JATINDRA NATH BHAR

(1911-1980)

Elected Fellow 1956

IF the credit for pioneering ionosphere research in India goes to the late National Professor S.K. Mitra, the same for building up the Ionosphere Field Station near Calcutta, the first of its kind in the East, and the Centre of Advanced Study in Radio Physics and Electronics, University of Calcutta considered by the U.G.C. as one of the excellent centres in India goes to Professor J. N. Bhar.

BIRTH, PARENTAGE AND CHILDHOOD

Jatindra Nath Bhar was born on the 20th July 1911, at Chandannagar, a small town on the West coast of the river Hooghly, at a distance of about 33 km from Calcutta. At that time the town was one of the French Settlements in India and remained so till 1951, when in consequence of a plebiscite held earlier, the town was incorporated in the Indian Union by an agreement between the Governments of India and France.

Jatindra Nath was the fifth child of his parents Harishchandra Bhar and Saradabala Bhar. He had three brothers and four sisters and was the third among the brothers. His father was on the staff of Martin Burn Co., a well-known managing agency house of the then Bengal.

EDUCATION

Jatindranath received his school education from the Kanailal Vidyamandir of Chandannagar and spent his entire childhood in this French town. This association had a formative influence on his personality and moulded many finer traits of his character. He loved his native town from the core of his heart and in his later life, when the daily journey to Calcutta and back became arduous, he continued to stay in Chandannagar although he could easily afford to stay comfortably in Calcutta and spare himself the rigours of a couple of hours journey back home everyday after the day's hard work.

After finishing his school education, Jatindranath joined the Hooghly Mahasin College in Chinsurah, a nearby town in the District of Hooghly and graduated from

there in 1931. He obtained his M.Sc. degree in Physics with Wireless as his special subject from the College of Science of Calcutta University in 1934.

Scientific Research

Soon after, Bhar joined the Wireless Laboratory of the University as a research scholar under Prof. S. K. Mitra on a fellowship of Rs. 75/- p.m. The first assignment his teacher gave him was to write an article on the discovery of the ionosphere and its role in establishing wireless communication between England and the U.S.A. Although this article which he later submitted to his guide never saw the light of the day, it served as sort of a beacon light in kindling in him an abiding attraction for the ionosphere, which remained his field of interest for the rest of his life. It should be noted however that he evinced keen interest in other fields of research as well. He was awarded the D.Sc. degree of Calcutta University in 1939 for his original researches on the ionosphere.

One of the early entrants in the field of ionosphere research in India, Bhar made a number of important contributions in the subject. He was a pioneer in discovering radio reflections from low heights of the ionosphere. He made the first substantial survey of ionospheric conditions in subtropical regions and its correlation with certain geophysical and geomagnetic phenomena. He made, in particular, a study of the association of the abnormal E-layer ionization with meteor showers and thunder storms and also carried out investigations on the magneto-ionic theory, and interpretation of the reflection conditions, particularly the so-called Z-trace.

His explanation of the formation of the E-region of the ionosphere and its stratification has been particularly helpful in clarifying the problem of ionospheric layer formation. Bhar suggested that the continuous nature of the solar radiation should be taken into consideration in determining its effect on the formation of a particular ionospheric layer as had been done earlier for explaining ionization in stellar atmospheres. This was in contrast to the original Chapman theory which assumed monochromatic radiation from the sun for explaining ionospheric layer formation. Although, with the help of recent rocket and satellite-borne studies, production and loss processes of electrons in the ionosphere are much better known now, Bhar's theory was able to explain broadly the formation of the various ionospheric layers (except the sporadic E) in terms of specific gases being ionized by radiations in various ultraviolet wave-length ranges.

Among the other contributions made by him, mention may be made of the design and fabrication of a nuclear resonance detector of the super-regenerative type. The first photographic records of nuclear resonance signals published in this country were obtained with this equipment.

