

Interviewer: Ms. Ishani Raychaudhuri, Bangalore, in her capacity as a Ph.D. worker registered under Prof. P. K. Basu, Institute of Radio Physics and Electronics (INRAPHEL), University of Calcutta

Face-to-Face with

Prof. Suhas C. Datta Roy

Dept. of Electrical Engg, IIT Delhi

- Good morning Sir. I am Ishani, coming from the Institute of Radio physics & Electronics in Kolkata .It is just an informal conversation between you & me down memory lane.
- **Good morning Ishani. It is such a pleasure to have the opportunity to talk about my alma mater, teachers and mentors and sharing my memories and views with all of you.**

- Sir, how do you rate your teachers and mentors?
- **Teachers were dedicated. They came to this profession by choice. Now-a-days, this choice is superseded by convenient and luxurious lifestyle, financial stability and security which you all get through highly paying corporate jobs. Not only that, as the teachers of our time used to love teaching, they used to be fully prepared for classes all the time.**

- With no exception?
- **May be one out of ten was not up to the standard or not dedicated enough or more research minded.**

- What about the interaction between the teachers and the students?
- **Excellent! Most of the teachers used to know all the minute details about their students, their positive and negative sides. Student-teacher interaction was not restricted within the classroom. It was spread even in personal level. Prof.J.N.Bhar, Prof S. Deb, Prof M.K. Das Gupta were all like that and remember that I am just naming a few.**

- Any particular personal memory?
- **Oh yes! Prof.A.K.Choudhuri treated me like his own son. He took extreme care to support my Ph.D work. I came from a very middle class background and needed a job desperately after obtaining my degree. But I was keen on doing my research as well. Prof. Choudhuri went all out to help me. I was registered under the supervision of Prof. Bhar. Prof. Choudhuri gave me active support to carry out my research work but he wanted me to have the guidance of Prof. Bhar as Prof.Bhar was famous for his systematic approach, grasp over**

language etc. So though Prof. Choudhuri extended his whole-hearted help, he did not take any credit for it.

- Was it difficult to continue research along with your job?
- **I was in River Research Institute for a couple of years. Then I joined the University of Kalyani as a teaching staff in the department of Physics. I was shuttling between Kolkata and Kalyani every week. I used to come to Kolkata every Saturday, do experimental research during the night, continue the same during the entire day and night on Sunday as well, catch a few hours of sleep in the wee hours of early Monday morning and go back to Kalyani on Monday morning itself to take my classes. At that time, labs were not to be kept open during night but Prof. Choudhuri personally ensured that lab was kept open so that I could work during the weekends uninterrupted.**
- But do you think that mentor- protégé relationship is still like that?
- **Most definitely not. It has become strained. That essence of devotion, respect and love for each other as well as for the subject itself is no longer there.**
- Do you think that high quality research work is happening in India?
- **In general, most of the premier institutes have deteriorated in quality research as majority of research scientists hanker for personal achievements. They believe in rapid publications even in non-reputed journals so that number of publications can be more in a short span of time.**
- What about the situation in Kolkata?
- **Group clashes are predominant in Kolkata. As a result the city has lost its grandeur in the fields of research and education in national as well as international levels. Basic reasons may be inter-group politics, lesser motivation, failure towards the identification of real merit and giving more preference to high level connections—though funding in most of the cases is not a problem at all! Unfortunately political backing is playing a major role in getting appointments. If we study the number of recipients of the prestigious Bhatnagar awards or the coveted Academy Fellowships in last twenty years, we find that the contribution from Kolkata is not significant at all though the number of Bengalis receiving the same is significant.**
- What is your opinion about these high level awards? Do you think that all the recipients are worthy enough?
- **More or less yes. At least when central or national level awards are announced, it is taken care of that justice prevails. But I am not so sure about the same in case of state-level awards.**

