

Cambridge University Press

978-0-521-87226-3 - Cometography: A Catalog of Comets, Volume 5: 1960-1982

Gary W. Kronk and Maik Meyer

Excerpt

[More information](#)

Catalog of Comets

- C/1960 B1** *Discovered:* 1960 January 21.15 ($\Delta = 1.44$ AU, $r = 2.08$ AU, Elong. = 116°)
(Burnham) *Last seen:* 1960 April 17.16 ($\Delta = 3.61$ AU, $r = 3.05$ AU, Elong. = 49°)
Closest to the Earth: 1959 December 4 (0.7873 AU)
1959 VII = 1960a *Calculated path:* TAU (Disc), PER (Mar. 16), AUR (Apr. 8)

R. Burnham Jr. (Lowell Observatory, Arizona, USA) discovered this comet on 1960 January 21.15, in the course of the Lowell Proper Motion Survey. He gave the position as $\alpha = 3^{\text{h}} 42.3^{\text{m}}$, $\delta = +14^\circ 07'$. Burnham estimated the magnitude as 14, and described the comet as diffuse, without a condensation. Burnham's discovery actually occurred on January 25, while matching plates made on January 21 with first epoch plates, in preparation of blinking. A confirmation plate was acquired on January 26.

On January 28, E. Roemer (US Naval Observatory, Flagstaff Station, Arizona, USA) obtained several photographic exposures ranging from 5 to 50 minutes using the 102-cm Ritchey–Chrétien reflector. She described the comet as “a very strongly condensed object, with little coma and no tail, even on a 50-minute exposure.” The magnitude was estimated as 15.5. Roemer visually examined the comet and noted it “appeared as an unusually small diffuse patch, but the nucleus was not seen.”

On February 1, M. Antal and A. Visnecová (Skalná Pleso Observatory, Slovakia) estimated the magnitude as 14. They described the comet as diffuse, without a condensation. Roemer acquired two 5-minute exposures on the 7th and noted a “small patch of nebulosity” of magnitude 16.3. On the 17th, Roemer obtained two 30-minute exposures which revealed a “practically stellar nucleus” of about magnitude 17.0. She detected only a trace of coma. On February 19 and 20, G. A. Van Biesbroeck (Yerkes Observatory, Wisconsin, USA) photographed the comet using the 61-cm reflector and estimated the magnitude as 17. He obtained a 10-minute exposure and noted a diffuse, round coma $10''$ across.

On March 1, Van Biesbroeck estimated the photographic magnitude as 18. On the 19th, Roemer acquired two 30-minute exposures and reported a “very small, sharp condensation” of magnitude 19.3. She said the comet was “almost without coma.” On March 19, 20, and 21, Van Biesbroeck (McDonald Observatory, Texas, USA) secured a couple of 10-minute exposures using the 208-cm reflector and estimated the magnitude as 18. He noted a well-condensed, diffuse coma which exhibited a faint tail extending $1'$ in PA 100° .

Cambridge University Press

978-0-521-87226-3 - Cometography: A Catalog of Comets, Volume 5: 1960-1982

Gary W. Kronk and Maik Meyer

Excerpt

[More information](#)

CATALOG OF COMETS

The comet was last detected on April 17.16, when Roemer obtained a single 60-minute exposure using the 102-cm Ritchey–Chrétien reflector. She detected a faint image of magnitude 19.8. The position was given as $\alpha = 4^{\text{h}} 45.2^{\text{m}}$, $\delta = +35^{\circ} 32'$.

The first parabolic orbit was calculated by B. G. Marsden, using positions from January 21, 26, 28, and February 1. The result was a perihelion date of 1959 September 27.83. Marsden said the comet “should have been a fairly bright object in high southern latitudes last summer.”

Marsden (1961) revised his calculations using eight positions from the period spanning January 21 and February 20. The result was a perihelion date of September 27.73. This orbit is given below.