Industrial Research

Although Bhar's main interest was in fundamental research, he was fully conscious of the importance of industrial research. He often expressed the view that the progress of fundamental research in a country depended largely on its industrial development. Bhar was of the firm conviction that science and technology are two facets of a common endeavour. Technology cannot grow without a sound basis of scientific knowledge; science cannot advance without the help of instruments and appliances provided by technology. It was perhaps this latter feeling that drew him to the laboratories of the Director, Scientific and Industrial Research, Government of India, where during the years 1940-42, he carried out research on industrial applications of ultrasonic waves and constructed an ultrasonic generator of high power, designed by him, which was believed to be the first of its kind in India.

Bhar had a great fascination for doing things by his own hand. Whenever he wanted to fabricate some mechanical gadget or some delicate part of an instrument, he would not remain content by merely asking the workshop mechanic to do it. On the contrary, he would spend hours in the workshop, himself working with the mechanic, understanding his problems and helping him with useful suggestions. Whether it was a building plan or a mechanical drawing, Bhar was equally at ease. His knowledge about materials, tools and implements also was extra-ordinary. Recalling that he was a student of pure physics and did not have a formal training in engineering, this dexterity with tools and implements must have been a self-acquired trait.

Professional Career

Secretary of Radio Research Committee

About this time, as a result of sustained and dedicated efforts of Prof. S. K. Mitra and Prof. M. N. Saha, Prof. Mitra's proposal for the establishment of a National Radio Research Board in India was accepted by the Government and the "Radio Research Committee," as the newly formed body was called, was created in 1942 with Prof. S.K. Mitra as its first Chairman.

Prof. Mitra was aware that if the new Committee were to discharge its responsibility properly, a dynamic secretary with initiative and vision was needed. He had no difficulty in making up his choice among his students and selected Jatindranath for this position. During his tenure (1942-47) as Secretary of the Committee, Jatindranath visited various industrial establishments and research institutions in different parts of the country to explore the possibility of manufacturing radio receivers in the country. On the basis of information collected by him, a compr

hensive report was prepared, detailing the complete range of components and raw materials needed for the production of a domestic radio receiver. A spin-off of this report was that the Radio Research Committee started sponsoring schemes on applied research in India, two of which were undertaken in the Calcutta University—one for the production of microphones and loud speakers and the other for the production of electron tubes.

Among other items of work undertaken by Bhar as Secretary of the Radio Research Committee, mention may be made of (i) the preparation of a survey report on the laboratory facilities existing in India for the standardisation of electrical quantities related to radio and electronic equipments and (ii) design and fabrication of a number of standardised equipment for the directional measurements of atmospherics at different centres in India.

As a Teacher : After finishing his work for the D.Sc. degree, Bhar worked for sometime in the Physics Department of Calcutta University as an assistant lecturer. This was a temporary assignment and he served in this position from November 1938 to December 1939. His substantive career as a teacher started several years later, in 1947, with his appointment in the same Department as a lecturer.

'Wireless', which Bhar used to teach was at that time included as an elective subject in the physics curriculum. His teacher, Prof. S.K. Mitra who was then holding the Chair of Ghosh Professor of Physics in the said Department was however convinced, after his tour of England and U.S.A. towards the end of the second world war that it was no longer possible to meet the needs of advanced research in the field of radio and electronics by teaching the subject as an elective one within the framework of the physics syllabus and that radio and electronics must have the status of an independent discipline. He had accordingly submitted in 1945 with the active help of Bhar a proposal for creating a separate post-graduate department for Radio Physics and Electronics. Funds for this purpose were made available by the Government of India in 1947 and Prof. Mitra lost no time in entrusting his student with the task of planning and organising the Department in all its details. From that moment, Bhar immersed himself fully in the job with characteristic zeal and ceaseless devotion.

Just two years later, the new Department of Radio Physics and Electronics was created by pooling the resources of the wireless laboratory of the Department of Physics and the Communication laboratory of the Department of Applied Physics of the University and Bhar was appointed Reader in this Department in June, 1949. From that time, the Department became his first love and he was inextricably linked with it until cruel death caused the separation in June 1980.

