

The Ford Amateur Astronomy Club Newsletter

Volume 5, Number 3

March 1996

COMET HYAKUTAKE TO APPROACH EARTH IN LATE MARCH

Astronomers Prepare for a Rare Event

In the early morning of January 31, 1996, Japanese amateur astronomer Yuji Hyakutake made his second comet discovery within five weeks. He found the new comet near the border between the southern constellations of Hydra and Libra, amazingly just three degrees from the position where he detected another comet on December 26, 1995.

After two weeks of hectic activity among amateur and professional astronomers all over the world, much interesting information has now been gathered about the new comet which has been designated C/1996 B2 (Hyakutake). In particular, it has been found to move in a near-parabolic orbit that will bring it unusually close to the Earth in March. It is then expected to become bright enough to be seen with the unaided eye and to remain so during several weeks thereafter. Preparations are now made to observe the celestial visitor with a large number of telescopes, on the ground and in space. This event offers a rare opportunity to study the immediate surroundings of a cometary nucleus in detail.

Discovery and orbit

Yuji Hyakutake, of profession photoengraver and a well-known amateur astronomer, announced his new discovery without delay, and within 24 hours, it had been sighted by several other observers in Japan and Australia. Experienced comet-watchers described its appearance as 'diffuse with central condensation and of magnitude 11-12'. This brightness is not unusual for a comet discovered by an amateur, although it would probably have been missed, had it been just a little fainter. In the present case, the decisive factors for Hyakutake's success were undoubtedly his powerful 25 x 150 binoculars, and the advantageous combination of the comet's southern position in the sky and his location in Kagoshima, the southernmost prefecture of Japan.

Within three days only, nearly 120 positional measurements of the comet were obtained, mostly by amateur observers in Australia, PR China, the Czech Republic, France, Japan, Spain and the U.S.A. This allowed Brian Marsden of the Central Bureau for Astronomical Telegrams of the International Astronomical Union (Cambridge, Mass.) to compute a preliminary orbit. It showed that the comet moves along a parabola - or at least an extremely elongated ellipse - and that it must therefore have come from far away and may never have been near the Sun before. At the time of discovery, the comet was about 280 million km from the Earth and outside the orbit of Mars. Moreover, the motion of the comet is such that it will continue to approach the Earth with a speed of about 58 km/sec during the next weeks and will pass within 15 million km of our planet in late March. This corresponds to one tenth of the distance between the Earth and the Sun (0.1 AU) and, in cosmical terms, the passage is therefore a very close one.

Continued observations have confirmed this and have also allowed to fix the moment of closest passage as Monday, March 25, at about 7h UT. At that time, the comet will be moving northwards through the northern constellation of Draco at the exceptional rate of 0.77 deg/hour. The event will be best observable from the northern hemisphere. Two days later, the comet passes within a few degrees of the northern celestial pole. The perihelion (the orbital point closest to the Sun) is reached on May 1, 1996, at a distance of 35 million km from the Sun, far inside the orbit of the innermost planet, Mercury. From then on, the comet will rapidly move south, crossing the celestial equator in mid-May and reaching 70 degrees south in late July.

Recent observations

Comet Hyakutake obviously comes from far away, maybe even from the very distant 'Oort Cloud' of comets that surrounds the solar system. In this sense it is different from the periodical comets which move in closed orbits around the

Sun with revolution periods between a few years and some decades. Its 'dirty snowball' nucleus of ices and dust has therefore not been heated by the Sun for a very long time, perhaps never, if this is its first visit to the inner regions of the solar system. Hence it is particularly difficult to predict its future performance. Nevertheless, the available observations seem to indicate that it is a quite 'active' comet and that it may therefore become comparatively bright when it approaches the Earth and later at perihelion. But how bright?

