

## Jagdish Chandra Bhattacharyya (1930–2012)

J. C. Bhattacharyya (JCB) passed away in Delhi on 4 June 2012. An eminent instrumentation scientist and observational astronomer, JCB is well known for his discoveries of the atmosphere of Jupiter's satellite Ganymede and of the ring system around Uranus. The next generation of scientists he trained and encouraged added further discoveries that include outer rings of Saturn, and six main belt asteroids, one of which bears the name *Bhattacharyya*.

Born in a family of scholars and educationists, grandson of Mahamahopadhyaya Pramath Nath Tarkabhusan – an eminent Indologist and scholar of Vedantic Philosophy, and son of Mrinalini and Phatik Chandra Vidya-bhusan – a Sanskrit and science teacher, JCB obtained his M Sc degree from the Institute of Radio Physics and Electronics at Calcutta University in 1951. After a brief stint at the Calcutta University as Ghosh Research Scholar, he joined the India Meteorological Department (IMD) as Assistant Meteorologist in 1953. Here he developed instruments for meteorology, and undertook some scientific studies in solar astronomy and ionospheric physics. Rising through the ranks, he was appointed Assistant Director of the Astrophysical Observatory at Kodaikanal in 1964, where he undertook research in the areas of solar and solar system astronomy using the state-of-the-art instruments that he himself designed and fabricated. In close association with the director, the late M. K. Vainu Bappu, he carved out the Indian Institute of Astrophysics (IIA) in 1971 and under the guidance of M. G. K. Menon nurtured it after the untimely demise of Bappu in 1982 until his own superannuation in 1990.

At Kodaikanal, JCB undertook more ambitious projects with encouragement and support from Bappu. The first of these, design and fabrication of a solar magnetograph, earned him the D Phil degree of Calcutta University in 1971. He used this instrument to measure the small-scale velocity field in solar chromosphere. In the meantime, an opportunity was presented of observing the 1970 solar eclipse in Mexico. Earlier expeditions of the Kodaikanal Observatory had all failed mostly due to clouds. The funds sanctioned for the Mexican expedition were just enough for the travel of two

persons with the equipment. Bappu and JCB could observe the eclipse successfully, and among other things, detect faint, low excitation emission lines in the solar corona. JCB later coordinated the national efforts to study the 1980 total solar eclipse in India.

By this time, Bappu was already developing a new observatory at Kavalur in Javadu hills of North Arcot district in Tamil Nadu. When Jupiter would occult the star  $\beta$  Scorpii in 1971, a 15-inch telescope fabricated at the Kodaikanal Observatory was in regular use with a photoelectric photometer. The chart recorder was too slow to record the occultation in detail, and JCB decided to



record it by photographing an oscilloscope screen, which resulted in the discovery of stratification in Jupiter's atmosphere. Occultation of the star SAO 186800 by Ganymede was observed with the Zeiss telescope in 1972 as part of an international collaboration. JCB could increase the time resolution to 0.1 sec, which helped in detecting the thin atmosphere around this Jovian satellite. Complex dark rings of Uranus were discovered in 1977 during an occultation of a faint star using the conventional chart recorder which sufficed as the event was a slow one. His student R. Vasundhara detected possible particulate matter in the magnetosphere of Saturn, through observations of an occultation in 1986. JCB continued to increase the time reso-

lution of photoelectric photometers aiming to undertake fast recording of occultation of stars by the moon, which would help in estimating diameter of stars directly.

With JCB's encouragement, R. Rajamohan initiated a project on identifying near-earth asteroids. This project led to discoveries of several main-belt asteroids in 1988–1989, the first of which was named *Ramanujan*. This was the first asteroid discovered by Indian scientists. Two of the other discoveries were named *Bhattacharyya* and *Gokumenon* subsequently.

Apart from encouraging scientists to build instruments for their needs, JCB also recruited engineers and set up a team for technology development. Development of hardware and software controls of telescopes, dome and new generation detectors such as charge-coupled devices were a few of the areas where considerable capabilities could be attained in the country.

The 2.3 m telescope project was conceived and initiated by Bappu in the 1970s and JCB took full charge of its electronic control systems apart from playing a supportive role in many other aspects. When Bappu passed away in 1982, the indigenous telescope was still under fabrication. Its successful completion, assembly and commissioning in 1985 was achieved through the untiring efforts and leadership of JCB. The telescope was inaugurated on 5 January 1986 by the then Prime Minister Rajiv Gandhi, who, along with his children, glimpsed the Comet Halley and several deep-sky objects directly at its prime focus. The telescope is India's largest facility in optical astronomy to this date, and has been serving national astronomers and students in their research programmes.

JCB provided strong support through IIA to the DST project of astronomical site survey in Leh, already initiated by Bappu for the next-generation telescope. Following encouraging results of the survey, JCB made a proposal for a high-altitude, remotely controlled infrared telescope of 4-m aperture in Leh district. Though this idea did not come to fruition fully, his successor, R. Cowsik, could take the lead in identifying the best site at Hanle and develop infrastructure for the large national telescope through a

2-m aperture remotely operated telescope as a first step.

