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**SCIENCE AND INTERNATIONAL
CO-OPERATION**

By

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PUBLISHERS' NOTE

Many valuable lectures are given, papers read said discussed and oral reviews of outstanding books presented at the Indian Institute of World Culture. A wider dissemination of at least a few of these addresses and papers is obviously in the interest of the better inter-cultural understanding so important for world peace.

A paper specially prepared by Professor A. V. Hill, Nobel Laureate, Fellow & Research Professor of the Royal Society, and former M.P., England, on "Science and International Co-operation" was read on 23rd November 1972 at the Indian Institute of World Culture under Major General Bhatia Endowment Lectureship for "Science and Humanities". The present Transaction is the text of this paper.

Bangalore - 4 16th December 1972

Prof. A. V. HILL F.R.S.

PREFACE

On behalf of The Indian Institute of World Culture, I had requested Professor A. V. Hill to contribute a paper to this Endowment on a subject connected with "Science and Humanities." He very kindly agreed to do so.

I have had the privilege of knowing Professor A. V. Hill, since my student days in Cambridge in 1911. He was then Demonstrator in Physiology in the Physiological Laboratory there. Apart from teaching he was fully engaged in research work. He is a very renowned Physiologist. For his basic work on the elucidation of thermodynamics of muscular contraction, he was awarded the Nobel prize in 1922. In 1923, he succeeded Professor E. R. Starling at University College, London, and in 1926 became a Royal Society Research Professor there. In 1940 he was elected as Member of Parliament for Cambridge University.

He came to India during the Second World War and arrived in Delhi on 16th November 1943 and went back on 5th April 1944. The object of his visit was to advise the Indian Government on various scientific problems including Medical and Scientific Research. I was in Delhi at the time, and we had the opportunity of meeting quite often. Actually he came and stayed with us for some time. For the purpose of his report he visited a number of places, including Bangalore where he met Sir C. V. Raman. He was at that time Biological Secretary and Research Professor of the Royal Society of London.

After retiring from University College, London, he has gone back to Cambridge and has settled down there. There are quite a number of publications to his credit, such as *The International Status and Obligations of Science*, *The Ethical Dilemma of Science*, and other writings. He has some very definite views on the subject of "Science and international Co-operation" and the paper he has contributed is full of interest and valuable advice.

It was of course understood from the outset that Professor A. V. Hill need not come to Bangalore from Cambridge to deliver this address. His paper was read at the meeting on 23rd November 1972 by Dr. M. N. Mahadevan; and Professor N. A. Nikam, Ex-Vice-Chancellor of Mysore University, presided on this occasion. For this, I am sincerely grateful to them both.

Bangalore
2nd December 1972

S.L. BHATIA

SCIENCE AND INTERNATIONAL CO-OPERATION

I am very glad to have this opportunity to make a contribution to the lectureship established by Major-General S. L. Bhatia at this Institute. At the outset may I refer briefly to the close friendship that has existed between us for many years. It goes back to the days when he was a student at Cambridge.

Large streams from little fountains flow:

Tall oaks from little acorns grow.

The tall oak is now a magnificent feature of New Delhi, the All-India Institute for Medical Sciences, established by an Act of Parliament in 1956; the little acorn was planted about 1910 by an elderly lady, Mrs. Poole, who had spent many years in India and felt a strong call to befriend Indian students in Cambridge. She lived in Newnham Terrace. An active agent in helping the oaks to grow was Sohan Lai Bhatia, to whom as a medical student, I demonstrated in 1911 in the physiology classes; he was one of Mrs. Poole's young friends, so I got to know him outside the laboratory. He still holds her memory in esteem and honour.

Now according to the Hippocratic Oath, the first obligation accepted by a student of medicine is:

“to reckon him who taught me this art equally dear to me as my parents, to share my substance with him and to relieve his necessities if required.”