Imaging as well as spectroscopic observations have been performed in order to better characterize Comet Hyakutake. On CCD-frames obtained in early February with telescopes at the ESO La Silla Observatory and elsewhere, an elongation is clearly visible in the anti-sunward direction of the coma (the cloud of gas and dust that surrounds the nucleus). A real tail has not yet developed, but is expected to happen soon. The size of the coma was measured as at least 7 arcmin, corresponding to a projected diameter of nearly 500,000 km.

It is also of interest that until recently the coma otherwise appeared absolutely symmetrical - there was no indication of 'jets', i.e. no large vents on the surface of the nucleus had yet become active. However, on images obtained with the ESO 3.6-metre telescope in the morning of February 13, a 'jet'-like feature is seen which emerges south-east of the nucleus (i.e. from the sunlit side) and curls counter-clockwise towards the opposite side (the 'tail'-direction). This is probably the first evidence of localized dust production on the surface of the nucleus. CCD observations were made on February 9 at the Lowell Observatory through special optical filters which isolate the light from different components of the coma. They show that the gas production rates are almost as high as those measured at famous Comet Halley when it was at about the same distance from the Sun during its approach in late 1985. The dust production of Comet Hyakutake also seems to be quite impressive.

The first spectra of the new comet were obtained at La Silla with the DFOSC instrument at the Danish 1.54-metre telescope of February 8; they show comparatively strong emission of CN, C₂ and C₃ molecules. This is not unusual for a comet at the corresponding heliocentric distance. In conclusion, the recent observations show Comet Hyakutake to be an 'active' comet. The evaporation of the ices on the surface of its nucleus, due to the heating of the Sun, is well underway and much dust is being ejected during this process. It is quite likely that this comet will put on a fine display, starting in mid-March and lasting until soon after the perihelion passage in early May. Nevertheless, there have been some cases in recent times when the activity level of new comets did not develop as expected, so some caution is necessary.

The encounter on March 25

By straightforward extrapolation of the current brightness, it would appear that Comet Hyakutake will reach magnitude 1 on March 25, 1996, the time of its closest approach to Earth. This is almost as bright as the brightest stars in the sky. However, it is important to consider that this is the 'integrated' brightness of the entire comet head which may fill an area of several degrees in diameter. Thus the comet will appear as a moderately bright, very diffuse object that is best visible in binoculars. There will be a central point of enhanced brightness, corresponding to the innermost part of the coma around the nucleus. The motion is sufficiently fast to be easily perceptible on the stellar background.

We do not know the size of the nucleus yet, but assuming - optimistically, from the measured gas and dust production - that the diameter is 10 km, i.e. about as large as that of Comet Halley, then the magnitude of the nucleus alone should be about 11 at the time of the closest encounter. It may therefore be well (continued on page 2)

(continued from page 1)

visible in even small telescopes, as a bright point near the centre of the diffuse coma. However, it will most probably not be possible to obtain resolved images of the nucleus with ground-based telescopes; even if the size turns out to be this large, the nucleus will only subtend an angle of about 0.15 arcsec and thus appear point-like. The comet's extremely rapid motion across the sky at the encounter will constitute a major technical-observational problem for most telescopes. Moreover, it cannot be excluded that the coma is so dense that the nucleus will be completely hidden from view. The only telescope which could possibly image the nucleus as an extended object is the Hubble Space Telescope, for which observations are now being planned.

Still, there is no doubt that the upcoming event offers very bright prospects for the investigation of the near-nucleus environment of a comet. Another technique which will most likely be attempted is that of radar soundings; the return time for a signal will only be 100 seconds. In the past, only a handful of comets have been investigated in this way and none in great detail. However, in view of recent technological advances, it should be possible to 'image' the nucleus with some of the largest radio telescopes. Predictions for the appearance of the tail(s) at the encounter are still uncertain, since their development has not started. In the best case, the dust tail may become quite impressive and reach a length of many degrees, and the expected ion tail could also be quite long.

