Prof. Sandip P. Trivedi

The fifth Prof. B. M. Anand Memorial Lecture is being delivered by Prof. Sandip P. Trivedi, Director, Tata Institute of Fundamental Research, Mumbai.

Prof. Trivedi is an internationally renowned theoretical physicist whose research areas include, string theory, cosmology and particle physics. In particular, his research contributions span Superstring theories, Quantum Gravity, Black holes and their thermo-dynamical properties, Holography of Black Holes and Entanglement Entropy in Gauge Theories. His most talked about research concerns resolution in string theory of the cosmological problem of an accelerating universe and providing a credible mechanism for generating a small, positive cosmological constant.

Dr. Sandip P. Trivedi is recipient of National Talent Scholarship (1980-85), Government of India. He did M.Sc., Physics (1985) from Indian Institute of Technology, Kanpur, and Ph.D. (1990) in Theoretical Physics with Professor John Preskill from California Institute of Technology, USA. Prof. Sandip P. Trivedi was Post-Doctoral Research Fellow (1990-1992) at Institute for Advanced Study, Princeton, USA; John A. McCone Research Fellow (1992-1994) at Department of Physics, California Institute of Technology; Associate Scientist (1994-1999) at Department of Theoretical Physics, Fermi National Accelerator Laboratory, Illinois, USA; He served as Reader (1999-2002), Associate Professor (2002-2006) and Professor (2006-2012) at Department of Theoretical Physics, TIFR, Mumbai. He is Senior Professor since 2013. He has taken the charge as Director of TIFR, Mumbai on January, 2015.

Prof. Sandip P. Trivedi has been with awarded various distinguished prizes – Third World Academy of Sciences (TWAS) Prize for Physics (2015); J.C. Bose Fellowship (DST), (2012); Distinguished Alumnus Award, IIT Kanpur (2010); Infosys Prize in Physical Sciences (2010), Shanti Swarup Bhatnagar Award in Physical Sciences (2005); Swarnajayanti Fellowship (DST), (2002).

Prof. Sandip P. Trivedi is Fellow, Indian Academy of Sciences, Bangalore (2006), Fellow, Indian National Science Academy, New Delhi (2012), and Editor, Annals of Physics, 2004-2006.

Programme

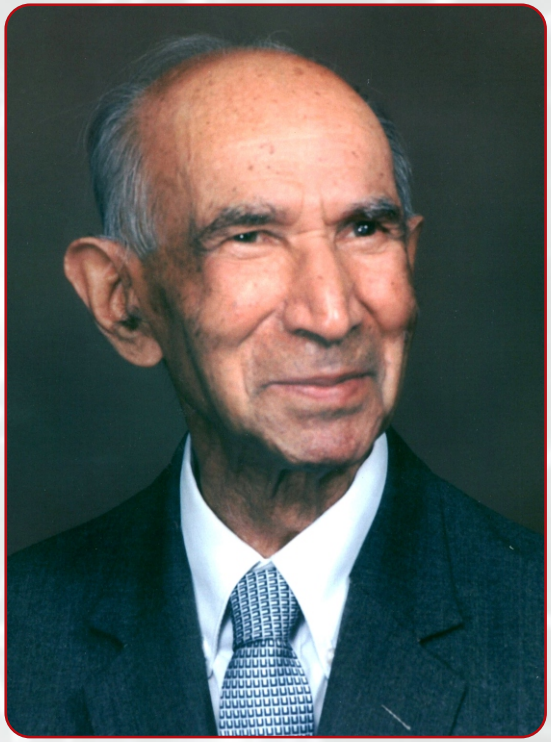
23rd April 2019

2:30 pm	PU Anthem Welcome Address by the Chairperson
2:40 pm	Address by Prof. K.N. Pathak Former Vice-Chancellor, PU
2:50 pm	5th Prof. B. M. Anand Memorial Lecture by Prof. Sandip P. Trivedi
4:00 pm	Tea

Organized by

Department of Physics
Panjab University

Fifth Prof. B.M. Anand Memorial Lecture



Prof. Bal Mokand Anand
(30 Dec. 1905 - 6 Feb. 1998)

"Quantum Entanglement"

by

Prof. Sandip P. Trivedi

Prof. Bal Mokand Anand (30 Dec. 1905 - 6 Feb. 1998)

Prof. Bal Mokand Anand was history's choice for establishing Panjab University's Physics Department in its permanent campus at Chandigarh and initiating research activity there. He published original research in the 1930s and 1940s and had the distinction of working for his doctorate, in the 1950s, under the supervision of Professor Cecil Frank Powell who a few years previously (1947) had been awarded physics Nobel Prize for his discovery of a subatomic particle pion (or pi meson), using nuclear emulsion technique. Anand's 20-page research paper, based on his Ph. D. work, and published by the Royal Society, London, in 1953 is still considered relevant.

