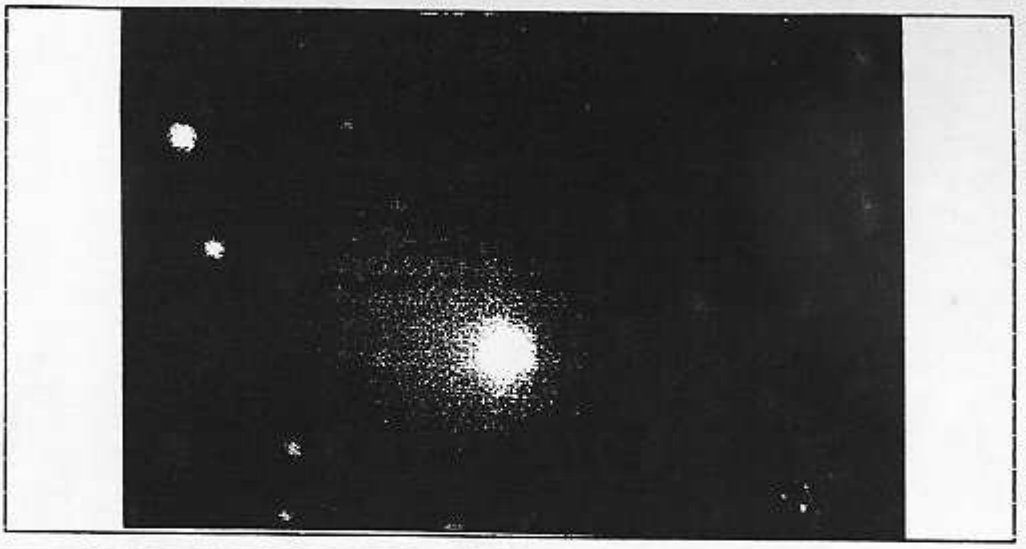
REFLECTIONS



March 1996

Comet Hyakutake (C/1996 B2) by Tony DeSalvo - This 45-second exposure was taken on the morning of February 25, 1996, using a 10" LX200 SCT at f/10 and a Meade Pictor 416 CCD imaging camera.

Chris Sarnecki
Editor

Of the University Lowbrow Astronomers

The University Lowbrow Astronomers is a club of Astronomy enthusiasts which meets on the third Friday of each month in the University of Michigan's Physics and Astronomy building (Dennison Hall, Room 807) Meetings begin at 7:30 pm and are open to the public Public star parties are held twice a month at the University's Peach Mountain Observatory on North Territorial Road (1.1 miles west of Dexter-Pinkney Road; further directions at the end of the newsletter) on Saturdays before and after the new Moon The party is canceled if it's cloudy or very cold at sunset For further information call club officers listed at the end of the newsletter

This Month:

March 15 - Meeting at 807 Dennison Members of the Lowbrows will be giving short talks on Comet Hyakutake.

March 16 - Public Star Party at Peach Mountain Observatory Recent predictions for Comet Hyakutake indicate this will be a significant event!!!

March 16 - Messier Marathon at Lake Hudson State Recreation Area, Clayton, Mi. See last month's newsletter for specifics.

March 19- New Moon at 5:45 am EST

March 23 - Public Star Party at Peach Mountain Observatory COMET HYAKUTAKE is approaching FIRST MAGNITUDE ! Grab your family and friends and head for Peach Mountain.

Next Month:

April 3 - Total Lunar Eclipse Total eclipse time begins at 6:26 pm and ends 7:53 pm

April 7 - Daylight Savings Time Begins

April 13 - Public Star Party at Peach Mountain Observatory Comet Hyakutake is approaching Algol, Beta Perseus and at mag 2.5

April 17 - New Moon at 6:49 pm EDT

April 19 - Meeting at 807 Dennison Annual club elections Be there so you can elect the Lowbrows who did not show up to club positions

April 20 - Public Star Party at Peach Mountain Observatory Astronomy Day Events with The Friends of Stichfield Woods out at Peach Mountain Contact Bernard Friberg to volunteer

Comets - A typical comet is but a few kilometers across it's solid head or **nucleus**. It has the constancy of a dirty snowball of frozen gases. When a comet approaches perihelion the nucleus **sublimates** (evaporates directly from a solid to a gas) to form a **coma** - a nebulous, luminescent cloud of gas and dust that may approach the size of the Earth. A dust tail forms which can extend millions of kilometers, equal to the distance from Earth orbit to Mars. A naked-eye comet is a rarity - maybe once or twice in a lifetime. It looks as if that time is here. Comet Hyakutake's closest approach to the Earth is March 26th. Don't miss it - Ed

FROM THE OBSERVATORY

by Bernard Friberg

February 18, 1996 - Congratulations Mark Vincent for being the first Lowbrow to find the newly discovered comet B2/ Hyakutake. This was accomplished on February 18th at 2:55 am. The eastern horizon was anything but dark. The humidity and the Detroit particulate matter acted as a conduit for the city lights. The comet was just barely above the pine trees when it was found in the constellation Libra. It took the 24 inch to spot this one. Since the comet brightness was just slightly brighter than the background, it did not appear to have much structure, and a tail was not visible. It looked like a faint fuzzball. The comet in the 6 " refractor was just barely perceptible and a smaller scope would be out of the question for finding it. The comet position was RA14h 45.5m, Dec -24d 23m.

