

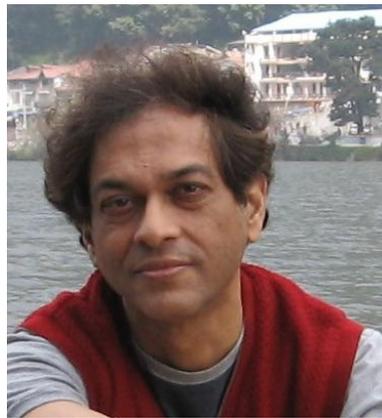
### Professor Anjan Kundu (1953 – 2016)

On 31 December 2016, India lost one of its finest Mathematical Physicists, Professor Anjan Kundu. He had breathed his last at Bangalore on a visit there.

Anjan Kundu was born at Kolkata as the second son of late Agaman Chandra Kundu and Bhanumoti Kundu on 24 January 1953. He had his schooling at the renowned Ballygunge Government High School, Kolkata, starting from 1959. He passed his Higher Secondary Examinations in 1970 and got admission to Presidency College (now Presidency University) in the Honours course in Physics. In the meantime he got selected for the prestigious Government of India – USSR Government scholarship to pursue higher studies in Soviet Union. In the same year he was also selected for the National Talent Search scholarship. In 1971, he got enrolled at Patrice Lumumba People's Friendship University, Moscow, in the integrated five years Masters course in Physics. He got excellent grades in all the semesters and his photo was always displayed in the university bulletin board for his outstanding performance. He passed the integrated course in 1976 with Excellence (Honours) in Physics.

Anjan continued his Ph.D. programme at the same Patrice Lumumba University under the supervision of Professor Yuri Petrovich Rybakov working on soliton solutions in field models with topological charge and obtained his Ph.D. degree in 1981. He continued his postdoctoral research in USSR at the Joint Institute of Nuclear Research, Dubna, during the period 1981-83. He returned to India in 1983 and joined as a Lecturer in Physics at Birla Institute of

Technology, Pilani, and later worked as a CSIR pool officer at Jadavpur University for a short time. In the year 1986 he joined as a faculty member at Saha Institute of Nuclear Physics, Kolkata, where he ultimately became Senior Professor (Professor H) on 01 February 2009, and superannuated in 2012 but continued on extension till his last.



During his tenure at SINP, he also visited Germany as an Alexander von Humboldt Foundation Fellow at senior level during 1993-94 and again revisited in 1996, 2004 and 2005. He was also a Senior Associate at the International Centre for Theoretical Physics, Trieste, Italy, during the period 2006-2011. He also served as an External Expert for City University of London. He held visiting positions at numerous centres all around the world including Joint Institute for Nuclear Research, Dubna, USSR, Sapienza University of Rome, Italy, University of Bonn, University of Hannover, University of Kassel, University of Dortmund, Freie Universität Berlin and University of Wuppertal, Germany, City University of London, LAPTh - Laboratoire d'Annecy-le-Vieux de Physique Théorique, France, University of North Carolina, Ohio

State University and Arizona State University, USA, Australian National University, Prague Technical University, etc. for short academic visits or to attend conferences and workshops. He had established collaboration all around the world, including Joint Institute for Nuclear Research, Dubna, USSR, University of Bonn, Germany, University of Hannover, Germany, City University of London, etc.

Anjan specialized in the theory of integrable nonlinear dynamical systems, especially on soliton possessing nonlinear systems represented by systems of nonlinear ordinary and partial differential equations and their quantum versions. With the kind of training he had in theoretical and mathematical physics all through his career he has been looking for unifying mathematical structures and their physical implications underlying different nonlinear systems, and with special reference to magnetic, optical, hydrodynamic and particle physics systems. He has been fascinated by the intricate mathematical structures, the solutions, conserved quantities, Poisson bracket structures and their quantum behaviour. In his early career, during his Ph.D. and postdoctoral work, he deduced a topological toroidal solution of large radius for the Faddeev model with large Hopf index which is now well recognized. He also deduced exact solutions of nonspherically symmetric exact skyrmions in two dimensions and obtained saturating Bogomolny bound which can explain certain magnetic pattern experiments.