The perihel passage

The brightness at perihel on May 1 will probably exceed that at the Earth encounter and Comet Hyakutake could then become a very spectacular object. How bright it will actually be is much dependent on the amount of dust released from the nucleus as it approaches the Sun. Unfortunately, the viewing conditions will not be very good and the full moon on May 3 will also adversely influence the sight. ☆

GALILEO LECTURE REVIEW

by Mark Wagner (PROFS mwagner2)

I was able to attend the Galileo Probes Jupiter lecture at U of M on February 7, 1996, and found it quite informative. They covered the entire history of the project starting from the drawing board some 22 years ago right up to our presence in Rackham that night!

There were numerous slides showing items such as orbital trajectories from beginning to end as well as detailed pictures of both parts of the Galileo craft (main body and the probe). In fact, they mentioned they wished they had made up two different names so as to differentiate between the main orbiter and the probe. However, they were able to explain both pieces very well. In addition, there were a couple of short videos showing the liftoff of the Atlantis shuttle and the subsequent launch of the Galileo itself from the shuttle bay. The other video was more of a computer animation showing exactly what the orbiter and probe would have looked like upon probe launch from the orbiter and its descent into Jupiter's atmosphere.

Then there were some very good details given about the actual results from the probe as it descended into the Jovian atmosphere. They were surprised (as they stated they are with every planetary analysis) at the types of gases found in the atmosphere—there were many more of the noble type of gases than they expected in more amounts than they believed existed. As a bonus to them, they only expected the probe to last around 30 minutes as it went down to 10 earth atmospheres. Instead, as the overall data indicated, the probe was able to withstand some 23 earth atmospheres and sent back data for 57 minutes! They then explained through slides exactly how long it took for the rest of the probe to literally melt into the Jovian "air"—with the aluminum melting first until the last drops of titanium were finally dissolved nearly 10 hours after the initial atmosphere encounter! They are still analyzing the data, but seemed to think that Jupiter may not have been formed at the same time as the Sun, nor of the same type of elements and composition as the Sun. So that was more of a surprise!

Overall, I thought it was a very good lecture—lasting some 90 minutes sharing some very good information with the public and encouraging everyone to keep their interests going with regard to planetary research. They even mentioned how the next major project will be to send another orbiter/probe spacecraft to Saturn, which should be launched sometime next year. This time they want to send a similar probe to Saturn's moon, Titan. Since this ice-covered moon is only 1 1/2 earth atmospheres, they fully expect this probe to reach the surface and be able to send back much more data for a much longer time period. I hope there are future lectures, not only on planetary research, but on all aspects of astronomy and space exploration too. ☆

STAR STUFF

Monthly Publication of the Ford Amateur Astronomy Club

Star Stuff Newsletter

P.O. Box 7527

Dearborn, Michigan 48121-7527

1996 CLUB OFFICERS

President:	Bob MacFarland	33-79750
Vice President:	Patti Forton	84-51740
Secretary:	Harry Kindt	313-835-1831
Treasurer:	Kevan Granat	24-87628

GENERAL MEETINGS

The Ford Amateur Astronomy Club holds regular general meetings open to the public on the fourth Thursday of the month at 5:00 PM. Meetings are held at the Ford Motor Credit Company (FMCC) building, Northeast of the World Headquarters build in Dearborn, in conference room 1491, lower floor, East side of the building.

OBSERVING SITE

The Ford Amateur Astronomy Club has an established observing site, by permit, at the Spring Mill Pond area of the Island Lake Recreational Area in Brighton, Michigan located near the intersections of I-96 and US-23. Members are responsible for opening and closing the gate after the parks 10:00pm closing time. The combination for the lock should be available on our hotline number. Always close the gate behind you after 10:00pm whether entering or leaving the park.

OBSERVING HOTLINE NUMBER - (313) 39-05456

On Friday and Saturday nights, or nights before holidays, you can call the hotline number up to 2 hours before sunset to find out if we will be observing that night. Assume that any clear Friday or Saturday night is a candidate observing night unless something else is going on or none of the club officers are able to make it.