Opportunities for research in astronomy and astrophysics were extremely limited in the country before 1980. JCB devoted considerable efforts to establish graduate schools. In addition to guiding students working in the areas of astronomical techniques, Sun and solar system astronomy, JCB assumed the responsibility of supervision of Bappu's students. The Joint Astronomy Programme of the Indian Institute of Science, involving several astronomy institutions, was initiated during his tenure, where he taught a course on astronomical techniques for several years. He went on to lay a firm foundation of IIA's graduate school and encouraged younger colleagues to teach as also to supervise projects. As the President of the Astronomical Society of India (1986–1988), he energized its programme on popularization of astronomy, especially to train students and teachers in astrophysics. His popular articles in Bengali and English magazines, which were written from 1977 onwards, inspired many students to take up astronomy as a career.

The structure of IIA, as it exists today, owes itself fully to JCB. He had initiated the new campus of IIA in Bangalore, leading a small group and setting up an electronics laboratory in the space provided by the Raman Research Institute during the early 1970s. The Institute moved to its present Koramangala campus in 1975 and the infrastructure development continued for nearly a decade. With JCB taking the reins in 1982, one

witnessed his skill in institution-building: setting up of the academic faculty, of departments named as Group Committees, instrumentation division, administrative structure, various benefits to the employees – such as career development opportunities, medical scheme and arrangements for residential accommodation. He fostered an atmosphere of academic discussions, involved scientists in the management of the Institute, and provided adequate administrative support to the academic staff. He set an example of personal integrity in public service, understood and followed rules and regulations of the government in the spirit of promoting discipline, transparency and accountability. Though some of the activities and organizational structure he established at IIA have undergone changes with time, the Institute stands firmly on the foundation he had laid.

Those who worked with JCB, or only just met him, would remember his smiling face which he wore even while working on difficult problems of management. At home and elsewhere, he was a perfect host, entertaining his guests through his culinary skills, sense of humour, and his interest in music, history and literature. Though he conducted himself in appropriate reserve in matters personal to staff members, he was always ready to provide sincere advice if called upon.

Following superannuation, JCB continued to be associated with IIA, as CSIR Emeritus Scientist (1990–1993), Emeritus Professor (1993–1995), Honorary Professor (1995–1997) and Member of Governing Council (1997–2007). He

served on many advisory committees and working groups at both national and international level over the last two decades of his tenure. He was associated with the Jawaharlal Nehru Planetarium for over two decades. He was Editor of the *Journal of Astrophysics and Astronomy* published by the Indian Academy of Sciences from 1988 to 1991. He was elected Fellow of all the three national science academies, the Institution of Electronics and Telecommunication Engineers, and was President of the IAU Commission 9 on Instruments and Techniques (1992–1995). The honours and awards he received include the M.N. Saha 30th Memorial Lecture Award of SINP (1983), P.A. Pandya Memorial Lecture Award of the IPA (1985), UGC–Hari Om Trust–Sir C.V. Raman Award for Research in Physical Sciences (1986), S.V.C. Aiya Lecture Award of the IETE (1986), ISOI Lifetime Achievement Award (1993) and S. K. Mitra Birth Centenary Award of the Indian Science Congress Association (2005). With his passing away, India has lost one of its founding fathers of modern experimental optical astronomy and an exemplary head of a scientific organization. He leaves behind his wife, daughter and son.

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## M. Anantaswamy Rau (1916–2012)

With the passing away of M. Anantaswamy Rau on 6 June 2012 in Mysore, the Indian scientific community has lost a senior, highly accomplished and enlightened botanist with multiple interests. Rau was born in Mysore on 15 August 1916 to Rukminamma and T. R. Krishna Rau. His maternal grandfather, was the eminent scholar M. Hiriyanna, who taught Indian philosophy and Sanskrit at Maharaja's College.

Rau received his education up to the intermediate level in Mysore. Later, he received the subject scholarship and

moved to Central College, Bangalore to do B Sc (Hons.) (1936) and M Sc (1938) in botany. He was appointed Lecturer in botany at the Intermediate College, Bangalore (1938). The Department of Botany at Central College was headed by M. A. Sampathkumaran, who had his doctoral degree from the University of Chicago, under the guidance of J. Chamberlain.

Rau started studying the embryology of Leguminosae (pea family) on the suggestion of B. G. L. Swamy, who later carved for himself a unique place among world botanists. His early publications in

the 1940s appeared in the *Proceedings of the Indian Academy of Sciences Section B* and *Current Science*. He was transferred to the Intermediate College, Mysore in 1941. The same year he married Vijayalakshmi, who bore him a daughter and two sons. He made extensive collections of leguminous plants. It was during his long stay in Mysore that I became his student (1946–48) and accompanied him on bicycle all over the city and its surroundings. L. N. Rao, C. V. K. Iyengar, P. Maheshwari (Delhi) and René Souèges (from France) gave him encouragement