

Address by Prof. M.G.K. Menon, Member Planning Commission at the 21st Convocation on March 18, 1983

Mr. President, Dr. B. Ramamurthi; Fellows and Members of the Academy; Ladies and Gentlemen:

I consider it a great honour to have been invited to deliver the Convocation Address of the National Academy of Medical Sciences at the Convocation being held today. This is particularly so when I look back at the previous occasions, and the galaxy of outstanding figures who have addressed the Convocations. The Academy was inaugurated by the then Prime Minister Jawaharlal Nehru, to whom we all owe a debt of gratitude for his deep and abiding interest in science and technology and the support he gave it, apart from all his other contributions. Thereafter, your Convocations have been addressed by two Presidents of our country, Dr. S. Radhakrishnan and Shri Fakhruddin Ali Ahmed; by Dr. Zakir Hussain, the then Vice President, who later became the President of India; by our Prime Minister Smt. Indira Gandhi; by several Ministers of Health in the Central Government-Dr. S. Chandrasekhar, Dr. Karan Singh and the present Minister for Health & Family Welfare Shri B. Shankaranand; as also by distinguished men in public life, such as Shri M.C. Chagla and Dr. C.D. Deshmukh.

I stand before you today not as a medical scientist- though it was my first choice as a profession; and I have always great regret that I did not have the opportunity to take up that choice.

What I shall be saying to you today is based on my experience as a practicing research scientist, and one who has been in the past President of two sister Academies-the Indian Academy of Sciences and the Indian National Science Academy.

I also speak to you from my experience as Member of the Planning Commission with responsibility for the area of health and family welfare; in this capacity my concern is that the Sector of health receives the highest priority as an area of investment in human resource development-and surely, human resources are the richest resource of a country, and this be not regarded, as it generally is, as purely an expenditure to treat disease; and equally important, that the allocations made for this sector provide the greatest possible benefits to the largest numbers.

Advances in Science and Technology : Consequences and Implications

Let me first share with you some of my thoughts on the great transformations that are taking place in, (and are being wrought by), science and technology.

Mankind moved four decades ago from energy releases measured in electron volts, characteristic of chemical reactions, to energy releases a million times larger, characteristic of the nuclear processes. It was unfortunate that this leap-forward was ushered in with the atomic bombs dropped over Hiroshima and Nagasaki; a spectre that has hung over humanity ever since then. With the nuclear stockpiles that exist, it is possible to cause damage on such a catastrophic scale as to endanger the very survival of civilization. As our Prime Minister, Smt. Indira Gandhi, said in her Inaugural Address to the Seventh Non-aligned Conference held recently in New Delhi: *"The hood of the cobra is spread. Humankind watches in frozen fear, hoping against hope that it will not strike. Never before has the earth faced so much death and danger"*. The breakdown of social organization and the magnitude of casualties would be so large that no medical system could be expected to cope with more than a minute fraction of the victims. Radioactive fall out will be a global phenomenon. Its aftermath will involve far larger numbers than those subjected to a nuclear attack. These dangers have been focused upon and publicized at many forums. However, I find that the social con-science of our scientific community has not been awakened in this regard. By and large, we continue to be blissfully ignorant or insensitive to the volcano on which we are sitting. India has, since Independence, played a positive role concerning the need for peace, and argued strongly for disarmament, particularly nuclear disarmament; the initiatives in this regard have been largely at governmental level, stemming from the initiatives taken by Jawaharlal Nehru and more recently by

Prime Minister Smt. Indira Gandhi. It is in my view very important to build greater awareness in India, and other developing countries, about these dangers of a nuclear holocaust; and the scientific community has a particularly important role to play in this.

We have seen in the past 25 years spectacular advances in the field of space technology; these have given rise to major capabilities in the areas of communications, remote sensing, meteorology, and broadcasting, which would enable developing countries like India, if one can properly manage these capabilities, to leap forward in many sectors such as agriculture, forestry, climatology and weather prediction, disaster warning, natural resources survey, education, national integration, and so on.

We have made a good start in this field; and must realize the capabilities that have come into existence must be seized if we are to make rapid advance rather than progress along the beaten track.

Over the past few decades electronics, has become all-pervasive, particularly through discoveries in solid state electronics, and their applications in the fields of computers, communications and consumer electronics. We live today in what is often referred to as "*Information Age*".

Instrumentation is assuming increasing importance in scientific research, in industry and indeed many aspects of daily life. This is particularly so with the advent of a whole host of new transducers, and capabilities in microelectronics and microprocessors, which have opened up new areas of measurement and converted most instruments into "*smart instruments*". This can be seen in the host of new capabilities now becoming available to medical science.

