Proc. of AP Akademi of Sciences
Vol. 6, No. 2, 2002, pp.79-86.

M.K.VAINU BAPPU: FATHER OF MODERN ASTRONOMY IN INDIA

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The life of Vainu Bappu will stand out as a memorable event in the history of Astronomy in India. He came into this world with a purpose. Although he had to leave before it could be fully achieved, he created the necessary infrastructure and atmosphere for the future scientists of his country to regain lost glory in the oldest of its sciences.

Manali Kallat Vainu Bappu was born on August 10, 1927. His ancestors hailed from Cannanore, but several members of his family had migrated to Mangalore and nearby places. Vainu's father, Manali Kakuzhi Bappu, had joined Nizamiah Observatory and settled down in Hyderabad.

Vainu had his school and College education in Hyderabad. His gift of oratory and writing skills from a very early age evoked wide spread admiration among his school teachers. Vainu apparently inherited this quality from his parents. His mother's elder brother, Rao Bahadur U Shankunny was a famous literateur and orator; another brother U. Balakrishnan, a headmaster, was known for years to have cultivated the love of reading in his students. In the College, he was instrumental in running the magazine and organising scientific activities. He became the secretary of the College's Physics Association, and was most active in arranging meetings and lectures. He was an ardent admirer of scientists and was bent on becoming one later. In 1943, when Sir C V Raman delivered a series of lectures in Hyderabad, Vainu did not miss a single word; for this purpose, he had to cycle ten miles each way daily after his classes.

An all rounder

But his involvement in scientific activities did not diminish his love for the artistic. He was a voracious reader of the classics; he loved to recite the poetry of Wordsworth, Shelley and Keats, and was equally fond of more modern poets like Owen and Kipling. He had a special fascination for Urdu literature; Mirza Ghalib was his favourite poet; often he would make a special effort to be present at Mushairas organised by Urdu lovers in Hyderabad.

He was an all rounder in every sense of the word. His scientific and literary activities were matched by his ability as sportsman. In college, he was an outstanding cricketer and an excellent tennis player. He had a secret ambition of becoming a pilot, chiefly because of the adventure it could provide, but it was never realised. One of his favourite books in his personal library was "The Spirit of St Louis" - the immortal saga of Charles A Lindbergh.

Vainu was an ardent admirer of Homi Bhabha; he admired him not only as a scientist and scientific organiser, but also as an artist, and as a true lover of nature. He himself took up painting later in life and showed his artistic taste not only in his canvasses but also in all his creations; the exquisite gardens and the telescope domes at Kodaikanal, Kavalur and Bangalore, the observatories he developed, bear mute testimony to his artistic vision.

Induction into Astronomy

Vainu Bappu was introduced to the mysteries of the sky at a very early age. He loved to accompany his father to the telescopes at Nizamiah Observatory, while still in school. He developed a deep familiarity with the sky and the instruments and his experience remained an important asset throughout his life. While still in college, he built a spectrograph all by himself and obtained a spectrum of the night sky airglow; he exposed the plate for six consecutive nights through his bedroom window for this purpose. His first paper in a standard scientific journal was published in 1946.

He wanted to follow a career in astronomy; but the opportunities available in India at that time were severely limited. He passed his M.Sc. in 1948, but could not find an opening in the subject of his choice. He was offered a research fellowship to work on a project on telecommunication at the Battersea Polytechnic in London. In the absence of other offers, he was thinking of accepting it, when fortuitous circumstances presented a unique opportunity towards the realisation of his life's goal.

It was at that time Sir Harold Spencer Jones, Astronomer Royal, UK and Professor Harlow Shapley of Harvard University, USA were visiting India. Vainu read in the papers that they would be coming to Hyderabad and decided his course of action that he would meet Professor Shapley and find out if any opportunity in the USA could be found. He met Shapley at his hotel. Shapley had already heard of Vainu Bappu's work as an amateur astronomer and thanks to Shapley's efforts, Vainu found himself in Harvard University in early 1949 on a Government of Hyderabad scholarship to do his research in Astronomy.

The astronomy batch of 1949 at Harvard, where Vainu was enrolled, was a remarkable one. It included several students who were later to hold pivotal positions in the development of several new branches of astronomy. Among his classmates were Harlan Smith, Bill Buscombe, Frank Kerr, Ivan King, William Liller and many others who later headed prestigeous research groups all over the world. Among the teaching members of the faculty were Professor Bart J Bok, Fred Whipple, Cecilia Payne Gaposchkin and Shapley himself. Vainu found himself among an ideal group of young men and guided by the ablest teachers of that time.

