here in Asia alone, there will be one billion more people by the dawn of the next century. That number is awesome enough in its single magnitude, but it grows even more disquieting when one looks at age demographics. In the ASEAN region alone, the proportion of young people under 15 years of age is extremely high -- 41 per cent in Indonesia, 43 per cent in Malaysia, 45 per cent in Thailand, 46 per cent in the Philippines. Singapore, with 31 per cent, is somewhat lower -- but, in all, we are talking about 110 million young ASEAN people. Creating employment opportunities for them in the decades ahead is perhaps the most perplexing and difficult challenge that we face, but it is crucial that we come to terms with it for it threatens the very viability of our societies.

The expectations of young people all over Asia for a more decent existence than their parents knew cannot be ignored. The just demands arising from those expectations will press heavily on your life's work and call on the best of your scientific expertise and moral capacity.

Since you are about to become graduates of one of Asia's foremost centres of scientific and technical excellence, I thought it appropriate to talk about the ways in which I believe you should seek to use science

and technology to respond to those expectations and demands. If the past record of AIT graduates obtains in your case, many of you will likely go on to influential positions in your national governments -- posts in which you may be able to do a great deal to ease the afflictions and sufferings of fellow Asians in the years that lie ahead.

Perhaps it might help to give you some sense of where you are today -- at this early stage of your professional careers -- if we looked back a moment to the closing decades of the 19th century, to consider where some of those figures who so vastly changed the scientific and social fabric of the 20th century stood in their lives.

In Europe, Sigmund Freud was just receiving his medical degree in 1881. Max Planck, the father of modern physics, had only recently been granted his doctorate. In America, Henry Ford was a young farm boy, fond of tinkering with machinery, and about to move to a Detroit machine shop -- his first automobile, with all its far-reaching implications for today's energy crisis, was 12 years away.

Here in Asia, many millions were still in colonial thrall. But Gandhi, in a few years, would sail off to London and law school and immortality. Jose Rizal, the physician-poet whose life and literary works were an inspiration to the Philippine and other Asian nationalist movements, was finishing university studies in Manila. In Japan, the Meiji Restoration was well underway, but young Sakichi Toyota was still working with his father as a carpenter's apprentice.

What this look backward says, of course, is that it is young men and women like yourselves, just now launched on their professional careers, who could very well make similarly significant and far-reaching

contributions to the shape and texture of life in the 21st century.

To be sure those I have just cited could not have known what the final outcome of their accomplishments would be -- nor can you of your future potential achievements. Neither Ford nor Toyota could have foreseen the end of the era of cheap energy and the profound adjustments in energy life-styles now necessary. Planck could not have been expected to see the road from quantum theory to Hiroshima and the nuclear arms race. Political, economic and cultural decisions beyond their control intervened along the way.

So too will you have to move into the future, step by step, testing possible scientific and social responses which you might help engender and adjusting those responses accordingly to perceived needs. The best we can ask of you is that you proceed on your task of trying to make science and technology serve humanity with a measure of humility and an ever-present consciousness of the human dimensions of your endeavours.

This will mean trying to learn as much as possible about the social and individual human needs of the societies in which you will be working, and fitting technological responses appropriate to those needs. Here in Asia, as elsewhere in the Third World, science and technology must be firmly rooted in our cultural soil and not blindly imitative of the high technology in the West.

This is in no way to suggest that the Third World does not need industrialization. Quite to the contrary, it is imperative to their future development. But it needs to be recognized that the trajectory of development for the poor and most populous countries -- who are late-comers to the modernization will most likely be quite different

from those that obtained in Europe, North America and Japan.

With low per capita incomes and increasing population densities, we here in Asia will be forced to develop labour-intensive industries that will relieve underemployment pressures that are already so apparent -- in, for example, agriculture where mechanization has forced many out of work, particularly women. These pressures will become more and more intense as growing numbers of young people attempt to move into the labour force.

This will require much more innovative thinking about different patterns of industrialization. Each piece of technology is part of a social system, so in making future technological choices, we will have to pose some tough political, social and ethical questions.

For example -- who will benefit and who will be disadvantaged, in the long and the short run, by introduction of a given technology? What degree of dislocation may ensue -- and how much disparity is socially and politically acceptable? The answers we make to such questions will depend not only on the political system, but even more importantly on the society's basic value system.

There is also the question of the impact of high energy costs. This will force us, for instance, to think about where to locate industries in relation to where the workers live, an important consideration in reducing transportation costs, which are so interlinked with energy costs. We must seek to optimize the spatial distribution of human activities in ways that are consonant with human dignity and maximum energy efficiency.

You must also be prepared to resolve the sorts of contradictions that can arise when even the seemingly most appropriate technologies

are introduced. The biogas digester in a country like India, for example, could actually work to deprive the poor of their traditional fuel -- the cow dung they gather from wandering cattle. After investment in a biogas digester, the owner is hardly likely to allow his cattle to roam freely -- and while his family's energy needs might be better met, the poor of his village would suffer all the more.

All of this makes it clear that the technician cannot operate in isolation, concerned only with the needs of a particular local situation. He must become more sensitive to the broader social, political, cultural and ethical contexts within which he will be working.

Without that social sensitivity, and a capacity for moral reasoning and innovative thinking, you may find yourselves caught up in pressures to emulate Western industrialization models through transfer of high technology to serve only the modern sectors of your societies.

