

**RADHA GOBINDA CHANDRA — A PIONEER IN
ASTRONOMICAL OBSERVATIONS IN INDIA**

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Radha Gobinda Chandra was born in the nineteenth century in a small village of undivided Bengal in India. He did not even enter the portals of a college, but he would make himself one of the pioneers in the study of variable stars in India. From old records, it appears that contemporary astronomers of top class western organizations used to attach great importance to the observations made by Radha Gobinda and great recognition of his valuable works came from abroad. It is really unfortunate that he remained almost unknown to his countrymen even after independence.

INTRODUCTION

In India, which is one of the oldest civilizations in the world, we get evidence of astronomical observations as early as 4000 B.C. in the verses of the *R̥g-Veda*¹ and in some developed form later in the *Yajur-Veda*.² As early as 1300 B.C. the Hindus developed a luni-solar calendar known as the *Vedāṅga Jyotiṣa* calendar. This was in vogue upto the third century A.D. Thereafter, astronomy in our country took a sharp turn and a new system based on scientific principles called the *Siddhāntic* system came into prominence. This development which continued upto the 12th century A.D. came to a standstill due to continued foreign invasions thereafter.

The prodmotion of the science of astronomy was not the aim of the British Government in India. The optical telescope was discovered in the western world in the year 1609 and its extensive use by Galileo revolutionized the study of astronomy. Very few Indians at individual level were influenced by such revolution even in the nineteenth century and it was almost a rare event for an academically less equipped person. In this state of indigenus science of astronomy, it may be singular to find a man born and brought up in a remote village of undivided Bengal during the British

rule, far removed from all higher educational activity and the influence of imported western civilization, silently threading his way into such a difficult science as observational astronomy. It may be a unique experience to find a man sincerely striving to acquire knowledge for its own sake, under difficulties less enormous than the boldness of his attempt. Radha Gobinda Chandra is that man.

Not many of us, even those with an interest in astronomy, may be acquainted with the name of Radha Gobinda Chandra, who is credited to the the first person not only in India, but also in Asia to have observed a nova (a star which exhibits a sudden and exceptional brightness, increasing rapidly to a maximum in several days) in the constellation of Aquila on June 7, 1918. But he was well known to western astronomers for his research work in astronomy. A petty clerk in the collectorate office, Radha Gobinda was a keen observer of the stars and planets in the sky. After his day's toil in office, he used to have a keen watch of the night sky at his house and kept meticulous records of his observations. So accurate were his observations that they have been widely acclaimed by established astronomers of Europe and America. The observations made by Radha Gobinda covered mainly variable stars, nova, meteors, eclipse and so on. His outstanding contribution in the field of variable stars helped in their classification to a great extent.

EARLY LIFE

Bengal, in the nineteenth century, presented a dark and dismal picture. On the one side were the bigoted, superstitious Hindu orthodoxy upholding the cause of obscurantism and blind faith, on the other side there was British rule and efforts to anglicise the 'heathen natives.'³ In the midst of this ocean of conservatism, Radha Gobinda was born in July 1878 in a small village called Bagchar of Jessore district now in Bangladesh. His father was Gorachand Chandra. He was brought up in the zaminder family of his maternal uncle and, educated first in a local primary school and then at the district High School. His academic career was brief and simple. He did not even proceed as far as the Entrance examination.



Radha Gobinda Chandra (1878-1975)

In his boyhood, Radha Gobinda once got the opportunity of going through a book on astronomy in Bengali, viz. "*Brahmāṇḍa Ki Prakāṇḍa*"⁴ (how vast is the universe) edited by Akshoy Kumar Dutta. That was a turning point in his life. Then on a clear night, the dark sky glittered with the sparkling stars and the silvery haze of the Milky Way attracted him. A number of questions started arising in his mind. What is a star? What are they? How large is the universe? Where did the sun, moon and earth come from? These were some of the questions which fascinated Radha Gobinda during his early boyhood. At the age of fourteen, he felt extraordinary desire to test for himself the position of the stars as they changed night after night. Also the varying position of the planets among the stars led him to watch their movements. This idle curiosity exhibited in star-gazing developed into a habit, of a really fruitful study of astronomy. There was, however, no teacher who could instruct him in the science. But observational astronomy certainly needs a guide. He, infact, took his first lesson on sky-watching from Kalinath Mukherjee, a lawyer of Jessore and also a noted author of some books on astronomy. Kalinath was then busy with editing a star atlas, Radha Gobinda assisted him. By this way Radha Govinda gained a good knowledge of the atlas of the sky. Kalinath in his school days at Krishnagar came in touch with Herschel, the then judge of Krishnanagar court. Justice Herschel, an amateur astronomer, was a descendant of the famous astronomers, William and James Herschel.⁵