February 25, 1996 - The comet was also found the following Sunday morning, February 25th, at 2:00 AM with the 24" looking through the pine trees. At1/2 magnitude brighter than the previous week the comet was easier to spot, even though we were looking through the trees. The eastern sky glow was about the same to maybe slightly darker. This comet is headed north, and expected to brighten to first magnitude the latter part of the month, and be 0.1 AU from the earth. This is suppose to be the brightest and best comet in the last 20 years or so, but we all have heard about great comet expectations in the recent past. See last month's article on Comet Hyakutake for an ephemeris. *[Dick Sider had his massive 11 x 80 binoculars out that night Comet Hyakutake was shinning at 7.5 mag and approximateiy 10 degrees above the horizon (still in the Detroit /Ann Arbor light pollution glow). The view was great ! I got a feeling that as this comet moves into the northern sky in late March, Dick's binoculars will be quite popular as this comet is expected to develop a significant tail. - Ed]*

March 9, 1996 - *Comet Hyakutake, shinning at 5.5 mag. is starting it's climb out of Libra. Tonight I found Bernard and Mark Cray out at the observatory. Just before midnight the Moon, just past full, rises through the tress. We attempt to locate Comet Haykutake four degrees away from the rising Moon. You can imagine what we saw in the scopes. The image of a polar bear in a blinding snow storm comes to mind. (I once tried to find a 6th mag comet during a full Moon and had to get up in the wee hours of the morning to do it!) Through out history comets have had a reputation of making people mad. Perhaps, nowadays they make Amateur Astronomers a little mad. - Ed*

COMET HYAKUTAKE TO APPROACH THE EARTH IN LATE MARCH 1996

by Ron Baalke, JPL, February 16, 1996

[Thanks to Kurt Hillig for submitting this artical - Ed]

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 (The Water-Snake) and Libra (The Scales), 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 next month. 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 and the specialists intend to make the most of it.

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', i.e. a little more than 100 times fainter than what can be seen with the unaided eye.

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 very powerful equipment (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., U.S.A.) 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 kilometres 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. Information about
some earlier comet encounters may be found in the Appendix at the end of this Press Release.

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 (The Dragon) 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 kilometres 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 of the comet in early February with telescopes at the ESO La Silla Observatory and elsewhere, an elongation is clearly visible (cf. ESO Press Photo 11/96) in the anti-sunward direction of the coma (the cloud of gas and dust that surrounds the cometary nucleus). A real tail has not yet developed, but this 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 kilometres.

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 (Flagstaff, U.S.A.) through special optical filters which isolate the light from different components of the coma, e.g. the light emitted by the OH-, C2- and CN-molecules in gaseous form and also the reflected sunlight from the dust grains. 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, cf. ESO Press Photo 12/96. 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 [1] 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 a straightforward extrapolation of the current brightness, it would appear

that Comet Hyakutake will reach magnitude 1 on March 25, 1996, at the time of the closest approach to the 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 in the sky. 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 kilometres, 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 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 the recent, great technological advances in this field, it should in principle be possible to 'image' the nucleus of Comet Hyakutake with some of the largest radio telescopes. Predictions for the appearance of the tail(s) at the encounter are still very uncertain, since their development has not yet 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.

Appendix: Comet encounters with the Earth - There is no doubt that the close encounter with C/1996 B2 (Hyakutake) is a relatively rare event. According to Brian Marsden (Central Bureau for Astronomical Telegrams of the International Astronomical Union, Cambridge, Mass., U.S.A.): The approach of C/1996 B2 to the Earth on March 25 (0.10 AU) [2] is the closest for any comet since 1983 (when there were two comets coming to 0.06 AU and 0.03 AU within a month of each other), and it is the fifth closest approach of any comet during the past century. What is unique about this comet is that no other comet is known then to have gone on to pass anything like as close to the Sun as this one does (0.23 AU on May 1). One of the 1983 comets had about twice this comet's perihelion distance, but the approach to the Earth was well after perihelion. There was possibly a comet with a perihelion distance comparable to this one that came closer to the Earth after perihelion in the year 400, but that is very uncertain. The time interval between passage near the Earth and subsequent passage near the Sun is longer for C/1996 B2 (37 days) than for any closer Earth approach since that of the famous Lexell comet in 1770 (43 days), that comet holding the record confirmed approach to the Earth (0.015 AU or 2.2 million kilometres). C/1996 B2 is intrinsically the brightest Earth-approacher since the early eighteenth century, and the 55 days between discovery and Earth approach is a record for apre-perihelic Earth approach.

More information about other close encounters and collisions of comets with the Earth may be found in an article by Zdenek Sekanina and Don Yeomans (Jet Propulsion Laboratory, CALTECH, Pasadena, U.S.A.) which appeared in 1984 in theAmerican journal The Astronomical Journal, Volume 89, page 154.