The same sense of obligation to a teacher is inherent in the ethical principles of India; not only in its ancient systems of medicine (going back much further than Hippocrates), but also — as I have continually experienced in common life. For sixty years “S.L.” has practiced these principles towards me; and indeed quite literally, in 1943-44 when I was in India, he shared his substance with me, and relieved my necessities. One of these necessities, arising out of my mission there, was to learn more about the state of medicine and of medical science in India. In this he in turn became my instructor, and from our discussions arose a plan for an All-India Medical Centre, which was the forerunner of what now exists in Delhi. Others too must have thought of such a plan, it seemed very obvious to us, as it would have been to them. The Bhore Committee's Report on the subject was published in 1946.

S. L. Bhatia was born in 1891 at Amritsar in the Punjab. Why I liked him directly we met I cannot tell; but I have always been fond of soldiers, he looked like a soldier, some of his relations have been in the Indian Army and Navy and — as it proved — he did distinguished and gallant service during the 1914-18 war. I must instinctively have felt the other qualities he had, which matured into his becoming a scholar, a historian and a philosopher, as well as a physician and administrator. He seems also, from his writings, to be both a Buddhist and a Christian! After qualifying at St. Thomas' Hospital in London, he served in the Indian Medical Service in the field, gaining an M.C. Then in 1920 he returned to the civil branch and worked at the Grant Medical College in Bombay till 1941, starting as Professor of Physiology, continuing as Dean and finally as Superintendent of a group of hospitals. When we collaborated in 1943-44 he was Deputy Director General of the I.M.S. He retired as a Major-General. Since his official retirement, he has been kept perpetually busy by innumerable people wanting his advice.

In 1959 I had to give a lecture to a medical audience in Karachi. In it, among many other names, I mentioned that of Bhatia. Unexpectedly, but to my great pleasure, his name drew long and enthusiastic applause — in spite of the bitter hostility existing between India and Pakistan. In Bombay and in the I.M.S., he had been the teacher, or the inspiring leader, of

many of them; political stupidity had not altered human gratitude. Here, reflected, were the principles on which his own conduct was based.

During the war of 1939-45 I was biological secretary of the Royal Society and also Member of Parliament for Cambridge University. Both gave special opportunities for being a nuisance, when necessary, in good causes. One of the good causes was to improve scientific contacts and communication between Britain, the United States and many countries of the British Commonwealth. Left to officials and politicians such things tend to be neglected. It proved rather easy to get full scientific partnership working, even with the United States nine months before Japan eased her into the war. But with India, progress was slower. At both ends politics tended to dominate the scene, to the -exclusion of more sensible things; together at our end, with the snobbishness of racial superiority. Finally, however, the Government of India was persuaded that something must be done, and I was asked to go to India to advise on scientific research in general, and its bearing on present and future problems. I consulted a good old friend of mine. Sir Stanley Reed (1872-1969), then an M.P., who had been editor (1907-23) of *The Times of India* and knew the Indian climate of opinion well. He replied, more or less, for God's sake don't let them think you are coming as a Member of Parliament or you will find suspicion and mistrust everywhere and failure to cooperate; get the Government of India to invite the Royal Society to send you there as its representative. He was right and I did; and I received nothing but kindness and help from everyone. The only unfavorable comment was early in Delhi, when a reporter stated that I was an elderly scientist who had passed his best days and was only fit to be a general busybody.

My Indian scientific friends, particularly Shanti Swarup Bhatnagar, being quicker witted than that, saw in my coming an opportunity of getting their needs at last attended to. I was given every possible assistance and encouragement, and was urged that discretion is not the better part of valour; but rather was invited to criticise openly whatever I thought wrong or stupid. Many things were wrong and stupid, and much has since been put right; but the particular thing to be considered in this note was the miserable state of medicine. I had recently been serving in London on the Interdepartment Committee on Medical Schools, so the matter was vividly in mind.

Returning now to Bhatia, I had met him at intervals over the years, he had always pressed me to come to India, but there was never an opportunity. In Delhi I stayed frequently in his house and we spent much time discussing the sorry state of Indian medicine — which I had every opportunity of witnessing for myself. I knew how, fifty years before, the whole level of American medicine had been raised by the single action of Johns Hopkins University in setting new standards which, in the end, the other universities were forced to follow. In my report to the Government of India in the spring of 1944 I had urged, among many other things, that the same should be done in India — in fact, as we said for short, an Indian Johns Hopkins should be founded. A shortened version of what

I wrote in my Report follows:

Although the purpose of my visit to India was not related to any special branch of science it was natural as a physiologist that I should be given special opportunities of seeing hospitals, medical colleges and departments of medicine. In this field my chief recommendation was the establishment of an All-India Medical Centre.

