

From the Bhavan's President

Keeping Pace with Modern Technology

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If the Industrial Revolution of the 18th century was 'mechanical' the Industrial Revolution we are now passing through is electronic.

Engineering and technology are like two banks of the river of a country's development. They shape the course of progress.

The period from the beginning of the century to Independence in 1947 was, for India, one of marginal growth—with only an increase of 1.2 per cent per annum on a very low base of G.N.P. Our agriculture which was organized on a feudal system followed archaic practices. Our food production in 1951 was a mere 50 million tonnes for a population of 360 million. A common feature of the rural economy was the recurrence of famines. Agro-based industries like cotton, jute

and sugar dominated the industrial scene. We faced acute shortages of resources, raw material, skills and enterprise.

Technologically, we had largely missed out on the industrial revolution. Our traditional village and cottage industries were on the decline. We imported everything, from safety pins to locomotives. India was among the most poor and backward nations of the world with a large population. Life expectancy at birth was only 32 years. India had thus before it, the challenge of encompassing the development of over a century, possibly in a generation, by leap-frogging in industry, science and technology.

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Thanks to the vision and foresight of Jawaharlal Nehru, when India attained Independence, she adopted a Constitution which enshrined the fundamental rights of the citizen as well as the Directive Principles of State Policy embodying the socio-economic goals of the nation. A strategy of development came to be outlined in the very First Five Year Plan. In keeping with these social and economic goals, India's Five Year Plans for national development have aimed at the following set of more specific objectives;

1. Rapid growth of national income so as to raise the standard of living of the people;
2. Rapid industrialization and in particular development of basic and heavy industries;
3. Self-reliance in resources, technology, food and other basic materials;
4. Creation of employment opportunities for taking care of the backlog of unemployment and the growing labour force;
5. Reduction of inequalities of

incomes and wealth and balanced regional development; and

6. Alleviation of poverty and taking care of basic minimum needs including health and education through direct Government action.

Jawaharlal Nehru realized that human progress depended on the application of science and technology to every department of activity, be it agriculture, industry, transport or communications. And scientific advance depended on basic and applied research. He, therefore, established a number of research laboratories like the National Physical Laboratory, chemical, metallurgical, electro-chemical and numerous other research organizations. To promote technical skills several Institutes of Technology, Regional Engineering Colleges, Polytechnics and Industrial Training Institutes came to be established during that time.

Jawaharlal Nehru knew that the industrialization of a country depended not so much on raw

materials and capital as on technological skills. Judged in terms of resources, Japan, for instance, is poor. It has no iron ore, coal, or oil, none of the basic raw materials needed for industrial development. And yet Japan is today the foremost industrialized country in the world. It imports all the raw materials and then converts them into products of high value and markets them at competitive prices. The case of Germany is also similar. Once when I was in Germany I asked a research organisation how it was that they in Germany could rebuild a country devastated by war within a period of one single decade. They answered that though the war had destroyed their factories, power plants and communications, the war had not and could not destroy their skills and that it was with their technical skills that they are able to rebuild the most modern new plants. It is technological skill that has brought Japan and Germany to the forefront of industrialization.

It is that technological skill that

we must assiduously foster in India. If the Industrial Revolution of the 18th century was 'mechanical' the Industrial Revolution we are now passing through is electronic. The substitution of manual calculations, memory and measurements by electronic devices has revolutionized activities in every sphere. Here again Japan has taken a lead. The modern miracle, 'the computer', is fast replacing earlier instruments and is becoming all pervasive. A new vista of software services opens itself before the present generation, offering enormous scope for employment. I am sure the country as a whole will be able to take advantage of the immense opportunities offered in this field. There is also an excellent scope for export of software to the countries with relatively low manpower. I am afraid that this vast opportunity has not been tapped by us. We have necessary skills to capture the software market if we seriously go about it.