MEMBERSHIP AND DUES

Membership to the Ford Amateur Astronomy Club is open to both Ford and Non-Ford Motor Company employees. The general public is also welcome to join. The dues structure is as follows:

Annual Individual/Family	\$20.00
Lifetime Membership	\$100.00

Membership benefits include a subscription to the Star Stuff newsletter, discounts on subscriptions to Astronomy and/or Sky & Telescope magazine(s), after hour use of the observing site at Island Lake, and discounts at selected area astronomical equipment retailers.

NEWSLETTER STAFF

Editor:	Paul Mrozek	313-33-73619
	PROFS: pmrozek; MD 3014 Building 3	
	pmrozek@av3168.pd8.ford.com	
	pmrozek@ford.com (outside of Ford)	
Contributing Editors:	Greg Burnett	313-84-53586

NEWSLETTER SUBSCRIPTION

A yearly subscription at a rate of \$12.00 is available to those who are not members of the Ford Amateur Astronomy Club. Subscription are free to any other astronomy clubs wishing to participate in a newsletter exchange.

Articles presented herein represent the views and opinions of their authors and not necessarily those of the Ford Amateur Astronomy Club or the Star Stuff Newsletter. Commercial advertisers appearing in the newsletter are not endorsed or in any way affiliated with Ford Motor Company, the FAAC, or Star Stuff newsletter.

MARCH 1996

SUN	MON	TUE	WED	THU	FRI	SAT
31					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

Mar 05 Full Moon (3:56 am EST \pm 2 mins)
 Mar 12 Last Quarter Moon (11:47 am EST \pm 2 mins)
 Mar 19 New Moon (5:19 am EST \pm 2 mins)
 Mar 20 First day of Spring (2:40 am EST \pm 15 mins)
 Mar 27 First Quarter Moon (8:03 pm EST \pm 2 mins)

MEETING ANNOUNCEMENT

The Ford Amateur Astronomy Club (FAAC) holds regular general meetings on the fourth Thursday of each month, except November and December. Our next meeting will be **Thursday, March 28, at 5:00 pm**. The program for the meeting has not been determined at this time.

The FAAC meets in the Ford Motor Credit Company (FMCC) building, conference room 1491, located on the lower east side of the building. FMCC is the low building immediately northeast of (but not attached to) Ford World Headquarters in Dearborn. The FMCC building is secured with a card entry system. The easiest way to enter the building for meetings is to park in the northeast lot (Employee Lot 7) and enter through the lower northeast or lower east doors. At 5:00 pm no one seems to have trouble getting in because many people are leaving around that time. At the east door you can dial 0911 on the security phone and say you are here to attend a Ford club meeting, and security will admit you. You may find your way into the building any way you see fit, but direction signs will only be posted at lower northeast and lower east doors. ☆

HOME-BUILT TELESCOPE SIG

from Chuck Boren III

We held our first meeting of our home built telescope sig on Feb 3 1996 at George Korody's home. We viewed a video on home built telescopes by John Dobson which explains in detail how to build a telescope and it's mounting. A very good book on home built telescopes by Richard Berry has several plans for many different types of scopes and will be the reference for your sig.

We can buy all our components from Orion. You will need to buy the major components, primary mirror, secondary mirror and tube but you can either buy or make the mirror cell, spider, focuser, altitude bearings, spotting scope and telescope mounting. The different sizes of scopes are quite varied. 4.25" f10 - 6"f5 - 6"f8 - 8"f6 - 10"f5 - 10"f6 - 12.5"f4.5 and 16"f4.5. The price will vary with size and quality of components. I will have a price list ready at our next meeting on March 9 @ 1:00 pm at George's home (19560 Meadowbrook, two streets west of Haggerty and two blocks north of 7 mile in Northville). This next meeting will be on the type of scope you want to build. If you need more information please contact me at 24-83446 or profs mc boren. My internet address at home is cboren@delphi.com. Hope to see you at the next sig meeting. ☆