Meanwhile, in 1899, at the age of 21, Radha Gobinda married a nine years old girl. One year later he joined in Jessore Collectorate office as a podder (coin tester) with a monthly salary of Rs. 15 only. He used to spend his day in the office, but coming back home, his passion was sky-watching during the night. Unaided and surrounded, as he was, by practical difficulties, what patient labour he must have undergone in his early days to observe and work out practically the astronomical elements of the celestial objects in the sky. What numberless observations must he have made to test the significance of the changing brightness of selected stars. Night after night passed away in the all-absorbing business of star-measurement. An eclipse of the sun or of the moon was an event in his life never to be forgotten. Thus it was that this early days passed.

PIONEERING CONTRIBUTIONS TO ASTRONOMY

During its apparition in the year 1910, appearance of Halley's Comet was one of the most striking celestial phenomena to be seen by the naked eye and Radha Gobinda took this opportunity to study it with the help of a binocular. He also at that time contacted Prof. Jagadananda Roy of Visva Bharati for detailed information on Halley's comet and Prof. Roy in his reply gave him the full details of the physical ephemerides of this comet and suggested Radha Gobinda to procure at least a small telescope for its observation. He took obserations of this great comet night after night for about two months and published a series of articles on this comet in a Bengali journal.⁶ After this astronomical event was over, he became impatient to have a telescope of his own for observing celestial phenomena and out of savings from his very small income, Radha Gobinda could finally purchase a 3-inch refracting telescope from London at a cost of Rupees 160/-. This was in the year 1912. Such was his determination and utmost fascination for astronomical observation.

On the night of 7th June, 1918 Radha Gobinda could observe a nova from Jessore. What is a nova? Nova is a latin word meaning a new star. But the term nova is misleading since it is not a newly created star. Nova is a star that rises rapidly in brightness from comparative obscurity but declines gradually. It is often designated by the word Nova followed by the possessive of the constellation name and the year of the outburst. The outburst occurs at place in the sky, where no star or only a very faint one, was previously visible. A typical nova always pre-exists as a small unknown star of no particular interest. Suddenly, its brightness increases by 10 to 15 magnitudes in the course of several hours corresponding to an increase in brightness of 10^4 to 10^6 times. The maximum is usually reached after two days at the most and lasts for a short time only. The particular nova referred to above was Nova Aquilae 1918 and its magnitude was measured by Harvard Observatory as 6.2 on June 7-8. Radha Gobinda observed it, but he could not realise its importance; yet he reported it to the Director of Harvard College Observatory in USA. Dr. Edward Pickering, the then Director, at once recognised the merit of Chandra's findings and made him a member of the American Association of Variable Star Observers (AAVSO). Harvard Observatory also supplied him necessary books, charts, etc. Since then Radha Govinda became an active member of AAVSO, regularly contributing observations to the Association.

Most of his contributions to the foreign observatories were on variable stars. What are variable stars? Wherein lies the importance in observing this celestial phenomenon? Variable stars are those that varies in brightness with time, either regularly or irregularly, with periods ranging from several hours to months. To decide whether a star is really variable or not requires observation over some years, particularly in the case of with long-period variable. During this time, the brightness must be measured continuously so as to arrive at the light curve. From the light curve the amplitude of the variability and possibly the period can be determined and a first classification made. The determination of magnitude (i.e., brightness) depends on the sensitivity of the receivers used, viz., eye, photographic plate, photoelectric cell etc.). The total number of stars now recognized as variables and for which the amplitudes, periods, times of maximum and minimum magnitude etc. are known, is about 33,000, but new stars are constantly being added to the list. Astronomers engaged in the research work on variable stars require observational data on some particular stars continuously for nights after nights. But this is not possible from one locations, as the observation may not be feasible due to obscuration of the star by cloud covering at some observatory and that is why astronomical observers on world-wide locations are selected for receiving continuous observations of variable stars. Therein lay the importance of the observational data on variable stars obtained by Radha Gobinda from Jessore in India.

