

# MRINAL KUMAR DASGUPTA

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*Mr K Dasgupta*



## **MRINAL KUMAR DASGUPTA**

**(1923 -2005)**

**Elected Fellow 1974**

**T**he Institute of Radio Physics and Electronics, the first University Department in India to conduct postgraduate teaching programme in Electronics, Communication, Computers and Radio Science, was established by Prof. Sisir Kumar Mitra, FRS, in 1949. One of the gems of students Prof. Mitra selected to work under him was Mrinal Kumar Dasgupta, who made a significant discovery in early 1950s in Radio Astronomy. Later back to Institute of Radio Physics and Electronics, he became one of the architects for earning the national and international recognition for the Institute.

### **BIRTH, PARENTAGE AND CHILDHOOD**

MRINAL KUMAR DASGUPTA was born on 1st September 1923 in Barishal district of the then undivided province Bengal under the British Raj (now in Bangladesh). Mrinal was the third son of Sukumar and Tarubala Dasgupta. His father, Sukumar, was a teacher in a secondary school. As a teacher, he created a deep impression in the mind of his students. One of his ex-students, Prof. Amalendu Bose, a renowned professor in English, recalled later with gratitude that the training he got from Sri Dasgupta in his school days helped him attain the feat. Needless to say that Mrinal got the same kind of training and guidance in his formative years.

### **EDUCATION**

Mrinal had his primary education in Barishal, but afterwards studied in the famous St. Gregory's School at Dacca. When he was in class IX, Prof. SK Mitra came to Dacca and gave a popular talk on radio in the conference hall of Jaggannath College. Mrinal attended the lecture and was deeply impressed by the simple but thought provoking style of presentation, and the personality of Prof. Mitra. Mrinal did not realize at that time that his destiny would one day bring him closer to Prof. Mitra, who eventually would shape his life and career.

Mrinal passed matriculation and intermediate examinations from Dacca and then joined B.Sc. (Honours in Physics) course in Dacca University. He was really fortunate to be a student of Professor Satyendra Nath Bose, who at that time was a Reader there. It was in this University that Prof. Bose derived the Planck's radiation formula. However, the period was not much congenial to study in peace. Recalls Mrinal: "The period 1942 to 1947 was a memorable one in the history



independence struggle in India. The Quit India movement was often modulated by communal riots and extreme chaos. It was in the midst of these disturbed times that I studied for the B.Sc. (Hons) and M.Sc. degrees at the Dacca University. I appeared at the final M.Sc. examinations in Physics towards the end of 1946, and the results were declared in the middle of 1947.

Then came the day of August 15 when the country became independent but at the cost of a division. Mrinal was hopeful of getting a scholarship at Dacca University. His family members however decided to migrate to Calcutta. The westward journey started on the auspicious day of the Durga Ashtami (eighth day in Navaratri) of the Durga Puja. Mrinal had no other choice to join the family.

Mrinal was in search of a job in Calcutta and spent some futile months. One day he found an advertisement in the then Amrita Bazar Patrika, seeking applications for a research assistantship under Prof. Sisir Kumar Mitra, the then Ghosh Professor of Physics at the University of Calcutta. Mrinal applied and then met Prof. Mitra. His first meeting was not much encouraging. Prof. Mitra said that his results were impressive, but added that if a 1st class M.Sc. from Calcutta University would apply, he would be the first choice. He then wanted to know the name of the external examiner of Mrinal's M.Sc. viva voce examination. Incidentally, the examiner Prof. Hrishikesh Rakshit was a Ph.D. student of Prof. Mitra. That impressed him, but after some pause, Prof. Mitra asked him to come about a fortnight later. In his second meeting, Mrinal was informed of his selection and was asked to join the next day. Such was the norm those days. Prof. Mitra's decision was the last word.

### EARLY SCIENTIFIC RESEARCH

As a Research Assistant to Professor Mitra, Mrinal's duties involved research, helping Prof. Mitra in revising and expanding his treatise "Upper Atmosphere" for its second edition and to keep account of Prof. Mitra's expenditure. There were about ten to twelve workers in Prof. Mitra's group at that time and each of them was given the task to include in different chapters of the book latest experimental and theoretical developments in a particular topic of the ionosphere. Mrinal had his own share in this task. In addition to that, hectic activities were also going on to create a new department, known as Institute of Radio Physics and Electronics. Although Prof. Mitra and Prof. Meghnad Saha had been the main architect, ably assisted by Prof. Jatindra Nath Bhar, the researchers in the group including Mrinal had to do secondary work also.