Bappu - Bok - Newkirk Comet

As luck would have it, within a few months of his arrival at Harvard, Vainu was involved in a comet discovery. On a routine sky picture taken on a photographic plate on the night before, Vainu's keen eyes noticed an unusual object. He and his colleague, Gordon Newkirk, together with Professor Bok, took a few more plates on successive nights and

computed the orbit of the object. It was indeed found to be a new comet and was named as Bappu-Bok-Newkirk, after its discoverers. It remains today as the only comet bearing an Indian name. Bappu was awarded the Donohoe Comet Medal of the Astronomical Society of the Pacific for this discovery.

Strangely, after the discovery, Bappu received a letter from the Hyderabad Government reprimanding him for indulging in the activties like discovering the comet and not doing research work in astronomy for which he was sent! The letter had apparently originated from an overzealous bureaucrat who lacked basic knowledge about scientific research. Harvard University, however, took it as an affront which criticised their system of education and wrote back to the Indian Embassy. The case was hushed up and Bappu could carry out his research without any further disturbances. Nevertheless, the incident left a deep mark on Bappu's mind, which could be noticed in his dealings with the bureaucracy later in his life.

Wilson - Bappu effect

Bappu completed his Ph D in August 1951, in almost record time and became the first Indian to have been offered the prestigeous Carnegie Fellowship in astronomy. This gave him an access to the Palomar 200 inch telescope, the largest telescope then existing in the world, with which he investigated some of the most challenging problems in stellar spectroscopy. During that one year fellowship, he made an exhaustive survey of Wolf-Rayet stars, a subject in which he remained an authority. He investigated the incidence of H and K emission from ionised calcium in late type stars. The results revealed a relation connecting the equivalent width of the H and K lines with the absolute magnitude of the star. The analysis was done jointly with Professor O C Wilson of the Observatory and the relation

has entered the astronomical literature as the Wilson-Bappu effect. This is one of the fundamental relations often used in stellar luminosity determination.

Dreams of building astronomical observatories in India

After the completion of his fellowship at Pasadena, Bappu worked as a guest investigator at Lick Observatory, California, where he carried out the photoelectric study of early type supergiants around the open cluster H and χ Persei. At that time, he was offered positions in several observatories outside India, but he refused them all. His intention was to return to India and to build up a base for research in astronomy and astrophysics. He denied himself the personal benefits he could have gained by a continued stay abroad and returned home without even the promise of a job.

One of Bappu's closest friends, Professor Harlan Smith later described how Vainu's enthusiasm used to infect everybody around him. He recalls how Bappu would tell about his dreams of building up observatories and research institutions, and how he used to wonder at Bappu's confidence when he was not even sure of a steady job in his own country which hardly had an established astronomical institution.

Many years later, Bappu had this to say: "I was returning to a country with facilities which were primitive compared with those in the United States; the largest telescope I could expect to use was a 15 inch refractor. For this reason, I.....took with me.....a photomultiplier tube, some optics for a spectrograph and some Coude and Cassegrain spectra taken at Mount Wilson and Palomar. My principal encouragement was some advice from Plaskett, on how it was possible to do good work even with limited resources if the topic were chosen carefully. Such words were crucial and have on occasions had great significance; I have had occasions to recall them many times in the next quarter century."

When Bappu returned to Hyderabad in early 1953, he was indeed without a job for almost a year. While going to USA on a Government scholarship, he had to execute a bond with the Government of Hyderabad to serve them for ten years after his return. And when he returned, the Government had no suitable job for him. He was offered the post of Lecturer of Physics at Osmania University and he refused it. During this time, though unemployed, he was encouraged by Mr Akbar Ali, Director of Nizamiah Observatory, to continue his analysis of stellar spectra taken earlier in USA. Bappu also got the opportunity of helping Akbar Ali in his plans to acquire a 48 inch telescope for Nizamiah Observatory. Subsequently, through Mr Akbar Ali's help, Bappu obtained a release from the bond.

At Varanasi and Nainital

In November 1954, Bappu joined the Uttar Pradesh State Observatory at Varanasi as Chief Astronomer. From the day he joined, he was up with the available instruments, trying the observing conditions over Varanasi. Before a week was out, he sought an interview with Dr Sampurnanand, the then Chief Minister of Uttar Pradesh, and explained to him the need for shifting the observatory to a better site. The request was granted and Bappu went with a young team to select a suitable site. A small hill known as Manora Peak, near

Nainital, was chosen as the final location. Pending construction of the main building at Manora Peak, the Observatory started functioning in a rented building in Nainital town. A 10 inch refractor telescope was installed at Devi Lodge and star observations were started. Bappu used to spend his entire day supervising construction at Manora Peak and often spent the whole night at the telescope.