<i>T</i>	ω	Ω (2000.0)	<i>i</i>	<i>q</i>	<i>e</i>
1959 Sep. 27.7275 (TT)	273.2478	83.7794	69.5010	1.170751	1.0

ABSOLUTE MAGNITUDE: $H_{10} = 10.9$ (Vsekhsvyatskij, 1963)

FULL MOON: Jan. 14, Feb. 12, Mar. 13, Apr. 11, May 11

SOURCES: R. Burnham Jr. *IAUC*, No. 1711 (1960 Jan. 29); R. Burnham Jr. *HAC*, No. 1468 (1960 Feb. 1); M. Antal and A. Visnocoová, *HAC*, No. 1469 (1960 Feb. 5); B. G. Marsden, *HAC*, No. 1470 (1960 Feb. 8); B. G. Marsden and M. Antal, *IAUC*, No. 1712 (1960 Feb. 9); R. Burnham Jr. and E. Roemer, *PASP*, **72** (1960 Apr.), pp. 135–6; M. Antal, *IAUC*, No. 1721 (1960 Apr. 22); E. Roemer, *PASP*, **72** (1960 Jun.), p. 213; E. Roemer, *PASP*, **72** (1960 Aug.), p. 323; G. A. Van Biesbroeck, *AJ*, **66** (1961 Mar.), pp. 100, 102; B. G. Marsden, *QJRS*, **2** (1961 Oct.), pp. 157–9; S. K. Vsekhsvyatskij, *SvA*, **6** (1963 May–Jun.), p. 853; E. Roemer, *AJ*, **71** (1966 Sep.), pp. 595, 600.

- 63P/1960** *Discovered:* 1960 March 26.99 ($\Delta = 1.00$ AU, $r = 1.93$ AU, Elong. = 149°)
G1 (Wild 1) *Last seen:* 1960 June 27.19 ($\Delta = 2.01$ AU, $r = 2.17$ AU, Elong. = 85°)
Closest to the Earth: 1960 March 6 (0.9545 AU)
1960 I = 1960b *Calculated path:* LEO (Disc), SEX (Apr. 22), LEO (May 13), CRT (Jun. 11)

P. Wild (Astronomical Institute of Bern, Switzerland) discovered this comet on a photographic plate exposed on 1960 March 26.99. He determined the magnitude as 14.3 and gave the position as $\alpha = 10^{\text{h}} 37.6^{\text{m}}$, $\delta = +14^{\circ} 43'$. Wild confirmed the discovery on April 5.10 and April 6.10, when he gave the magnitudes as 14.7 and 14.5, respectively.

The comet showed some signs of fading during April. Photographs by Wild revealed magnitudes of 14.8 on the 13th and 15.0 on the 21st. On the 14th, H. L. Giclas (Lowell Observatory, Arizona, USA) photographed the comet using the 33-cm A. Lawrence Lowell Astrograph and estimated the magnitude as 15. He described the comet as small, diffuse, and fairly sharply condensed. On both the 22nd and 23rd, G. A. Van Biesbroeck (Yerkes Observatory) estimated the photographic magnitude as 16. He said exposures ranging from 10 to 20 minutes revealed the comet was round and diffuse, with a central condensation. On 25th and 27th,

CATALOG OF COMETS

Van Biesbroeck estimated the photographic magnitude as 17. E. Roemer (US Naval Observatory, Flagstaff Station, Arizona, USA) obtained several photographs with the 102-cm Ritchey–Chrétien reflector with the purpose of examining the comet's nuclear region. Two 10-minute exposures on the 16th revealed the nuclear magnitude as 18.0. Roemer described the nuclear condensation as a quite sharp, "essentially stellar nucleus" with "practically no coma." On the 21st and 25th, Roemer acquired 10-minute exposures and estimated the nuclear magnitude as 17.5. She noted the comet was very sharply condensed and practically stellar, with "only a very faint trace of coma."

The comet steadily faded during the remainder of this apparition. On May 1, Roemer obtained two 10-minute exposures which revealed a "quite sharp, essentially stellar nucleus" of about magnitude 17.8. She added that there was "practically no coma." Van Biesbroeck used the 61-cm reflector at Yerkes Observatory to obtain "strong exposures" of the comet's expected position on the 14th and 18th, but the comet was not detected and "must have been well below 18 mag." On May 16, Roemer obtained two 30-minute exposures which revealed a "moderately condensed nucleus" of about magnitude 18.0. She noted a trace of coma, with a diameter of 0.2'. On June 21 and 22, Roemer acquired exposures of 60 and 44 minutes, respectively, and estimated the magnitude as 19.0. She noted a "rather diffuse image with some condensation." Roemer said the coma was mostly on the southeast side of the nucleus.

The comet was last detected on June 27.19, when Roemer found it on a 52-minute exposure obtained using the 102-cm Ritchey–Chrétien reflector. She simply wrote, "Comet image very weak" and gave the position as $\alpha = 11^{\text{h}} 44.1^{\text{m}}$, $\delta = -10^{\circ} 09'$.

