On the 'Astronomical Notes' in *Current Science* about the bright comet of 1941

R. C. Kapoor

T. P. Bhaskaran, Director of the Nizamiah Observatory during 1918–44, used to write astronomical notes for the 'Science Notes and News' section of *Current Science*. We revisit his 'Astronomical Notes' that featured the bright comet of 1941 in the February and March 1941 issues of the journal.

The Nizamiah Observatory

In 1901, a private observatory struck roots in Hyderabad with the efforts of an aristocrat, Nawab Zafar Jung. He had bought a small telescope and later another one, a Grubb refracting telescope of 15 inch diameter from England and even an 8 inch Cooke astrographic camera. With intent to build an observatory, he wrote on 29 September 1901 to the sixth Nizam of Hyderabad, Nawab Mir Mahboob Ali Khan Bahadur, about his acquisition and expressed that[1]:

> 'When this observatory building is constructed it will be one of the greatest observatories in India. If your Highness approves, I will designate it the 'Nizamiah' or 'H.H. the Nizam's Observatory….'

The consent was given the next day itself 'with the greatest pleasure' of the Nizam. The observatory came up at the Nawab's estate at Phisalbanda in Hyderabad. After the Nawab's demise in 1907, as he had wished, the Observatory was taken over by the Government of Nizam in 1908. Arthur B. Chatwood was made its Director. The Nizamiah Observatory as it came to be called was soon moved to Begumpet. The astrograph was installed by the end of 1909. In due course, it was utilized in the international programme 'Carte du Ciel' to map the sky in which 18 observatories the world over actively participated. To affect the programme, the 8 inch astrograph came handy. The Observatory was allocated the region of the skies between the declinations ranging from +17° to –23° and subsequently also the declinations from +39° to +36°. Beginning 1914, the programme that lasted until 1946 under the direction of A. B. Chatwood (Director 1908–14), Robert J. Pocock (Director 1914–18) and T. P. Bhaskaran (Director 1918–44) produced 12 star catalogues that covered 763,542 stars in all[1]. Bhaskaran (1889–1950) was the in-charge Director during 1918–22 and appointed Director in 1922 (ref. 2). The Grubb refractor was installed rather late, in 1922, under Bhaskaran's supervision. In 1939, the Observatory acquired a Hale spectrohelioscope also, to conduct solar observations in Hα. During Bhaskaran's tenure, in 1919 the Observatory was given to the just established Osmania University (1918). Writing in a 1943 issue of *Current Science*, C. V. Raman[3] commented about the Observatory so:

> 'Surveying the contribution of India to astronomy during recent years, one of its most heartening features is the work done by the Nizamiah Observatory at Hyderabad (Dn.) under its present Director, Rao Saheb T. P. Bhaskara Sastri. The equipment of this Observatory is comparatively modest and consists principally of an eight-inch photographic telescope and a fifteen inch visual instrument.'

Raman went on to talk about the Observatory's contribution to the Carte du Ciel programme and other works. In recognition of his public services, Bhaskaran was conferred the title 'Rao Saheb' in 1940 by the then Viceroy of India (Figure 1). He was a Fellow of the Royal Astronomical Society, a foundation Fellow of the National Institute of Science, Calcutta (now Kolkata) and the Indian Academy of Sciences[2].

The Department of Astronomy at Osmania University that came up in 1959 has made significant contribution to the growth of astronomy in India. The Nizamiah Observatory is also noted for its work on variable stars, binary stars, their proper motion studies, etc. In 1964 the Observatory acquired a 48 inch reflector manufactured by J. W. Fecker Co., Philadelphia, USA, that was installed in December 1968 at a new site, to be named the Japal-Rangapur Observatory. This Observatory, along with the Nizamiah Observatory and the Department of Astronomy, became part of the Centre of Advanced Study in Astronomy at Osmania University. In 1983, the Nizamiah Observatory was relocated once again, this time at the Osmania University campus itself. As of today, the Observatory needs resuscitation and its historical plate collection needs to be resurrected.

