

BIRTH CENTENARY CELEBRATION

OF

Prof. P. C. Mahalanobis

1992-93

SOUVENIR

INDIAN STATISTICAL INSTITUTE

203 BARRACKPORE TRUNK ROAD

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It gives me a great pleasure to learn that ISI Club is bringing out a Souvenir. This year is special in the history of our Institute being the Birth Centenary year of our founder, late Professor Prasanta Chandra Mahalanobis. His birth Centenary falls on June 29 of this year. Professor Mahalanobis contributed to many fields other than Statistics. He was an outstanding Statistician. He was a visionary. Our Institute owes its existence to him. All of us who work here owe a debt of gratitude to him. I pay my deepest respects. Let us rededicate ourselves to follow his footsteps and to work for this Institute which he founded so that it will continue to be considered as an institute for excellence, high quality and distinction.

Sd/-

(B. L. S. Prakasa Rao)

CHIEF MINISTER
WEST BENGAL

No. 5109-DOCM
February 25, 1993

I am glad to know that the Indian Statistical Institute Club is Celebrating the Birth Centenary of Professor Prasanta Chandra Mahalanobis shortly.

I wish the Celebrations all success.

Sd/-
Jyoti Basu

Shri Niranjan Chatterjee,
General Secretary,
Indian Statistical Institute,
203, Barrackpore Trunk Road,
Calcutta-700 035.

Minister
Information & Cultural Affairs, Municipal
Affairs and Urban Development Departments
Government of West Bengal

D.O. No.....

Calcutta, the 19 Jan. 1993

I am glad to learn that INDIAN STATISTICAL INSTITUTE CLUB is going to observe the Birth Centenary Year of its founder Professor Prasanta Chandra Mahalanobis and also publish a Souvenir during February, 1993.

I convey my greetings to the members of the institute and wish the programme all success.

Sd/-
(Buddhadeb Bhattacharjee)

Genl. Secy.
Indian Statistical
Institute Club

STATEMENT OF GENERAL SECRETARY

To begin with I must remember with heartfelt respect, Professor Prasanta Chandra Mahalanobis, the founder of Indian Statistical Institute and the father of Statistics in India, in whose Birth Centenary Year this Souvenir is being published. I also like to convey my thankful gratitude to the donors and my colleagues, without whose cooperation this publication could not be possible.

Though I never had the chance to see Professor P. C. Mahalanobis (PCM) I think it as a great privilege on my part to have a chance to write a few lines in his memory. Professor had no child and naturally he poured all his love, energy, carefulness and everything in nourishing this institute which was in every meaning nothing but his son or daughter. In the year 1932 he started his creation in the Physics Laboratory of famous Presidency College of Calcutta with an elevated hope to work for the nation as well as for the mankind as a whole with the help of his instinctive genius. As a result of his continuous effort ISI has been able to reach at its present stage of an institute of national importance and a centre of excellence in several disciplines consisting of so many eminent scientists in different areas, who are really the pride of the institute. PCM was of the opinion that we should work with more devotion on any nationally important days instead of wasting them to observe as holidays. He used to inspire everybody to work and only work, that also with maximum neatness and in very correct form. He was a man of towering personality and tremendous power to convince or influence any body irrespective of his or her position in the society. On the other hand he also possessed a great sense of humour. He felt the necessity of forming Union or Club amongst the workers to assess their genuine demands to be fulfilled or relax themselves with some sort of entertainment and recreation. The great poet Rabindranath Tagore was one of Professor's close associates. Professor was so interested in cultural programmes that at one time at his own initiation the famous drama of Rabindranath "Rakta-Karabi" was arranged at ISI and several other cultural functions were also organised by him. On the one hand he liked to see everybody being engaged with some work and on the other hand he had a very soft corner in his mind for all of them. He had an unexpectedly sharp eye to find out skills and he never hesitated to honour them. However, in my thinking Professor will ever remain with ISI as long as it will exist,

It is the right time for us to take a fresh oath that from now on, keeping aside our self interest at all times, we would march forward with the idea of PCM in all our scientific and non-scientific activities and I think this will be the only way to show proper respect to our great founder in his Birth Centenary Year. Workers' Organisation of ISI and the ISI Club have also some responsibility in this connection to inspire their members, particularly the new generation, who are not so much acquainted with the ideology of PCM, to be so disciplined to maintain the norms of Professor to reach our only goal to see more prosperous ISI.

To commemorate the Birth Centenary Year of its founder President Indian Statistical Institute Club chalked out some programmes, but could not do all these due to shortage of fund. During our Blood Donation Camp of the year we gave every donor one special certificate and one badge in memory of PCM. We could introduce one inter-University PCM Memorial Football Tournament with great enthusiasm in our own small football ground with a very festive mood. This is the first time of holding this type of tournament in ISI. We are thankful to everybody for their cooperation with the Club in completing this tournament very successfully. We are also going to revive the publication of the annual magazine of our Club LEKHAN as "PCM Issue". While performing other routine activities of Club like football, cricket, volley ball, drama, music, sports, etc. we have an idea of holding one classical cultural performance during the year.

I like to finish with an appeal to all, irrespective of their personal ideologies, to be united for the betterment of the institute.

Niranjan Chatterjee
General Secretary

PROFESSOR PRASANTA CHANDRA MAHALANOBIS—
A SCIENTIST WITH A SOCIAL COMMITMENT

by Dwijesh Dutta Majumder

1992-93 happens to be Birth Centenary Year of some of our greatest scientists of the country, such as P.C. Mahalanobis, Meghnad Saha, Satyendra Nath Bose and J. C. Ghosh. This is also the Birth Centenary Year of another great scientist who adopted India as his place of work, viz. Professor J.B.S. Haldane.