The first orbits were calculated by Wild. A parabolic orbit, using three semi-accurate positions measured from his own photographic plates exposed on March 26, April 5, and April 6 was published on April 20. It gave the perihelion date as 1960 February 15.75. An elliptical orbit was then published on April 27 that used his positions measured through April 21 and gave the perihelion date as March 16.83 and the period as 12.42 years.

Just over a week later, B. G. Marsden calculated an elliptical orbit using three positions from the period spanning April 14 and 21. The result was a perihelion date of March 20.54 and a period of 15.4 years. Marsden said the period was uncertain by several months. About six months later, Marsden revised his calculations using 22 positions measured during the period March 26–June 22. The perihelion date was determined as March 17.38, while the period was 13.19 years. Marsden said the orbital period was uncertain by up to one week.

In anticipation of the comet's return in 1973, Wild (1971) remeasured the five positions from photographic plates he had exposed in 1960 and sent the results to Marsden. Marsden (1971) then took a total of 16 positions

Cambridge University Press

978-0-521-87226-3 - Cometography: A Catalog of Comets, Volume 5: 1960-1982

Gary W. Kronk and Maik Meyer

Excerpt

[More information](#)

CATALOG OF COMETS

measured during the period spanning March 26 and June 27 and calculated a revised elliptical orbit. The perihelion date was determined as March 17.34 and the orbital period was 13.17 years. Marsden said the orbital period was still uncertain by about one week, but indicated the orbit was an improvement over his earlier results.

Multiple apparition orbits have been calculated by Marsden (1979), S. Nakano (1996), and K. Kinoshita (2001). Planetary perturbations were included by each, and Kinoshita also solved for nongravitational effects. The perihelion date was given as March 17.36 and the period was 13.17 years. Kinoshita gave the nongravitational terms as $A_1 = +0.8775$ and $A_2 = -0.1145$. This orbit is given below.

T	ω	Ω (2000.0)	i	q	e
1960 Mar. 17.3583 (TT)	166.7367	359.7141	19.6955	1.926986	0.654538

ABSOLUTE MAGNITUDE: $H_{10} = 12.0-13.9$ (Vsekhsvyatskij, 1963); $H_{10} = 8.6$ (Kresák and Kresáková, 1989)

FULL MOON: Mar. 13, Apr. 11, May 11, Jun. 9, Jul. 8

SOURCES: P. Wild, *IAUC*, No. 1719 (1960 Apr. 8); H. L. Giclas, *HAC*, No. 1479 (1960 Apr. 18); P. Wild and H. L. Giclas, *IAUC*, No. 1720 (1960 Apr. 20); E. Roemer, *HAC*, No. 1481 (1960 Apr. 26); P. Wild, *IAUC*, No. 1722 (1960 Apr. 27); B. G. Marsden, *HAC*, No. 1482 (1960 Apr. 29); E. Roemer, *IAUC*, No. 1723 (1960 May 2); B. G. Marsden, *IAUC*, No. 1724 (1960 May 6); H. L. Giclas and E. Roemer, *PASP*, **72** (1960 Aug.), p. 322; B. G. Marsden, *IAUC*, No. 1740 (1960 Oct. 13); P. Wild, H. L. Giclas, E. Roemer, G. A. Van Biesbroeck, and B. G. Marsden, *QJRAS*, **2** (1961 Oct.), pp. 153, 157-9; G. A. Van Biesbroeck, *AJ*, **66** (1961 Mar.), pp. 100, 102; S. K. Vsekhsvyatskij, *SvA*, **6** (1963 May-Jun.), p. 853; E. Roemer, *AJ*, **70** (1965 Aug.), pp. 398, 401; P. Wild and B. G. Marsden, *IAUC*, No. 2352 (1971 Aug. 27); B. G. Marsden, *CCO*, 1st ed. (1972), pp. 28, 49; B. G. Marsden, *CCO*, 3rd ed. (1979), pp. 28, 53; L. Kresák and M. Kresáková, *BAICz*, **40** (1989), p. 275; S. Nakano, *Nakano Note*, No. 645 (1996 Apr. 14); K. Kinoshita correspondence with G. W. Kronk (2001).

44P/Reinmuth 2 *Recovered*: 1960 May 22.40 ($\Delta = 1.65$ AU, $r = 2.43$ AU, Elong. = 131°)
Last seen: 1961 January 13.11 ($\Delta = 2.48$ AU, $r = 1.98$ AU, Elong. = 49°)

1960 IX = 1960c *Closest to the Earth*: 1960 July 24 (1.1918 AU)
Calculated path: SGR (Rec), CAP (Oct. 30), AQR (Nov. 15), CAP (Dec. 8), AQR (Dec. 15)

E. K. Rabe (1959) improved the orbital elements for the apparitions of 1947 and 1954, and then applied perturbations from Venus to Neptune. The result was a prediction that the comet would return to perihelion on 1960 November 24.85.