Initially Mrinal was asked to do experiments on active nitrogen. The famous British Physicist Lord Rayleigh did some pioneering work in the area, but no satisfactory theory was available. Prof. Mitra had his own idea about the origin and wrote a monograph on that. However, the idea needed experimental support. His two students started fabricating the equipment, but left it unfinished as they went



abroad for higher studies. Mrinal was asked to start from where they left and complete the experiment. That he indeed accomplished. One day, he was able to demonstrate the glow-golden yellow in colour of the "active nitrogen". Prof. Mitra was deeply impressed.

Mrinal also helped Prof. Mitra in preparing popular invited lectures. One such topic merits special mention. Prof. Mitra had to give a popular lecture on post war television. At that time it was difficult to obtain proper and latest information. However, Mrinal was undaunted. He collected latest information from journals like *Wireless World*, *Wireless Engineer*, *Nature*, etc. The lecture material was finalized to the utmost satisfaction of Prof. Mitra. Later, he asked Mrinal to write a review article on the topic, which he did. Prof. Mitra made necessary revision and got it published in *Science and Culture*, with MK Dasgupta as the sole author.

Deeply impressed by Mrinal's intellectual ability and hard work, Prof. Mitra recommended him for an overseas fellowship and suggested that he should work in an emerging field: Radio Astronomy. Mrinal was selected and also accepted by Prof. PMS Blackett of Manchester University, a Nobel Laureate in Physics in 1948. Prof. Blackett set up a modern radio astronomy laboratory at Jodrell Bank, which was directed by Sir Bernard Lovell. Mrinal started his sea voyage, leaving his work on active nitrogen unfinished.

The subject of Radio Astronomy was at the formative stage during 1950's. Until 1930's scientists relied on optical astronomy to study the behaviour of the universe. It was in 1931 that the subject Radio Astronomy was born with the experiments on cosmic radio noise by Karl G Jansky at Holmdel, New Jersey, at the field site of Bell Labs. It took another fifteen years, just after the World War II, for the scientists to take up Radio Astronomy seriously.

R Hanbury Brown conceived in 1950 a radio interferometer, called the intensity interferometer. Dasgupta and his associate Roger Jennison were the first to design, fabricate and operate a long base line post detection correlator radio interferometer. Before their work, radio astronomical observations were beset with poor angular resolutions of radio telescopes and the limited sensitivity of receiving systems. The problems were solved with the advent of long base line intensity interferometer.

The intensity interferometer is based on the principle of comparison of the fluctuations in the intensity of the radio source as the separation of the antennae receiving radio signal from it is increased until the correlation between the signals received from the source disappear. The intensity interferometer constructed by Dasgupta and Jennison consisted two radio telescopes, one fixed at the ground and the other carried on a truck. This allowed realizing the long-base-line system. The two observation points separated by 20 kms could give high resolving power of the angular measurement system. The data from the radio telescope on the truck was



sent to the fixed (i.e., the base) station by a microwave radio link and not by conventional cables used in those days. Dasgupta and Jennison with the instrument measured the apparent angular structure of the two strong radio sources - Cygnus A and Cassiopeia A - for the first time with desired precision. Their measurement and analysis led to the discovery that for Cygnus A, the modulus of the Fourier transform of the east-west brightness profile shows a primary and secondary maxima with increase of the antennae spacing. The amplitude of the secondary maximum was significantly large and could not be explained on the basis of a single-component source model. The double-component model suggested by them explained things perfectly. The distance between primary and secondary lobes of the Cygnus A radio sources was 1 ft. 28 in. This discovery by Dasgupta and Jennison of the double radio source in Cygnus A is now regarded as one of the 10 classical discoveries in radio astronomy. The results of their land-marking discovery were published in *Nature* and also in *Philosophical Magazine*.

The discovery of Dasgupta and Jennison is perhaps the first indirect evidence of black holes. This discovery was made at a time when astronomers were yet to accept the concept of the black holes. Today, it is known that almost all the radio galaxies and enigmatic quasars show double structures.

## PROFESSIONAL CAREER

### a) As a Teacher

Mrinal was awarded Ph.D. degree of Manchester University in 1954, after which he returned to India and joined the Institute of Radio Physics and Electronics as a Lecturer. In addition to his normal teaching duties, he started developing a research school with a few students. During early 1960's UGC was planning to establish Centres of Advanced Study in selected University departments and in recognition of the pioneering contribution of Prof. Sisir Kumar Mitra, INRAPHEL was included in the list. Mrinal was promoted to the post of a Reader and then in 1968 he became a Professor.