SKY & TELESCOPE NEWS BULLETINS

from the editors of SKY & TELESCOPE magazine

BETELGEUSE's SPOT: Astronomers released the first image of a star's surface other than our Sun. Betelgeuse, the red giant in Orion, was studied with the HST by A. Dupree and R. Gilliland. This star is so large (its diameter is bigger than Jupiter's orbit) and so close (500 light-years away) that the observers felt they could confirm hints of surface structure. Indeed, HST detected a hot spot 10 times Earth's diameter, and it's not clear what could be causing it. Betelgeuse is known to oscillate with a 420-day period, so one possibility is that these pulses shock the star's atmosphere. The spot could also represent a giant convection cell or magnetic activity. ☆

March 1996

STATISTICALLY SPEAKING

Location (Dearborn, MI): 42°22'00" N, 83°17'00" W, 180 meters elevation
 Local Time = Universal Time - 5.5 hours (Eastern Standard Time)

Abbreviations used in reports:

FM Full Moon FQ First Qtr Moon LQ Last Qtr Moon NM New Moon
 MR Moon Rise MS Moon Set SR Sun Rise SS Sun Set

Calendar Report for March 1996						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
31 SR: 5:47 SS: 18:28 MR: 15:22 MS: 3:54		Lunar Events FM: 3:54 Mar 05 LQ: 11:46 Mar 12 NM: 5:17 Mar 19 FQ: 20:01 Mar 26			1 SR: 6:38 SS: 17:54 MR: 14:39 MS: 4:15	2 SR: 6:36 SS: 17:55 MR: 15:36 MS: 4:51
3 SR: 6:35 SS: 17:56 MR: 16:34 MS: 5:24	4 SR: 6:33 SS: 17:57 MR: 17:34 MS: 5:55	5 SR: 6:31 SS: 17:58 MR: 18:35 MS: 6:25	6 SR: 6:30 SS: 17:58 MR: 19:37 MS: 6:55	7 SR: 6:28 SS: 18:00 MR: 20:40 MS: 7:26	8 SR: 6:26 SS: 18:01 MR: 21:44 MS: 7:59	9 SR: 6:25 SS: 18:03 MR: 22:49 MS: 8:35
10 SR: 6:23 SS: 18:04 MR: 23:53 MS: 9:16	11 SR: 6:21 SS: 18:05 MR: None MS: 10:02	12 SR: 6:20 SS: 18:07 MR: 0:55 MS: 10:55	13 SR: 6:18 SS: 18:08 MR: 1:53 MS: 11:54	14 SR: 6:16 SS: 18:09 MR: 2:46 MS: 12:59	15 SR: 6:14 SS: 18:10 MR: 3:34 MS: 14:08	16 SR: 6:13 SS: 18:11 MR: 4:17 MS: 15:19
17 SR: 6:11 SS: 18:12 MR: 4:56 MS: 16:30	18 SR: 6:09 SS: 18:14 MR: 5:32 MS: 17:40	19 SR: 6:08 SS: 18:15 MR: 6:06 MS: 18:49	20 SR: 6:06 SS: 18:16 MR: 6:40 MS: 19:56	21 SR: 6:04 SS: 18:17 MR: 7:15 MS: 21:01	22 SR: 6:02 SS: 18:18 MR: 7:51 MS: 22:03	23 SR: 6:01 SS: 18:19 MR: 8:30 MS: 23:01
24 SR: 5:59 SS: 18:20 MR: 9:11 MS: 23:56	25 SR: 5:57 SS: 18:22 MR: 9:56 MS: None	26 SR: 5:55 SS: 18:23 MR: 10:45 MS: 0:45	27 SR: 5:54 SS: 18:24 MR: 11:36 MS: 1:31	28 SR: 5:52 SS: 18:25 MR: 12:30 MS: 2:11	29 SR: 5:50 SS: 18:26 MR: 13:25 MS: 2:48	30 SR: 5:48 SS: 18:27 MR: 14:23 MS: 3:22