A bright comet in 1941

The Nizamiah Observatory published its annual reports in the *Monthly Notices of the Royal Astronomical Society*. Many of these carry brief references to observations of comets made at the Observatory. Bhaskaran, the then Director of the Nizamiah, used to write astronomical notes for the 'Science Notes and News' section of *Current Science*.

In this note, the object of our interest is a bright comet that appeared in 1941. In the column 'Astronomical Notes' in the February 1941 issue of *Current Science*, Bhaskaran[4] writes about the appearance of a comet, *1940d*, that he says

Figure 1. T. P. Bhaskaran (from Sanwal)[1].

was a bright naked-eye comet in several years. Towards the end of January 1941, the comet was noticed in the southwestern sky just after sunset and, as he says, 'the object has been, since then, widely observed in India and Ceylon, and has attracted popular attention'.

As the 'Notes' go on, the comet was then noticed with a long tail extending to about 6° that was gradually decreasing in length. On 4 February the comet was located 5° below the star β Ceti (2.24 magnitude) moving towards northeast at a fast pace, 2° or 3° per day. By 10 February Bhaskaran noticed its brightness to have faded out to between 5 and 6 mag. By 11 February, the tail had diminished to about 2° only, since the comet was moving away from the Sun. Bhaskaran's 'Notes' included a photograph of the comet (*1940d*) taken at the Nizamiah Observatory on 7 February 1941 with a 4 inch astro-camera, at an exposure of 70 min (ref. 4). The star trails seen in the photograph resulted as the telescope had to be driven to follow the comet. Bhaskaran[5] wrote on the comet in the next issue of the journal also. Herein, he states that the comet had faded out of naked-eye visibility by the end of February, but continued to be an interesting object for observations with a binocular or a small telescope. The tail could be traced to be about a degree long. Beginning March, the comet magnitude was estimated around 7.0. The comet had apparently slowed down and Bhaskaran expressed that for another few days, it 'can be seen in the western sky a little away to the south-west of Jupiter and Saturn'. These 'Notes' were also illustrated with a photograph, taken at the Nizamiah Observatory on 21 February 1941, given an exposure of 80 min (ref. 5). Here the star trails are not noticeable. In these 'Notes'[5], the object is identified as Comet *1941I*.

The two accounts by Bhaskaran in the respective issues of *Current Science* are, purportedly, about the same comet. However, comet *1940d* and Comet *1941I* as referred to in the respective 'Notes' are two different entities and none of these is the comet of Bhaskaran's observations. Looking up the journals of the times as also the accounts of the comets *1940d* and *1941I* as given in the cometography of Vsekhosvyatskii[6], we find that the comet *1940d* (also designated *1940IV*), was quite a faint object, discovered by Fred Whipple on plates taken on 29 July, 5 August and 8 August 1940 at 10.5 mag. It rose to be as bright as 9 mag. in October, after which it gradually faded out. The comet *1941I* (also designated 1940c and now C/1940 R2), was discovered by L. E. Cunningham from Oak Ridge station of the Harvard College Observatory (HCO) on a plate taken on 5 September 1940, where it showed up as a 13 mag. object. Interestingly, this comet reached naked-eye visibility in the last days of December 1940 to the first week of January 1941, touching + 3.5 mag. on 5 January 1941, and even + 3 mag. on 21 January. The comet passed its perihelion on 16.234 January 1941. Most importantly, on 4 February 1941, the Comet *1941I* did not pass by β Ceti at all. Computing with the Horizons System[7], the comet's apparent positions (with respect to the Earth's true equator and the meridian containing the Earth's true equinox of date) indicate that on 4 February, it lay at the border of the constellation of Telescopium with Sagittarius and a few degrees east of Corona Australis, and ~ 64° from β Ceti.