Notes:
[1] Prominent examples are Comet Kohoutek in 1973 and Comet Austin in 1990.
[2] 1 Astronomical Unit (AU) = 149.6 million kilometres (the mean distance between the Earth and the Sun).

Note also that ESO has set up a special Home Page for the Comet Hyakutake event (http://www.eso.org/educnpubrelns/comet-hyakutake.html) where new information from ESO will be brought.

Naked Eye Viewing of C/1996 B2 (Hyakutake) (California, USA Edition)

Charles S. Morris and Stephen J. Edberg Jet Propulsion Laboratory, California Institute of Technology

Last Updated: 6 Mar 1996

Observing Hints:

- The comet will look much better from a dark sky. This is particularly true for late March when the head of the comet will be very large.
- Let your eyes get dark adapted. This requires at least 20-30 minutes for most folks.
- Be kind to your eyes and your fellow observers...use a red flashlight. This won't hurt your dark adaption (unless it is too bright)! Don't have a red flashlight? Put red paper or even a layer of brown paper bag over your white light flashlight. To get the correct brightness level, go into a dark room (without windows). You should be able to see the floor (or ground) in front of you, but not much more. If you see more, the light is too bright.
- Most importantly, contact your local astronomical society or planetarium. They will probably be having a "star party" to show folks the comet. You will get the most out of the experience this way.
- We strongly recommend that you take a simple star chart with you when you go to observe the comet.

Definitions:

Coma or Head of the Comet: The dust and gas that surrounds the comet's nucleus. This will typically look round or, if the tail is bright, parabolic in shape. The coma will usually appear fuzzy (like in March), but can be well-defined with sharp boundaries when the comet is close to the Sun (in mid- to late April). Often there is a bright central "star" in the coma. This is not the actual nucleus of the comet, but rather the material that surrounds the nucleus. We can't see the nucleus directly.

Tail: When the comet comes close to the Sun, the dust and gas is pushed away from the comet's head. This extension from the coma is called the tail. Tails typically point away from the Sun. They can be straight, curved, or fan-shaped. A comet can have more than one tail. Tails can be quite bright or rather faint.

Half a Degree in the Sky: The size of the full Moon.

One Degree in the Sky: Two full Moons or one finger held at arm's length.

Ten Degrees in the Sky: Width of one fists at arm's length.

Alpha, Beta, Gamma, etc.: Are (usually) the brightest, second brightest, and third brightest stars in a constellation.

The following is for California or the West Coast of the USA (8 hours earlier than Greenwich Mean Time).

The positions will be close for all the USA and Canada. Times for Moonset are specific to Southern California, but will be close across North America.

Note: The brightness, size of the comet's coma, and tail length are all educated guesses based on the current (3/6/96) information concerning the comet. Comet's are unpredictable so this is only a guide as to what to expect. (If an error is found in this write-up, each author blames the other.)

March 14-15, 1996: The comet will be located about three degrees north and slightly east of the star Alpha Libra. The brightness of the coma should be only slightly fainter than Alpha Libra, but because that brightness will be spread over half a degree (about the same size as the full Moon), the comet will appear quite a bit less obvious than the star. A faint tail will be visible in binoculars pointing toward the west. The comet will be at its highest point in the sky (looking due south) at about 3 AM.

March 19-20, 1996: The comet will be located in eastern Virgo (about 1/3 of the way from Beta Libra to Arcturus [Alpha Bootes]). Over the past five days the comet has traveled north nearly 15 degrees and it has brightened significantly. The comet shines at magnitude ~1.5 (or just slightly brighter than the middle star in the Big Dipper's handle. As the comet approaches the Earth, the coma or head of the comet also grows in size, perhaps reaching a degree in diameter on this date. The comet's brightness is spread over that area. The comet, if observed from dark skies, should be display a tail faintly visible to the naked eye. In binoculars, the tail may reach 5-10 degrees in length. The best time to see the comet is still about 3 AM.

March 20-21, 1996: The comet has moved about six degrees north near the border of Virgo and Bootes (half the distance between Arcturus and Beta Libra). Its magnitude is now about 1.1 or slightly brighter than Deneb, the brightest star in Cygnus (or the Northern Cross), visible in the northeast sky at 3 AM. The comet's coma now covers over a degree of the sky making the comet much less obvious than Deneb, but still an impressive sight.

March 21-22, 1996: As it continues its northward trek, the comet is located about 10 degrees southeast of Arcturus. The tail, which has grown, is now pointing toward the southwest. The comet is best seen at about 2:30 AM.

March 22-23, 1996: The comet will have moved another 11 degrees northward and will be situated near the star Epsilon in the constellation Bootes, about 10 degrees northest of Arcturus. In fact, the star Epsilon may be within the comet's coma. The comet's head is only slightly fainter than Vega in the constellation Lyra.

which is high in the northeast sky above Deneb at 2:30 AM

March 23-24, 1996: Hyakutake continues its rush toward the Earth and moves another 15 degrees north. Located about four degrees to the south-southeast of Gamma Bootes and six degrees southeast of Beta Bootes, the comet is now about as bright as Arcturus and about 17 degrees north of it. Its motion is obvious over a minute or two in binoculars. The comet's tail should be pointing southwest. The comet is highest in the sky at about 2 AM, but will be visible for much of the night.