An illustration of the nature of the great transformation that has been brought about through computing capabilities is the area of computer-aided tomography. In this, the powerful physical technique of x-rays, which had earlier existed, was married to computing capabilities in a special manner, to look for phenomena in the brain which would otherwise not be discernible. The CATSCAN is now a technique in regular use, of great value.

In general, the consequences of the present developments in the field of computing are beyond our imagination; I can only state that we can now ask questions of a complexity that would have been out of question even five years ago. An interesting aspect of this field is the availability of the young to come rapidly and easily to terms with these capabilities.

There are many other areas where important advances have been taking place. Great discoveries continue to be made in our understanding of the microstructure of matter, and the fields and forces that are concerned; this is the area which has been of interest to me in my research. Our knowledge and understanding of the macrocosmos that surrounds us, the universe, and the myriads of fascinating objects and phenomena seen in it has greatly moved forward. In the field of chemistry the range of contemporary interest is very wide; spectacular developments have taken place, often based on powerful new sophisticated methods of analyses and through the use of computers. We have innumerable common place items where scientific discovery and application have resulted in artefacts that are now part of daily life and have transformed the world around us in radical fashion.

From what I have briefly said, it is clear that spectacular advances are taking place, on a wide variety of fronts, some with great hope of a bright future, others holding the spectre of total destruction, and yet others where the future cannot be properly judged.

And yet there is one area of advance that I have not yet referred to, of great significance for humankind, and of particular relevance to you; the discoveries, in life sciences, which lead many to believe that this is the Age of Biology. Man has, in recent decades, probed deep to understand the living state at molecular and cellular levels. Biotechnologies born of this understanding hold great promise, and are poised for development, as was atomic energy in 1945, or space technology in 1957.

Homi Bhabha was quick to appreciate the potential in the field of nuclear energy; and embarked on a major national programme to ensure that India could achieve self-reliance, and derive the fullest benefits from these advances. Vikram Sarabhai equally envisioned the potential of the space age for a country like India to leap forward into the future.

It is the promises of the new biotechnologies that led the Government of India to set up the National Biotechnology Board, with the hope that activities over a wide spectrum, on a multi-institutional and multi-agency basis will be initiated, so that India can be ready in terms of manpower and competence, as well as infrastructure and production facilities, to utilize the unfolding potential of this field in the many areas of agriculture, health and industry.

It would be of interest for a group such as this to recall the transformation that has taken place in this field in just a matter of a few years. After the Second World War there were major developments in studies relating to complex biological molecules. Structures of hemoglobin, Vitamin B-12, insulin, collagen, etc were determined, using the tools available from physics and chemistry, principally x-ray crystallography. A milestone discovery related to the structure of DNA and the genetic code. Whilst exciting work continued for almost two decades at regular laboratory level, with a stream of understanding pouring out, it was during the late 1970s that techniques became available for rapid analysis of complicated bio-molecules. By 1978, a computer "*protein atlas*" had been written, containing the amino-acid sequence of more than 500 proteins. Soon afterwards it became possible for a scientist to determine the sequences of 200 amino-acids in a single day and to determine the sequence of 1000 of the nucleotides which form DNA in one week. The first gene was synthesized in 1964, but it is only during 1978-79 that it became possible partially to synthesize the genes responsible for the production of insulin and the human growth hormone. This became possible with the discovery of enzymes capable of cutting DNA at precise sites, of enzymes capable of sealing the loose ends, and of those which could synthesize DNA from messenger RNA. In 1979 it took two years to synthesize a gene with 120 nucleotides and by 1981 the same job could be done by a machine in three days.

There are many exciting implications of this work: the synthesis of insulin, somatostatin and human growth hormone; of interferon which could be of significance as an anti-viral and anti-tumour agent; production of chemicals potentially suitable as vaccines, for example against the hepatitis B virus, and a protein characteristic of one of the foot-and mouth viruses etc. These techniques could result in production of essentially pure products, free from toxic effects, reducing long and costly toxicity tests. These techniques should enable small quantities of the DNA or the RNA of an invading virus to be isolated, mapped, sequenced and replicated. In agriculture it may be possible to transfer nitrogen-fixing genes of certain bacteria to certain plants, as also transfer to a number of different crops specific genes responsible for improved yield or pest resistance; and there are many other applications in industry.

I have mentioned all this only because I am convinced of the great potential inherent in these new developments. It is vital that our scientific community become increasingly aware of this potential and rise to the occasion to take the fullest advantage of this.