Planet View Info Report for March 1996

Mercury	Rise	Set	RA	Dec	Elongation	Ill. Fr	DIST(AU)
3/ 1/1996	5:58	16:02	21h31m32s	-16°31'48"	20°52'13"	0.824	1.22634
3/ 8/1996	6:00	16:32	22h14m37s	-13°11'17"	17°00'35"	0.881	1.29000
3/15/1996	6:01	17:07	22h59m30s	-8°49'14"	12°12'24"	0.933	1.33514
3/22/1996	6:00	17:47	23h46m26s	-3°28'34"	6°24'54"	0.978	1.35584
3/29/1996	5:59	18:32	0h35m54s	2°41'50"	1°17'39"	0.999	1.33979
Venus							
3/ 1/1996	8:14	21:39	1h28m39s	10°12'48"	43°35'37"	0.656	0.94262
3/ 8/1996	8:02	21:53	1h57m50s	13°31'37"	44°26'56"	0.627	0.89185
3/15/1996	7:51	22:07	2h27m02s	16°35'54"	45°08'56"	0.596	0.83996
3/22/1996	7:41	22:21	2h56m13s	19°22'20"	45°39'37"	0.563	0.78706
3/29/1996	7:32	22:33	3h25m10s	21°47'52"	45°56'11"	0.527	0.73327
Mars							
3/ 1/1996	6:46	17:53	22h53m08s	-8°10'59"	1°15'44"	1.000	2.37257
3/ 8/1996	6:31	17:54	23h13m35s	-6°01'33"	1°12'07"	1.000	2.37569
3/15/1996	6:15	17:55	23h33m49s	-3°49'51"	2°23'51"	1.000	2.37849
3/22/1996	6:00	17:55	23h53m52s	-1°37'03"	3°48'09"	0.999	2.38087
3/29/1996	5:44	17:56	0h13m48s	0°35'43"	5°14'53"	0.999	2.38276
Jupiter							
3/ 1/1996	3:43	12:49	18h51m00s	-22°44'59"	58°57'01"	0.993	5.68464
3/ 8/1996	3:20	12:27	18h55m52s	-22°39'20"	64°50'07"	0.993	5.58474
3/15/1996	2:56	12:04	19h00m19s	-22°33'43"	70°47'32"	0.992	5.48003
3/22/1996	2:32	11:41	19h04m18s	-22°28'22"	76°49'51"	0.991	5.37153
3/29/1996	2:08	11:17	19h07m47s	-22°23'29"	82°57'22"	0.991	5.26044
Saturn							
3/ 1/1996	7:21	18:58	23h45m09s	-3°48'15"	14°31'42"	1.000	10.53879
3/ 8/1996	6:55	18:35	23h48m17s	-3°27'51"	8°28'34"	1.000	10.56135
3/15/1996	6:30	18:11	23h51m28s	-3°07'20"	2°55'10"	1.000	10.57164
3/22/1996	6:04	17:48	23h54m39s	-2°46'53"	4°28'02"	1.000	10.56952
3/29/1996	5:38	17:25	23h57m50s	-2°26'39"	10°15'26"	1.000	10.55505
Uranus							
3/ 1/1996	5:00	14:30	20h20m38s	-20°04'19"	37°56'56"	1.000	20.52805
3/29/1996	3:14	12:46	20h25m28s	-19°48'50"	64°40'55"	0.999	20.16646
Neptune							
3/ 1/1996	4:36	14:03	19h55m04s	-20°18'48"	43°51'52"	1.000	30.87025
3/29/1996	2:48	12:17	19h57m50s	-20°11'03"	71°06'06"	1.000	30.47157