March 24-25, 1996: The night of Hyakutake's closest approach...the comet moves some 18 degrees or an average of 0.75 degrees an hour! Motion is obvious to the naked eye over several minutes. Through a small telescope, background stars seem to float past the comet. The comet's coma may be as much as two degrees or more in diameter. A faint tail will be visible in dark skies extending 10 - 20 degrees (or perhaps even more in binoculars). From the city, the comet appears like a large, strongly condensed (sharp brightening towards the center) fuzz ball. The comet starts the evening about 10 degrees from the end star of the Big Dipper's handle - above the handle. Over the night it moves six degrees further north. The comet should be at its brightest and largest during this night.

March 25-26, 1996: The comet will be located just off the Little Dipper's cup (or bowl) as it continues to move north and now to the west. Its brightness and size should remain near peak values.

March 26-27, 1996: The comet is sitting next to Polaris, the North Star, which will appear faint in comparison. The comet is just past its most northerly point and is heading south and west. The tail has swung around and is now pointing toward the east. The first quarter Moon is beginning to interfere with observing the comet. The best observing is after Moon set (1:05 AM).

March 27-28, 1996: The comet is now noticeably fainter and the tail has begun to shrink. The comet is situated about 15 degrees from Polaris, along the line from cup of the Little Dipper through Polaris. The Moon sets at 1:47 AM.

March 28-29, 1996: The comet is sitting on a line extended from Delta through Epsilon Cassiopeia (the two stars on the squashed end of Cassiopeia's W) about 10 degrees from east of Epsilon. The Moon sets at 2:47 AM.

March 29-30, 1996: The comet is now 10 degrees due east of Cassiopeia's W on the line from Gamma (the middle star in the W) to Epsilon Cassiopeia (the end star on the squashed end of the W). The comet is now a factor of six fainter than just five days ago. The comet's coma has also shrunk by a factor of two. The Moon sets at 3:03 AM.

March 30-31, 1996: This is the last night that the comet is circumpolar, never setting below a flat horizon, for Southern California. The only time to see the comet in a dark sky is to catch it at the beginning of morning twilight when the comet is less than seven degrees above the north-northeast horizon. The Moon sets at 3:39 AM.

April 1-4, 1996: The Moon interferes with viewing the comet. It should be noted that early in the evening of April 3rd, a lunar eclipse will be visible from the Eastern US. This will provide an opportunity to observe the comet in a darker sky. The Western US will not see the total phase of the eclipse and thus, it will not gain any advantage in viewing the comet.

April 5-26, 1996: The comet will be visible in the northwest sky (starting about 30 degrees off the horizon at the end of twilight) as a fuzzy star with a tail. The comet should fade at first, but by April 10th it will be brightening each night. The comet will be easier to pick out than in late March because the head will be smaller and the tail should be brighter. As it sinks lower towards the northwest horizon each night, the tail should grow brighter and longer. It is possible that the comet's head will equal the brightness of Sirius (low in the southwest after dark, the brightest star in the sky) by the 26th, and the tail could stretch 15 - 30 degrees in length. On the 26th, the comet will set at the end of astronomical twilight and thus, will not be visible in a totally dark sky. However, the tail may be visible after the comet's head has disappeared below the horizon. The comet will remain visible for two or three more days in bright twilight before disappearing for good (for the Northern Hemisphere) in the Sun's glow.

Closest Approaches to the Earth by Comets

from MPC

The following table lists, in order of increasing geocentric distance, the closest known approaches to the Earth by comets. In order to qualify for this listing, the approach must have occurred during an observed apparition, although in some cases the object was not under observation at the time of closest approach. A list of closest approaches to the Earth by minor planets is also available. The dates of closest approach are given in Terrestrial Time (TT), although at the precision of this table they can be considered to be in Universal Time (UT). For comparison, the mean distance of the Moon is 0.0026 AU = 384400 km = 238900 miles. (1 AU is approximately the mean distance of the Earth from the Sun = 149597870 km = 92955810 miles.)

Distance (AU)	Date (TT) Permanent designation
0.0151	1770 July 1.7 D/1770 L1 (Lexell)
0.0229	1366 Oct. 26.4 55P/1366 U1 (Tempel-Tuttle)
0.0312	1983 May 11.5 C/1983 H1 (IRAS-Araki-Alcock)
0.0334	837 Apr. 10.5 1P/837 F1 (Halley)
0.0366	1805 Dec. 9.9 3D/1805 V1 (Biela)
0.0390	1743 Feb. 8.9 C/1743 C1
0.0394	1927 June 26.8 7P/Pons-Winnecke
0.0437	1702 Apr. 20 2 C/1702 H1
0.0617	1930 May 31.7 73P/1930 J1 (Schwassmann-Wachmann 3)
0.0628	1983 June 12.8 C/1983 J1 (Sugano-Saigusa-Fujikawa)
0.0682	1760 Jan. 8.2 C/1760 A1 (Great comet)
0.0839	1853 Apr. 29.1 C/1853 G1 (Schweizer)
0.0879	1797 Aug. 16.5 C/1797 P1 (Bouvard-Herschel)
0.0884	374 Apr. 1.9 1 P/374 E1 (Halley)
0.0898	607 Apr. 19.2 1P/607 H1 (Halley)
0.0934	1763 Sept.23.7 C/1763 S1 (Messier)
0.0964	1864 Aug. 8.4 C/1864 N1 (Tempel)
0.0982	1862 July 4.6 C/1862 N1 (Schmidt)
0.1019	1996 Mar. 25.3 C/1996 B2 (Hyakutake)
0.1019	1961 Nov. 15.2 C/1961 T1 (Seki)