BACKGROUND—BENGAL RENAISSANCE

Mahalanobis, Saha, Bose and Ghosh and their predecessors P.C. Ray and J.C. Bose are all products of Bengal renaissance which also is known as 19th Centurys new awakening which ultimately spread throughout the country.

P. C. Mahalanobis was born on 29th of June 1893 in a Brahma family which was actively involved in that movement. Prasanta Chandra's grand father Gurucharan Mahalanobis was one of the founder members of Sadharan Brahma Samaj, who was initiated into Brahma Samaj by Maharshi Debendra Nath Tagore and Brahmananda Keshab Chandra Sen, who were other stalwarts of Bengal renaissance apart from Raja Rammohan Roy. I cannot resist the temptation of an intriguing co-incidence that Raja Rammohan Roy, Maharshi Debendra Nath Tagore (father of Rabindranath) and Gurucharan Mahalanobis (grand father of Prasanta Chandra) had a common ancestor in Bhattanarayan, a great poet and one of the five brahmins whom King Adisur of Bengal brought from Kannakubja and settled them in Bikrampur of Dhaka District, now in Bangladesh.

A MAN IN THE MAKING—ACCIDENTS ARE PRECEDENTS !

In 1908 Prasanta Chandra passed his Entrance Examination from Brahma Boys, School and he graduated with honours in Physics from the Presidency College, Calcutta in 1912. In 1913 he proceeded to England with the intention of studying in the University of London, but before getting admission in the University of London he went to Cambridge on a days excursion with a friend and had a chance of meeting with the Provost of the Kings College who offered him to join Kings College impressed by his brief interaction which

he accepted with great pleasure. Prasanta Chandra was in Cambridge for about an year and 8 months during which he passed Tripos Examplication of the University of Cambridge Part-1 in Mathematics in 1914 and Part-II in Natural Science (Physics) in 1915. He stood first in the Tripos Examination of Cambridge University that year and was awarded a Senior Research Scholarship to work in Physics. Mahalanobis's stay in Cambridge had a great impact on him in his later life. In Cambridge, he came in close contacts with eminent scholars like Srinivasa Ramanujam, G.H. Hardy, J.M. Keynes, Lowes Deckinson and Bertrand Russel and many others. Mahalanobis used to recollect the happy days of his Cambridge life in the company of his friends and colleagues. Mahalanobis and Ramanujam used to go out for long walks on Sunday mornings and used to discuss wide ranging subjects including philosophical questions and theory of reality based on the fundamental concepts of zero, infinity and the set of finite numbers. Ramanujam used to explain the significance of 'zero' as the symbol of 'Nirguna Brahma' which is completely beyond the reach of the human mind. Mahalanobis understood these things generally. It may be mentioned that Mahalanobis also in his later life discovered interesting resemblances of the ancient Jaina philosophy to the Probabilistic and statistical view of reality.

Mahalanobis made all arrangements to work in the famous Cavendish Laboratory under CTR Wilson and Sir J.J. Thomson. It may also be mentioned that it was in Cambridge, Mahalanobis first became interested in statistics. His tutor Professor W.H. Machauly, one day gave him a few volumes of the journal 'Biometrica' edited by Karl Pearson to have a look at them and give his opinion. He becaume extremely interested in them and purchased a few volumes and as a serious student of theoretical physics he was definitely acquainted with tools of probability and mathematical statistics, but it was unexpected that he will switch over from physics to statistics and will play a pioneering role in building up an Indian Sciool of Statistics and Probability.

A SHORT TRIP TO HOME !

With the intention of joining Cavendish Laboratory to study physics he came to India for a short vacation during which his uncle Professor S.C. Mahalanobis, the then Head of the Department of Physiology of Presidency College, Introduced him to the then Principal of the College. Principal James offered him a post in the College in a vacancy caused by the departure of a senior teaching staff of the Physics in the War Services. Mahalanobis having

accepted the post became so much involved in different aspects of the then social movement and also his research in statistics that he gave up his idea of going back to Cambridge. He worked in Presidency College till 1948 after which he was made Professor Emeritus of the College after retirement. From 1945 to 1948 he was the Principal of the College. For a period of 4 years from 1922 till 1926 he held also the post of Meteorologist in Alipore Observatory concurrently with his post in Presidency College. He was an extremely hard-working person normally working 16 to 18 hours a day. While working in Presidency College he laid the foundations of Statistics in India and of the Indian Statistical Institute, which played a significant role in the country's development after independence.

EVENTS THAT SHAPED

Some of the most important events that were instrumental in shaping his life and works were his close association with two distinguished luminaries of Bengal, viz. Sir Brojendra Nath Seal, Head of the Department of Philosophy who became Vice-Chancellor of Mysore University and Gurudev Rabindranath Tagore. His marriage with Smt. Nirmalkumari, daughter of another great educationist of Bengal Professor Heramba Chandra Moitra which involved a fierce social controversy at that time was also an important event.

Mahalanobis's family was extremely close with Tagore family and personally Prasanta Chandra was very much attracted by the ideas and ideals of universalism preached by poet Rabindranath Tagore. Rabindranath Tagore though was a poet of high reputation by then, was not very much liked by the senior leaders of Bengal and of Brahma Samaj. Prasanta Chandra after his return from England organised the younger generation along with Sukumar Ray, father of Satyajit Ray, to induct the poet into the Sadharan Brahma Samaj as its Honorary Fellow. Mahalanobis and Ray also organised a youth movement in the Samaj to remove the conditions imposed by the leaders, viz. the abstaining from smoking, drinking and watch dramas in public theatres, to become members of the Chhatra Samaj, the Youth Wing of the Brahma Samaj.