Bal Mokand was born in a village, Domel, in the Bannu district of what is now the Khyber Pakthunwa province of Pakistan. An only child who lost his mother at birth, he was raised by an aunt until the age of seven. With a view to be with his son and educating him, his father gave up his job as a travelling salesman, and moved to Peshawar where he opened a small grocery store, the back portion of which was improvised to serve as the family's modest living quarter.

Anand was a brilliant student whose studies were financed by scholarships. He passed his Matriculation Examination from Frontier High School, Peshawar, in 1922. A highlight of his school days was his playing the disguised Portia character in Shakespeare's Merchant of Venice. For his role in the play, Anand got a special suit stitched for him. This was the first time, he was wearing a suit. He passed his F.Sc. with Biology from Dayanand Anglo-Vedic College, Lahore, in 1924. He would have liked to become a doctor, but the attraction of a two-year scholarship brought him to basic science. He passed his B.Sc. with Honours in Physics from Government College, Lahore, in 1926; and M.Sc. in 1928, from Panjab University. He was mentored by two eminent faculty members: J. B. Seth of Indian Education Service, and Partap Kishan Kichlu. During 1928-1930, Anand worked at Government College, Lahore, on a Panjab University research scholarship, whereas the next two years, 1932-1934, were spent at the Irrigation Research Institute, Lahore, as a Research Assistant. Both these temporary appointments were marked by good-quality research output, including publications in the well-respected journal, *Nature*, and Soil Science (U.S.A). In 1934, when Panjab University introduced Honours School in Physics, Anand was appointed a Lecturer. He was promoted to Readership in June 1947.

East Panjab University (renamed Panjab University on 26 January 1950) came into existence on 1 October 1947. For two years, the Physics (as well as the Chemistry) Department was housed in Delhi University. The Department started operating from Government College, Hoshiarpur, on 15 May 1949. In August 1949, Anand was appointed Head of the (teaching) Department, while Dr H. R. Sarna was made the Director of Physics Laboratories. From December 1950 till July 1953, Anand was on study leave to avail of a Government of India scholarship to work for his Ph.D. He was made Professor in March, 1955.

Physics Department moved to Chandigarh on 15 September 1958 and finally to its own building in 1960. In Hoshiarpur itself, Anand had set up a nuclear emulsion laboratory with grants from the Union Ministry of Education and University Grants Commission. Now, thanks to grants from various agencies, including Department of Atomic Energy, and the US Wheat Loan Programme, research facilities were strengthened in nuclear emulsions, spectroscopy and nuclear physics. Two Ph. D. theses were written under Prof. Anand's supervision: Prem Kumar Aditya (1961) and Prakash Mohan Sood (1967). Aditya's is the first Physics Ph.D. from (the post-1947) Panjab University. If the Panjab University Physics Department today enjoys a world-class reputation, its roots go back to the Anand era. Professor Anand retired from the University on 20 September 1967.

(*Rajesh Kochhar*)

B. M. Anand (far left) with colleagues at Bristol University, England, 1952.

From Nuclear Emulsions to Collider Experiments

Prof. Anand established the nuclear emulsion laboratory for research in the field of Particle Physics. The lab was equipped with a world class Koristka microscope. To accelerate the research activities in this field, he inducted Dr. I. S. Mittra, a fresh post-doc from Brookhaven National Laboratory. Simultaneously, Prof. B. M. Anand also appointed a number of qualified faculties in the fields of nuclear physics and solid state physics. The particle physics research using nuclear emulsion technique was vigorously pursued by a number of faculty members (Prof. P. M. Sood, Prof. V. S. Bhatia, Prof. J. M. Kohli, Prof. Suman Bala, Prof. J. B. Singh, Prof. Manjit Kaur and Prof. M. M. Aggarwal) until 1990. The research work using Bubble Chamber for particle detection was carried out in parallel. This platform gave opportunity to the faculty members and research scholars to participate in the front-ranking online experiments using colliders as part of the national and international collaborations. The experiments were conducted at various international accelerator centers such as Joint Institute of Nuclear Research (JINR), Dubna, USSR, Fermi national accelerator laboratory (Fermilab), USA, European center for nuclear and particle research (CERN), Geneva Switzerland, Brookhaven National laboratory (BNL), US, KEK, Japan and HERA, Germany, etc. Faculty and research students from this department participated in the discoveries of top quark, Quark-Gluon Plasma and Higgs Boson. Dr. Vipin Bhatnagar joined as faculty member in the high energy physics group in early 2000. The High Energy Physics (HEP) group also established two detector fabrication laboratories which are currently fabricating detector parts for the international experiments such as LHC. The group is also actively participating in the national project – India based Neutrino Observatory (INO) both in detector fabrication and neutrino physics studies. The HEP group of this department is now well recognized nationally and internationally.

Panjab University has set up Prof. B. M. Anand Memorial Endowment Fund from the donation by Prof. Anand's family and has initiated an annual lecture series to commemorate Prof. B. M. Anand.