With the help of his 3-inch refractor telescope, Radha Gobinda used to measure accurately the variations in brightness of variable stars with utmost seriousness and his astronomical findings in this respect were of much significance. And who were the regular recipients of such observational findings from him? Most famous astronomical organizations like Harvard Observatory of America, British Astronomical Association and Lyon Observatory of France, used to receive regularly such observations on

variable stars from Radha Gobinda. A huge number of observations made by him can still be found in the archives of Harvard, British Astronomical and Lyon Observatories. Some references to Chandra in the Annual Reports of the American Association of Variable Star Observers can be seen (Annexure-I). Famous astronomical journals like "Sky and Telescope"⁷ also mentioned his name in relation to the reports regarding variable stars.

Apart from AAVSO, the British Astronomical Association, American Meteor Society, American Museum of Natural History and Lyon Observatory, France offered him their memberships.

There are two references that are available from British Astronomical Association which are shown here (Annex. II), and also a few records of Chandra from Lyon Observatory can be seen (Annex. III).

In June, 1946, the AAVSO published a Roll of Honour of its members who had completed 10,000 or more observations on variable stars, comets etc. This roll contained names of 25 such members all over the world and one amongst them was Chandra. In 1947, he became an emeritus member of AAVSO. Chandra contributed 37000 variable star observations to the AAVSO from 1920 to 1954.

Another of his contributions was in regard to *Pañcāṅg* (conventional almanac) rectification. There are distinctly two classes of *Pañcāṅg* published in our country. In one type of *Pañcāṅg*, the calculated positions of the sun, the moon and planets, as published, agree with their actual positions in the heavens. This system is known as *Drksiddha Pañcāṅg* which is correct and accurate. In the other system, the calculated positions of the heavenly bodies, as published, do not agree with the actual positions in the sky. This class is known as old and incorrect *Pañcāṅg*. Majority of *Pañcāṅgs* published in our country belong to the latter group, i.e. astronomical elements, as published, are completely erroneous. A movement was started in Bengal by late Prof. MN Saha, and late NC Lahiri to wipe out such erroneous publications of astronomical elements in *Pañcāṅg*. Radha Gobinda was associated with this movement and wrote a good number of articles for this purpose, which were published in reputed journals in Bengali. He delivered several lectures in support of this movement and also to popularise the reformed *Drksiddha Pañcāṅg*.

RECOGNITION FROM ABROAD

From whatever is available of his old records, it appears that contemporary western astronomers attached great importance to the observations made by Radha Gobinda Chandra. One letter addressed to him by Harvard College Observatory on January 17, 1920 states: "The observations which you contributed are very good and we hope you will continue to send them every month." Similarly, a letter from the British Astronomical Association, dated December 27, 1923 says, "Your excellent observations and remarks are always much valued by this section (variable star section)

and I hope we may continue to enjoy your hearty enthusiastic support". Dr. Harlow Shapley, the then Director of the Harvard College Observatory and an astronomer of international repute, appreciated contributions of Radha Gobinda very much and this may be verified from his letter written to Chandra.

Recently, in reply to a letter dated July 31, 1984 from one of the authors (Chakraborty), the Director of the American Association of Variable Star Observers wrote, "Mr. Chandra submitted thousands of variable star observations. His report forms fill two huge folders in our permanent titles. His observations are in the permanent records also of each star he observed. He was a very valued member of the AAVSO".