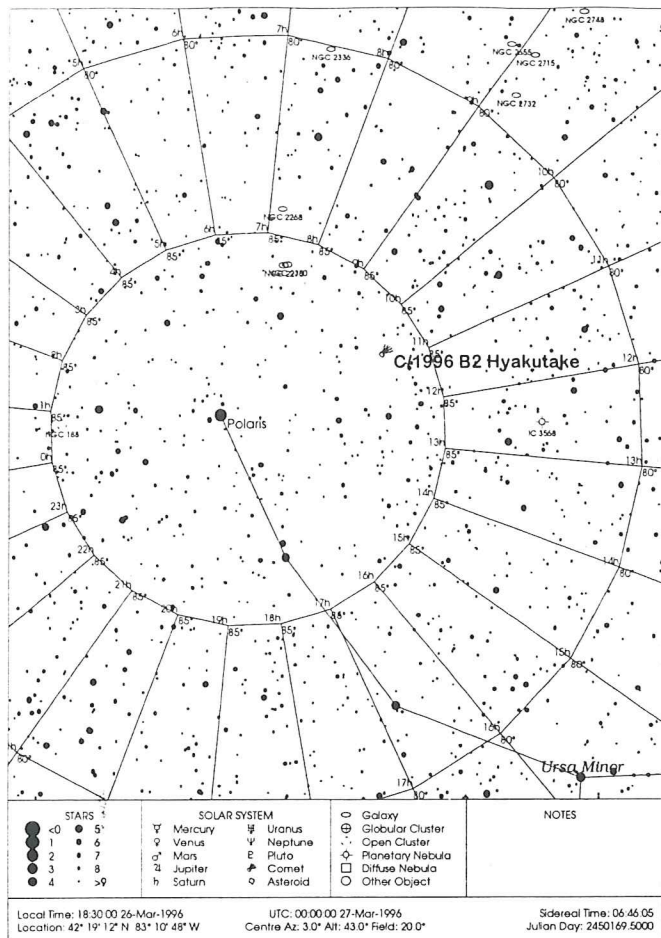
Planet/Moon Apisides/Conjunction/Opposition Report for March 1996

3/ 4/1996	Mars	@ Conjunction	Hour: 18
3/16/1996	Moon	@ Perigee	Hour: 01
3/17/1996	Saturn	@ Conjunction	Hour: 04
3/27/1996	Moon	@ Apogee	Hour: 22
3/28/1996	Mercury	@ Superior Conjunction	Hour: 01

Twilight Report for March 1996

Date	Sun Rise	Sun Set	Astronomical Begin	Astronomical End	Nautical Begin	Nautical End	Civil Begin	Civil End
3/ 1/1996	6:38	17:54	5:00	19:31	5:33	18:59	6:05	18:26
3/ 8/1996	6:26	18:02	4:49	19:39	5:22	19:07	5:54	18:34
3/22/1996	6:02	18:18	4:23	19:57	4:57	19:23	5:30	18:51
3/29/1996	5:50	18:26	4:10	20:06	4:44	19:32	5:18	18:59

Star Stuff



COMET HYAKUTAKE EPHEMERIS

Ephemeris (with perturbations) for Comet 1996 B2 Hyakutake by D.K. Yeomans, Feb. 12, 1996 (http://encke.jpl.nasa.gov/eph/96B2_2000_Yeomans.html). The apparent total magnitude predictions are rough estimates.