Role of the Academy

May I now speak to you briefly on the role of the Academy, as I see it? Here we have to recognise that medical education is imparted through various medical colleges, and degrees given by universities. One has professional bodies, like the Indian Medical Council which is concerned with quality, certification, etc. Medicine is also practiced individually or in hospitals. The latter come under the management of the Central and State Governments or various autonomous public or private bodies. In addition there is an increasing amount of medical research that is being embarked upon. One of the principal vehicles for this today is the Indian Council of Medical Research; in addition, there is medical research carried out under various other auspices. May I point out that

Government, recognizing the great importance of medical research has, in the 6th Five Year Plan, increased significantly the allocation under this head.

In this framework, where does a body, such as the Academy, fit? It does not have large resources for running hospitals or providing medical facilities. It does not undertake educational activities; nor is it a research or grant-giving institution. Its role, in my view, should be to bring about a coherence in the leadership levels of the medical community: to ensure that the spirit of science and the scientific-method prevails, with the possibilities for honest, objective and unbiased dialogue and criticism. It must provide for standards of excellence; and it was Jawaharlal Nehru, who, in his inaugural address, emphasized that "quality should be absolutely first class". This was emphasized again by Dr. Radhakrishnan in his convocation address. In my view, there can be no compromise with the concept of excellence, and of quality, for an Academy. Excellence does not mean elitism; nor does it mean that those practicing are separated from the rest of the community. Excellence represents an altitude which influences behaviour, functioning and the approach taken to all aspects of work.

A further role of the Academy would be to promote interdisciplinary and inter-institutional thinking, through organizing appropriate scientific sessions. In this, great benefit could clearly be derived through cooperative ventures, involving other academies in the country an aspect, which I had the privilege of discussing last year with your President, Dr. Ramamurthi, when I was President of Indian National Science Academy; and I hope this will progress rapidly.

I believe that an academy has a vital role to play in assisting and evaluating programmes in the sector of health and family welfare undertaken by Government, for which large sums of money have been allocated. It is important that the views of the medical community at the highest level, after careful objective consideration of these programmes, is brought to the attention of Government.

It is also my personal view that academic activities are best carried out under the auspices of academic bodies. It has been customary for professional bodies in other fields, such as in engineering and technology, in finance, commerce, etc. to conduct examinations and to certify professional quality. These academic responsibilities should not be undertaken by Government through whatever structures it sets up. Such activities should be clearly the responsibility of professional academic institutions.

This brings me to another thought which I would like to bring to your attention. A very large part of medical work is concerned with the actual treatment of diseases; this is the clinical side of medicine. It is a vital area for which I have the greatest respect. There is, however, a spectrum of non-clinical areas. Many of these are well recognized by the medical profession, such as the fields of pathology, bacteriology, microbiology, and so on. But there are the fields of mathematics, physics, chemistry, biophysics, biochemistry, electronics, etc., which in recent years have been the sources for many advances of significance to medicine. With the manner in which science and technology is advancing, barriers between these different disciplines are being rapidly broken up. Please recognize that there is an enormous amount of electronics and instrumentation now coming into medicine, as well as analytical techniques based on mathematics, physics, chemistry. Whereas, on a day-to-day basis, practitioners in the different disciplines may find it difficult to get together, it is important that the more traditional medical practitioners recognize the importance and value of these related disciplines to the progress of medicine itself; and furthermore that bodies such as this Academy, foster inter-disciplinary activities to ensure the development of the field as a whole.

National Health Care and Delivery Systems

We have a rich heritage in medicine going back to more than 2000 years. The philosophy and science of Ayurveda and the surgical skills, as enunciated by Charaka and Sushruta, stand testimony to a long and glorious tradition in the care of the health of our people. Traditionally, the Indian approach to health care has been of a holistic nature, and takes into consideration all aspects of human health and disease. Many of the indigenous ideas and technologies that exist should be carefully looked

into as they could well be fertile starting points for major new approaches. However, over the past few decades the holistic concept of medicine and medical care has been fragmented and the thrust is on treatment of disease as it appears, or prevention of diseases on a specific basis; the concept of health tends to be ignored. In recent years, elsewhere in the world, there has been healthy growth of what used to be called whole animal and whole plant biology-in contrast to the emphasis on molecular structure of living systems or what stems from the approach of a physicist to look at the smallest structure where precise details can be worked out. We need to understand complex biological functioning as a whole-and particularly the synergistic and catalytic elements in functioning. Academy can play a vital role in ensuring that medicine and medical care retains a comprehensive character. Health care, unless comprehensive in nature, will never be able to achieve the desired goals and prove to be too expensive.