- Now let us talk about the laboratory facilities during that time.
- **Laboratories were very well-organized even with fund constraints. Mostly instruments were acquired through army disposals. Students were much more innovative, hardworking and used to get incessant encouragement and support from their teachers and mentors. But in general, Mostly set-up experiments were there. So there was not much scope or exposure for hands-on experience in fields like instrumentation or circuitry.**
- And what is your opinion about present-day laboratories?
- **My overall reaction, you can say, is positive. You know, in lower levels like first and second years, no set-up experiments are there in IITs. So students are having hands-on experience and thereby face challenge to learn instrumentation and circuitry by themselves, but of course teachers are there to guide them. Later, during third or fourth year or even during M.Tech, mostly there are experiments involving software; simulation etc, so naturally there is lesser scope for hands-on experience.**
- How do you rate the current trend in our educational system?
- **It has become much more job-oriented. Research is less in demand. Students are more interested in like IT and all because of high pay scale and glittering lifestyle.**
- And brain drain?
- **Yes! It has become an ominous problem. As such, number of students interested in research is decreasing at an alarming rate. So naturally with this continuous brain drain, we are left with mediocrity and thus the progress and quality of research is deteriorated.**
- Any message for our generation next?
- **I want to convey just one message. Your mother may be poor, she may not be as ideal as you like her to be, but you cannot ignore her contribution in your life at any point of time. It is true for your motherland as well. You cannot disown your motherland. You must try to repay her in whatever way you can. Please do not forget your root. Just remember that whatever you do to repay your motherland is not enough. So wherever you stay, whatever you achieve in your life, please value three things the most : self- confidence, honesty and integrity.**

Face-to-Face with

Prof. Mihir Chakrabari

Former Professor & Dean, Indian Statistical Institute, Kolkata

- Hello Sir. We hope to learn a few things from you about ISI, mostly about the early period.
- **ISI was registered as an institute in the year 1932. I joined ISI in 1962.**

- That was the first time that you have stepped inside ISI?
- **Not exactly. I first visited ISI in the year 1959 as a student from the Institute of Radio physics & Electronics to see and have a feel of HEC 2M and URAL.**

- When did ISI develop first analog computer?
- **In the later half of the year 1950. Prof. P.C. Mahalanobis engaged Sri. Samarendra Kumar Mitra , a fresh Master's degree holder from the University of Calcutta. Samar Mitra was the son of Justice Rupen Mitra , who was a friend of Prof. Mahalanobis.**
He sent Samarendra to U.S. to have an idea of computer development and how to initiate the same in our Country. Samarendra returned in 1951 and even before he was back, a computer development unit was built in ISI.

- What was the picture elsewhere in Kolkata? Were other stalwarts thinking in the same line?
- **Yes. Actually the foundation stone of the Institute of Radio physics & Electronics was laid. Prof S. K. Mitra had been nurturing the dream of this institution for a long time and it ultimately happened in the year 1949. The first batch came out in the year 1952.**

- So from 1952, professionals in electronics were available?
- **Yes .Technically you can say so. Though IIT Kharagpur was established in the year 1949 as the first IIT in India, its first batch was out a year later, in 1953.**

- In these technological institutes, a lot of instruments were needed. How were those acquired?
- **Instruments like radar, beacon etc. were sold here by American war supply disposal after World War II. ISI and INRAPHEL grabbed that opportunity to get hold of such instruments at an affordable price.**

- Did any student from INRAPHEL join ISI at that point of time?