Date(UT)	R.A. J2000	Dec.	Delta	Deldot	r	Theta	Beta	Moon	PsAng	TMag
Mar 1	14 51 36.9	-22 43 29.0	.82	-58.0	1.52	113.4	36.9	115	289.6	6.9
Mar 3	14 52 31.2	-22 10 27.7	.75	-57.8	1.48	115.4	37.3	91	289.5	6.6
Mar 5	14 53 20.1	-21 29 43.2	.69	-57.7	1.44	117.4	37.6	67	289.3	6.3
Mar 7	14 54 03.0	-20 38 53.0	.62	-57.4	1.40	119.5	37.9	42	289.0	5.9
Mar 9	14 54 38.6	-19 34 28.8	.55	-57.1	1.37	121.8	38.1	16	288.5	5.6
Mar 10	14 54 53.3	-18 55 38.3	.52	-57.0	1.35	122.9	38.2	5	288.1	5.4
Mar 11	14 55 05.6	-18 11 13.1	.49	-56.8	1.33	124.1	38.2	13	287.7	5.2
Mar 12	14 55 15.1	-17 20 03.4	.45	-56.5	1.31	125.3	38.3	26	287.1	5.0
Mar 13	14 55 21.5	-16 20 38.8	.42	-56.2	1.29	126.6	38.2	40	286.4	4.7
Mar 14	14 55 24.3	-15 11 00.2	.39	-55.9	1.27	127.9	38.1	55	285.5	4.5
Mar 15	14 55 22.7	-13 48 27.6	.36	-55.4	1.25	129.2	38.0	69	284.4	4.2
Mar 16	14 55 16.0	-12 09 22.4	.33	-54.9	1.23	130.6	37.8	84	283.0	4.0
Mar 17	14 55 02.9	-10 08 38.4	.29	-54.1	1.21	132.1	37.5	99	281.1	3.7
Mar 18	14 54 41.7	-07 38 56.6	.26	-53.2	1.19	133.6	37.2	114	278.6	3.4
Mar 19	14 54 09.8	-04 29 32.9	.23	-51.8	1.17	135.1	36.9	129	275.2	3.0
Mar 20	14 53 23.4	-00 24 19.3	.20	-49.8	1.15	136.4	36.6	142	270.6	2.7
Mar 21	14 52 15.9	+05 01 17.6	.17	-46.8	1.13	137.3	36.7	153	264.1	2.3
Mar 22	14 50 36.0	+12 24 12.4	.15	-42.0	1.11	137.2	37.6	154	255.2	1.8
Mar 23	14 48 01.0	+22 35 11.3	.13	-34.4	1.09	134.8	40.4	143	243.8	1.4
Mar 24	14 43 39.9	+36 23 37.7	.11	-22.4	1.07	128.5	46.8	125	231.1	1.0
Mar 25	14 35 06.4	+53 37 34.9	.10	-5.7	1.05	117.5	57.5	103	219.7	.8
Mar 26	14 11 29.6	+71 48 49.6	.10	12.5	1.03	103.8	70.5	83	208.5	.7
Mar 27	10 40 48.6	+86 06 54.7	.12	27.4	1.01	90.8	82.5	70	154.1	.9
Mar 28	04 05 33.9	+78 48 46.9	.13	37.5	.98	80.5	91.7	66	55.4	1.1
Mar 29	03 32 31.2	+70 02 03.1	.16	43.7	.96	72.8	98.2	68	47.9	1.3
Mar 30	03 21 59.3	+63 31 41.5	.18	47.6	.94	66.9	102.7	75	46.1	1.6
Mar 31	03 16 46.0	+58 39 48.7	.21	50.0	.92	62.4	105.7	85	45.6	1.8
Apr 10	03 02 30.2	+40 34 50.5	.53	55.8	.69	40.3	110.2	130	43.5	2.5
Apr 20	02 50 47.7	+33 52 37.6	.85	57.4	.44	26.0	96.5	20	34.2	1.6
Apr 30	02 30 00.7	+24 04 37.0	1.16	41.7	.24	9.3	43.5	133	359.5	-4

RA J2000 Dec = Geocentric astrometric right ascension and declination referred to mean equator and J2000 equinox (with light time corrections).

Delta = Geocentric distance of object in AU
 Deldot = Geocentric radial velocity of object in km/s
 r = Heliocentric distance of object in AU
 Theta = Sun-Earth-Object angle in degrees
 Beta = Sun-Object-Earth angle in degrees
 Moon = Object-Earth-Moon angle in degrees
 PsAng = Position angle of extended radius vector in degrees
 TMag = Approximate Total magnitude

Ford Amateur Astronomy Club
 Star Stuff Newsletter
 P.O. Box 7527
 Dearborn, MI 48121