A glance at our international trade reveals the rapid strides that

India has made towards self-reliance—strides that hold great promise for our future. Our imports are now primarily limited to basic raw materials like non-ferrous metals, sulphur phosphates, etc. while our exports consist substantially of manufactured goods of various kinds including a variety of machinery and engineering goods. Sophisticated technologies have been absorbed and adapted to meet local needs. There are also some outstanding examples of technologies developed within the country.

But notwithstanding the positive factors, our trade deficit is widening and threatens to erode our fiscal system. There is an imperative need to re-examine our imports and prune them drastically. While imports that accelerate exports should be given the highest consideration, imports that go into items of mere domestic consumption have to be cut drastically.

Import of technology is no doubt necessary for accelerated growth. Developing countries need not spend time, money and

energy to rediscover known developments in the world. It is absurd to start once again with the James Watt's kettle and go through the same process centuries later. But having obtained the technology we should try to innovate and improve upon it so as to keep pace with the rapid developments in the world. Unless this is done, our technology will become obsolete and will lead to recurrent imports of every improvement in technology that takes place in the world.

India has been able to absorb and even adapt imported technology. However, its record of innovation and improvement leaves something to be desired, with the result that repetitive imports of every improvement abroad have become necessary. It is upto the research and teaching institutions and universities to offer the corrective to the situation.

Education trains the mind to release the creative impulses and expressions in an individual, and gives him a skill to create wealth for himself and the nation. This

constant harmony between individual's goals and nation's needs must be one of the cornerstones of any educational process. I consider training as an effective instrument for the potential growth of an individual, of a society. In an age of science and technology and bewildering pace of change this becomes all the more imperative.

Unfortunately, there is no linkage between universities and technological institutions and the industry. Having lived in a sheltered sellers' market, without either internal or external competition, the urge to cut costs, improve productivity and quality has been missing. Consequently the painstaking work in our universities and laboratories remains largely dormant without finding application in the production of goods and services. This phenomenon has also led to a sense of frustration among research scientists as the results of their research are ignored by Industry. Industry has done relatively little by way of

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promoting in-house research and development activities. The massive investments we have made in research laboratories and higher technical institutions will be wasted unless the industry refer their problems to them for solution and interact with them.

Knowledge, particularly scientific and technological is advancing at a rapid pace. To consolidate this knowledge, to build bridges between theory and practice and transfer it to the ground to give concretized structures and to cater to the social needs is a stupendous task.

Our scientists have very largely followed the stream of research that had been undertaken in the West. The West carried on research on materials available to them and turned them into wealth. But in India research on the raw materials available in the country is inadequate. Contrast this with what our ancients had done on the herbs and flora of our land and produced an Ayurveda. There is nothing like waste in the world. Bauxite was clay before science

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turned it into aluminium and iron ore mere rubble before it was made into steel. It is said that not a grain lies in the beach but infinite knowledge knows how to utilise it. We should, therefore, strive more purposefully to utilise indigenous materials.

I know the constraints on research work in India. But pessimism is no cure for poverty. Sir M. Visvesvarayya did not command vast resources. Among researchers, C.V.Raman, P.C. Ray and others of that calibre functioned from simple, even frugal, circumstances. The culture of rueing our lack of resources has to change. If technological innovation cannot overcome the resource crunch it loses its very meaning. To act under the shadow of constraint and crunch should be a challenge and an opportunity to give one's best. We all know how engineers of many nations have risen to meet the oil

shock.

Mere abundance of raw materials and capital resources cannot achieve results unless there is sound management. The capacity to husband resources effectively and to stretch every rupee to bring maximum benefit, is the function of sound management. The term technocrat has gained currency throughout the world because technologists have acquired skills in management so as to derive maximum advantage in the creation of wealth. In western countries engineers qualifying in other disciplines like economics is fairly common. Our universities should help their alumni to study any combination of subjects that the pupil wants instead of requiring them to go through a regimented course study.

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PH: 4312345	exaggerates.	
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