- **Yes. Prof. B.R.Nag passed out from INRAPHEL and joined ISI in the year 1954.**
- What happened to Samarendranath ?
- **He developed an analog computer to solve linear equation having 10 variables and Prof. B.R. Nag also played a significant role in that developmental work.**
- It was understood that Pandit Nehru made a visit to ISI ?
- **Yes. He visited ISI in 1956. Prof.Mahalanobis showed him the analog computer. Incidentally you know I saw a photograph in Samarendranath's residence depicting that occasion.**
- What was Prof. Mahalanobis's idea all along?
- **He wanted to make a complete computing facility and as till early 1950's there was no commercially available computer in the market and no company developed computer as it involved huge investment, this type of development could only happen under Government funding.**
- But what was the situation worldwide?
- **It was same in U.S.A. and Europe. In 1945 Von Neumann Architecture came into picture. The first stored program computer was installed in Ballistic Research Institute, U.S.A. Almost simultaneously Prof. Mahalanobis made the computer development unit in 1950.During 1953-1954 first analog computer was developed in ISI and just after that Prof. B.R. Nag returned to his alma mater INRAPHEL. Then most probably in 1955-56 Prof.A. K. Choudhuri and Prof. B. R. Nag developed first analog computer in INRAPHEL.**
- Did Prof. Mahalanobis use this computer?
- **Yes. He used that to do experiments and computer development was expensive. Only Government funding was there for developing the computer in universities and aided institutions.**
- But he could have sought help from abroad!
- **In 1954 Prof. Mahalanobis went to U.S.A. in connection with some United Nations work and University of Illinois proposed that ILLIAC blue print would be given and that could be developed in India but at India's cost.**
- So ISI took that offer?
- **No. The offer was rejected by ISI because ILLIAC was not a state-of-the art computer at that time.**

- So the offer was of no use to anybody?
- **TIFR accepted this offer and TIFRAC was eventually developed. But it was a valve computer.**

- So what happened next?
- **USSR offered help to ISI through their Academy of Science towards development and know-how of analog computer. But after a while the negotiation was off as USSR Government refused to let their technologists come to India.**

- How did Prof. Mahalanobis sort it out?
- **In the year 1954, he made a trip to Britain. During that period a small size computer was available commercially—Hollerith Electronic computer. He purchased HEC 2M priced at £ 18,000. This computer was originally designed by Booth. ISI got this computer in 1956.**

- Was there any pre-assigned condition for sale of this computer?
- **Oh yes! Sale of this computer was subjected to certain conditions. Firstly, the computer was to be maintained by ISI employees. No after-sales service contract would be signed by Britain. Secondly, installation would be done by Indians but they could get suitable training from Britain. Britain did not have any other facility there except tabulating facility.**

- What was Professor's reaction?
- **Prof. Mahalanobis agreed to it because it was indeed an excellent opportunity for training of his own people.**

- It was ultimately installed?
- **Yes .It was installed and maintained by few Indian engineers who got training from United Kingdom. It was a valve machine, belonging to first generation computer.**

- So Professor's dream came true?
- **Yes. All along he had been trying to initiate a project for computer development in ISI but could not get the assurance of funding.**

- So what happened next?
- **In 1958, Russia offered a computer called URAL as a gift through the United Nations. ISI got it in 1959 and it was installed by a group of Russian engineers along with the engineers from ISI who were maintaining HEC 2M. During that**

period, there was an offer from Jadavpur University to build a computer jointly and Prof. Mahalanobis accepted readily.

- Why?
- Basically for two reasons. Firstly, Jadavpur University could provide ready man power and secondly, the provision of UGC funding was there.
- But no such offer was made by INRAPHEL or the University of Calcutta?
- No.
- Any specific reason was there behind it?
- INRAPHEL or Calcutta University was not very enthusiastic about this joint venture. The reason behind it might have been its orthodox closed-door attitude.
- So the joint venture took off?
- Yes. In 1961, the much talked- about ISIJU project started. But unfortunately after one year, in 1962, Indo- China War started and project ISIJU was stopped for one full year. Then of course it took off again in full swing and finally in May 1966, ISIJU was completed.
- Thank you, Sir.