E. Roemer (US Naval Observatory, Flagstaff Station, Arizona, USA) acquired several photographic exposures centered on the comet's predicted positions during late March of 1960, but nothing was found. The comet was

Cambridge University Press

978-0-521-87226-3 - Cometography: A Catalog of Comets, Volume 5: 1960-1982

Gary W. Kronk and Maik Meyer

Excerpt

[More information](#)

CATALOG OF COMETS

then low in the south in the morning sky. Roemer finally recovered this comet on 60-minute exposures obtained using the 102-cm Ritchey–Chrétien reflector on 1960 May 22.35 and May 22.40. She described it as “a fairly well-condensed nucleus of [magnitude] about 19.3 in a faint coma.” The position on the first date was given as $\alpha = 19^{\text{h}} 29.9^{\text{m}}$, $\delta = -26^{\circ} 10'$.

The only physical descriptions provided for the comet during this apparition came from Roemer and G. A. Van Biesbroeck (Yerkes Observatory, Wisconsin, USA). Roemer secured exposures of 30 and 32 minutes on June 17 and reported an “essentially stellar nucleus” of about magnitude 17.8, with “practically no coma.” On July 15, Roemer obtained two 30-minute exposures and reported a “strongly condensed nucleus” of about magnitude 18.0. She again noted there was “practically no coma.” On August 17, Roemer said two 10-minute exposures revealed a “slightly diffuse spot” of about magnitude 17.6. The comet reached a minimum elongation of 39° on September 5. Van Biesbroeck obtained 20 minute exposures of the comet on September 11 and 15, using the 61-cm reflector. He described the comet as a round, diffuse coma $8''$ across, with a magnitude of about 18. On September 26, Roemer acquired two 10-minute exposures and noted a “small, slightly diffuse spot” of about magnitude 17.6. She obtained a 30-minute exposure on October 14 which revealed a “small, slightly diffuse spot” of about magnitude 18.0. On November 10, she said two 60-minute exposures revealed a “well-condensed nucleus” of about magnitude 18.8, “with a trace of coma.” A 90-minute exposure was obtained by Roemer on December 20, which revealed a “fairly well-condensed but distinctly nonstellar nucleus” of about magnitude 18.8.

The comet was last detected on 1961 January 13.11, when Roemer acquired a single 86-minute exposure using the 102-cm Ritchey–Chrétien reflector. She described the comet as an “essentially stellar nucleus” of magnitude 18.8, with “only the barest suggestion of coma.” The position was given as $\alpha = 22^{\text{h}} 42.1^{\text{m}}$, $\delta = -2^{\circ} 43'$.

Multiple apparition orbits have been calculated by Rabe (1965), B. G. Marsden (1968), and S. Nakano (1985, 1997). They gave the perihelion date as November 24.81 and the period as 6.71 years. Nakano (1997) gave the nongravitational terms as $A_1 = +0.066$ and $A_2 = -0.00367$. The orbit of Nakano (1997) is given below.

T	ω	Ω (2000.0)	i	q	e
1960 Nov. 24.8124 (TT)	45.4439	296.9167	6.9948	1.932490	0.456843

ABSOLUTE MAGNITUDE: $H_{10} = 14.2$ (Vsekhsvyatskij, 1963); $H_{10} = 9.3$ (Kresák and Kresáková, 1989)

FULL MOON: May 11, Jun. 9, Jul. 8, Aug. 7, Sep. 5, Oct. 4, Nov. 3, Dec. 3, 1961 Jan. 1, Jan. 31

SOURCES: E. K. Rabe, *BAA Handbook for 1960* (1959 Nov.), p. 53; E. Roemer, *IAUC*, No. 1728 (1960 May 27); E. Roemer, *HAC*, No. 1486 (1960 May 31);

Cambridge University Press

978-0-521-87226-3 - Cometography: A Catalog of Comets, Volume 5: 1960-1982

Gary W. Kronk and Maik Meyer

Excerpt

[More information](#)