The bright comet 1941 IV

So what comet did Bhaskaran observe? It was war time when communications were not quick and smooth. Besides, with three discoveries in January 1941 and multiple discoverers, comet identities were bound to get mixed up. We find that it was actually the comet 1941 IV (also designated 1941c, now C/1941 B2), that Bhaskaran observed and his 'Notes' in *Current Science*[4,5] should be referring to it. The comet was discovered by R. P. de Kock from Paarl in South Africa on the morning of 15 January in the constellation of Norma as an object of 6 mag. and with a tail[6], and has since been named Comet de Kock-Paraskevopoulos. Initially, the comet was favourably placed for southern observers until end of January 1941. It continued to brighten up to turn into a spectacular one. It was independently discovered in the adjoining constellation of Ara as a 2 mag. object with a 5° long tail by J. S. Paraskevopoulos from the Boyden Station, Bloemfontein and by R. Grandon from Santiago, Chile on 23 January 1941, and the following day by several others[6]. Stoy[8] wrote that on 2 February the comet shone at about 2 mag. with a 5° long tail. George van Biesbroeck of Yerkes Observatory saw it at + 3 mag. in moonlight to the unaided eye on 5 February with a sunward jet and a wide and long tail. According to John Jackson of the Cape Observatory, the comet had turned out in the month of January to be the brightest since the comet *1910I* (ref. 6). One may recall, the latter is the Great January Comet of 1910 [C/1910 A1 (1910 I)], also known as the Daylight Comet.

The comet 1941 IV finds mention in Bortle's[9] list of all the comets observed between 1800 and 2000 that reached 'an observed maximum brightness of magnitude 0 or brighter, together with a few additional objects of special interest'. A few basics about the comet, are[7]: the comet passed its perihelion on 27.6577 January 1941 and its closest by the Earth from 0.26556 AU on 29 January, around 20 : 00 UT; perihelion q = 0.790033 AU, eccentricity e = 0.999102, orbital inclination i = 168°.2039. For a few dates and times of our interest here, the positions of the comet as computed with the Jet Propulsion Laboratory's (JPL's) system[7] are presented in Table 1.

Our choice of time of the day is arbitrary, just to signify a morning or evening observation. The comet positions are apparent and with respect to the Earth's true equator and the meridian containing the Earth's true equinox of date. In Table 1, RA stands for right ascension, Dec. for declination, the quantities r and Δ are respectively, the heliocentric and geocentric distances of the comet (in AU). We also list the positions of a few stars of interest, precessed to the epoch 1941.1 with the Chandra toolkit[10]. On 4 February, the comet 1941 IV is indeed placed about 5° below the bright giant star β Ceti (*Diphada*, tail of Cetus), just as observed by Bhaskaran[4].

The February 1941 'Notes'[4] carried a photograph of the comet taken on 7 February 1941. There is no detail given about the background sky, the image scale or the time when the image was taken. As the original plate is inaccessible, we reproduce here a scan from the *Current Science* issue itself. We call it the Nizamiah Image I (Figure 2). We have made an attempt to identify its sky background in the following manner. As we get it from its computed apparent positions, the comet should be placed that evening ~ 6° southwest of θ Ceti and ~ 3° west of 46 Ceti (vide Table 1). We looked up the Cetus region around these stars, as generated from sky-map.org[11],

Table 1. Positions of the comet 1941 IV on a few dates of interest and those of a few stars

	UT	RA			Dec			*r*	Δ
Comet 1941 IV									
1941-Jan-23	00 : 00	16	44	12.31	–45	45	45.0	0.7952	0.4049
1941-Feb-04	13 : 00	00	45	49.36	–23	03	15.1	0.8046	0.3694
1941-Feb-07	13 : 00	01	12	53.77	–13	23	22.5	0.8174	0.4718
1941-Feb-09	13 : 00	01	23	50.28	–09	00	48.8	0.8281	0.5466
1941-Feb-21	13 : 00	01	50	36.29	+03	04	16.4	0.9216	1.0181
Stars									
β Ceti	B1941.1	00	40	38.96	–18	18	32.75		
θ Ceti	B1941.1	01	23	34.67	–08	13	46.31		
46 Ceti	B1941.1	01	25	11.02	–14	38	41.81		
α Piscium	B1941.1	01	59	00.04	+02	28	49.14		
ξ Piscium	B1941.1	01	50	30.41	+02	53	53.51		

and considered the path the comet had taken in the first week of February 1941. The path starts from below β Ceti corresponding to the observation of 4 February and proceeds northeastwards, passing between 46 Ceti and η Ceti as on 7 February. As a first guess, the brightest trail on the left edge of the Nizamiah Image I should be the star 46 Ceti.