To help Radha Gobinda in his meticulous study on observational astronomy, Harvard Observatory presented him with a 6-inch telescope in 1926 which was sent to his native village directly from U.S.A. In the later years of his life, when he could no longer take observations, he handed over this telescope to late Dr. M.K. Vainu Bappu, who in later years became the first Director of the Indian Institute of Astrophysics, Bangalore. It has been kept in the Kavalur Observatory as a tribute to Radha Gobinda's dedicated work.

The Ministry of the French Government honoured Radha Gobinda by conferring on him the title "Officer d'Academic. The title and a medal were forwarded to him by the Consulate General of the Government of France in Calcutta on August 1, 1928.

The concerned letter is quoted below:

Consulate General de La Republique France,
Calcutta.

Dear Sir,

In continuation of my letter dated 26.3.28, I have the honour to inform you that the Ministry of Education has decided to confer upon you the distinction of Officer d'Academic.

You will find herein enclosed the Brevet and the Badge of this distinction for which I shall be obliged to receive a receipt.

I am pleased to convey to you my best congratulations for the token that has been granted to you in recognition of your valuable services to the Observatory of Lyon.

Mr. R.G. Chandra
Bagchar, Jessore.

Yours faithfully,
R. Lazonies
Consul General for France

LAST PHASE

After independence, Radha Gobinda with his family migrated to India from erstwhile East Pakistan. Before his final settlement at Barasat, he was at Panihati, near Calcutta, where he continued to pursue his astronomical activities. He founded an astronomical club and wrote several books on popular astronomy in Bengali out of which only one 'Dhumketu'⁸ (comet) was published during his life time (second edition of this book was published in 1985) and the rest are still in manuscript form. In course of his transit from Jessore to Barasat, a major part of his collections were lost.

At the good old age of 97, Radha Gobinda expired on 3 April, 1975. It is really unfortunate that the man who won recognition for his valuable works on astronomy from top class astronomical organizations of the western world, was not honoured in any form by his own countrymen even after independence. It is also unfortunate that no serious attempt has so far been made to explore the complete works of this dedicated astronomer who won international acclaim through sheer perseverance and hard work.

CONCLUSION

Radha Gobinda has no one to encourage him in his pursuit and no notice was taken of his work in our country. Yet from his life and works, it can be easily seen, how a man without any university degree, any training in the specialised field of work, or an well-equipped astronomical observatory, can make himself one of the pioneers in the study of variable stars in India, only with utmost devotion for work and perseverance. Let us hope that the past neglect of his countrymen may yet be compensated and that his scientific endeavour will give him proper place in the history of Indian science.

ACKNOWLEDGEMENT

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NOTES AND REFERENCES

¹*Rg Veda*, 1.33.8.

²*Yajur-Veda*, 33

³Chattopadhyay, Gautam (Ed.), *Awakening in Bengal* Vol. I, Calcutta Progressive Publishers, Calcutta, 1965.

⁴Dutta, Akshoy Kumar, *Charupath* Part III, Metcalf, Press, Calcutta, 1907.

⁵*Banglar Manisha* Vol. II, Sarat Publishing House, Calcutt-9, 137-144, 1987.

⁶Chandra, Radha Gobinda, *Hindu Patrika*, Ashada & Paus, 1317 B.S.

⁷*Sky and Telescope* 1, No. 11, by Sky Publishing Corporation, Harvard College Observatory, Cambridge, Mass., 6, 1942.

⁸Chandra, Radha Gobinda, *Dhumketu* (comet), Puthipatra, Calcutta 9, 1985.

ANNEXURE I

SOME OF CHANDRA'S CONTRIBUTIONS IN ANNUAL AND MONTHLY REPORTS ALONG WITH COMMENT (BELOW) IN AAVSO RECORDS. CHANDRA'S NAME IS ABBREVIATED TO 'Ch'.

ANNUAL REPORT OF THE AMERICAN ASSOCIATION OF VARIABLE STAR OBSERVERS, 1920-21.