CATALOG OF COMETS

E. Roemer, *PASP*, **72** (1960 Jun.), p. 215; E. Roemer, *PASP*, **72** (1960 Aug.), pp. 322–3; E. Roemer, *PASP*, **72** (1960 Oct.), p. 425; E. Roemer, *PASP*, **73** (1961 Apr.), p. 171; E. K. Rabe, *QJRAS*, **2** (1961 Oct.), pp. 158–9; G. A. Van Biesbroeck, *AJ*, **67** (1962 Aug.), pp. 423, 427; S. K. Vsekhsvyatskij, *SvA*, **6** (1963 May–Jun.), p. 853; E. K. Rabe, *QJRAS*, **6** (1965 Dec.), pp. 342–3; E. Roemer, *AJ*, **71** (1966 Sep.), pp. 595, 600; B. G. Marsden, *AJ*, **73** (1968 Jun.), pp. 369, 371; S. Nakano, *Nakano Note*, No. 484 (1985 Dec. 16); L. Kresák and M. Kresáková, *BAICz*, **40** (1989), p. 275; S. Nakano, *Nakano Note*, No. 668 (1997 Jul. 10).

- 15P/Finlay** *Prerecovery*: 1960 June 20.5 ($\Delta = 0.71$ AU, $r = 1.45$ AU, Elong. = 112°)
Recovered: 1960 June 21.38 ($\Delta = 0.70$ AU, $r = 1.44$ AU, Elong. = 112°)
1960 VIII = 1960d *Last seen*: 1961 January 13.30 ($\Delta = 1.05$ AU, $r = 1.99$ AU, Elong. = 154°)
Closest to the Earth: 1960 August 9 (0.4194 AU)
Calculated path: AQR (Pre), CET (Jul. 7), PSC–CET (Jul. 31), TAU (Aug. 14), ORI (Sep. 16), GEM (Sep. 22), AUR (Dec. 9)

M. P. Candy (1959) used the observations from 1953–1954 and computed an orbit which was then linked to the 1926 apparition after applying perturbations by Jupiter and Saturn. Candy then took this orbit, applied perturbations by Venus to Saturn, and predicted the comet would next arrive at perihelion on 1960 September 2.29.

E. Roemer (US Naval Observatory, Flagstaff Station, Arizona, USA) photographed the predicted position using the 102-cm Ritchey–Chrétien reflector during late March of 1960, “but nothing very convincing was found on the single exposures made necessary by their awkward positions rather low in the south and well east of the meridian at dawn.”

The comet was recovered by R. Burnham Jr. (Lowell Observatory, Arizona, USA) when he obtained a 35-minute exposure on 1960 June 21.38 using the 33-cm A. Lawrence Lowell Astrograph. He gave the position as $\alpha = 22^{\text{h}} 47.3^{\text{m}}$, $\delta = -15^\circ 29'$. A second plate, with an exposure of 40 minutes, was obtained shortly thereafter. Burnham estimated the magnitude as 16 and described the comet as diffuse, without a condensation. The comet had actually been photographed by J. B. Gibson (Lick Observatory, California, USA) on June 20.5 and 21.5, using the 51-cm Carnegie astrograph, but, according to Roemer, “some bad luck prevented him from being the first to announce the recovery.” Gibson described the comet as quite faint and diffuse. A. McClure (Hollywood, California, USA) also photographed this comet on June 20.5 using his 18-cm refractor, but was not able to locate the image until Burnham told him where to look.

On June 22, Roemer said two 30-minute exposures revealed a “strong nuclear condensation” of about magnitude 18.5. There was a faint coma. G. A. Van Biesbroeck (Yerkes Observatory, Wisconsin, USA) acquired a 10-minute exposure using the 61-cm reflector on July 22. He estimated the magnitude as 15 and noted the comet was round, diffuse, and $20''$ across. On July 27, Van Biesbroeck obtained an

Cambridge University Press

978-0-521-87226-3 - Cometography: A Catalog of Comets, Volume 5: 1960-1982

Gary W. Kronk and Maik Meyer

Excerpt

[More information](#)

CATALOG OF COMETS

8-minute exposure. He estimated the magnitude as 14 and noted a round, centrally condensed coma.

On August 2, Roemer said the comet was easily visible in the 102-cm reflector. Her two 5-minute exposures acquired that same night, using the same telescope, revealed a "strong, practically stellar nuclear condensation of magnitude about 16.8 in a faint coma 0.5' in diameter." Roemer obtained two 5-minute exposures on the 17th and noted a "well-condensed but nonstellar nucleus" of about magnitude 16.0. The coma was 0.6' across. On August 21 and 22, A. F. A. L. Jones (New Zealand) observed with his 32-cm reflector and gave the magnitude as 10.2 and the coma diameter as 2.5'. The comet reached a minimum elongation of 59° on August 30. On August 31, Van Biesbroeck said a 5-minute exposure revealed a magnitude of about 11. He described the comet as 1' across, with a well-defined central condensation.