Face-to- face with

Dr. Mrs. Rajeswari Chatterjee

Ex-Professor, Dept of Electrical Communication Engineering

Indian Institute of Science, Bangalore

(This interview was taken shortly before her demise)

- Good morning Madam. It is indeed an immense privilege for us to meet you in person and share your valuable insight and experience
- **Good morning. When we talked over telephone about your plan to retrieve the past records of electronics research and education in India, I also felt the importance of the same.**
- Let us go back to your childhood days.
- **I was born on 24th January 1922 in Bangalore. I studied in a school called “Mahila Seva Samaja” .When I was a school girl, may be in the year 1934 or so, we were taken for a visit to IISc. The lady who welcomed us was none other than Lady Lokasundari Raman, the wife of Sir C.V. Raman, but of course we had no clue of her identity at that time.**

- Tell us more about your schooling.
- **I went to the London Mission High School (currently known as Mithralaya Girls' School from 1934 to 1937. I passed my SSLC examination in 1937 and took admission in the Women's Intermediate College in Bangalore and finished my Intermediate studies from there.**

- Then your college life started?
- **Yes. I joined the Central College in the three year B.Sc (Hons) course in Mathematics. I passed in the year 1942 and successfully completed my M. Sc from The Mysore University in the year 1943.**

- What was your plan at that point of time?
- **I wanted to pursue my career somewhere abroad like UK or USA. I wanted to have a doctorate degree in Mathematics but I could not do so at that time because of World War II. So I decided to join IISc for research.**

- In the department of Mathematics.
- **Oh no. There was no Mathematics department there at that time. When I approached Sir C.V. Raman to give me a chance to join the Physics department, he flatly refused as I did not do my Master's in Physics.**

- Why didn't you check for other options like going to other universities in some other states?
- **During that time only other option was Calcutta. There were many good mathematicians there who could guide me towards a Ph. D. degree but my family did not allow me to go there as I was a girl!**

- So what did you opt for?
- **I applied and was called for an interview by Prof. S. P. Chakrabarti of the department of Electrical Technology. He informed me that I had to make trips to far away places like Calcutta and Jamshedpur during summer for practical training. So I opted out.**

- But why there was no scope in Bangalore itself for practical training?
- **There was no industry in Bangalore at that. The Hindustan Aeronautics Ltd had just come up and it was not willing to take any student trainee.**

- You must have felt disappointed.
- **No. Prof. Chakrabarti offered me another scholarship so that I could learn some Electronics and Electrical communication Engineering and work on some**

research problems on electron tube circuits and publish some papers which would eventually help me to go abroad .

- So you must have accepted the offer?
- **Yes. I joined the department in 1944 and attended courses on Electrical Communication Engineering, vacuum tubes, electro-acoustics and line communication. I tried to do some experiments on vacuum tube circuits as well.**

- How did you feel at that time?
- **I was a bit confused. I was not sure whether I was making any progress in my research work or simply waiting to go abroad.**

- So the dream of studying abroad was always there at the back of your mind?
- **Yes. After the end of World War II, scholarships were announced for interested students to go to UK, USA or Canada, get qualified from there and come back to India to build up industry and economy which had suffered a lot during the British Raj and World War II.**

- Did you have any research publication at that point of time?
- **I had two with Prof. S.P. Chakrabarti and one with Mr.S.K.Chatterjee . The latter was an M.Sc in Applied Physics from Calcutta University and joined the department of Electrical Technology of IISc as a lecturer.**

- Where did you go?
- **I went to Michigan, Ann Arbor and joined the department of Electrical Engineering.**

- What were the courses?
- **I completed three undergraduate courses as I did not have an undergraduate degree in Electrical Engineering and then opted for post-graduate courses on electron tubes, microwave engineering, electromagnetic theory and antennas, advanced network theory, partial differential equations, Laplace transform etc.**

- After completing your Master's degree, did you start your Ph. D. work immediately?
- **I could not do so as the Government of India wanted me to take some practical training. So I took training in radio frequency measurements at the National Bureau of Standards in Washington DC before joining for the Ph. D. program.**

- What happened next?