After the retirement of Prof. S.K. Mitra from the Ghosh Professorship of Physics in 1955, Bhar became the Head of the Department of Radio Physics and

Electronics. He was appointed to the aforesaid prestigious Chair in 1957 in recognition of his academic attainments. He adorned this position with dignity and dedication till his retirement at the age of 65 in July 1976.

Success as a Teacher : It has been aptly said that the quality of students produced by a teacher is a measure of his success. Judged from this angle, Prof. Bhar may be easily ranked as a truly illustrious teacher. During the span of three decades of his teaching career, Prof. Bhar produced a galaxy of students, who now occupy prestigious positions in various institutions/organisations and are leaders in their respective spheres of life. Those in this list include Directors of National Laboratories, I.I.T.'s and R & D institutions, Fellows of the Indian National Science Academy, Heads of Departments of Universities in India and abroad, successful enterpreneurs, etc. Indeed, there is hardly any establishment or institution in India in the field of electronics where there is no student of Prof. Bhar, occupying some position of responsibility.

Bhar's success as a teacher can be partly ascribed to the influence of his own teacher and guide Prof. S.K. Mitra. Like the latter, he would prepare lecture notes with meticulous care and stress upon the fundamentals with great emphasis. Bhar possessed an inimitable style of delivery, which was his own and which kept his students spell bound. In their later life, his students have frankly admitted that they owed much of their understanding of basic electronics to the pedagogy of their revered teacher.

Although Prof. Bhar maintained a distance between himself and the students in his class, his relationship with his ex-students was completely different. To them, he was more than a "friend, philosopher and guide", almost an elder member of their family. This familiar behaviour was not restricted to his ex-students only. Others too who came in contact with him in the professional field were struck by his informal personality and became his close acquaintances. Wherever he went in India or abroad, it was a familiar sight to see him surrounded by his students and close associates, and an enjoyable evening would be spent, free from official cares and constraints.

Director, CAS in Radio Physics and Electronics : A striking feature of Prof. Bhar's character was that he could place the interest of the Institution he served over his own. This was amply demonstrated at the time of the setting up of the Centre of Advanced Study in Radio Physics and Electronics in 1963. Originally, the U.G.C. had recommended that the thrust area of the Centre be "Radio Wave Propagation and Upper Atmospheric Research", an area which was Prof. Bhar's own field of specialisation. Prof. Bhar, however, was fully aware of the vast potentialities of the newly emerging areas in Electronics and was convinced that in the long term interest of the Institute, these new areas had to be nurtured side by side with studies on the

Upper Atmosphere. And it was mainly due to his efforts that the Centre of Advanced Study was renamed as CAS in Radio Physics and Electronics.

As a result of the creation of the Centre, substantial grants, and teaching positions were received by the Department. However, unlike the Heads of other centres, Prof. Bhar made it very clear to all his colleagues that "the Department was the Centre and the Centre was the Department" so that whatever additional facilities were created were available to all the faculty of the Department. He was convinced that any artificial distinction between the Department and the Centre would only give rise to fissiparous tendencies and might cause hindrance in the healthy growth of the Department. Time has shown how prophetically true Prof. Bhar was. When the U.G.C. reviewed the working of the various Centres of Advanced Study established by it, and adjudged the CAS in Radio Physics and Electronics as "an excellent centre", it was one of the happiest days of Prof. Bhar's life.

Meanwhile, another important change had taken place in regard to the field station at Haringhata. In the initial phase, this station was being run as a C.S.I.R. project and the staff of the station were working on a temporary basis. As a result of Prof. Bhar's initiative, the field station was fully merged with the Department, resulting in the formation of what was called the Institute of Radio Physics and Electronics. This act of integration greatly paved the way for the future growth of the Institute.

An Administrator

Right from Prof. Mitra's time, the administrative burden of the Institute was borne by Prof. Bhar. After Prof. Bhar's appointment as the Head of the Institute, the burden became all the more onerous. This no doubt affected Prof. Bhar's academic pursuits in his later life, when duties and responsibilities of administration would not permit him to devote as much time to research as he wished. While this was a loss to him, the Institute gained from his sacrifice.