On September 5, McClure acquired a 20-minute exposure of the comet during a lunar eclipse. He said the coma was 2.7' across. On the 18th, G. E. D. Alcock (Peterborough, England) by chance observed this comet while conducting a routine search for comets with a 25 × 105 binocular telescope. He estimated the magnitude as 10. Roemer said the comet was easily seen with the 13-cm finder on the reflector on the 26th. She also obtained two 3-minute exposures which revealed a "condensed, but nonstellar nucleus" of about magnitude 15.5, which was within "a symmetrical coma 0.6" in diameter." On September 26, 27, and 28, Van Biesbroeck acquired 2-minute exposures which revealed a centrally condensed coma about 30" across, with a magnitude of 11.

During the remainder of the year, Van Biesbroeck and Roemer provided the only physical descriptions. On October 17 and 18, Van Biesbroeck said 3-minute exposures revealed a magnitude of about 12. On October 25, Roemer reported two 3-minute exposures revealed a "moderately condensed object" of magnitude 17.0. Roemer obtained two 10-minute exposures on November 11 and noted a "centrally condensed diffuse object" of magnitude 17.6. On the 17th, Van Biesbroeck said a 16-minute exposure revealed a centrally condensed coma and a tail extending 1' toward PA 265°. The magnitude was estimated as 15. Van Biesbroeck obtained a 10-minute exposure on November 23 which revealed a magnitude of 15 and a faint tail toward PA 270°. On December 18, Roemer secured a 30-minute exposure and found a "sharply condensed nucleus" of about magnitude 18.2, with an "extremely faint trace of coma." The comet attained its most northerly declination of +30° on December 26. On that same night, Roemer obtained two exposures of about an hour and noted a "sharply condensed nucleus" of magnitude 18.2 "embedded in a faint trace of coma 0.3' in diameter."

The last two detections of the comet were on 1961 January 10.31 and January 13.30, when Roemer acquired exposures of 90 and 91 minutes, respectively. On the first date, she noted an "essentially stellar nucleus" of

Cambridge University Press

978-0-521-87226-3 - Cometography: A Catalog of Comets, Volume 5: 1960-1982

Gary W. Kronk and Maik Meyer

Excerpt

[More information](#)

CATALOG OF COMETS

magnitude 18.8 and “only the faintest trace of coma.” On the second date, Roemer found a “sharply condensed nucleus” of about magnitude 19.0 “embedded in a very faint round coma 0.2” in diameter.” Roemer gave the position on the final date as $\alpha = 5^{\text{h}} 50.7^{\text{m}}$, $\delta = +29^{\circ} 16''$.

I. Hasegawa (1960) predicted a meteor shower from this comet. He suggested peak activity would occur around September 28, when the orbits of Earth and the comet were separated by 0.085 AU. He gave two potential radiants based on slightly different assumptions. One was at $\alpha = 270^{\circ}$, $\delta = -34^{\circ}$, while the other was at $\alpha = 268^{\circ}$, $\delta = -23.5^{\circ}$. No display was observed.

Candy (1960) improved the orbit of this comet using positions from the period spanning June 22 and September 26. He gave the perihelion date as September 1.10 and indicated a period of 6.90 years.

Multiple apparition orbits have been calculated by B. G. Marsden (1968), D. K. Yeomans (1972), and S. Nakano (1986). These calculations included planetary perturbations and solved for nongravitational effects. The perihelion date was given as September 1.10 and the period as 6.89 years. Marsden wrote that the comet “seems to have a secular deceleration . . . , although the value is somewhat uncertain on account of the large perturbations by Jupiter (minimum separation 0.60 a.u.) in 1957.” The nongravitational terms were given as $A_1 = +0.26$ and $A_2 = +0.0255$ by Marsden, Z. Sekanina, and Yeomans (1973) and $A_1 = +0.257$ and $A_2 = +0.01709$ by Nakano. The orbit of Nakano is given below.