At Nainital, Bappu negotiated for the installation of a satellite tracking camera, which the Smithsonian Institute, USA was only happy to put in his charge. Within a few years, a team of young and highly motivated astronomers had been trained at Nainital. It speaks for Bappu's inspired leadership and teaching that many members of that team made their life time careers in astronomy and continued to do world class research work.

At Kodaikanal Observatory

In 1960, the Government of India invited Bappu to take up the directorship of the Kodaikanal Observatory and on April 1 of that year, he moved over to Kodaikanal to begin a glorious chapter in his life and in the history of Indian astronomy.

Bappu became the youngest-ever Director of the 170-year old Observatory and took up developmental plans in right earnest. The Observatory, originally set up by the British East India Company at Madras in 1792, was shifted to Kodaikanal in 1899 and was placed under the direct control of the Government of India; it was merged with the India Meteorological Department for administrative convenience. Its list of past Directors included the illustrious names of N R Pogson and John Evershed of the Evershed Effect fame. By the time Bappu came in, Kodaikanal Observatory had done front line research work in solar physics along with other astronomical investigations.

Under Bappu's leadership, research in stellar astronomy was initiated as a complement to the meteorological and solar observations that had been carried out there for over 70 years. He established an instrumental and optics workshop. Several small telescopes and sophisticated spectrographs were constructed. He introduced modern electronic controls in the existing solar telescope and commenced on new investigational projects in the studies of the sun. It was at Kodaikanal that Bappu's dream of a full-fledged astrophysical institute and observatory began to take shape.

Kavalur Observatory

Realising that the skies of Kodaikanal were not suitable for prolonged stellar exposures over a substantial portion of the year, he started looking for a more appropriate site. Bappu set about achieving the objective with his characteristic vigour and enthusiasm. He raised a fresh team of young scientists at Kodaikanal and set out to find a suitable site. From Kanyakumari to the seven hills of Tirupathi, he searched every hill for such a location. At last he came across the sandal wood forested Javadi Hills in Tamil Nadu and immediately recognised the suitability of the place for his dream observatory.

A plateau ringed by hills, created a natural trap for still air, producing excellent stability

of the local atmosphere. A dense forest reduced ground heating by insulation. The site, near a sleepy hamlet Kavalur, was accessible by a motorable road; not too far away from a small town, yet free from pollution by industrial smoke and city lights. It seemed to offer all the requisites of a modern observatory. He arranged for a long term lease of 40 acres of forest land and set up the first instruments for astronomical observations. Kavalur Observatory thus came into existence and the first observations with a relatively small 38 cm telescope were made in late 1967. Soon after he persuaded the authorities to place an order for a 1 metre Zeiss telescope to be used in the new observatory.

Indian Institute of Astrophysics

In the meanwhile, the activities of the Meteorological Department expanded manifold. On April 1, 1971 the old Kodaikanal Observatory and the upcoming Kavalur Observatory together formed an autonmous research institute named "The Indian Institute of Astrophysics". This formation was a major step in Bappu's plan for the development of an astronomical centre in India. Two major areas on which he laid special emphasis were the development of a strong theoretical group in various topics of astronomy and the project of indigenously constructing a large optical telescope in India.

Kodaikanal lacked facilities for such development and thus a centre was opened on the premises of the Raman Research Institute, Bangalore where many new scientists joined the research programmes of the Institute. A site for the laboratories was chosen at Koramangala, at the south east corner of Bangalore city and the first new building was formally occupied on November 5, 1975. The next year, Bappu shifted the Institute headquarters from Kodaikanal to Bangalore. Very soon, due to the fabulous artistic sense of Bappu, the campus of the Institute acquired fame for its grace and beauty.

He strived with great care to build up the academic stature of the Institute. The scientists found facilities and freedom not available in other research institutes. He encouraged seminars and colloquia and other academic activities among the staff. At considerable expense he had an in-house computer installed and started regular training courses for the young scientists. He laid special stress on the library. He once said ".....A time may come when the free flow of funds for research will dry up. If such a time comes (heaven forbid !), then..... this is the only section which will keep our academic activities going.".

Even before the one-metre Zeiss telescope was installed in 1972 at the Kavalur observatory, he had designed a complete set of instruments for observations, which included high dispersion coude spectrograph, on-line computer controlled spectrum scanner, high speed photometry equipment and many other instruments. His plan was highly ambitious, aiming to create facilities matching those available in the leading observatories of the world.

Startling Findings: Dame fortune smiled on him once again. Barely a fortnight had passed after the installation of the Zeiss telescope, when a rare occultation event observed at Kavalur brought in unexpected evidence of a trace of atmosphere on Jupiter's largest satellite Ganymede. Five years later, the same telescope discovered the rings of Uranus, a

major step in the advancement of our knowledge about the solar system. Bappu thus succeeded in creating an observatory which could match any leading astronomical centre of the world in its capability to achieve results in observational astronomy.