Incidentally, it may be mentioned that inspite of all the progressive movement in Bengal in those days even as late as 1927 when Rabindranath Tagore's dance drama 'Natir Puja' was staged, dancing in public by grown up girls was not permissible. Mahalanobis and Sukumar Ray organised a successful campaign for removing this negative clause from the membership pledge.

Incidentally, Mr. C.D. Deshmukh, a brilliant ICS Officer, who became Minister of Finance, Government of India afterwards used to visit Mahalanobis and stay with him—who afterwards played a keyrole in shaping the destiny of ISI.

After his return from England Prasanta Chandra met Nirmalkumari (Rani), daughter of Heramba Chandra Moitra and the acquaintance ultimately blossomed into a love affair, but Prasanta Chandra's confrontations with elder leaders of Samaj of which Heramba Chandra Moitra, father of Nirmalkumari stood in the way. To make the situation worse, Mahalanobis refused to marry according to the civil Marriages Act, which was totally contrary to the views of Heramba Chandra. Mahalanobis worked out a strategy to overcome this. At that time Nirmalkumari fell seriously ill and was advised bed rest. This was the year 1919, in which Tagore wrote his famous book of poems 'Lipika', still in the manuscript stage. This was also the year in which Poet renounced his Knighthood in protest against the Jalianwalabag massacre by the British Government and it is wellknown that when Tagore was writing his letter to the then Governor General renouncing the Knighthood, Prasanta Chandra was by his side. Prasanta Chandra copied the entire manuscript of 'Lipika' and straight went to Nirmalkumari's bed side and started to read out the poems to her. The strategy worked like a magic. Heramba Chandra was convinced about the devotion of Prasanta Chandra to Rani and informed her that they can marry, but Heramba Chandra and his wife will not participate in the marriage ceremony. So after all these controversies the marriage took place on 27 February 1923 at the residence of Mahalanobis's maternal uncle Dr. Sir Nilratan Sarkar, the famous physician of Calcutta in the presence of Rabindranath Tagore, when Tagore not only blessed the couple and sang songs, but also presented the bound volume of the manuscript of 'Basanta' with an inscription. Prasanta Chandra's close association with Tagore is clear from the fact that when the Visva Bharati was formally inaugurated as a public institution on 22 December 1921 with Rabindranath as founder President and his son Rathindranath and Prasanta Chandra as its Secretaries. Mahalanobis remained Secretary of Visva Bharati until 1931, the year the Indian Statistical Institute was borne and during this period and also afterwards he helped the institution to place itself on a firm footing. Mahalanobis wrote a series of articles in Bengali under the title 'Rabindra Parichoy', which were published in the then leading Bengali monthly 'Prabashi'. It can be safely said that these were the first work on Tagore's early writings and was extremely useful in publishing afterwards the Poet's collected works. In 1926 during Tagore's

Europe tour he asked Prasanta Chandra and Nirmalkumari to accompany him. They readily agreed and accompanied him during his lecture tour in Italy, Switzerland, Austria, France, Germany, Hungary, England, Norway and Sweden. During this tour he met many eminent personalities including A. Einstein, Sigmund Freud and John Bojer. Rani Mahalanobis in her book 'With the Poet in Europe', published in 1969 observed that Mussolini's purpose of inviting Tagore to Italy was to use him for fascist propaganda and used to publish distorted version of Tagore's speeches in the controlled press. Prasanta chandra translated the newspaper version of the speeches and would understand Mussolini's intention and explained this to Tagore. During this tour itself after Tagore discussed the issues of fascism and non-violence with Romain Rolland along with Mahalanobis's translation, Tagore realised that Mussolini was using him. Tagore then started bitterly criticising fascism.

Tagore's influence on Mahalanobis will be obvious even to a casual visitor to the Indian Statistical Institute, Prasanta Chandra's brain child. Among Prasanta Chankra's unpublished manuscript there is an essay entitled 'Impact of Tagore on Modern India'. In this essay Mahalanobis deals with Tagore's philosophy on Indian heritage, its development and his nationalism enshrined in humanism and universalism. Mahalanobis concludes the essay with the lines—'I am fortunate indeed to have seen in the light of his face his firm faith in the glory of man'.

ENTERING STATISTICS

If Rabindranath influenced Mahalanobis's social outlook, it was Acharya Brojendra Nath Seal, who influenced most his attitude towards statistical investigation. Acharya Seal was holding the Chair of Philosophy at the University of Calcutta at that time. In 1917 the University appointed a Committee with Acharya Seal as Chairman to enquire into the examination system of the University. Seal asked Mahalanobis to help in the work of the Committee by using statistical methods for the analysis of the examination data, and that was the first introduction to actual statistical analysis in its modern or mathematical sense. In course of this work a most comprehensive survey of the whole question was made using detailed investigation of frequency distribution of the marks in the different University examination in different years, correlation between marks, percentage of passes in different years, rate of continuation of higher studies rate of wastage etc. with separate study for women and also certain selected communities. It was an outstanding report—but authorities decided not to publish it.