To those who would decry our efforts in the field of medical care, I would like to present the following facts relating to our successes:

We have been able to successfully wipe out the scourge of smallpox from our country; this has been the success of prophylaxis and of the health management system. Death rate, in the last 3 decades, has been reduced to half from about 30 per thousand in the early 50s to 14 per thousand today. We have been able to reduce infant mortality to 125 per thousand live births. In spite of the reduction, we must accept that what we have is a very high infant mortality rate and we have to reduce it further; we have set a goal for reducing it to 60 per thousand by the turn of the century. Average expectancy of life has increased from 32 years in 1950 to about 54 years in 1983. Plague is no longer a problem. Malaria has been brought under control to a considerable extent, though there has been a resurgence in recent years, but no where near the earlier situation: Substantial indigenous capacity has been established for the production of drugs; though I am sorry that our policies have of late resulted in scarcity of drugs, increase imports of even the most basic ones, loss of markets abroad that our industry had captured, and slackening of tempo in our scientific thrust towards self-reliance and indigenization. A large infra-structure of trained health manpower at various levels has been created and a vast network of health institutions has been built up.

In spite of such impressive progress, the health picture of the country today is a cause of serious concern, the mortality rates, particularly of children and women, are distressingly high. It is disheartening to note that more than a third of the total deaths occurred in children below the age of 5 years. The extent and severity of medical malnutrition is alarmingly high; and, in fact, has not shown much improvement. Hardly 10 per cent of our rural population has access to safe water supply and less than 2 per cent enjoy basic sanitation. Diseases of the gastrointestinal tract in infants and children, with other preventable communicable diseases, acting against a background of malnutrition, are the principal causes of high infant/child mortality. One fifth of the total blind population of the world is believed to be in India; the major causes are cataract, trachoma and other infections, and malnutrition. Diseases arising from poverty, ignorance, malnutrition and poor environmental sanitation are still highly prevalent.

The reasons for this situation are not far to seek. The wholesale adoption of the health care delivery systems, including of manpower development, based on the western models has proved inappropriate to the socio-economic conditions existing in our country. There has been an excessive pursuit of the disease-oriented and hospital-based approach for the privileged few to the detriment of providing comprehensive health care constituting promotive, preventive, curative and rehabilitative services for the many. It is clear that there are formidable problems that we have to face in the health field in the country.

A serious dimension to the existing situation relates to the very high cost of medical treatment due to increase in the cost of drugs and hospitalization which makes medical care more and more beyond the reach of majority of our people! Some experts say that it costs Rs. 2 lakhs per bed, or even more, in a good modern hospital, exclusive of the cost of land. This would mean a capital outlay

of Rs. 28,000 crores on a minimum national basis. Should our hospitals be so expensive? There are solutions to all problems. The solution to this problem will lie in our effort to create conditions which could decrease the necessity for prolonged hospitalization and drug administration. The domiciliary treatment of tuberculosis was a step in this direction. Promotive and preventive health care programmes will go a long way to solve this problem. This calls for an integration of preventive, promotive and curative health services at all levels of health care. I call upon the medical profession to apply its mind on urgent basis to a cheaper health delivery system. We today have all our resources going into cement concrete, steel, aluminium, glass, expensive drugs, with the problems compounded by poor management. Often one sees the equivalent of the saying in Malayalam: We observe Onam (a festival) when we have, or Ekadashi (a fast) when we don't," but please remember that there is a middle way also.

The health programmes in our country, by and large, have failed to involve the people actively to build a self-reliant community. On the other hand, the system has tended to enhance dependency, and weaken the community's capacity to cope with its own problems. A cultural gap exists between the health personnel and the people. I most earnestly plead to the Members and Fellows of the National Academy of Medical Sciences to strive to the maximum to plug this cultural gap and develop a relationship of partnership with the people in actively involving them to solve their problems. To my mind, the cherished dream of achieving and attaining the "Health for All" by the year 2000 A.D. cannot be achieved without the active cooperation and support of the community.

We have set a goal for ourselves to reduce the birth rate from the existing about 32 per thousand to 21 per thousand before the turn of the century. We are also planning to reduce the net reproduction rate to one by the same time. This would require that 60% of our eligible couples would be using effective fertility control measures. The present effective couple protection rate in the country is about 23.7. By the end of the Sixth Five-Year Plan, we must raise it to 36% : this would require a colossal commitment on the part of all of us, particularly on the health profession of which you are the luminaries. We need to work on biomedical as well as biosocial aspects of research for population stabilization. I hope that the Fellows and Members of the National Academy of Medical Sciences as an institution would leave no stone unturned to propagate the concept of a small size family norm in this country.