Over the years Anjan Kundu had developed a mastery over the inverse scattering theory (both

classical and quantum) underlying completely integrable soliton systems. Various types of nonlinear Schrödinger equations and Heisenberg spin chains known in the literature were thought to be independent with independent solutions. It was Anjan Kundu who characteristically pointed out that these equations are all interrelated through a gauge unifying scheme thereby bringing clarity to the situation. This idea has led to the identification of several new systems by Anjan, which are now called Kundu, Kundu-Eckhaus and Radhakrishnan-Kundu-Lakshmanan equations in the literature. A similar challenge for the need for unifying quantum integrable models was met by Anjan and coworkers by an ancestor model scheme, which is based on a new quantum algebra discovered by him. Applying this scheme Anjan found new integrable quantum models like (i) quantum relativistic Toda chain, (ii) derivative quantum nonlinear Schrödinger field theoretical model, and (iii) a new lattice quantum nonlinear Schrödinger equation, besides the existing ones. Analysis of these systems have greatly clarified the structure of quantum integrable models. A long standing challenge of formulating non-ultralocal class of quantum integrable models was solved by Anjan by proposing a new braided Yang-Baxter equation. Further, Anjan had also proposed pioneering models of delta and derivative delta function anyon gas models and solved them for the first time using Bethe ansatz method. Further, along with his coworkers, Anjan constructed a novel  $PT$  invariant Calogero model and

showed that the system yields completely real spectrum.

Anjan Kundu also suggested a novel scheme of nonlinearizing linear equations to integrable systems, thereby deducing important equations like nonholonomic deformations of nonlinear Schrödinger, Korteweg-de Vries and sine-Gordon equations with innovative applications to optical soliton communications and bending of light beam. He has also proposed a pioneering scheme of exploiting unusual time-Lax operator, yielding new integrable higher dimensional nonlinear Schrödinger equations with application in modelling two-dimensional ocean rogue waves. Further, based on the above ideas, the problem of defect integrable models were solved by Anjan and colleagues including defect nonlinear Schrödinger and Toda chain equations. It is in fitness of things that his last work, accepted for publication on 03 January 2017, documents his commitment to direct efforts in controlling the hazardous near-shore oceanic waves by implementing his theoretical ideas on leakage based methods. This is a sequel to his concern to control the devastating consequences of extreme events like the December 2004 Indian ocean tsunami.

Anjan was recipient of many honours all through his life. Apart from the ones mentioned above, he was also elected to the Fellowship of Indian National Science Academy (2014) and Indian Academy of Sciences, Bangalore (2015). He was acting as a member of the Editorial Board of the Proceedings of Royal Society of London A since 2012. He has trained several

outstanding students in his career at SINP and published more than 100 papers besides several articles to Proceedings and editing important books. It is remarkable that Anjan could achieve all these inspite of his life long affliction with acute myopia and later heroically fighting leukaemia during the final four years of his life.

Anjan was always brimming with novel ideas to expand the horizon of integrable nonlinear systems in multipronged ways. Even when he was under severe physical strain later on in his life, he could overcome them by concentrating on his desire to invent new integrable systems and understanding their mathematical structures and applying the results to new physical contexts. These traits have enabled him to develop deep friendship with like-minded scientists both in India and outside India, who all deeply mourn his passing away at the pinnacle of his career. Anjan retained his passion for travel to newer places and tasting exotic food, as well as writing science fiction stories and poetry especially in his mother tongue, Bengali. He remained cheerful all through his life which was endeared by everyone. He is survived by his wife Sanjukta and daughter Konkona, and a grandchild.

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