Mahalanobis's next important statistical work was 'Anthropological observation on the Anglo-Indian in Calcutta—male stature', which he did using the data collected by Dr. M. Annan Dale, the then Director of the Geological and Anthropological Survey of India. Sir Gilbert Wacker, the then Director General of observatories attracted by the statistical work being carried out by Mahalanobis requested him to undertake a systematic study of some meteorological problems. This resulted in two papers published by him in 1923 and Mahalanobis being appointed Meteorologist in addition to his duties as Professor of Physics in Presidency College.

STUDIES ON FLOOD CONTROL—NORTH BENGAL AND ORISSA AND DVC

The next most important work in which Mahalanobis got involved concerned flood control. In 1922 there was a disastrous flood in North Bengal. Government referred the Expert Committee Report prepared by some top civil engineers on flood control to Mahalanobis. He carried out a statistical study of rainfall and flood extending for a period of about 50 years and contradicted the Expert Committee report submitting his own entirely different recommendations many of which were implemented afterwards and proved effective. In 1926 again there was a severe flood in Brahmini river of Orissa. There also the Expert Committee's recommendations were referred to Mahalanobis, who carried out a statistical study covering about a period of 60 years and contradicted the Expert Committee report pointing out his new recommendations of constructing drains in the upper reaches of the rivers to hold up the water for the purpose of flood control and generation of electricity which later on formed the foundation of Hirakund Project. He conducted a similar study in West Bengal on the Burdwan-Hooghly-Howrah flashing and irrigation, which was very helpful in connection with the DVC Project afterwards.

SOWING SEED OF A BANYAN TREE

All these studies were being carried out from a small laboratory in Presidency College, which was known as Statistical Laboratory, with the help of a band of young dedicated talented workers, without any funding from the Government. In 1930 the top representatives of Imperial Council of Agricultural Research (ICAR) met Mahalanobis and suggested that he could ask for small research grant for statistical studies relating to agriculture and in July 1931 the ICAR sanctioned an annual grant of Rs. 2500 for 3 years. This grant enabled Mahalanobis to make some appointments. The grant was

originally intended to be used for theoretical research on the margin of error of agricultural field experiments. But at that time he started receiving enquiries about large number of applied problems of many kinds from all over India and nature of work of the group changed rapidly.

The year 1931 marks a water-shed in the statistical organisation in India. In a meeting on 17 December 1931 the Indian Statistical Institute was formally established and Sir R.N. Mukherjee presided over the meeting was the first President of the Institute and Prasanta Chandra Mahalanobis was appointed Honorary Secretary. It was also decided in the meeting that Professor V.G. Kalley, Professor K.B. Madhaba, Professor C.N. Vakil be requested to organise local centres at Pune, Mysore and Bombay respectively. Number of eminent citizens of the country occupied the position of the President of the Institute, such as Sir Edward Bantall (1936-38), Sir James Reidkay (1939-40), Sir Badridas Goenka (1941-42), Sir N.R. Sircar (1942-44). During 1944-64 Chintamani Dwarkanath Deshmukh, a Cambridge Alumnus, a friend of Mahalanobis held the office of the President and helped the development of the Institute in every possible way. After C.D. Deshmukh, Professor S.N. Bose held the Presidentship for many years till his demise.

It may be mentioned that in 1916, he wrote a letter to his cousin that in Cambridge he intends to, study physics, mathematics, psychology, zoology, biology, physiology, embryology, botany, sociology, economics, educational theory, geology, astronomy, logic, philosophy, statistics, eugenics, archeology, sculpture, painting, modern literature and Sanskrit. As he did not go back to Cambridge—so he did not have the chance to study these subjects, but he established ISI—in which—as we shall see later—some work of almost all the subjects mentioned above—and some more are going on.

Mahalanobis was well known for his special ability for locating talent and was seldom wrong in his choice. He collected a band of talented young researchers from Physics and Mathematics, such as Subhendu Sekhar Bose, Raj Chandra Bose, Samarendra Nath Roy, K. Raghavan Nair, C. Radhakrishna Rao and hosts of others.

THE D^2 STATISTIC

Mahalanobis's first published paper on statistical study was in anthropometry concerning Anglo-Indians in Calcutta. His presidential address

of the Anthropology section of the Indian Science Congress in 1925 was on "Analysis of Race Mixture in Bengal". When in London in 1927 for a few months at Karl Pearson's Laboratory in London—he studied Pearson's Coefficient of Racial Likeness (CRL) functions—its strength and weakness. In 1930 he published his seminal paper on "Tests and Measures of Group Divergence", in which he proposed his now-famous D^2 statistic. The Mahalanobis's D^2 -Statistic is one of the most widely used for drawing inferences on interrelations among variables—be it populations, plant taxa, engineering objects, speech sounds or image pixels. I have met students of computer science abroad applying D^2 -Statistic in pattern recognition problems, does not know that Mahalanobis was an Indian. Important theoretical properties of D^2 were also obtained by his students in ISI—such as R.C. Bose, S.N. Roy and C.R. Rao—last named contributing most on the subject. These were the beginning of the rich heritage of research in multi-variate statistical analysis at ISI by a galaxy of researchers.

RESEARCH AND TRAINING IN STATISTICS AND RELATED AREAS

From 1932 ISI started different types of post-graduate level training courses in Statistics, which was the only available post-graduate level training courses in the country till 1941 when post-graduate department of the statistics of the University of Calcutta was established with Mahalanobis as its honorary Head.