Note: This list is complete for comets discovered after 1700 that approached the Earth to within 0.1020 AU. It also includes a number of well-documented earlier approaches by periodic comets. C/1491 B1 allegedly came to within 0.0094 AU on 1491 Feb. 20.0 TT, but the orbit of this comet is very uncertain. Additional (uncertain) ancient approaches are given in `Close Encounters and Collisions of Comets with the Earth' by Z. Sekanina and D. K. Yeomans (Astron. J. 89, 154-161).

Fly Your Name on the Cassini Spacecraft

Ron Baalke, JPL

[Thanks to Kurt Hillig for submitting this artical - Ed]

To fly your name, simply mail a plain postcard with your signature on the non-address side to:

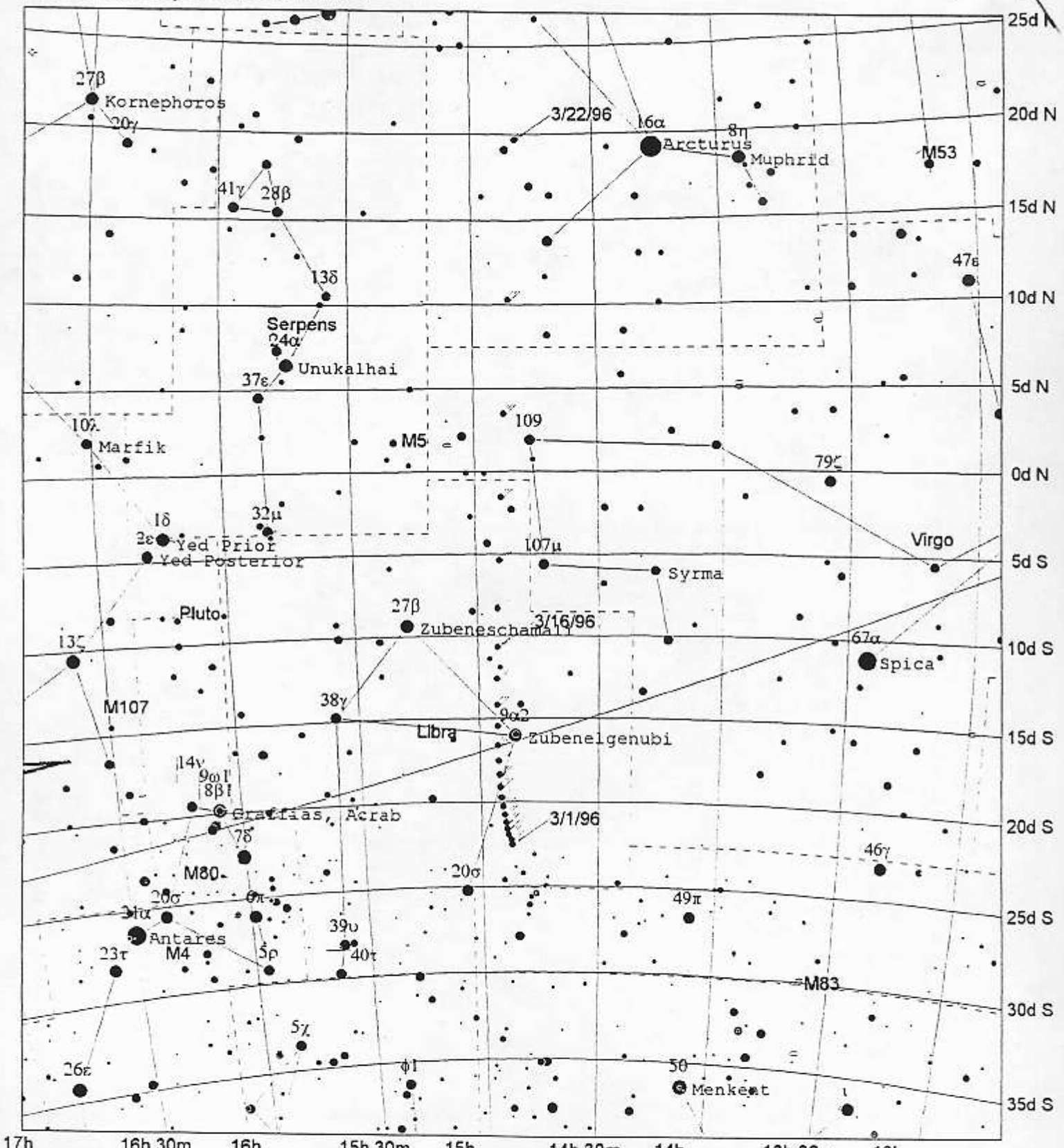
Suzanne Barber
M.S. 264-441
Jet Propulsion Laboratory (JPL)
4800 Oak Grove Drive
Pasadena, CA 91109-8099

Here is how it works.