Observer	Initial	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Totals
Bancroft	Ba	228	351	....	....	51	....	....	156	....	....	....	....	786
Barns	Bs	33	11	....	18	19	23	9	34	23	....	....	....	170
Bemporad	Bp	36	....	....	....	....	....	59	....	....	20	....	33	148
Benini	Be	29	....	....	....	....	....	....	....	....	....	20	35	84
Bouton	B	126	133	68	21	49	38	49	38	32	....	46	46	646
Bunch	Bh	46	9	....	....	....	....	....	....	....	....	15	....	70
Carr	Ca	70	....	....	....	....	....	....	....	28	11	31	83	223
Chandler	Cd	....	....	....	....	....	9	12	14	6	....	....	....	41
Chandra	Ch	42	48	72	83	71	50	95	59	73	50	62	46	751
Clement	Cl	21	36	22	15	10	....	17	20	23	....	23	....	187

MONTHLY REPORT OF THE AMERICAN ASSOCIATION

VARIABLE STAR OBSERVATIONS, October 20 to November 20, 1921									
		October 0 = J.D. 2422963				November 0 = J.D. 2422994			
Star	J.D.	Est.Obs.	J.D.	Est.Obs.	J.D.	Est.Obs.	J.D.	Est.Obs.	
001046 X ANDROMEDAE —	2984.8	10.8 Wf.	2987.5	10.7 V.	2989.6	10.0 Hu	2996.8	9.9 Wt.	
	2997.6	9.8 B							
001032 S SCULPTORIS —	2995.6	8.6 Bh.							
001620 T CETI—	2966.3	5.5 L,	2974.4	5.5 L,	2983.3	5.8 L,	2994.3	5.8 L	
001755 T CASSIOPEIAE —	2940.2	11.8 Ch,	2965.4	11.4 Gi,	2966.4	11.8 L,	2971.3	12.0 L	
	2983.3	11.9 L	2985.5	11.7 Pt,	2992.6	11.7 B,	2994.5	11.4 G	
	2994.7	11.9 L,	3009.5	10.9 B.					
001726 T ANDROMEDAE —	2940.1	12.2 Ch.	2959.1	11.7 Ch,	2964.3	10.9 Pe,	2985.5	9.7 O,	
	2985.5	10.0 Pt,	2992.5	9.4 O,	2996.5	8.6 B,	3009.5	8.3 B,	
001838 R ANDROMEDAE —	2940.1<	11.0 Ch,	2987.5	11.1 Pt.					
001909 S CETI —	2937.3<	11.5 Ch.	2964.4	14.2 L,	2964.4<	12.1 Rk,	2983.3	13.1 L	
	2988.7<	10.2 Mu,	2992.7<	10.2 Mu,	2994.3	12.3 L			
004047 U CASSIOPEIAE—	2984.8	9.3 Wf,	2985.6	9.3 Pt,	2990.5	9.5 Y,	2996.8	8.5 Wf,	
	2997.6	8.0 B.							

The above classifications have been determined from the plotted observations received during the past month and made by Messrs. Baldwin, Bancroft, Bouton, Campbell, *Chandra*, Dawson, Eaton, Gartlein, Janczewski, Lacchini, Long, McAteer, Merrill, Mundt, Peltier, de Perrot, Pickering, Skjellerup, Suter, Tapia, Vrooman, Yalden and Yont, Misses Downer, Jenkins, Parsons, and Young, and at the McCormick Observatory.

S. I. BAILEY

CAMBRIDGE, MASS, U.S.A.

April 12, 1920

ANNEXURE II

R.G. CHANDRA'S CONTRIBUTIONS TO BRITISH ASTRONOMICAL ASSOCIATION COMMUNICATION

FEB. 1934.] PAPERS COMMUNICATED TO THE ASSOCIATION. 157

Observations of Annular Eclipse of the Sun at Jessore (India), 1933 August 21.

By R.G. CHANDRA

Latitude .. 23°10' 5" N.

Longitude .. 15°15' 15" E.

First Contact	3 ^h 40 ^m 15 ^s G.M.T.
Second Contact (formation of annulus)	5 ^h 19 ^m 59.2 ^s G.M.T.
Third Contact (end of annular phase)	5 ^h 20 ^m 14 ^s G.M.T.

Last Contact not observable owing to clouds.

Instrument: 3-inch refractor.