CHALLENGE-FINANCIAL CRUNCH : RESPONSE—APPLIED PROJECTS

Though ISI was gaining its recognition with the effort of Mahalanobis and his colleagues he had to face several financial crisis in the early period. The first such crisis was in 1938 when the Government withheld the additional grant of Rs. 10,000 per year and the second crisis developed in 1942-43 due to the sudden termination of the big project of Bengal Crop Survey. Mahalanobis undertook some applied projects on a paid basis to salvage the situation. Well-wishers of the institute also helped tiding over the difficulties. One among them is C.D. Deshmukh. As the Governor of the Reserve Bank of India and as Union Finance Minister and also as the President of ISI several times he came to the rescue of the institute in times of financial difficulty. It should also be mentioned that Nehru's close contact with Mahalanobis also started from the early 1940s and lasted till his death in 1964. Nehru deputed his Secretary, Pitambar Pant, also physicist by training, to Mahalanobis and

ISI which lasted for about 25 years. Nehru's lasting contribution to ISI was his moving of the Indian Statistical Institute Bill in Parliament in 1959 declaring ISI as an institution of national importance and empowering the institute to confer degrees.

INTRODUCING COMPUTERS IN INDIA

From the very beginning Mahalanobis was convinced about the need for mechanisation of arithmetical calculations in connection with statistical data processing. That is why he was the first to acquire mechanical desk calculators and also electro-mechanical desk calculators for ISI. He was the first to introduce punched card calculating equipments in India through different business machine companies in UK and USA, such as 'Powers Samas Company', BTM (British Tabulating Machines) and IBM. Mahalanobis was keenly following the developments of automatic high speed electronic computing equipments during the second World War years and also afterwards. During his visits abroad he held discussions with the pioneers like Howard H. Alken, John Von Neumann, Norbert Wiener and others. He personally told me the stories about the development of high speed electronic computers at Harvard and Cambridge in September 1955 when I first met him prior to my joining ISI. He established an Electronics and Precision Mechanics Division around 1950 to develop both mechanical and electronic computing machines and laid the foundation for the electronics, computer, communication and related sciences research and development in the institute. In 1953 a small analog computer capable of solving linear equations in ten variables was designed and built in the institute from war surplus materials and was demonstrated to Prime Minister Nehru during his visit in 1954. Mahalanobis placed an order for a HEC-2M digital computer from UK in 1954 which arrived in 1956, which was installed and maintained by ISI's own engineers. This was the first electronic computer functioning in India. The second electronic computer called URAL was acquired by the institute from USSR in 1958 through a UNTAAB collaboration. It has already been explained that Mahalanobis's idea was not only to provide computing aids to statisticians of the institute but also to provide the institute's scientists and engineers a first hand knowledge of state-of-the-art technology in the field of mechanical and electronic computers so that India can be self-sufficient in this emerging technology. As a result of 1st Review Committee Report the computer hardware development activities in the institute had to be shrunk, but he advised the scientists to carry out theoretical and experimental research of applications of

computers in different problems of science and society applying statistical methods which ultimately resulted in extensive research in the fields of pattern recognition, image processing, speech recognition and artificial intelligence. He also initiated development of software packages, specially in relation to statistical data analysis and he personally supervised development of computer software for his own innovation of a non-parametric method for comparison of two samples, which he called fractile graphical analysis.

LARGE SCALE SAMPLE SURVEYS

Mahalanobis's contributions to survey sampling are among his most significant and lasting gifts to statistics.

Mahalanobis developed special sampling techniques to carry out mapping surveys, production and yield surveys and areas surveys dealing cost versus efficiency aspect as an optimisation problem. His idea of pilot surveys was the precursor to the sequential method developed by Abraham Wald which Wald recognised profusely in the introduction of his book "Sequential Analysis". The level of importance Mahalanobis gave to diverse types of observation errors in sampling methods is like a Physicist give to his measurement errors. Mahalanobis also raised important philosophical questions on randomness which are relevant in the world of science even to-day. He received Weldon Medal from Oxford University in 1944 and was elected a Fellow of the Royal Society, London in 1945 for his fundamental contributions to Statistics, particularly in the area of large-scale sample surveys.

NATIONAL PLANNING FOR SOCIAL DEVELOPMENT

Mahalanobis's involvement in national planning started in early 1940s. It is well known that when Subhash Chandra Bose was elected Congress President in 1938 he appointed a National Planning Committee with Jawaharlal Nehru as its Chairman and several scientists, industrialists and economists, such as M. Visheshwarya, M.N. Saha, K.T. Shah, A.D. Shroff, Ambalal Sarabhai, H.V. Kamath etc., as its members. In 1940 when Mahalanobis went to Allahabad and spent a day with Nehru in his house Mahalanobis was asked by Nehru to write a statistical supplement to the report by the Committee that was his first involvement in National Planning. But actually the work on planning could not make much headway till India attained independence in August 1947.

Mahalanobis was the architect of the second Five-Year Plan. The studies which was inaugurated by Nehru in ISI in November 1954, Mahalanobis

prepared a draft plan-frame which was submitted to the Govt. in March 1955, and was accepted as a basis for the second plan. I do not want to go into the details of the Mahalanobis's plan model of which there are admirers and critics. But it must be admitted that Mahalanobis saw the need for adopting a broad and scientific approach to planning in order to solve diverse problems of the country in the quickest possible time. Mahalanobis's approach to planning may be criticised for certain inadequacies, but it should also be remembered that Professor did not claim any new contribution to economic theory or was providing the best solution to the problems of the country. His model was the starting point to understand the broad characteristics of the economic system, which was flexible enough to introduce changes. As a matter of fact, he used to call such things as scaffolding to be dismantled when the purpose is served. He was free from economic dogma. His views in this regard are explained in his two books "Talks on Planning" and "The Approach of Operational Research to Planning in India". Professor was a member of the Planning Commission from 1955 to 1967.