The success achieved by Prof. Bhar in building up the Institute was in no small measure due to his ability to judge and assess the capability of persons. He had picked around himself a band of workers who were sincere, capable and loyal. As an administrator, he believed in delegation of power and once he had chosen his deputies, he relied unwaveringly on them—a policy which paid him rich dividend in due course of time. Similarly, once he was satisfied about the research capabilities of his students and colleagues, he would hardly pester them with questions like why they needed a particular equipment, why a less costly equipment would not do, why they were using up so much of components, etc. So long as funds were available, he would go all out in ensuring that no research work was hindered due to non-availability

of funds in time. In fact, by a judicious utilisation of funds received by the Institute, the infrastructure that was created by him was in those days considered to be way ahead of those of other typical university departments of the country. For achieving the same, he had to by-pass sometimes the official rules. But this he would do with boldness and ingenuity. Prof. Bhar had the conviction that if one had no personal axe to grind, one could venture to disregard the bureaucratic rules. Indeed, if the success of the Institute and the contributions made by its staff during his stewardship are any indication, Prof. Bhar must have been a very inspiring leader.

Honours

In recognition of his valuable contribution to new knowledge, Prof. Bhar was elected a Fellow of the Indian National Science Academy (then known as the National Institute of Sciences of India) early in 1956. His name was proposed, seconded and supported by luminaries like Prof. S.K. Mitra, Prof. S.N. Bose, Prof. M.N. Saha, Prof. D.M. Bose and others. He served several terms as a council member of the Academy.

Among the professional institutions with which he was connected, mention may be made of the Indian Physical Society, the Institution of Engineers (India) and the Institution of Electronic and Radio Engineers (IERE), London. His connection with the last mentioned Institution (which was previously known as the British Institution of Radio Engineers) started in early fifties when he became the Secretary of its Calcutta centre with Prof. S.K. Mitra as the Chairman. After Prof. Mitra's retirement, he took over as Chairman of the local centre. In 1965, he was elected Chairman of the Indian Council of the I.E.R.E. and continued in this position till 1969. He was made Vice-President of the I.E.R.E., London for the year 1970. He was a member of the Scientific Advisory Committee for the Division of Radio Science, National Physical Laboratory, New Delhi; the Eastern Regional Committee of the All India Council for Technical Education; Electronics, Materials & Components Research Committee, C.S.I.R.; the Advisory and Users Board of the Regional Sophisticated Instrumentation Centre, Calcutta; Research & Development Committee for West Bengal and Chairman of its Electronics Sub-committee. He was President of the Engineering Sciences Section of the 65th Indian Science Congress held at Bhubaneswar in January, 1977.

In 1961, Professor Bhar was elected Dean of the Faculty of Technology of the University of Calcutta. In 1973, he became the Dean of the Faculty of Engineering of the University. He was a member of the Senate, and the Syndicate of Calcutta University till his retirement. He was a member of the Academic Council of Jadavpur University and of the Executive Council of the National Physical Laboratory, New Delhi.

Because of his personal attainments and his devotion and success in building up the Institute of Radio Physics and Electronics, Professor Bhar was held in high esteem by the Vice-Chancellor and other high officials of the University. And as a token of their respect for Professor Bhar, the last Syndicate meeting which he attended before retirement was held in his Institute, which was quite a departure from usual practice.

Foreign Tours

Professor Bhar went abroad several times. He visited different laboratories of U.K., Sweden, Germany and France in 1961 and again in 1964-65. He went to the U.S.A. to attend a symposium in Boston during September, 1969. In August 1972, Professor Bhar, as Chairman of the Indian National Committee of URSI, led the Indian Delegation to the XVIIth General Assembly of the URSI held at Warsaw, Poland and visited the U.S.S.R. on his way back. It was indeed a fitting tribute to his hallowed memory that the Indian National Committee of URSI joined hands with the Institute of Radio Physics and Electronics in organising a symposium in 1986 on Advances of Radio Science in India to commemorate the 75th birth anniversary of the late Professor.