- **I took some more courses on microwaves vacuum tubes and other related subjects. My research project was on vacuum tube trigger circuits. Transistors were just being invented at the Bell Telephone Laboratories during that time. Finally my dream of obtaining my Ph. D. degree was fulfilled.**
- **Then you came back to India?**
- **Yes. I joined as a lecturer in the ECE department. During that time my husband S.K.Chatterjee used to teach subjects like satellite communications etc. along with electromagnetic theory, microwave engineering and antennas. I was also teaching various courses on the same subjects.**
- **What about Research projects?**
- **I had several projects from CSIR, UGC and also from the Defence. My husband had a PL-480 project from USA. Another important Defence R & D project was on the YIG-tuned microwave devices.**
- **Please tell us more about your husband Prof. S. K. Chatterjee.**
- **He had an M. Sc. in Applied Physics from the University of Calcutta in the year 1932. Calcutta was in the limelight of research and education at that time. The great scientist Dr.S.K.Mitra , known as the father of Ionospheric studies all over the world, had introduced Radio Engineering and Electronics together with the study of Electromagnetic wave propagation and Ionospheric studies for the first time in India in the Institute of Radiophysics and Electronics. Sisir was captivated by the research work done by Dr. M.N. Saha, Dr. C.V. Raman, Dr. S. K. Mitra, Dr. S.N. Bose and other numerous stalwart scientists working in Calcutta at that time. Many of them were his teachers as well. So when one of them Prof. P. N. Ghosh offered to take him as a research student, he immediately accepted. Unfortunately, it did not work out well and so Sisir gave up his research career after a while. Then his professional life started. He started working with one of his classmates and went into making sound heads for projectors in the cinema houses in Calcutta.They used to design, construct and install these equipments in cities like Calcutta, Vishakhapatnam, Vijayawada and Vellore. He again returned to Calcutta University in 1939 to work under Prof. S. P. Chakrabarti in the Electrical Communications Laboratory, who was quite up to date on Wireless communications.**
- **So Prof. Chatterjee started working there?**
- **Yes. After a few months, he was told to go and work as a lecturer in the Signal Training Centre in Jabbalpore. It was actually a British Military training centre. There he had to repair a large number of trans-receivers covered completely by desert dust coming from the battle fields of the North African**

deserts. It was too much hard work that he resigned and returned to Calcutta. This time he was told to take up a teaching assignment in Radio Engineering and was also given a task to design an acoustic soundproof chamber. He was given the designation of an assistant lecturer in Communication Engineering.

- Did he have any interaction with Prof. S. K. Mitra?
- **Yes. Sisir was asked by him to take care of a scheme to construct equipment to measure the direction of atmospherics and its intensity. The work consisted of construction of such equipment and installation of those at the meteorological laboratories situated in New Delhi, Poona, Andhra University at Guntur, IISc at Bangalore, Dacca University etc. He was requested by the Director General of the Meteorological department at New Delhi to report to the American Air Force station at Barrackpore near Calcutta to take over the equipment of Radiosonde , which was used to find the temperature, pressure and humidity at different heights of the atmosphere by radio method and also another special equipment used for radar meteorology. He was then instructed to install the Radiosonde and Rawin equipments at the Chittagong, Calcutta and New Delhi airports.**

In the mean time, he applied for the post of a lecturer of Electrical Communication Engineering in the Indian Institute of Science, Bangalore. He got selected and joined there in the year 1946. He continued working there and was instrumental in initiating the teaching and research work of the upcoming subject of Microwave Engineering in India for the first time. He retired in 1969 as a professor but continued active research work under UGC for some more years. He left peacefully for his heavenly abode on 26th January, 1994.

- Thank you for your valuable time Madam. I want to ask you one last question. You being a woman scientist, do you want to convey any message to our present day women scientists?
 - **Though the percentage of educated women is still less than that of men, women have made very important strides in all sectors. Women are assigned very important roles in Government, industries, education, management, politics and where not! You name it and we are there!! So let us welcome literacy of women folk in remote villages, in rural areas, I mean everywhere. Educate the women and the whole nation will thrive.**
-