A BANYAN TREE TAKING SHAPE

The story of the growth of Indian Statistical Institute is the most fascinating aspect of the life and works of Professor P. C. Mahalanobis. In 1951 after over two decades of cramped existence in the Physics Department of Presidency College, the ISI shifted itself to its own campus on B.T. Road. This gave the institute an opportunity to act as the host society for many national and international events and Mahalanobis became the scientific ambassador of India in its true sense. ISI became the meeting place for scientists from all the three international alignments, viz. western world, communist world and the third world countries. It would have been impossible for most of research workers of ISI to meet such world renowned scientists such as, Ronald Fisher, J.B.S. Haldane, A.N. Kolmogorov, Y.V. Linik, Abraham Wald, Norbert Wiener or economist like Charles Bettelhem, Oscar Lange, Jan Tinbergen, J.K. Galbreth to name a few if Mahalanobis had not made arrangement for them to come and stay in the Institute.

I have already mentioned about Mahalanobis's 1916 letter to his cousin indicating his interest in diverse subjects. In 1972, the year of Professor's sudden demise (28 June 1972), the institute was sprawling in several large buildings of its own and apart from large divisions of research and training school and national sample survey research and training on diverse subjects,

such as psychometry, bio-chemistry, botany, chemistry, computer science, communication science, crop science, demography, economics, electronics, geology, human genetics, leaf protein, linguistics, mathematics, national income, planning, physics, pre-census population studies, anthropometry, sociology and of course statistics and mathematics with hostels for students and scholars, staff quarters and guest houses. The institute had functioning centres in Baroda, Bombay, Pune, Hyderabad, Coimbatore, Mysore, Tribundrum, Madras and Giridih.

The teaching programme in the institute began with short term training courses to practitioners in different Govt. services which I mentioned earlier, but the teaching and training activities of ISI expanded in varieties and levels in 60's and 70's and ISI is now one of the foremost centres of excellence in India and the world in several fields including of course statistics. Since 1950 the UNESCO sponsored International Statistical Education Centre (ISEC) is functioning to provide systematic training to statistical personnel of the Govt. of developing countries of Asia and Africa. In 1959 after the Parliament declared the ISI as an institution of national importance the institute started its B.Stat. and M.Stat. programmes. Electronics Commission, Department of Electronics, Government of India recognise ISI as one of the premier institution for advanced training and research in the field of computer science and related advanced fields, such as —pattern recognition, image processing, computer vision and artificial intelligence. ISI is conducting one of the best 2-Year M.Tech. course in computer sciences. In 1986 a National Nodal Centre for Knowledge Based Computing Research and Development Centre has been established funded by UNDP and DOE to participate in the industrial modernisation programme of the country. Very rightly ISI has also initiated an M.Tech. programme in Quality, Reliability and Operation research. The quality of the Ph.D. thesis submitted to ISI in statistics, mathematics, computer science and economics and other related fields have earned good name and many of those who received the doctorate of the institute are well known researchers in different countries of the world.

THE FEATHURES IN HIS CAP

Professor Mahalanobis received a number of awards and honours for his outstanding and fundamental contributions to statistics and plannings. To mention some of these are : Weldon Medal of Oxford University (1944) ; Fellow, The Royal Society, London (1945) ; Chairman, UN Subcommission on Statistical Sampling (1947-51) ; Philadelphia Award, USA (1949) ; General

President, Indian Science Congress (1950) ; Chairman, UN Statistical Commission (1954-58) ; Honorary Fellow, Royal Statistical Society, London (1954) ; Honorary President, International Statistical Institute (1957) ; Sir Devaprasad Sarbadhikari Gold Medal, C.U. (1957) ; Foreign Fellow, USSR Academy of Science (1958) ; Honorary Fellow, Kings' College Cambridge (1958) ; D.P. Khaitan Memorial Gold Medal, Asiatic Society (1968) ; Srinivas Ramanujam Gold Medal (1968) ; Deshikottama, Viswabharati University (1961) ; Padma Vibhushan (1968). He was awarded honorary doctorates by several universities in India and abroad and also honorary fellowship by many other scientific associations in India and abroad.

Scientists, students and all workers of ISI will have to prove in coming days that they are worthy of the motto of the Institute "Unity in Diversity" and its logo the banyan tree with its many branches. The sagacity, foresight and dynamic leadership of Professor is absent from the scene, but they have to dedicate themselves to follow his ideas and ideals to fulfil his dreams about the Institute and the country.