What high technology transfer ignores is that vast numbers of people in developing countries are living outside the international, and even national, mainstreams. Half of the world is still basically untouched by oil and depends on fuel wood and agricultural wastes for their energy needs. Most of that half is here in the rural areas of Asia.

The energy systems with which you will be involved here in Asia should be seen basically as social energy systems -- developed and structured ultimately by countless millions of individual decisions made by farmers and villagers about their own survival and welfare. The energy-mix options must be seen, therefore, as essentially a

political and cultural choice, not only a technological and economic one.

I was most encouraged, incidentally, in reading through some of the AIT literature, to note the emphasis already being placed on people-related technology projects. I have in mind, for example, the Jedee Thong village project north of Bangkok where AIT expertise is combining with local workers and local resources to improve the village water supply. Or the "Building Together" project here in Bangkok which enables low-income families, with AIT guidance, to build their own homes at relatively low cost. These are good examples of working closely with the people to find solutions that are culturally, socially and economically acceptable, and I commend AIT for its efforts along these lines.

But while underlining the importance of people-related technology, I would not wish to leave the impression that high technology has nothing to offer the developing countries. It is indeed at the very frontiers of modern science and technology that Third World scientists must also focus their attention. Ways must be found to relate these latest scientific strides to the needs of their societies, thus meshing knowledge-intensive technology with people-oriented labour-intensive production processes. Each country will have to make difficult decisions about what this "mix" should be.

Consider, for instance, the significant role that modern science might play in the closely interlinked areas of food and energy. The present outlook is highly disquieting, indicating converging paths. Rising fuel prices, boosting transportation and agricultural costs, will inevitably push food prices beyond the reach of hundreds of

millions of already hungry people. Rising populations, despite the best efforts to reduce fertility rates, will continue to increase the demand for both food and energy.

To combat this, the poorer and most populous countries will have to find ways to grow more food themselves using less energy-intensive methods. Advances in biotechnology -- biological nitrogen fixation, genetic improvement and the like -- offer promise of ways to increase agricultural yield without high-priced energy inputs. But record sums are already being spent by major multinational companies on improving these new technologies and developing markets for them. The Third World must move quickly before a whole new range of dependencies emerge from these biotechnological advances. This speaks to their need to strengthen their own capabilities in the basic sciences as well as to find ways to assist the diffusion of innovations despite international legal and financial obstacles raised by patent conventions.

Another area in which the Third World cannot risk falling behind is in the field of computerization and information-processing -- for advances here will be crucial to progress in a range of other scientific fields. Many see the age of the inexpensive and versatile microcomputer as only a few decades away -- an age which could involve fundamental transformation in methods of production and consumption, ways of living, and the organization of social structures.

In his new book, The World Challenge, Jean-Jacques Servan-Schreiber argues forcefully that the benefits of the "computer revolution" just over the horizon must not be limited to affluent nations:

"One thing is certain [he writes]. As the industrialized West transforms itself into a computerized,



information-based society, the Third World must have the same opportunity. If the Western world adopts this new course -- more productive as far as the performance of machines is concerned, and more humane in regard to full employment of man's capability -- how can we imagine that the Third World would continue to supply 'cheap labour' to outmoded factories whose products would no longer find outlets?"

Still, for all the scientific wonders that might lie ahead, and all their promise of helping lift Asia's poor from their present status of squalor, indignity and despair, it must be recognized that science and technology, while essential, will not alone provide the solutions to these problems. If we hope to reshape the social structures in which these afflictions are embedded, we must learn to make science and technology serve clearer social and ethical goals.

The Reverend Martin Luther King, Jr. said that scientific power in the modern world has outrun our spiritual power, leaving us with "guided missiles and unguided men." The contributions which you AIT graduates will make to the lives of your fellow Asians will likely depend more on your understanding of the ethical and moral dimensions of the problems you are tackling than they will on your scientific or technological grasp of those problems. I say this in no derogation of the many long hours you have spent here over your textbooks and in the laboratories nor of the excellent instruction you have received from the AIT faculty.

We all of us badly need to improve our understanding of the social and cultural dimensions of the problems of hunger and poverty which

confront us. We need to know much more, for example, about the dynamics of community participation, village self-management and farmers' associations. We need to pay fuller heed to many hitherto unheard voices -- the marginal farmer, the landless labourers, women and other disadvantaged groups in the countryside.

These voices are now clamouring to be heard and we need to listen to them because they may have something very, very significant to say. There is much that is fresh and original in many of their challenges to old assumptions about development and economic growth. We need to think about new instrumentalities that will be more capable of hearing and assimilating into development thinking these voices. They represent the aspirations and hopes of vast numbers of humanity who have been too long at the bottom of the pile -- those whom Gandhi characterized as "the last, the least, the lowest and the lost."

So let me again wish you all success and best of luck as you move into your professional lives. My institution, the United Nations University, will be intensely interested in your work. We believe there is great need to reach out to your scholars and scientists, all over the world, and bring them into the task of working together to help improve this world and the lives of its people. As I said at the outset, the future is yours, not ours. It is you ultimately who can make the choices that could reshape and restructure a world system that is now seen as not just non-viable but plainly immoral to hundreds of millions of people. So much hangs on your ability to make the right choices -- technologically, ethically, and morally -- and thereby create a future of dignity and security for all humankind.