An attempt was made to see the corona by putting the Sun out of the field of view, but without success.

[OCT. 1935] COMMUNICATION TO THE ASSOCIATION. 407

RAHU:— There have been several communications to the Association" regarding "Rahu," but so far there has been no correct explanation. Hindoo astronomy may be divided into two sections, mythological and mathematical. In the Indian Epics there are many narratives and fables relating to celestial bodies, and these may be taken to constitute the first of these sections. As well as Rahu there is another term Ketu, and

there are with these, planets called "Nabagraham," viz., Rabi, the Sun; Shome, the Moon; Kuja, Mars; Budha, Mercury; Guru, Jupiter; Shitau, Venus; Manda, Saturn, Rahu being the ascending node and Ketu the descending node. These are regarded as powerful deities having influence on the affairs of humanity, and they are also used in Indian astrology.

In the Sreemat Bhagabat Puran, Part 8, Chapter 9, Shloks 21-23, it is narrated that Rahu was a Danab (demon), the son of Shinghika, the wife of Biprachitti. The Danabs were the antiparty of the Devs, having no right to drink the "Amrita," a divine liquor which made the Devs immortal. Rahu made an attempt in disguise to drink the Amrita along with the Devs, but this was pointed out by Surja (the Sun) and Chandra (the Moon). On this, Hari, the Prince of the Devs, cut off the head of Danab Rahu, but as a small quantity of the Amrita entered the throat his head become immortal and was placed in the sky as a "Graha." The Sun and Moon having betrayed his attempt to drink the Amrita, Rahu developed a hatred for them, which has resulted in his endeavouring to devour them whenever he gets an opportunity; this he cannot do because he has only a head and no body.

This is the story from the epic, of Rahu and the cause of eclipses; but Indian astronomers have known the real causes from time immemorial.

As Rahu's body was not immortal it was thrown away, but at a later date Indian astronomers and astrologers placed the body as Ketu, 180° from Rahu in the Zodiac.

In Hindoo mathematical astronomy Rahu and Ketu, the ascending and descending node, of the planet's orbits, resemble the Greek Dragon's Head and Tail, and are the two points where eclipses occur, being referred to as Patha in the Surja Shiddanta —

R.G CHANDRA.

XS.

ANNEXURE III

R.G. CHANDRA'S REFERENCE IN THE RECORDS OF LYON OBSERVATORY.

M. GROUILLER AVAIT PUT FAIRE 3,730 OBSERVATIONS EN 1921.

ASSOCIATION FRANCAISE D'OBSERVATEURS D'ETOILES VARIABLES

Recrutement des observateurs — Un nouvel appel aux amateurs a été publié dans le numéro the janvier du *Bulletin de la Société astronomique de France (B.S.A.F.)*. De nombreuses adhésions se sont produites par la suite dans le courant de l'année 1922.

Actuellement 51 personnes ont adhéré à notre programme d'étude en commun des étoiles variables. Leur répartition par nationalité s'effectue ainsi:

Angleterre	1	Hollande	1
Belgique	7	Inde	1
Bulgarie	1	Italie	3
Chine	1	Madagascar	1
Denemark	1	Portugal	1
Espagne	2	Suisse	3
France	28		

25 de ces observateurs bénévoles ont déjà pris une part active aux travaux de l'Association, ce sont:

M^{lle} Bac et Bellemin, MM. Bernard, Bougon, Brun, Chandra,

NOMBRE D'OBSERVATIONS EFFECTUÉES EN 1923 PAR CHUQUE OBSERVATEUR.

Abbott	61	Herzong	145
Bernard	368	Houdard	164
Berson	129	Janssen	56
Brun	1,823	Kruger	3
Butterworth	1,325	Lauritzen	51
Chandra	283	La	81
Cristofar	13	Lombardi	392
Delpierre	112	Nissen	7
Dermul	124	Racaud	9
Duruy	389	Silva	146
Ellsworth	191	Stubbe	5
Fillaudeau	a70	Tarnt	52
M Fillaudeau	190	Thorrud	124
Gindre	17	Van Cuyek	307
Gromiller	833	Waterfield	45