In all the subjects of a medical course, in laboratory as well as hospital, the crying need in India was for fulltime workers, capable and well-trained, able to devote their lives to the advancement of the science and practice of medicine by education and research. It has

become almost a cliché to say so, but in no other subject than medicine is it so necessary that, education should be given in a research atmosphere. Each patient presents a problem, each diagnosis is a theory, each treatment an experiment, often an expensive and painful one; and it must seem to anyone of scientific upbringing almost a crime that the results of nearly all these costly experiments go unrecorded. In the right research atmosphere this would not be so, but in that of an ordinary general hospital, with a very part-time staff and no provision e.g., by an almoner's department, for 'follow-up', it literally is. How can medical education produce a scientific attitude of mind in such circumstances? In fact it very seldom does.

By far the most effective way of producing a change in all this would be to set out deliberately to create teachers and research workers of a new kind, people who would devote their lives to the single object of advancing in India the art, science and practice of medicine. For this purpose an All-India Medical Centre should be established, an 'Indian Johns Hopkins' staffed in all departments by the ablest people available anywhere, employed full time and adequately paid. The students of the All-India Medical Centre should be highly selected, preferably with good degrees in arts or science as a start; and since a large proportion of the most desirable students, cannot meet the financial cost of a long framing in medicine, all who require help should be given & in the form of scholarships or bursaries.

The All-India Medical Centre should be genuinely an All-India affair. It might be thought best to establish it in some great industrial city; but the seed to avoid communal, political, inter-provincial and inter-state difficulties and rivalries is so great, the seed to avoid jealousies and conflict with existing interests is evident, that I have been convinced that the centre should be established in the capital city of India. Delhi University is growing in stature and importance; there are many scientific institutions in and around Delhi; Delhi is the meeting ground of many scientific and medical interests; Delhi will probably become the headquarter of a future national academy of sciences and of other specialist national scientific bodies; and air transport in the future will make communication with other parts of India vastly quicker than at present. If the All-India Medical Centre is to play the national part, it should be advancing medicine and public health, and to gain the international reputation which will put the Indian medicine 'on the map' and attract first class teachers and research workers from any part of the world, then I think it must be given the national recognition and status which is possible only by its establishment at the capital of India.

In 1945 Bhatia went to U.S.A. and Canada on a special assignment, and in the course of his travels he paid a special visit to Johns Hopkins Medical School at Baltimore. This experience of his was helpful in establishing this Centre.

Ultimately, an All-India Medical Centre which I had proposed came into being in 1966 by an Act of Parliament as the All-India Institute of Medical Sciences at New Delhi. The main concern of this Institute is to develop; patterns of teaching in undergraduate and post-graduate medical education in all the branches so as to demonstrate a high standard of medical education to all medical colleges and other allied institutions in India. This educational experience is to be imparted in an atmosphere of research.

This evolution of the Science of Medicine in India is an example of close cooperation in the international sphere between India, England and U.S.A.

Science and International, Co-operation

Science is a common interest of mankind, whatever their barriers or the difficulties or the struggles between them. Civilized societies have accorded a certain immunity and tolerance to people concerned with scientific discovery and learning.

Religion, literature, art depend in part upon customs, race, climate, age and sex. The religious instinct, the artistic sense, may be universal enough, but their expressions can be so different, that they may lead sometimes to strife, rather than co-operation. In science, however, one finds that its discoveries do gradually build up a structure, which is approved by all sane men. In the last 300 years, the experimental method, which is universal, has produced results beyond all previous human achievements. It is this universality of its methods and results, which gives science a unique place among the interests of mankind.

But science may be grossly mis-applied, whether in making poison gases for war or in poisoning the decent sense of mankind.