T	ω	Ω (2000.0)	i	q	e
1960 Sep. 1.1026 (TT)	321.6912	42.6766	3.6487	1.077195	0.702477

ABSOLUTE MAGNITUDE: $H_{10} = 12.3\text{--}15.8$ (Vsekhsvyatskij, 1963); $H_{10} = 11.0$ (Kresák and Kresáková, 1989)

FULL MOON: Jun. 9, Jul. 8, Aug. 7, Sep. 5, Oct. 4, Nov. 3, Dec. 3, 1961 Jan. 1, Jan. 31
 SOURCES: M. P. Candy, *BAA Handbook for 1960* (1959 Nov.), pp. 57–8; E. Roemer, *PASP*, **72** (1960 Jun.), p. 215; R. Burnham Jr. *HAC*, No. 1488 (1960 Jun. 22); R. Burnham Jr. *IAUC*, No. 1731 (1960 Jun. 24); E. Roemer, *HAC*, No. 1492 (1960 Jul. 1); E. Roemer, *IAUC*, No. 1734 (1960 Jul. 11); I. Hasegawa, *IAUC*, No. 1737 (1960 Aug. 29); R. Burnham Jr. E. Roemer, and J. B. Gibson, *PASP*, **72** (1960 Oct.), pp. 423–4; M. P. Candy, *IAUC*, No. 1741 (1960 Oct. 27); A. McClure, *ST*, **20** (1960 Nov.), p. 289; E. Roemer, *PASP*, **72** (1960 Dec.), p. 514; E. Roemer, *PASP*, **73** (1961 Apr.), p. 171; M. P. Candy, *QJRAS*, **2** (1961 Oct.), pp. 158–9; G. A. Van Biesbroeck, *AJ*, **67** (1962 Aug.), pp. 423, 427; S. K. Vsekhsvyatskij, *SvA*, **6** (1963 May–Jun.), p. 853; G. E. D. Alcock, *JBAA*, **76** (1965 Dec.), pp. 52–3; E. Roemer, *AJ*, **71** (1966 Sep.), pp. 595, 600; B. G. Marsden, *AJ*, **73** (1968 Jun.), pp. 372, 374; D. K. Yeomans, *CCO*, 1st ed. (1972), pp. 28, 49; B. G. Marsden, Z. Sekanina, and D. K. Yeomans, *AJ*, **78** (1973 Mar.), p. 213; A. F. A. L. Jones, *ICQ*, **7** (1985 Oct.), p. 99; S. Nakano, *Nakano Note*, No. 491 (1986 Dec. 23); L. Kresák and M. Kresáková, *BAICz*, **40** (1989), p. 273; B. Skiff correspondence with G. W. Kronk (2009).

Cambridge University Press

978-0-521-87226-3 - Cometography: A Catalog of Comets, Volume 5: 1960-1982

Gary W. Kronk and Maik Meyer

Excerpt

[More information](#)

CATALOG OF COMETS

- C/1960 M1 (Humason)** *Discovered:* 1960 June 18.27 ($\Delta = 4.07$ AU, $r = 4.55$ AU, Elong. = 112°)
Last seen: 1961 June 7.32 ($\Delta = 6.03$ AU, $r = 6.11$ AU, Elong. = 90°)
Closest to the Earth: 1960 May 16 (3.9102 AU)
- 1959 X = 1960e** *Calculated path:* HER (Disc), BOO (Jul. 6), CrB (Nov. 4), BOO (1961 Feb. 2), UMa (Apr. 18), CVn (May 7)

M. L. Humason (Palomar Observatory, California, USA) photographically discovered this comet on plates exposed using the 122-cm Schmidt telescope on 1960 June 18.27 during a supernova search program. He gave the position as $\alpha = 16^{\text{h}} 18.6^{\text{m}}$, $\delta = +41^\circ 46'$. Humason estimated the magnitude as 17 and described the comet as diffuse, with a condensation and a short tail. The daily motion was given as -1.9^{m} in α and $+1'$ in δ .

The comet attained a declination of $+42^\circ$ on June 20 and then began a southward motion. On the 23rd and 27th, E. Roemer (US Naval Observatory, Flagstaff Station, Arizona, USA) obtained exposures of 10 and 12 minutes using the 102-cm Ritchey–Chrétien reflector and gave the magnitude as 18.2. She described the comet as a “sharply condensed spot . . . with little coma.” Roemer said a 60-minute exposure on the 27th revealed a “faint, broad tail” extending $5'$ toward the southeast. During the period June 24–26, G. A. Van Biesbroeck (Yerkes Observatory, Wisconsin, USA) obtained photographs using the 61-cm reflector. The exposures ranged from 10 to 20 minutes and revealed a very diffuse, centrally condensed coma of magnitude 18. On June 30, Roemer said two 10-minute exposures revealed a “sharp, essentially stellar condensation” of about magnitude 18.0.