জন্মশতবার্ষিকীর প্রেক্ষাপটে রাশিবিজ্ঞানের জনক প্রশান্তচন্দ্র মহলানবিশ

বিশ্বনাথ রায়

বর্তমান শতাব্দীর গোড়ার দিকে স্ট্যাটিস্টিক্যাল ল্যাবরেটোরিটি প্রেসিডেন্সির পদার্থবিজ্ঞান বিভাগের একটি ছোট অংশে অবস্থিত ছিল। প্রেসিডেন্সি কলেজে অবস্থিত স্ট্যাটিস্টিক্যাল ল্যাবরেটোরিতে বিভিন্ন অনুষ্ঠানে রবীন্দ্রনাথ এসেছিলেন। তখন কবির সাহচর্য, পরিসংখ্যান সম্বন্ধীয় কাজকর্ম, অনুসন্ধিৎসা ও প্রেরণা ছিল অধ্যাপক মহলানবিশের কাছে বড় নৈতিক সমর্থন। এই সময় বাজেট ছিল মোটে আড়াই হাজার টাকা। কর্মী সংখ্যা ছিল ৬ জন। আজকের আই-এস-আই-এর বাজেট প্রায় ৪ কোটি। কর্মী সংখ্যা ষোলশোর বেশী। ১৯৩১ সালের ডিসেম্বর মাসে প্রয়াত স্যার রাজেন্দ্রনাথ মুখার্জীর প্রস্তাব অনুসারে ঐ স্ট্যাটিস্টিক্যাল ল্যাবরেটোরির নাম করন হয় ইণ্ডিয়ান স্ট্যাটিস্টিক্যাল ইন্সটিটিউট। ১৯৫১ সালে প্রেসিডেন্সি কলেজের পদার্থ-বিদ্যা বিভাগ থেকে আই-এস-আই বি-টি-রোডের নিজস্ব বাড়ীতে স্থানান্তরিত হয়।

কবিশ্রেষ্ঠ রবীন্দ্রনাথ বিশ্বভারতীর প্রতিষ্ঠাতা সম্পাদক ছিলেন এবং তাঁর পুত্র রথীন্দ্রনাথ ও অধ্যাপক মহলানবিশ ছিলেন সম্পাদক। ১৯১৯ সালে লর্ড চেম্‌স্‌ ফোর্ডকে 'নাইটহুড' উপাধি প্রত্যাখানের ঐতিহাসিক চিঠিটি লেখার সময় অধ্যাপক মহলানবিশ কবির পাশে ছিলেন। অধ্যাপক মহলানবিশ 'রবীন্দ্র পরিচয়' শীর্ষক-এ অনেকগুলি বাংলা প্রবন্ধ লেখেন। তিনি এডওয়ার্ড থমসন্-এর রবীন্দ্রনাথ ঠাকুরের জীবনালেখ্য রচনাতেও সহায়তা করেছিলেন। ১৯২০ সালের ২৭শে ফেব্রুয়ারী স্যার নীলরতন সরকারের বাড়ীতে শ্রীমতী নির্মলকুমারী মৈত্রের সাথে অধ্যাপক মহলানবিশের বিয়ে হয়। এই বিয়েতে রবীন্দ্রনাথের উপস্থিতিতে 'বসন্ত' নাটকটি অভিনীত হয়। অধ্যাপক মহলানবিশ ও শ্রীমতী মহলানবিশ রবীন্দ্রনাথের সাথে ইতালি, সুইজারল্যান্ড, অস্ট্রিয়া, ফ্রান্স, জার্মানী, হাঙ্গেরী, ইংলণ্ড, নরওয়ে, সুইডেন প্রভৃতি স্থান ভ্রমণ করেন। এই ভ্রমণের মাঝ দিয়ে তাঁদের বিশ্ববিদ্যুৎ বিজ্ঞানী আলবার্ট আইনস্টাইন, জন বোজার প্রমুখের সাথে সাক্ষাৎ হয়। কেম্ব্রিজ বিশ্ববিদ্যালয়ের পড়াশুনা করার সময় তিনি ডিকিন্‌শন, রাসেল, হার্ডি, ম্যাকুলে ও রামানুজনের নিবিড় সাহচর্য লাভ করেন।

১৯৩১ সালে রাশিবিজ্ঞানী মহলানবিশ লণ্ডনে 'নেচার' জার্নালে প্রকাশিত 'কোয়ালিটি কন্ট্রোল'-এর ওপর বক্তৃতামালা থেকে সর্বপ্রথম ডঃ ওয়ালটারিয়ার শিউয়ার্টকে জানতে পেরেছিলেন। ডঃ শিউয়ার্টের 'ইকনমিক কন্ট্রোল অফ ম্যানুফেকচার্‌ প্রোডাক্টস' বইটি অধ্যাপক মহলানবিশকে ভীষণভাবে আকৃষ্ট করেছিল। তিনি ইউ-এস-এ ভ্রমণে প্রথমেই ডঃ শিউয়ার্টের সাথে সাক্ষাৎ করেন। কেননা, ওখানে ডঃ শিউয়ার্ট ফাদার অফ স্ট্যাটিস্টিক্যাল কোয়ালিটি কন্ট্রোল হিসেবে খ্যাত ছিলেন।

এই নিবন্ধের বহু তথ্য প্রয়াত শ্রীমতী নির্মলকুমারী মহলানবিশের কাছ থেকে সংগৃহীত হয়েছে।

ডঃ শিউয়ার্ট আই-এস-আই-এ কয়েকবার এসেছিলেন এবং তাঁর বহু মূল্যবান বই ইন্সটিটিউটকে দান করেন। ভারতবর্ষে ডঃ শিউয়ার্টের ভ্রমণের পর থেকেই ইউ-এস-এ, ইউ-কে এবং জাপান প্রভৃতি দেশ থেকে 'কোয়ালিটি কন্ট্রোল'-এর বিশেষজ্ঞরা এই ইন্সটিটিউটে আসতে থাকেন। এই প্রেক্ষাপটে অধ্যাপক মহলানবিশ ভারতবর্ষের বিভিন্ন স্থানে 'কোয়ালিটি কন্ট্রোল'-এর ইউনিট গড়ে তোলেন।