Any physiologist, who regards the living animal as a whole, after surveying in detail the functions of its several parts, is impressed by the extraordinary extent of coordination of those parts and functions. The further he explores, the more intricate and perfect do the adjustments and adaptations appear. The differentiation of function, which has made the higher animals possible, has led to an extreme degree of co-operation between the different organs themselves, ensuring the well-being of the animal as a whole. The brain and muscle, the pancreas and the liver do not normally war against each other in order to ensure the survival of the fittest. What is true of a single creature is true also of a community — indeed, it is often impossible to say, where individual ends and community begins.

The chief principle, therefore, in biology, the principle which differentiates it fundamentally from physics, is that the living organism is stable and self-perpetuating, within wide limits of treatment or environments owing not to incessant struggle, or tribal prejudice, but to the requisite integration, co-ordination and co-operation of its parts. This is the principle we should adopt in creating good-will and co-operation in the social and international sphere.

If scientific people are to be accorded the privilege of immunity and tolerance by civilized societies they must observe the rules. These rules could not be better summarised than they were by Robert Hooke in 1663 in a statement which was probably drawn up after the passage of the second charter of the Royal Society of London. It begins as follows:

“The business and design of the Royal Society is to improve the knowledge of natural things, and all useful Arts, manufactures; mechanical practices, and inventions by experiments— (not meddling with Divinity, Metaphysics, morals, politics, grammar, Rhetorick or logic)”

It continues:

"All to advance the glory of God, the honour of the king, the benefit of his kingdom and the general good of mankind."

No meddling with divinity, metaphysics, morals, politics, rhetoric, but for the general good of mankind. This is what a scientist should observe. To avoid such meddling is the price the scientific man must pay for his immunity. Not a very heavy one perhaps, though times come, as at present, when it is difficult not to meddle with morals or politics. No meddling with morals or politics, such is the normal condition, of tolerance and immunity for scientific pursuits in a civilized state.

Newton, shortly before his death, is reported to have said:

“I know not what I may appear to the world, but to myself I seem to have been only like a boy playing on the sea-shore and diverting myself in now and then finding a smoother

pebble or a prettier shell than ordinary, whilst the great ocean of truth lay all un-dis- covered before me."

If science loses its intellectual honesty and its political independence, if it becomes tied to emotion, to propaganda to particular social and economic theories, it will cease altogether to have its general appeal and its political immunity will be lost.

If science is to continue to make progress, if it is to lead to the advancement and not to the destruction of human institutions, it must insist on keeping its traditional position of independence, it must refuse to meddle with or to be dominated by divinity, morals, politics or rhetoric.

The attachment of certain branches of science to competitive industry, desirable within limits, if it went too far, might lead to the control of such science by industrial interests.

The necessity of science in modern warfare might in some future war give it a purely national instead of an international basis and it might result in a terrible catastrophe to mankind.

As a reaction to nationalism, we see internationalism developing today. One need not have a low opinion of one's own country to appreciate the virtues of others. Another tendency today fostered by the same conditions is toleration in religious matters.

Had learning and science no other gifts at all to offer to mankind, their habit of transcending language, nationality and prejudice would have made them more perhaps than anything worthwhile. Religion should have played, and sometimes actually did play this part. But very often it was associated with the bitterest of struggles. But today we should consider religion also from a broad point of view and look upon all religious beliefs with toleration.

We must consider science as a common link between the different races of mankind, as a means of promoting international understanding. To thinking people, the progress of knowledge, the advance of medicine, the improvement of health and happiness, which can be — should be the result of scientific and technical achievement, are among the major interests of mankind. It seemed that nations and governments were certain to realize them and so would encourage cooperation, at least in intellectual things. Private agencies have contributed very generously in recent times to this end. For example, the Rockefeller Foundation has contributed generously to medical science and biology and in this way to the welfare of mankind throughout the world. This work is done not in any religious fervour, but as a matter of ordinary business and commonsense— not meddling as Hooke wrote with divinity, morals, politics or rhetoric. The Rhodes Scholarships, the Commonwealth Fund Fellowships, Guggenheim Fellowships serve similar ends.