It indeed is. With 46 Ceti as reference, a correspondence is made with star-trails in the Nizamiah Image I, pasted here alongside a sector in Cetus containing 46 Ceti (Figure 2). The best possible identifications in the Nizamiah Image I, clockwise, are as follows: the star-trail at the top (in the middle) is that of HD 8121 (6.15 mag.) and the trail below (and to the right of) the comet is that of HD 6616 (7.194 mag.). The bright trail a little above the middle point at the bottom is HD 7495 (7.335 mag.). The trail to its left and lowermost in the Image I is HD 8071 (7.34 mag.). The last trail in the lower left corner is HD 8589 (6.14 mag.). Right above it, the brightest trail (on the left) is that of 46 Ceti (4.9 mag.). The trail between 46 Ceti and the comet is that of HD 8142 (6.834 mag.). A one-to-one correspondence in brightness should not be made, for, the glass photographic plates used in the times would have nonlinear response and different sensitivity to colours of the spectrum.

The 'Notes' in the March 1941 issue[5] carried another photograph of the comet taken on 21 February, hereinafter the Nizamiah Image II. Its captions specifically identify the comet – 'Comet 1941I. Photograph …'. The date and exposure time are given, but image scale is not provided. Also, none of the stars is identified.

The computed position of the comet suggests that on 21 February 1941, it was near the star Alrescha (α Piscium), and nearly over ξ (ksi) Piscium (Table 1). Just to have an idea of its brightness, note that the comet had shone at 4.8 mag. the previous day[6].

We have identified the sky background in the Nizamiah Image II also. We believe the image scale is the same as in the Nizamiah Image I although, comparatively, the latter image as printed seems to have been magnified. We looked up the Pisces region around Alrescha in skymap.org[11], to identify the stars in the Nizamiah image II. The section of the sky of our interest is reproduced in Figure 3, alongside the Nizamiah Image II. The top of the photograph is towards the east. The brightest star, at the top, is Alrescha (4.104 mag.) and the next in brightness is ξ (ksi) Piscium (4.62 mag.). The comet head is near this star. Between the two lies 112 Piscium (5.88 mag.); it is near but west of Alrescha. The stars Alrescha and ξ Piscium are ~ 2° apart. From their coordinates, one can get an idea of the image scale of the Nizamiah Image II.

Interestingly, in his 'Notes', Bhaskaran[5] mentions the planets Jupiter and Saturn also. The planets had a close conjunction on 21 February 1941. In respect of their positions, the two planets lie outside the Nizamiah Image II. For instance, at 13 : 00 UT on 21 February 1941, we find Saturn about 13º.88 and Jupiter 14º.87 from the comet head. Bhaskaran[5] further writes that 'for a few days more, the comet can be seen in the western sky a little away to the south-west of Jupiter and Saturn', apparently for the write-up to correspond to the month of March. Accordingly, say on the evening of 3 March and as seen from Hyderabad, Jupiter and Saturn and the Moon all within a few degrees of each other would have been observed high up in the sky. A not so bright Moon (new Moon on 27 January/26 February 1941) would imperil the view of the comet to a certain extent only.

Some other observers of the comet 1941 IV

Incidentally, there were some others too who observed the comet 1941 IV from the Indian region. Bhaskaran's February 'Notes'[4] does not mention who observed the comet from Ceylon (now Sri Lanka). The Kodaikanal Observatory in its annual reports for 1941 and 1942 has nothing on the comet. However, the well-known amateur astronomer Radha Gobinda Chandra had observed this comet. That should be from where he lived, Bagchar in Jessore, now in Bangladesh. Chandra found the comet first on 9 February 1941 with his binocular as a faint nebulous patch, about 1° below θ Ceti. Chandra continued to observe the comet until 28 February though he could not identify it. Writing on Chandra's astronomical activity, Biswas *et al.*[12] identify the comet as *C/1941 B1 Friend-Reese-Honda*. However, theirs too is a misidentification. The actual comet is 1941 IV (1941c, C/1941 B2) only. The reader may refer to Table 1 for the 9 February position of the comet and notice how closely it is positioned with θ Ceti. On the day, the comet shone at 3.7 mag. (ref. 6). Note that the full moon was on 11 February.