Your signature will be scanned from the postcard and stored on a CD-ROM. The CD-ROM will be placed inside the Cassini spacecraft, and your signature (along with many others) will be flown on a deep-space journey, with plans to go into orbit around the ringed-planet Saturn in the next decade. Postcards will be accepted until June 1, 1996, or until the CD- ROM is full.

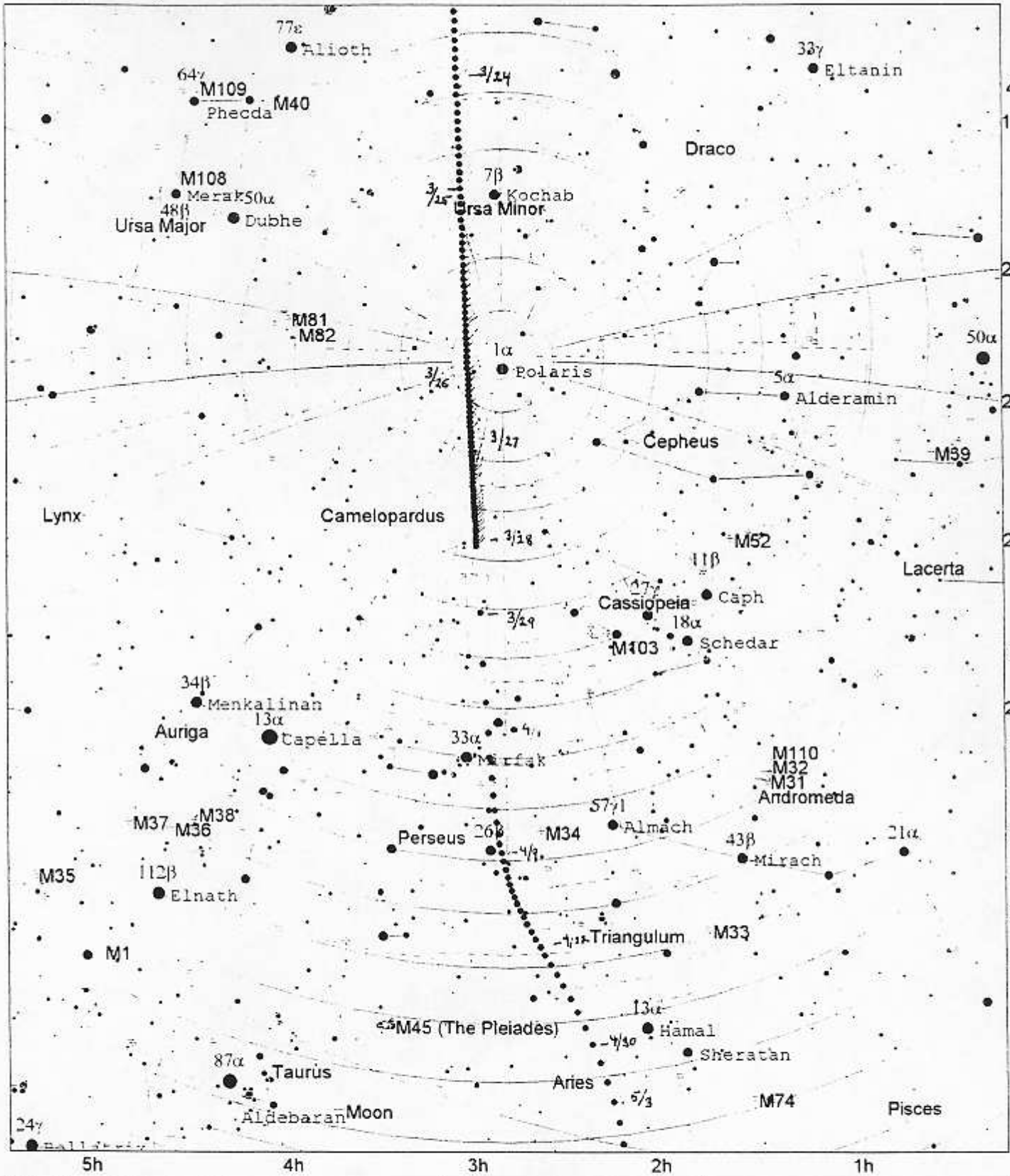
Notification will appear on this page when postcards can no longer be accepted. So, mail early and reserve a place for your name on this historic flight. It's that simple. In fact, you can even have your friends and family members sign the same postcard as yourself.

It is both fun and personally exciting to imagine one's signature aboard a large robot craft bound for another planet. You can be proud to be a member of a society that has made this possible by its quest to explore and its pursuit of new knowledge.