Both the authors of this obituary had the good fortune of being the pupil of Prof. Dasgupta. They vividly recall the high standard of teaching by him. He used to start his course by displaying an "Electronics Tree" by epidiascope. The tree contained many branches, like electron devices, computer, control, communication, radio wave propagation, cybernetics, television, etc. He spent the full hour explaining the function of each branch keeping his students spellbound, mesmerising them slowly to drag into the beautiful world of electronics. He also kept his students abreast of the job opportunities. To be honest, electronics engineering was not his cup of tea. Therefore, when he taught subjects like electronic measurement or electronic instruments, teaching became somewhat monotonous after a few days lectures. In



spite of this, his gift-of the-gab captivated all the attendees. He was systematic, and very sympathetic to the students. At that time number of copies of good textbooks available in the departmental library was not large. He dictated the lecture materials quite often for the benefit of the students. Occasionally after a few days of routine lectures, on an august day he talked about recent developments and discoveries.

The authors remember his lucid description of "3 cm radio noise" "big bang" and the like. One of his students during 1963-1966, Professor S Ananthkrishan, former Director of National Centre for Radio Astrophysics, TIFR-Pune Campus, gratefully acknowledges that such lectures motivated him to choose research in radio astronomy as his career. One of the authors (PKB) had been his colleague since 1971 and acknowledges his affection, guidance and training given to him in administrative and other activities.

## Research

After returning from England and then joining the Institute of Radio Physics and Electronics, Dasgupta started forming a research team to work on radio astronomy and space science problems. Later, he became the Professor-in-Charge of the thrust area in Space Physics of the Centre. He guided a number of Ph.D. students, who later held key positions in National Laboratories of the USA, Universities in Brazil, West Indies and Canada and became Professors in Indian Universities. The list of Ph.D scholars, who were guided by Professor Dasgupta are:

1. Dr. Santimay Basu, Reader in INRAPHEL, now at Space Vehicle Directorate, Air Force Research Lab., Mass., USA.
2. Dr. Dipak Basu, now at Clareton University, Canada as Emeritus Scientist
3. Prof. Arun Kumar Sen, Professor and HoD, INRAPHEL (deceased).
4. Prof. Santosh Kumar Sarkar, Professor, Dept. Physics, CU (retd); ex-Vice Chancellor, Jadavpur University and Kalyani University, WB.
5. Dr. Rina Bhattacharyya
6. Dr. Nandini Sengupta, now at Univ. Bath, UK.

Dasgupta made significant research contributions in the field of atmospheric, solar-terrestrial physics, solar microwave and X-ray emission, etc. Some of his notable contributions may be summarized as follows:

- The sudden enhancement of the integrated field intensity of atmospheric subsequent to nuclear bomb explosions of megaton range.
- The gradual enhancement of the integrated field intensity of atmospheric prior to the incidence of Nor'westers.
- The solar cycle dependence of the incidence of sporadic E (ES) - a global picture



- The variability of solar microwave radiations.
- The effect of a total solar eclipse on microwave line-of-sight propagation and also on ionosphere electron content.
- The effect of earth's orbital eccentricity on incident solar flux at 10.7 cm.
- Studies on solar radio burst in relation to other solar optical features.
- Spectral studies on different types of solar microwave emission - basic component, slowly varying and burst components.

In collaboration with his colleague, Prof. AK Sen (deceased), he successfully conducted a research project on "Microwave rain attenuation from radiometric measurements at 12 GHz and 22.235 GHz" funded by the UGC. The investigations included the following: radiometric signature of layer clouds; attenuation in clear air and during rain over Calcutta using dual frequency radiometer; rain attenuation characteristics at these wavelength for the earth-space path and the measurement of water vapour content and cloud cover using scanning radiometry at 22.235 GHz.

The radiometric data obtained in clear weather, during rain and at the time of overhead cloud formation were analysed, from which communication parameters and attenuation could be derived. The results show that the monthly variation of parameters clearly follow the monthly variation of water vapour density and was found to be maximum in the month of August. Further the diurnal and seasonal variation of water vapour density over Calcutta has also been obtained. It has been revealed from these analyses that the water vapour scale height around 2-3 km is in conformity with other observations. Water vapour profiles for different months have also been drawn. Besides these, the peak rain attenuation has been plotted against peak rain rate and by regression analysis it has been found that the relationship is linear ( $A=0.22 R$ , where  $R$  is in mm/hr). It has been strikingly observed that the rain attenuation persisted for about 2-5 hr even after the rain stops. This is presumably due to the presence of large ambient humidity and slow wind activity.