It is perilous to disregard the scientific basis of modern civilization or its dependence on international cooperation. Science and learning must realise that they exist not only for what they can do for the material welfare of mankind, but perhaps chiefly for the fact, that they alone seem to be truly international, to be capable of transcending national follies and absurdities. If this does not happen, there is danger, that *Homo sapiens* may ultimately destroy by his irreconcilable folly all he has built up. Mankind's amazing intellectual achievement in understanding and controlling the forces of nature may be neutralized by the domination of his intellect, by his passions, by his emotional inability to realise, what must be obvious to his intellect alone, the demands of common humanity. The outlook, however, is not quite so bad, but we must emphasise, that science and learning, particularly science, which in its experimental method, has an absolute means of deciding between opinions, as being the

strongest link between the intelligent people of the world.

The best and noblest motive for the study of science is the intense mental enjoyment and the spiritual satisfaction that it brings. Science has proved and will continue to prove useful, in a material way, in alleviating man's lot, in curing disease, in prolonging and beautifying life; and there are few investments more profitable than provision for those who have the skill, the persistence and the ability to pursue the close and careful analysis of the ways of the living organism.

The atomic bomb and the future possibilities of atomic power, have produced a revolution in human affairs. Rightly used atomic energy could bring inestimable benefit to mankind — wrongly used it could bring civilisation to an end.

To suppose that this business of atomic energy could remain secret for long — long enough to matter — is complete moonshine. The only hope of decent and reasonable use of what could be a priceless gift to mankind, lies in frankness.

Nothing in the long run breeds fear, jealousy, mistrust and insecurity so effectively as so-called "security". Nuclear fission has released the threat of unprecedented violence with the possible destruction of many millions of lives and the accumulated treasures, moral and material, of civilisation.

Much scientific and technical advance has led to unexpected dangers and difficulties. Because of the dangerous uncertainties looming ahead, it is necessary for us to take stock of the species, *Homo sapiens*, whose evolution has culminated in mankind today. It is our duty as scientists to insist, that this is a matter of extraordinary urgency, and to make it apparent as far and wide as possible. The question is now arising, whether, the civilisation which mankind has slowly and laboriously built up over a period of many thousands of years can avoid disastrous dissolution as the result of un-controllable (or at any rate uncontrolled) struggles for political power or economic superiority and indeed, whether the human species can avoid at least partial extinction by the mis-application of its own ingenuity.

Intellectual processes are only capable of full expression if they are activated and energised by the driving power of emotional processes which come to be associated with feelings of aesthetic satisfaction.

John Stewart Mill said about 135 years ago, that "there is not a more accurate test of the progress of civilisation than the progress of the power of cooperation". This cooperation has led in the past to the progressive assimilation of smaller groups into larger groups of increasingly complex social structure — at first families into wide communities based on kinship, these into classes and tribes, these into political units represented by States and the nations of the world. There has been a broad historical trend in the direction of a progressive unification of mankind. In some cases this has come about by mutual agreement for furtherance of common interests, but it has often been the result of conflict between opposing groups ending in the subsequent mergence of the vanquished into the social and economic structure of the victor. This process of unification may be regarded as a major factor determining sociological progress. But if this process comes to a halt as the outcome of conflict involving nations of these world today, it would lead to a degree of destruction, that would be precarious to the very existence of mankind. We must try our best to escape from this crisis.

In this process of unification, science has a vital part to play. As I have already mentioned, science is a common link between races of mankind, as a means of promoting

international goodwill and understanding. Scientists of all countries feel impelled to retain and develop harmonious relations, simply because they realise that the very advancement of their subject depends on a thorough acquaintance with; work going on elsewhere.

The progress of science is essentially the result of cooperative human effort. There is a universality in the logic of scientific method, which provides an intimacy of understanding hardly possible in other fields of learning, where there are fundamental conflicts of opinion derived from preconceived convictions and beliefs based on unverifiable evidence and not amenable to scientific methods of enquiry by the rigorous test of repeated observation and experiment. Thus the scientists have to observe an ethical code, which has profound respect for the objective truth.

Cooperation with other workers in the same field contributes to a sense of tolerance and intellectual humility. It is essential to attain this moral growth in reciprocal relationship with other human beings. This is part of the scientific humanist's moral programme, which should be implemented as effectively as possible, so that peace and harmony may be preserved on this earth.

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