Formative Influences and Personal Traits

While the influence of his father was perceptible in his domestic life, that of his teacher and mentor Professor S.K. Mitra was clearly evident in his professional life. He inherited from Professor Mitra his penchant for thoroughness in whatever he did or wrote. Like his teacher, he was a perfectionist and had a superb mastery over the English language. He would frequently consult Nuttal's dictionary of synonyms, which was his favourite companion, before releasing a manuscript for final typing. It is no wonder therefore that whatever he wrote bore the stamp of his clarity of style. Those who had the opportunity of showing the manuscript of their research papers to him for correction were surprised to see how quickly he could get to the heart of the matter and re-express the same in a much more precise and succinct fashion. He wrote very sparingly in Bengali, but whatever came out of his pen bore the stamp of his lucid style. The memorial article he wrote on his impressions about Professor Mitra after the latter's demise for the journal "*Jnan-O-Bignan*" will ever remain as a masterpiece.

Prof. Bhar was a voracious reader. Among non-scientific periodicals, he was particularly fond of the *Reader's Digest*. P.G. Wodehouse was one of his very favourite authors. Whenever he came across a particularly interesting article, he would not be satisfied until he could share it with his close colleagues over a cup of tea in his room in the Institute, at the end of the day's work. This was the time when

he would discuss diverse topics with his colleagues, ranging from the academic programmes and activities of the Institute to the lighter things of life and his experiences as a commuter. He was a brilliant narrator and could keep his audience spellbound by the vivid description of any event that he might have witnessed.

Those who came in contact with Prof. Bhar were immediately struck by his informal personality. He was very simple in his habits and dress. In culinary matters, however, he evinced great interest and was not to be easily satisfied. He could himself cook well and detect the slightest defect in any cooked food. With his close friends and colleagues, his conversation was somewhat rustic and unpolished. This was perhaps a manifestation of his outspoken and open-hearted nature. He would not hesitate to express his views on many controversial topics with admirable frankness. In fact, he detested the tendency to shut out the truth for the sake of what one may call gentlemanly behaviour.

Prof. Bhar had deep faith in God. He had his initiation under the Ramakrishna Mission in 1967. While he would recite his daily prayers silently with great devotion and regularity, he was above any religious dogmatism.

Last Days

After retirement, Prof. Bhar continued his association with the Institute of Radio Physics and Electronics under the U.G.C. scheme for utilisation of services of outstanding retired teachers. During this time, Prof. Bhar started writing a book on astronomy. His life long association with space science had kindled in him a liking for astronomy and the title chosen by him was "Planets, Galaxies and the Universe". The book was to be in the nature of a monograph and the level suitable for graduates in science. He finished writing nearly twelve chapters of this book, when he became somewhat busy in making arrangements for the wedding of his beloved daughter. One Friday evening, he left the Institute after having invited his colleagues to join the wedding ceremony at his house. On his way home, he felt feverish and complained of aching sensation of the body. What initially had appeared to be an attack of common influenza, turned out ultimately to be a fatal attack of encephalitis. His condition turned worse and on the advice of his attending physician, he was taken to the S.S.K.M. Hospital in Calcutta for better treatment, where defying all attempts by his physicians, relatives, admirers and students, he breathed his last on June 29, 1980.

It might be of interest to his admirers that the book has since been completed by some of his students and is awaiting publication.

Family

Prof. Bhar married in 1949. His wife Tushar Kana, daughter of Harendra Chandra Pal and Amala Pal of Calcutta was a celebrated and top-ranking singer of

her time, specially in the field of Kirtan. She had her M.Sc. degree in Physics from the Calcutta University.

Prof. Bhar had a very happy married life and was deeply attached to his family. Besides his wife, he has left behind, a son and a daughter.

A. N. DAW

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