

Address by Professor P. C. Mahalanobis at the FIFTH Annual
Convocation, 17 March 1967

Dr. Deshmukh, Vice-Chairman, Dr. Rao and Friends :

It is a great pleasure to have the opportunity to say a few words on this occasion, particularly so because I am very happy to announce that Professor C. R. Rao was elected a Fellow of the Royal Society yesterday (Applause). I may mention that at present there are, besides Professor Rao, five other Fellows of the Royal Society resident in India, National Professor C. V. Raman, National Professor S. N. Bose, National Professor D. N. Wadia, Professor T. R. Seshadri, and I myself happen to be one. Now Dr. Rao is the sixth Indian Fellow of the Royal Society.

I am particularly happy because, at the age of 46, Rao is the first Indian F.R.S. of his generation. The other five of us are nearly 70 or over. Ramanujan, C. V. Raman, J. C. Bose were the representative of an earlier generation. Rao represents the younger generation. This is most welcome indeed. It is a very happy occasion for me because Rao started studying statistics 26 years ago when he joined the Institute in early 1941, and later joined the course for the master's degree in statistics which was started in Calcutta in 1941 for the first time in India when I was honorary head of the Department of Statistics of the Calcutta University.

On the present occasion it may be perhaps pertinent to say a few words about the importance of science and technology in relation to economic and national development. We all know that the spectacular improvement

2)

in the level of living which was brought about by the industrial revolution 150 years or at the most 200 years ago in the advanced countries, rests on science and technology. The substitution of organic energy, that is human and animal labour, by inorganic energy, that is, coal, steam and electricity and such other things, is the essential basis of a rapid development of industry, that is, of production with the use of machinery driven by power, which alone can give an amazingly high production per person and much, and incomparably, more than his own needs, which is the only way to improve the level of living of all the people gradually over the whole world. We all know that we need engineers, scientists, medical men and many other categories of professional people to transform an agricultural economy into an industrial society. This is well recognized. We also know about the need of scientific research.

But I should like today to draw attention to a deeper aspect of science. This is a point which I should like to mention today, because a little more than 300 years ago the establishment of the Royal Society was a kind of landmark in the history, if I may use somewhat hyperbolic language, of the present phase of human civilisation. There were early academies of science in Europe but the Royal Society is the oldest society with a most distinguished record of scientific achievement. I may take the emergence of science in the modern sense, in an oversimplified way, as of the last 300 years; or we may, perhaps, go back a little further, and accept the birth year of Gallileo, a little more than 400 years ago, as the beginning of the emergence of modern science.

Scientific discoveries there were from time immemorial; and technology in the sense of application of scientific knowledge for specified purposes, is also of course ancient and from time immemorial. The taming of fire, the great technological revolution of agriculture, the building of the pyramids, and in our country the great cities of Indus valley civilisation, and such other things would testify to that long history of scientific and technological innovation.

But the real break-through in human thought and in human civilisation came with emergence of science in its modern sense roughly 400 or 300 years ago. This is the point which I should like to stress today. Until then there was the view in the West of the earth as the centre of the whole universe, the sun and all the stars going round the earth. The whole of theology and philosophy in the West was built on this image. In our country there was something similar, that the earth rests on Besuki the serpent which rests on a tortoise and so on and so on. This was the view 300 years or 400 years ago.

Then there was a change, a very big change, when the view of the world suddenly became different with the earth a very small little planet going round the sun, and the sun itself a small little star among millions of other stars. For the first time the human being became aware of what we now call nature which is inter-related and integrated and which is amenable to rational human understanding through observations, experiments, and logical, and if I may say so, statistical and scientific inference. This was a very big change. This nature, this world of reality was something beyond the domain of human authority. This was

4)

the dramatic story of the conflict between Gallileo and the Pope; you know that story.

I should like now to present the transformation in a slightly different way, to bring out its inner significance. Before the emergence of science, and the emergence of the view of an objective reality which was inter-related which we call nature, there were only two basic types of human decisions, one of individual freedom of choice which exists in any organised society not only of human beings but of ants, bees, elephants, partisans fighters, or even bands of robbers. Each individual had, has, and will continue to have, a certain degree of freedom of choice within the limits of physical availabilities and of social and legal permissibilities. This freedom remains, and will endure in the choice of sports, what music you would like to hear, what food you would take, what clothes to wear, and so on, but always, of course, within physical availabilities and social permissibilities, and also the world of individual values of art, literature, moral and spiritual values. This is one type of choice which will always remain.

The only other type of decision was that which was based on authority. The decision or sanction of a higher authority must prevail. This must be true in the family, whether it is tribal, matriarchal or patriarchal, in business, in industry, administration, the police, the army, everywhere in organised activities. Without this principle of authority orderly progress of every day affairs would not be possible. This also must remain.

The principle of authority can be seen in its most dramatic form in a system of law. A system of law is not conceivable without the possibility of at least one single appeal from a lower court or lower authority to a higher one. Also, if there is a right of appeal, there must also be the possibility of upholding or a complete reversal of the decision of the lower authority. There is nothing improper in such reversal. Without the possibility of such a reversal we cannot speak of a system or a regime of law.

Now look to the nature of scientific decisions. The principle of individual choice can motivate the subject field of research, but immediately some scientific results are reached the individual goes out. He has no room in his own scientific discoveries. The principle of individual choice is irrelevant and has to be rejected absolutely and categorically in the domain of modern science.

The principle of authority, on which rests the second type of decision, must remain on the organisational side of science, in somebody making decisions about what books or equipment should be purchased, who should be employed, what would be the location of new buildings within this Institute or any other institution; in all such matters the principle of authority would remain. But in the domain of science, in decisions relating to the knowledge of nature, human authority is irrelevant. The sanction of human authority however high its status, must be rejected categorically and absolutely.

6)

We thus find that the transition from the old world to the modern age of science ultimately means a great break-through, the most difficult transition of accepting the principle of reality of nature, of accepting the validity of the third type of decision in the scientific field. This is what I mean by the tradition of science. I have tried to explain the importance of science not merely on the surface needs of engineers, or of the need of applied research, but still more deeply on the need of fundamental research which alone can help in building up a community of scientists in which lives and is carried forward the tradition of science.

The most urgent need in my country and in all underdeveloped countries is establishing the tradition of science, without which, I am convinced, no sustained economic growth is possible. If we continually live in a world of dreams, of infantile wishful thinking, denying the principle of reality, we shall never succeed in the field of economic growth nor in social and political affairs. We can not. This is not the occasion to give you particular examples. At my age, and with my experience partly as an onlooker in government affairs, and also with my intimate connexion with Indian science, I find that the tradition of science has not yet been adequately established in my country.

This is what I have very much in my mind today. I think I see in a symbolic way, in the election to the Royal Society of C. R. Rao, who is my direct pupil, the recognition of the younger generation of Indian scientists at the international level (applause), and the promise of the future of science in India.

I have tried to indicate the importance of the scientific tradition. It is not enough to have a large number of scientists in research Institutes publishing many papers most of which may be useless and therefore called pure research, but which have no connexion with economic growth - we have too much of this in my country. We can never have too much of true basic research. Therefore today, I should like to say to our young graduates and to my colleagues, our teachers and our students, and also to our guests from neighbouring countries which are underdeveloped, that you must realise that the essential need is the most difficult transition of lifting our country into the modern age by establishing a sound and growing tradition of science. This is the task which is before us, nothing less would be enough.