### **Academic and Scientific Administration:**

Prof. Dasgupta served as the Head of the Department of Radio Physics and Electronics for four years (1976-80) after the retirement of Prof. JN Bhar. He acted also as the Programme Coordinator of the Centre of Advanced Study in Radio Physics and Electronics, a post he held till 1980. The UGC rule that a teacher should serve as head of the department for two years at the first instance came into force in 1980. He then continued as the Professor in Charge of the Space Science in the department. He also served as a member of the Senate of the University of Calcutta for sometime.





Mrinal developed close ties with a few Universities in UK through his visits. This resulted in bilateral exchange programme between INRAPHEL and these Universities with support from UGC and British Council. A few distinguished young researchers visited INRAPHEL under this program and initiated new research activities in the Institute, by which younger faculties were immensely benefited.

He retired from University service in 1988 and worked in the same Institute as INSA senior scientist during 1988-1991. He initiated a diploma course in astronomy and planetarium science – the first of its kind in India at the MP Birla Institute of Fundamental Research in Kolkata in 1992. He has been associated with the programme till he breathed his last. He was a member of the senate and syndicate of the University of Calcutta and served in the Governing bodies of several Educational/Research Institutions and State owned Electronic enterprises.

### **HONOURS AND AWARDS**

For his pioneering research in Radio Astronomy, Prof. Dasgupta was elected a Fellow of the Indian National Science Academy (New Delhi) in 1974. He became a Fellow (FASc) of the Indian Academy of Science, Bangalore. He was the President of the Engineering section in the 68th Science Congress held at Banaras in 1981. He was felicitated in an international symposium on "Black Holes" organized by SN Bose National Centre for Basic Sciences in Kolkata in 1988.

He was Council member in many organizations such as Indian Association for the Cultivation of Science, Saha Institute of Nuclear Physics, Indian Statistical Institute, and Indian National Academy of Engineering. He was in the senate of IIT, Kharagpur. He worked as expert in CSIR, DoE and UGC committees and in selection committees of IITs and different Universities.

### **FOREIGN VISITS, NATIONAL REPRESENTATION**

Mrinal had his first foreign visit in 1950 to UK as an overseas scholar. He visited a few Universities in UK in 1977 under the support from British Council and during his stay he developed research collaboration and strong ties with University of Manchester and London. A bilateral exchange programme between IRPE and a few UK Universities soon emerged and under its auspices few bright and young faculties came to INRAPHEL.

### **FAMILY LIFE**

Mrinal was married to Dipali in 1955. Dipali was totally the manager of the house. They had one daughter, Pampa, and one son, Anindya alias Bappa. Pampa got her master's degree and was then married to a Physician. The daughter's family is settled in England. Anindya studied B.Tech. in Electronics and Telecommunication



Engineering at Jadavpur University. He also completed M.Tech. and after serving different organizations, he is now in teaching profession. He is also married and has two sons. He with his family has been with his parents throughout.

Professor Dasgupta had been a devoted family man and very affectionate to his children. He did his best to give proper education to his offsprings. In addition, he was also deeply concerned about the well-being of his nephews and nieces. One of his elder brother's sons, Kalyan, studied B. Tech. and M. Tech. in the Institute of Radio Physics and Electronics. As a husband, father and grandfather Prof. Dasgupta did his duties perfectly.

Professor Dasgupta lived a very simple life. Excepting the years he served as the hostel superintendent, his family lived in rented house. In about 1993, he finally moved to his own residence at Salt Lake, Kolkata. His retirement benefits from the University were not lucrative and he used to live on meagre pension and some earning from Birla Planetarium. In spite of that, he never allowed monetary matters to take grip upon him. His smiling face never turned grave. All visitors to his house were bound to take refreshments. He had been a true believer of "simple living and high thinking".

### LAST DAYS

He had a severe heart attack in 2003, after which he was almost confined to his house. In spite of this, he continued his work at Birla Planetarium. He used to read all the newspapers and periodicals he received from INSA, IAS, UGC, etc. Whenever he heard of any good news about one of the authors (SKP), he made phone call to him to congratulate. He also devoted some time to educate his grandsons about planets and stars. A few days before his death, he taught them to identify the planet Mars.

He was watching the one day international between India and SriLanka on Monday, November 28, 2005, half lying on his bed. He felt depressed when Sachin Tendulkar became out in the chase for runs and uttered that India had no chance of winning. Those were the last words heard from him by his attendant. It was about 8.10 PM. A few minutes later, his family members realised that he had already left for his heavenly abode.