There are many reasons why medical research in India should be supported strongly. Firstly, as in the case of all research, it provides challenges to test the keenest of minds; it is one of the most decisive methods to establish excellence. The second feature is that the genetic stock and societal patterns over long periods of time provide relatively undisturbed samples of population with defined characteristics in many cases. In the tropical environment, the range of living systems encountered is of far greater diversity than in the temperate climates. Great opportunities exist for research on problems in the immediate environment.

Research of high quality had been conducted in this country, not all of it is well known or well publicized. To cite only a few examples: of those not now in our midst, there was the brilliant work of Upendra Brahmachari on Kala Azar and of Rostum Vakil on *Rauwolfia Serpentina*; amongst those still working, we have G.N. Ramachandran, who discovered the triple helical structure of collagen, Avtar Paintal, who has done distinguished work on cardiopulmonary physiology and J. Receptors, and Salimuzzaman Siddiqi now in Pakistan who did the earliest work on the chemistry of *rauwolfia*. These are only names for illustration, but we have many more. We need to create a sense of unity of our community, with the achievement of one being a source of pride for all of us.

What we have not yet been able to do is to carry through our researches to a determined logical conclusion; nor expand it in ever-expanding waves, building on our Guru-Shishya traditions, to create centres and schools of excellence. Many of our efforts have also not been incorporated into programmes to better the health care delivery in this country. We need to establish close linkages between workers carrying out research in laboratories in many disciplines, clinical research workers those who are concerned with field and extension work, as also with large scale facilities such as

animal houses and toxicological centres, the pharmaceutical industry and administrators concerned with health management. The Academy could play a very important role in trying to bring about these linkages.

You are all aware of the 20-Point Programmes, which was announced by the Prime Minister in January 1982, which focuses attention, in our developmental planning programmes, on aspects which are of particular importance to the under-privileged, disadvantaged and economically weaker sections of our society. Four of the 20 points deal with the prevention of disease and promotion of health; five other points, though not directly within the health sector, are in some way related. The points dealing with health include the area of family planning, control of leprosy, tuberculosis and blindness, augmentation of universal primary health care facilities, accelerated programmes of welfare for women and children and nutrition programmes for pregnant women, nursing mothers and children, specially in tribal, hill and backward areas. In all of these programmes, fullest support has been given by the Planning Commission in terms of financial allocations. This is also true in health-related areas, such as supply of drinking water, improving the environment of slums, integrated child development services, and so on. As in the case of eradication of smallpox, it is always desirable to define a few programmes, where major efforts can be mounted and tangible results obtained. This is particularly true in a developing economy, where resources, both in terms of money and trained manpower, are scarce.

In concluding, I would like to place before you what I consider to be one of the most important problems that we face. Those of us who are concerned with functions of this nature, in the running of programmes of government, or administering hospitals, institutions, etc, are already those belonging to the older generation. What should be of the greatest interest to us is the up-and-coming younger generation, and how to imbue it with a spirit of idealism, dedicated work and enthusiasm. It is that generation which can adapt itself most easily to the great transformations that are taking place in society, and the rapid developments in science and technology. I ask myself as to what we are doing for this generation. Right from the children going to nursery school, up to those emerging with professional degrees, say in medicine, we put them through a soulless grind for acquisition of knowledge: little children with satchels of books that they can hardly carry, and equally, medical students with tonnes that they can hardly lift. Is that education? The spirit of curiosity, of being able to think, and of enjoying the process of learning is destroyed under this dead weight. There is also very little that is taught concerning any code of ethics and conduct, of one's responsibilities to the community and to society. Is this not an essential part of a medical education, particularly for those bound by the Oath of Hippocrates?

Very large numbers would deliver their very best with relatively small guidance, encouragement and support: and yet these elements, which cost nothing, are seldom available. The greatest quality of leadership is to raise a younger generation of truly great leaders of the future. I hope the Academy will pay some attention to what it can do in this regard in the case of the medical profession.

Finally, I take this opportunity to congratulate all those who have been admitted today to the fraternity and fold of medical scientists in the National Academy of Medical Sciences. The country keenly look forward to your leadership to help us achieve the goal of "**Health for All**" by the year 2000 AD. I wish you very success.