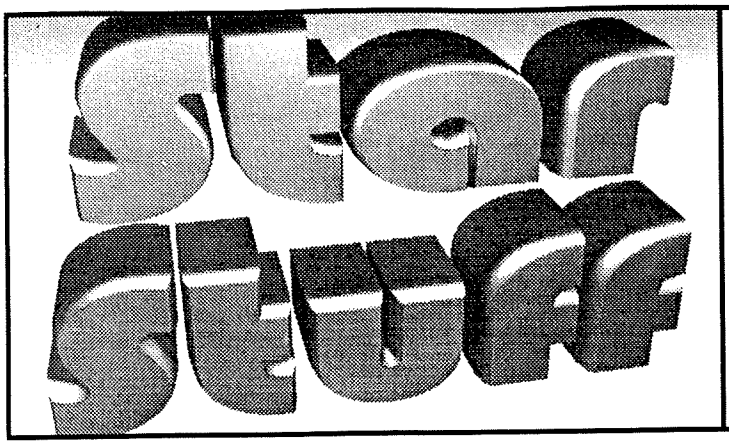

The Ford Amateur Astronomy Club Newsletter

Volume 5, Number 12 December 1996

HUBBLE SPIES SUPERSONIC "COMET-CLOUDS" IN HEART OF GALAXY

HST Press Releases from the ST Scl Office of Public Outreach

Analyses of dramatic images by NASA's Hubble Space Telescope reveal immense comet-shaped knots of gas in the heart of the Cartwheel galaxy, a peculiar looking wagon-wheel shaped galaxy which collided with another galaxy. Their discovery may eventually help explain why the center of the Cartwheel galaxy has little star formation, and what causes the unusual spoke pattern between the bright outer ring of young stars and the mysterious, dusty galactic nucleus.

A team of astronomers used Hubble's Wide Field Planetary Camera 2 to probe the nucleus of the Cartwheel galaxy, which has an unusual network of dust lanes but lacks giant starbirth regions found in our own Milky Way. They were surprised to find comet like features crossing a dust lane. The objects uncovered by Hubble really aren't comets because they are far too huge.

The "heads" are a few hundred light-years across and the tails are more than 1,000 light-years long, the longest being nearly 5,000 light-years long. The "comet heads" are most likely vast clouds of molecular hydrogen, similar to those found in our own Milky Way galaxy. The "tails" are an incandescent wake of hot glowing gasses and possible newborn stars, as suggested by their bluish color in the Hubble images.

The structures look like comets because they probably result from a collision between high speed and slower moving material. This creates an arrowhead-shaped pattern called a bow-shock, similar to the wake of a boat speeding across a lake. Researchers conclude the maelstrom was kicked up by a nearly head-on collision between the Cartwheel galaxy and a smaller galaxy 200 million years ago. This makes the Cartwheel galaxy a unique laboratory for studying supersonic collisions between massive clouds and large scale "ripples" of gas created by the collision.

One possible explanation for the features results from the fact that during the collision gas clouds are pulled inward, but afterwards they are released to oscillate around their original position like a plucked guitar string. (These oscillations are around the balance point between centrifugal and gravitational forces). Comets may result when large clouds plowing through space at nearly 700,000 miles per hour, smash into a ring of gas and dust pushing outwards as part of the next oscillation.

A second explanation is that the spokes and "comets" may represent a later stage where material begins falling back into the galaxy — a phenomena not seen in most other ring-shaped galaxies younger than the Cartwheel. In this scenario, the molecular cloud "comet heads" were first splashed out from the galaxy's plane, and, like a baseball tossed into the air, the clouds slowed and then fell back into the galaxy. As they plummet, they locally heat interstellar gas to more than a million degrees Fahrenheit.

The new findings were made by Curt Struck, Philip Appleton (Iowa State University), Kirk Borne (Hughes STX Corporation), and Ray Lucas (Space Telescope Science Institute). Their results appear in the November issue of the Astronomical Journal.

The puzzling findings call for a variety of follow-on observations, including spectroscopy of the "comets" and X-ray observations to search for shocked gas in the nucleus.

HUBBLE IMAGES REVEAL SUPERSONIC COMET-LIKE OBJECTS

Researchers analyzing the Hubble Space Telescope's dramatic pictures of the Cartwheel galaxy have discovered immense comet-like clouds of gas speeding through the heart of the galaxy at nearly 700,000 mph.

[Image on left] - Located 500 million light-years away in the constellation Sculptor, the galaxy looks like a wagon wheel. The galaxy's nucleus is the bright object in the center of the image; the spoke-like structures are wisps of material connecting the nucleus to the outer ring of young stars. The galaxy's unusual configuration was created by a nearly head-on collision with a smaller galaxy about 200 million years ago.

[Image on right] - This close-up image of the galaxy's nucleus reveals the comet-like knots of gas. These knots are mostly confined to the core's left side and appear as white streaks inside the blue ring. The "heads" are a few hundred light-years across; the tails are more than 1,000 light-years long, the longest of which is nearly 5,000 light-years. The structures look like comets because they probably were spawned by a collision between high-speed and slower-moving material. This collision created an arrowhead-shaped pattern called a bow shock, which is similar to the wake of a boat speeding across a lake.

The images were taken October 16 and 17, 1994 by the telescope's Wide Field and Planetary Camera 2.