### EXTRA CURRICULAR ACTIVITIES

Professor Dasgupta developed a high blood sugar when he was in his mid -forties. But he had a strong determination to overcome the problem. He started running in the morning. One of the authors (PKB) was a research scholar in INRAPHEL during 1967-71. He and his fellow workers started playing badminton in the winter evenings. Prof. Dasgupta was a very enthusiastic member of the club and he never missed any evening. He was a good player also. Unfortunately the activity could not



continue beyond 1970 due to political disturbances in West Bengal. Disheartened Prof. Dasgupta depended on running and jogging to shed adequate perspiration.

Prof. Dasgupta was a voracious reader of books of all sorts, magazines, and other publications, not to speak of scientific journals. He had a colourful personality. He himself wrote poems, and at least two humorous plays, which were directed by him and were staged by the students and staff of his department in the annual reunion. He wrote many popular articles for the Bengali Science magazine "Jnan-O-Bignan". He was invited on numerous occasions by Akashbani (All India Radio) and Doordarshan to deliver popular science lectures and to act as Coordinator for scientific discussions. He volunteered to act as the Superintendent of the newly founded Postgraduate Students Hall during 1965-68 and acted as the real "Friend, Philosopher and Guide" to all the boarders, most of whom were not his students. Since the Hall was not within the University campus, but rather surrounded by residences of local inhabitants, altercations between the boarders and the local people were very common and at times the situations took difficult turn. The role of Prof. Dasgupta was of a true protector of the boarders, and at the same time of a real counselor pointing out their follies. Prof. Dasgupta was a lover of music – both classical and light, and had a taste for culinary art. In short, he was a person with all finer senses. He was very social and amicable, too.

### ACKNOWLEDGEMENTS

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## REFERENCES

- 1982 WT Sullivan III, Classics in Radio Astronomy, (D Reidel Publishing Co).
- 1995 Profiles in Scientific Research: Contributions of the Fellows, 1 Mrinal Kumar Das Gupta, Diamond Jubilee Publication, INSA, New Delhi.
- 1999 Observational Evidence for Black Holes in the Universe, Ed. Sandip Chakrabarti, Kluwer Publ.
- 2000 Mrinal Kumar Dasgupta, Professor Sisir Kumar Mitra – as I remember him, in Resonance 5(7) 92-97.
- 2005 Subal Kar: Journey into Space, The Statesman, Monday, 26 Dec. 2005, Kolkata.

## BIBLIOGRAPHY

- 1952 (With HANBURY BROWN and JENNISON RC) Apparent angular sizes of discrete radio sources *Nature* 70 1061.
- 1953 (With JENNISON RC) Fine structure of the extra-terrestrial radio source Cygnus I *Nature* 172 996.
- 1956 (With JENNISON RC) The measurement of the angular diameter of two intense radio sources-correlation *Phil Mag Ser 8* 55.
- (With JENNISON RC) Diameter and structural measurements of the radio stars *Cygnus A and Cassiopeia A Phil Mag Ser 8* (1956).
- 1962 (With MITRA RK) Solar activity and the occurrence of ES *J Atmos Terr Phys* 24 408.
- (With SEN AK) Sudden enhancement of atmospheric associated with high altitude nuclear explosions *J Atmos Terr Phys* 24 739.
- 1963 (With BASU D) Slowly varying component of solar radio emission *Nature* 197 442.
- 1964 (With BASU D) Effect of earth's orbital eccentricity on incident solar flux at 10.7 cm *J Atmos Terr Phys* 26 135.
- 1972 (With SARKAR SK) Some studies on the solar microwave bursts in relation to the slowly varying component *Solar Phys* 26 378.
- 1979 (With SARKAR SK and DAS TK) A Comparative study of the H flares of different visual features in relation to radio bursts and sunspots *Solar Phys* 64 323.
- 1980 (With SARKAR SK and DAS TK) Wide band average spectra of Solar radio bursts *Solar Phys* 67 (1980) 109.
- 1981 (With DAS TK and SARKAR SK) The role of photospheric magnetic field in the development of Solar flares *Solar Phys* 69 131.
- 1982 (With DAS TK) Distribution of sunspots according to their magnetic fluxes *Solar Phys* 78 67.
- 1983 (With SEN GUPTA N) A comparative study of microwave signal characteristics observed over two line-of-sight links *IEEE Trans Ant & Propagation AP-31* (1983) 999.
- 1990 (With SEN AK et al) Radiometric studies of clear air attenuation and atmospheric water vapour at 22.235 GHz over Calcutta *Atmos Envir* 24A 1909-1913.