The other observers of this comet we came to know of are M. A. Rahman

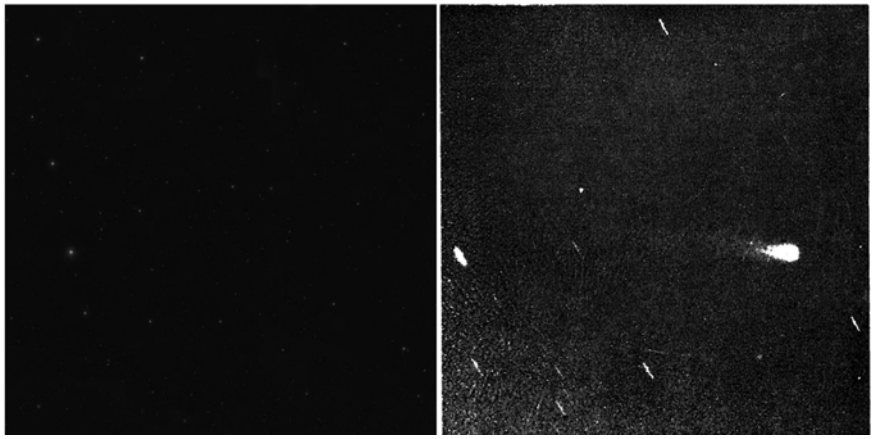

Figure 2. Left, A section of Cetus, appropriately magnified (generated from http://www.sky-map.org/epoch J2000); north is at the top. The brightest star, on the left, in the middle, is 46 Ceti. The path of the comet is diagonal, starting on 4 February from lower right bottom. Right, Nizamiah Image I, 7 February 1941 (reproduced from *Current Science*)[4].

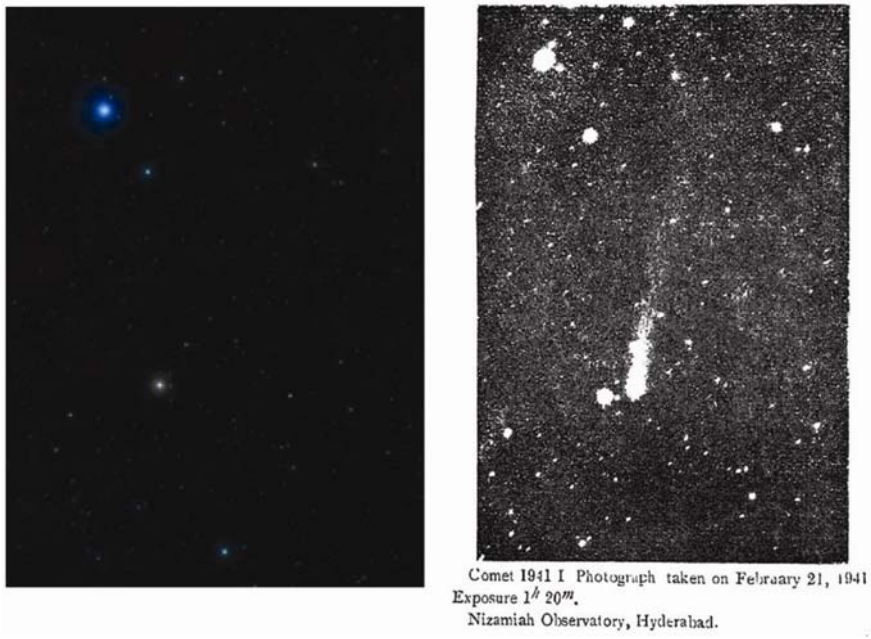

Figure 3. Left, The sky around the star Alrescha (α Piscium; top brightest object) in the constellation of Pisces, generated from http://www.sky-map.org/ (epoch J2000); the top is towards the east. Right, Nizamiah Image II, 21 February 1941 (reproduced from *Current Science*)[5].