The indigeneous 234 cm telescope

His project of indigenously constructing a large optical telescope in India was taking shape around 1968 when he started producing sketches of the proposed telescope. Those were the days when high cost of a large telescope and the difficult foreign exchange situation prevented the procurement of a large telescope from outside the country. So Bappu finally prepared a proposal for an indigenous venture in 1973. The only imported item was the primary mirror blank of 93 inch diameter from Germany which was received in 1974.

Bappu was involved in the herculian task of managing the technical aspects of the project while convincing the financial authorities about the advantages of embarking upon this venture. He convinced the leading group of scientists in the country about the positive advantages of the project and with their help, the financial assurance was obtained.

The premises of the Kavalur Observatory was enhanced to a total of 100 acres and the exact location for installing the 93 inch telescope was marked. By 1982, the massive building came up and the manufacturing of the telescope was in its final stages at Walchandnagar in Maharashtra. The dome was also being assembled on top of the concrete building.

It was in this period that Bappu's organisational ability and vision in planning were demonstrated best. Nobel Laureate S Chandrasekar who visited the Indian Institute of Astrophysics during that time and who had also visited Kodaikanal Observatory at the beginning of Bappu's era, exclaimed that it was an example of what one dedicated individual can accomplish in a mere twenty years.

But the destiny was different. Bappu had indications of a failing health from 1970. In 1973, he had a minor stroke of facial paralysis, in 1978, he suffered from a severe angina problem, in January 1982, another medical check up revealed an advanced stage of arterio-sclerosis, and in August 1982, he underwent cardiac bypass surgery. Two days after the surgery, he suffered a cardiac arrest; although revived temporarily, his condition worsened day by day, and on the afternoon of August 19, 1982, he breathed his last.

Dream realised posthumously

It is a matter of extreme regret that he did not live to see the realisation of his dream project of the large telescope, which however, was since completed successfully. This 93 inch (234 cm) telescope was duly dedicated to the nation in January 1986 by the then Prime Minister of India, Sri Rajiv Gandhi and the telescope was named as Vainu Bappu Telescope while the Kavalur Observatory was renamed as the Vainu Bappu Observatory.

Laurels and honours

He published more than 60 high quality research papers on various topics in Astronomy and Astrophysics on subjects like stars and stellar systems, sun and solar system objects, galaxies, instrumentation and observational techniques, and so on. Bappu had won many laurels during his multifaceted career. In 1960, he was elected a Fellow of the Indian Academy of Sciences; he later served as a member of its Executive Council during 1971-73 and as Vice President during 1980-82. He was elected a Fellow of the Indian National Science Academy in 1968 and served on its Council during 1972-74. He won the S S Bhatnagar Prize for Physical Sciences in 1970 and the Sri Hari Om Ashram Award in Physics in 1977. On Republic Day, 1981, he was honoured with the national award of "Padmabhushan". He was awarded the S N Bose Medal of the INSA for 1983, the formal presentation of which unfortunately had to be done posthumously. He was the first President of the Astronomical Society of India during 1972-74. He held several official positions in the International Astronomical Union and reached the peak of his esteem when he was elected as its President in 1979 - a unique honour that made him the pride of the Indian astronomical community. He worked with an untiring devotion in the fulfilment of his presidential duties, and his death was more poignant in that it occurred before the end of his term in office.

Bappu, the gentleman

For all his achievements and honours, Bappu remained a courteous, pleasant and friendly person. Beneath his commanding presence and the aura of leadership lay his profound simplicity that stemmed from a total commitment to his calling and a full understanding of the individual's role in the larger scheme of things. In his presidential address to the General Assembly of the IAU, that was to become his final farewell, he said " Time and again we have seen how an individual has appeared on the scene and transformed a picture of gathering confusion into one of logical rigour and aesthetic simplicity. In the final reckoning, it is this aspect of Man that is a responsibility shared by each one of us in our individual roles, be it of a teacher or a senior colleague..... The history of the human race provides the evidence that the spark of the enthusiasm that fires the genius in Man has no regional preferences for its origin. To fan this streak into the flame of intellectual achievement is at once an obligation and an assurance of a dynamic future". Little did he realise that these words really applied to himself. Before he was snatched away from our midst, Bappu had fulfilled the obligation and has assured a dynamic future for astronomy in India.

The life of Vainu Bappu will stand out as a memorable event in the history of Astronomy in India. He came into this world with a purpose. Although he had to leave before it could be fully achieved, he created the necessary infrastructure and atmosphere for the future scientists of his country to regain lost glory in the oldest of its sciences.

K Vainu Bappu was indeed the father of modern astronomy in India.