On July 13, Roemer’s photograph revealed a “sharply condensed image” of magnitude 18.0. Van Biesbroeck obtained 20-minute exposures on the 21st, 22nd, and 24th, which revealed a centrally condensed coma about $8''$ across and about magnitude 18. On the 25th, Van Biesbroeck acquired a 20-minute exposure in a “thick sky” and noted the comet appeared very faint. Van Biesbroeck’s final observation came on July 28, when his 20-minute exposure revealed a magnitude of 18.

Roemer was the only person to follow the comet after July. Two 15-minute exposures on August 2 revealed a “faint, practically stellar spot” of about magnitude 18.3. On August 17, she reported that two 30-minute exposures showed an “essentially stellar nucleus” of magnitude 18.2 within a faint coma about $0.2'$ across. Roemer again photographed a nearly stellar nucleus on September 25 and gave its magnitude as 18.6. She added that it exhibited a faint coma. On October 22, she noted a “weak, but well-condensed image” of magnitude 19.3. The comet reached a minimum elongation of 46° on October 26 and attained its most southerly declination of $+31^\circ$ on November 8. On December 26, Roemer obtained a 110-minute exposure and detected a moderately condensed image of about magnitude 18.9.

Roemer obtained a few additional photographs during the first half of 1961. Exposures of 90 and 110 minutes on January 17 revealed a “sharply

Cambridge University Press

978-0-521-87226-3 - Cometography: A Catalog of Comets, Volume 5: 1960-1982

Gary W. Kronk and Maik Meyer

Excerpt

[More information](#)

CATALOG OF COMETS

condensed nucleus" of magnitude 19.0 located within a "faint symmetrical coma 0.3' in diameter." Exposures of 90 and 92 minutes on March 23 revealed a "strongly condensed nucleus" of about magnitude 19.8 within a "trace of coma." The comet reached a maximum elongation of 120° on March 31. Two 90-minute exposures on April 9 revealed a condensed image of magnitude 19.8. The comet attained its most northerly declination of $+52^\circ$ on April 30. A poor plate with an exposure of 108 minutes was obtained on May 9 which revealed a rather diffuse image that was elongated in right ascension. On May 14, a 90.5-minute exposure revealed a condensed image of magnitude 20.2.

The last two detections of the comet were on June 7.22 and June 7.32, when Roemer obtained two-hour exposures which revealed "only the barest trace of coma around a weak, essentially stellar condensation" of about magnitude 19.8. The position was given as $\alpha = 12^{\text{h}} 55.4^{\text{m}}$, $\delta = +49^\circ 29'$.

The first parabolic orbit was calculated by M. P. Candy, using positions from June 23, 27, and 30. First published on July 19, the orbit gave the perihelion date as 1959 December 8.95. Considering the comet had a perihelion distance of over 4.2 AU, the fact that Candy's calculations produced a perihelion date that was in error by just over two days was rather remarkable. Additional parabolic orbits came from P. Herget and Candy.

Definitive orbits have been calculated by Van Biesbroeck (1970) and B. G. Marsden and Z. Sekanina (1973). Van Biesbroeck took 34 positions spanning the period 1960 June 23–1961 June 7 and included perturbations by Venus to Neptune. The result was a hyperbolic orbit with a perihelion date of December 11.36 and an eccentricity of 1.0000400. Marsden and Sekanina took 30 positions spanning the period 1960 June 18–1961 June 7 and included perturbations by all nine planets. The result was a hyperbolic orbit with a perihelion date of December 11.20 and an eccentricity of 1.0008842. The orbit of Marsden and Sekanina is given below. Although Marsden (1970) had used Van Biesbroeck's orbit to determine that the original and future orbits had been elliptical with periods of 791 thousand years and 1.6 million years, respectively, somewhat different results came from the calculations of Marsden and Sekanina. They found the original orbit had been elliptical with a period of about 3.9 million years, while the future orbit would be hyperbolic with an eccentricity of 1.0000085.

T	ω	Ω (2000.0)	i	q	e
1959 Dec. 11.2050 (TT)	46.4607	307.2619	125.4695	4.266927	1.000884

ABSOLUTE MAGNITUDE: $H_{10} = 8.3$ (Vsekhsvyatskij, 1963)

FULL MOON: Jun. 9, Jul. 8, Aug. 7, Sep. 5, Oct. 4, Nov. 3, Dec. 3, 1961 Jan. 1, Jan. 31, Mar. 2, Apr. 1, Apr. 30, May 30, Jun. 28

SOURCES: M. L. Humason, *HAC*, No. 1488 (1960 Jun. 22); M. L. Humason, *IAUC*, No. 1731 (1960 Jun. 24); E. Roemer, *HAC*, No. 1492 (1960 Jul. 1);