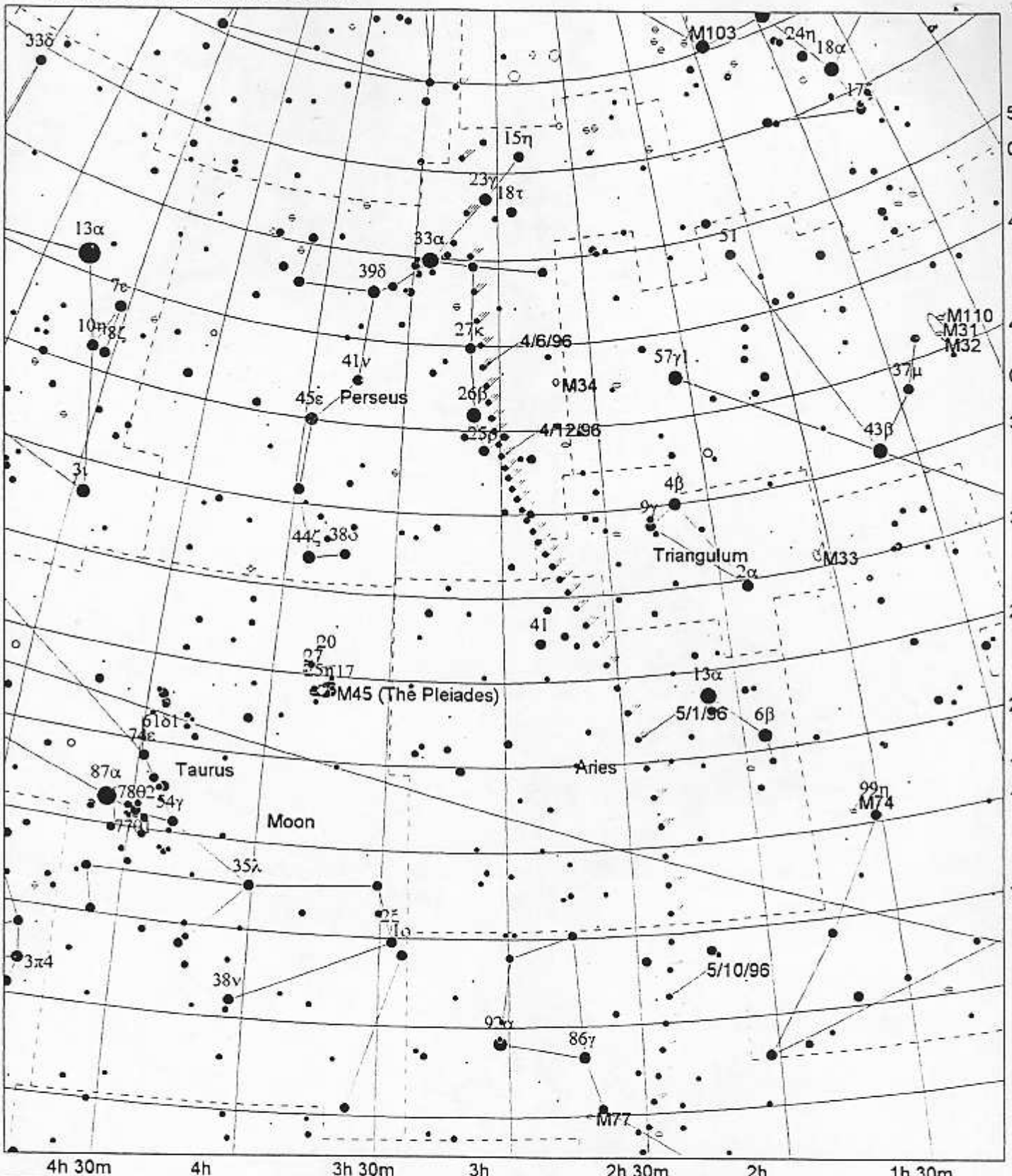
Star Magnitudes			
0 1 2 3 4 5	Variable Star	Open Cluster	Pluto
6 7 8 9 10 11	Double Star	Globular Cluster	
	Galaxy	Cluster+Nebula	
	Nebula	Prob. Star	
	Planetary Neb.	Other NGC Objects	

Center RA:14h 51m Dec: 6d 14m S



Star Magnitudes			
0 1 2 3 4 5	Variable Star	Open Cluster	Moon
6 7 8 9 10 11	Double Star	Globular Cluster	
	Galaxy	Cluster+Nebula	
	Nebula	Prob. Star	
	Planetary Neb.	Other NGC Objects	

Center RA: 2h 57m Dec: 68d 12m N

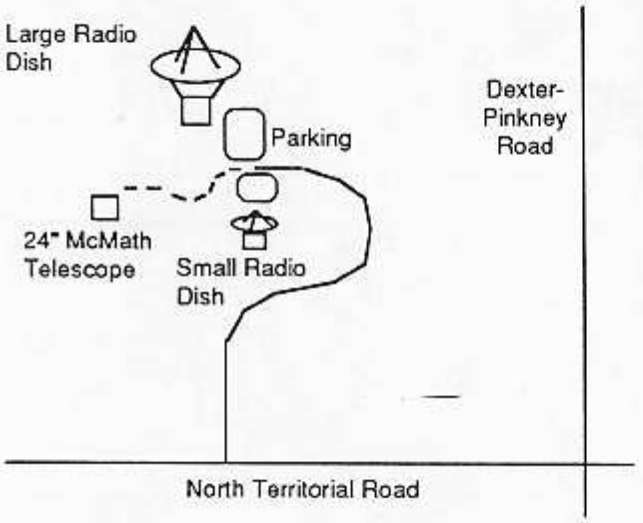


Center RA: 2h 59m Dec: 30d 57m N

Places:

Dennison Hall, also known as The University of Michigan's Physics and Astronomy building, is the site of the monthly meeting of the University Lowbrow Astronomers. It is found in Ann Arbor on Church Street about one block north of South University Avenue. The meeting is held in room 807.

Peach Mountain Observatory is the home of The University of Michigan's 25 meter radio telescope as well as the University's McMath 24 inch telescope which is maintained by the Lowbrows. The observatory is located northwest of Dexter. The entrance is on North Territorial Road, 1.1 miles west of Dexter-Pickney Road. A small maize-and-blue sign marks the gate. Follow the gravel road one mile to a parking area near the radio telescopes. Walk along the path between the two fenced in areas (about 300 feet) to reach the McMath telescope building.



Times:

Monthly meetings of the Lowbrows are held on the 3rd Friday of each month at 7:30 PM in 807 Dennison Hall. During the summer months, and when weather permits, a club observing session at Peach Mountain will follow the meeting.

Computer subgroup meetings are held on the first of each month, rotating among member's houses. See the calendar on the cover page for the location of next meeting.

Public Open House/Star Parties are held on the Saturday before and after each new Moon at the Peach Mountain Observatory. Star Parties are canceled if the sky is cloudy at sunset or the temperature is below 10 degrees F. Call 480-4514 for a recorded message on the afternoon of a scheduled Star Party to check on the status. Many members bring their telescopes and visitors are welcome to do likewise. Peach Mountain is home to millions of hungry mosquitos - bring insect repellent, and it does get cold at night so dress warmly !

Dues:

Membership dues in the University Lowbrow Astronomers are $20 per year for individuals or families, and $12 per year for students. This entitles you to the monthly REFLECTIONS newsletter and the use of the 24" McMath telescope (after some training). Dues can be paid to the club treasurer Doug Scobel either at the monthly meeting or by mail at:

Doug Scobel
1426 Wedgewood Drive
Saline, MI 48176

Magazines:

Members of the University Lowbrow Astronomers can get a discount on these magazine subscriptions:

Sky and Telescope: $24 / year
Astronomy: $20 / year
Odyssey: $16.95 / year

For more information contact the club Treasurer. Members renewing subscriptions are reminded to send your renewal notice along with your check when applying through the club Treasurer.

Newsletter Contributions:

Members and (non-members) are encouraged to write about any astronomy related topic of interest. Call the Newsletter Editor Chris Sarnecki at 426-5772 or e-mail to chrisandi@aol.com to discuss length and format. Announcements and articles are due by the first Friday of each month. Articles should be mailed to:

Christopher Sarnecki
4835 Holly Way
Ann Arbor, MI 48103

Telephone Numbers

President:	Bill Razgunas	995-0934
Vice Pres:	Mark Cray	283-6311
	DC Moons	254-9439
	Tom Pettit	878-0438
	Tom Ryan	662-4188
	Randy Stevenson	429-5099
Treasurer:	Doug Scobel	429-4954
Observatory Director:	Bernard Friberg	761-1875
Newsletter:	Chris Sarnecki	426-5772
Peach Mtn Keyholder:	Fred Schebor	426-2363

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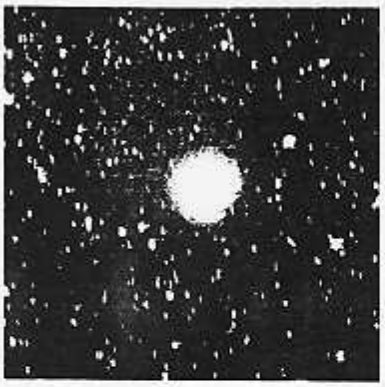

Comet Hale-Bopp (Hubble Space Telescope release October 10, 1995) -The full-field picture, taken with the Wide Field Planetary Camera 2 (in WF mode), shows the comet against a stellar backdrop in the constellation Sagittarius. The stars are streaked due to a combination of Hubble's orbital motion and its tracking of the nucleus, which is now falling toward the Sun at 33,800 miles per hour (54,000 km/hr). Credit: H.A. Weaver (Applied Research Corp.), P.D. Feldman (The Johns Hopkins University), and NASA

MONTHLY MEETING:

SELECTED LOWBROWS WILL BE SPEAKING ON COMET HYAKUTAKE

The meeting starts at 7:30 pm, Friday, March 15th in Room 807 of Dennison Hall (Physics & Astronomy Building)

University Lowbrow Astronomers
1740 David Ct.
Ann Arbor, MI 48105

Check your membership expiration date on the mailing label !