১৯৪৫-১৯৫০ সাল পর্যন্ত আই-এস-আই বিরাট সংকটের মাঝ দিয়ে চলেছিল। ইন্সটিটিউটের এই সংকটময় অবস্থার প্রেক্ষাপটে চিন্তামন দেশমুখের সাথে যোগসূত্র একটি অন্যতম তাৎপর্য পূর্ণ ঘটনা। অধ্যাপক মহলানবিশের বিভিন্ন নমুনা সমীক্ষার সাফল্যে দেশমুখ আকৃষ্ট হন। এই পটভূমিতে দু'জনের মধ্যে নিবিড় সম্পর্ক গড়ে ওঠে। চিন্তামন দেশমুখ ভারত সরকারের অর্থ মন্ত্রী হওয়ার পরই আই-এস-আই-এর বাজেট ৪.৫ লক্ষ টাকাতে দাঁড়ায়-যা ইন্সটিটিউটের রিসার্চ এণ্ড ট্রেনিং স্কুল গড়াতে যথেষ্ট সাহায্য করেছিল। চিন্তামন দেশমুখ সভাপতি থাকাকালীন ইন্সটিটিউটের প্রভূত বিকাশ হয়েছিল। শুধু তাই নয়, ইন্সটিটিউটের চরম উন্নতির মূলে ছিল প্রয়াত প্রধানমন্ত্রী জওহরলাল নেহেরুর অসামান্য অবদান। পণ্ডিত জওহরলাল নেহেরুর সাথে শান্তিনিকেতনে রবীন্দ্রনাথ ও অধ্যাপক মহলানবিশের অনেকবারই সাক্ষাৎ ঘটে। এমন-কি, পণ্ডিতজীর এলাহাবাদের বাড়িতে অধ্যাপক মহলানবিশের সাথে পরিকল্পনার গুরুত্ব, প্রয়োজনীয়তা ও পরিকল্পনায় পরিসংখ্যানের ভূমিকা প্রভৃতি বিষয়ে আলোচনা হয়। পণ্ডিতজী আই-এস-আই-এর 'আম্রপালি'-তে অবস্থান করেন। ১৯৬১ সালে রোনাল্ড ফিসার এই ইন্সটিটিউটকে বটগাছের শাখা-প্রশাখার সাথে তুলনা করেন। সেই সময় থেকেই আই-এস-আই শাখা-প্রশাখা যুক্ত বটগাছকে প্রতীক চিহ্ন এবং লক্ষ 'ইউনিটি ইন ডাইভারসিটি' হিসেবে গ্রহণ করেছে। আজকের ইণ্ডিয়ান স্ট্যাটিস্টিক্যাল ইন্সটিটিউট শুধু কলকাতার মধ্যে সীমাবদ্ধ নয়, সমগ্র ভারতবর্ষ জুড়ে ছড়িয়ে পড়েছে তার শাখা-প্রশাখা। ১৯৫৯ সালে আই-এস-আই পার্লামেন্টে জাতীয় গুরুত্বপূর্ণ সংস্থার স্বীকৃতি লাভ করে এবং বিজ্ঞানের নানা শাখায় গবেষণাসহ পি-এইচ-ডি, বি-স্ট্যাট, এম-স্ট্যাট ডিগ্রি দেবার অধিকার পায়। আই-এস-আই বিশ্বের বিজ্ঞানীদের মিলনক্ষেত্র। এটাই অধ্যাপক প্রশান্তচন্দ্র মহলানবিশের মহাজীবনের অক্ষয় কীর্তি। রাশিবিজ্ঞানী মহলানবিশের অসামান্য বৈজ্ঞানিক প্রতিভার জন্য বিশ্বদুনিয়ার বিদ্বদ সংস্থা সমূহ তাঁকে নানানভাবে সম্মান জানান।

অধ্যাপক প্রশান্তচন্দ্র মহলানবিশ প্রাচ্য ও পাশ্চাত্যের মধ্যে বিজ্ঞান সাধনায় সহযোগিতার সেতু রচনা করেছিলেন। ভারতবর্ষে রাশিবিজ্ঞানের প্রসার, গবেষণা ও চর্চায় তাঁর অবদান ছিল অপরিমিত। ভারতবর্ষের অর্থনৈতিক পুনর্গঠনে দ্বিতীয় পঞ্চবার্ষিক পরিকল্পনার কাঠামো তৈরীতে তাঁর অসামান্য অবদান ছিল। বস্তুত, দ্বিতীয় পঞ্চবার্ষিকী পরিকল্পনা 'মহলানবিশ প্ল্যান' নামে খ্যাত। ভারতবর্ষে তিনিই 'প্ল্যান মডেল'-এর জনক। দ্বিতীয় যোজনা থেকেই ভারতবর্ষ ব্যাপক শিল্পায়নের পথে পা বাড়ায়। এই প্রেক্ষাপটে প্রথম যোজনায় শিল্পায়নের বাজেট বরাদ্দের চেয়ে দ্বিতীয় যোজনায় দ্বিগুনের বেশী বাজেট বরাদ্দ করা হয়। ভারতবর্ষে অধ্যাপক মহলানবিশ সর্বপ্রথম বৈজ্ঞানিক অর্থনৈতিক পরিকল্পনা রচনা করেন। অধ্যাপক এম-জিকে মেনন-এর ভাষায় বলা যায় "ভারতের অর্থনৈতিক পরিকল্পনা ও অর্থনৈতিক কর্ম-কাণ্ডের মৌলিক বুনিয়েদটাই গড়ে দিয়ে গেছেন অধ্যাপক মহলানবিশ"।