Khan and H. Subramony Iyer. Rahman Khan (1881–?) of the Osmania University College and Research Associate, Institute of Meteoretics, University of New Mexico was a keen pursuer of the meteoric phenomena, had several papers and on their observations to his credit. In his autobiography, Khan[13] writes about observing on different occasions not only meteors and showers, but also three comets. The comets are – Comet Peltier (1936a; also 1936 II and now C/1936 K1), 'a new comet in February 1941' and a comet in February 1943 that he identified as Whipple. The designation of the last comet is Whipple-Fedtke-Tevzadze (1943 I, 1942g), and now C/1942 X1.

About the 'new comet in February 1941', Rahman Khan[13] notes (p. 375):

> 'On 13th, 14th and 17th February at about 8 p.m. S. I. time, I saw a new comet in position about (alpha = 23.5°, delta = –3.5°), (25°, –2°) and (25°/0′, 0°) respectively of magnitude 3.5 m'.

Here, alpha and delta are for the right ascension and declination of the comet. Khan gives no further detail. According to the description, the comet is 1941 IV (1941c), discovered by R. P. de Kock from Paarl on 15 January in the constellation of Norma. At the time of discovery, it was an object of 6 mag., that kept brightening up. On the dates Khan observed, the comet was a naked-eye object. Other estimates placed it then at 4–5 mag. (see Vsekhosvyatskii[6]). A correspondence is possible with the observed positions of the comet given by Goedicke[14] as also with the ephemeris generated from the JPL's Horizons system[7]. The apparent positions of the comet for 13, 14 and 17 February match Khan's values well.

In the website of the University of Kerala, there is an entry on 'Trivendrum Observatory' in its section on the University Observatory of the Department of Physics. The information provided is introductory only. However, elsewhere, Gopchandran[15] writes on the observatory's past in good detail. The observatory was built in 1837 in Trivandrum (now Thiruvananthapuram) by Rama Vurma (Swathi Thirunal), the Raja of Travancore. The part relevant here is as follows:

> 'In 1927, the work of the Observatory was divided into two sections, Astronomical and Meteorological, under the charge of the Government Astronomer Dr H. Subramani Iyer and the Government Meteorologist Mr Sivaramakrishna Iyer then Director respectively. From that time two independent sections started functioning in the Observatory. With the creation of Astronomical Department, weekly publication of astronomical notes giving the position of the Sun, Moon and the planets for Trivandrum and details of other important celestial phenomena were started. Other important works done during that period include Celestial photography and from 1928 daily time signals being received by the use of a wireless set … .
>
> In 1937, the centenary year of the Observatory, the University of Travancore was established. On August 17, 1939 the Observatory was transferred to the control of this University. In 1940 the Meteorological and Astronomical sections were amalgamated. The Thiruvananthapuram Observatory captured international attention when Dr H. Subramony Iyer sighted a new comet 1941-C at the Observatory on the morning of 23rd January 1941.'

No other information is given on the particular observation. For the day, the ephemerides of the comet generated with the Horizons system[7] are given in the Table 1. That was the bright phase of the comet, touching ~ 2 mag. on 23 January and showing a 5° long tail[6]. Being favourably positioned for an observer at low latitudes, the comet would have been an easy catch. On the day, the comet lay a few degrees southwest of η Scorpii, near the borders of Ara, Norma and Scorpio. For his 23 January observation of the comet, Subramony Iyer also was an independent discoverer, alongside J. S. Paraskevopoulos and R. Grandon. It is important that the University Observatory of the Department of Physics at the University of Kerala visited their archives to bring out crucial information.

Incidentally, around the same time, Bhaskaran's team, Radha Gobinda Chandra, Rahman Khan and Subramony Iyer missed out the other comet 1941 I (1940c; C/1940 R2), discovered by Cunningham from Oak Ridge, that too brightened up to reach the naked-eye levels in the last days of December 1940 and early January 1941 (ref. 6).

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R. C. Kapoor lives at No. 31, 4th 'B' Block, Koramangala, Bangalore 560 034, India.
e-mail: rckapoor@outlook.com

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