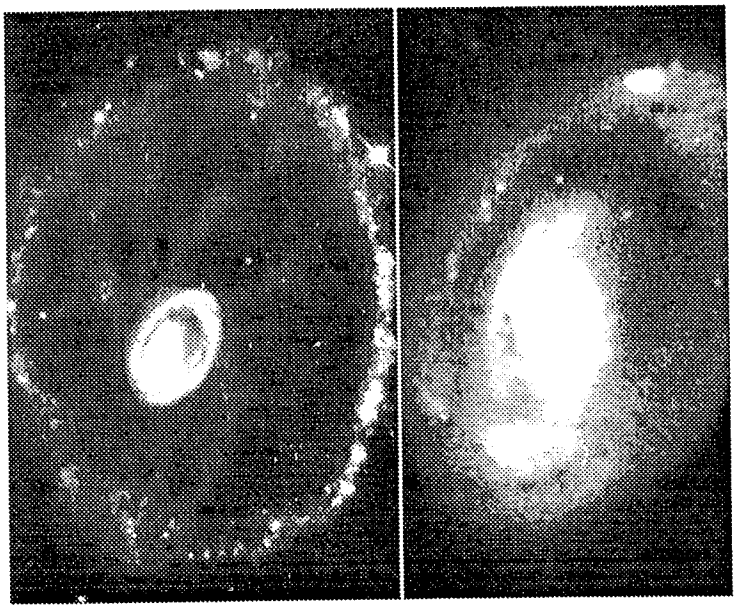

PHOTO NO.: STScI-PRC96-36a

Credits: Curt Struck and Philip Appleton (Iowa State University), Kirk Borne (Hughes STX Corporation), and Ray Lucas (Space Telescope Science Institute), and NASA

☆

IN PRAISE OF SMALL APERTURES

by David W. Knisely (dk84538@navix.net) via sci.astro.amateur

I have seen some individuals on the net making claims about small aperture Deep-Sky instrument performance which are often quickly challenged by others. After my many years observing with larger telescopes, I fondly recalled the difficulties and triumphs of my early days with my trusty (or is it rusty?) Sears Discoverer 2.4" (60mm f/11.67) refractor, so I thought it might be fun to see what it could still do as far as Deep-Sky observing is concerned. The mount of the 2.4 gave up the ghost some time ago, so I got out my old variable aperture off-axis stop I built for double star resolution tests and put it on my 10" f/5.6 Newtonian to really get an idea of what could be expected with smaller apertures. It allowed me to assess performance for 50, 60, 70, 80, and 94mm aperture systems.

Maybe its better eyepieces, years of observing experience, a good site, or a combination of all these factors, but under dark sky conditions (limiting naked-eye magnitude +6.8, 1" arc seeing, 47x, 94x), the smaller apertures performed surprisingly well. I started with something easy: M33. With the full 10 inch aperture, spiral arms and star clouds were easy to see, although they were somewhat diffuse. I was startled to see that when I stopped down to 94mm, I could still just begin to see the spiral structure of the galaxy. There was extensive mottling in the area surrounding the nucleus, although the very outermost sections visible in the full 10 inch aperture had vanished. Even little NGC 604 (the HII region) remained plainly visible at 94x as I stopped down to 70mm. The hints of mottling were still present even at 60mm, although there was no clear spiral structure. I don't remember my old 2.4" doing that well!

The next target was M57: the Ring Nebula. My old notes from my 2.4" observations indicated that I had some trouble seeing any ring shape with it. However, at 94x, the ring shape was obvious with the 80mm stop, and was still just visible at 50mm! It looked like one of those faint annular planetaries I like hunting down with the full aperture. Clearly, many of the observing books and guides are a little too pessimistic about small aperture Deep-Sky performance.

NGC 7293 (Giant Helical Nebula) offered a bit more of a challenge, but one which was met by the smaller apertures. 10x50 Binoculars easily showed the object as a dim diffuse disk, but I was still a bit surprised when the diffuse ring was clearly (but dimly) visible in every aperture except the 50mm, (marginal there, but I still could see a hint of it). Contrary to the opinions of some so-called "experts", nebular filters did indeed help the visibility of the Helix in these smaller apertures. The OIII filter did boost the contrast enough so that even the 60mm showed a little improvement.

The Veil Nebula upped the stakes a little. It was not very bright in any of the smaller apertures, but it was just visible, and again a nebular filter helped. In the 60mm, the long arc was barely seen (even without a filter), and the portion running through 52 Cygni required an 80mm aperture and the OIII to be noticed. I suppose it helps to know the object and field beforehand, but it's still a little surprising to see how far you can really go with smaller apertures.

Globular clusters offered a bit different sort of a challenge, but again, the small apertures did perform. On M15 at 94mm, many of the outlying stars were visible, and the object obviously appeared to be a slightly hazy cluster. As I reduced the aperture, the number of stars visible dropped, and the cluster became more nebulous. At 70mm, the cluster showed only a scattering of outlying stars, along with a granular appearance, although the bright central core remained tiny and easy to see. At 60mm, only the granular appearance and the bright core were seen. Perhaps higher power would have helped, but it's still surprising when an aperture less than 4" shows a lot of stars in a globular.

A last challenge was the edge-on spiral galaxy NGC 891 in Andromeda. Its elongated shape was visible with the 80mm and 94mm apertures, but the galaxy became difficult in the 70mm and 60mm. In fact, unless I had previously known what I was looking at, I doubt I could have found it with anything less than the 70mm at 47x. After using the smaller stops, I went back to full-aperture to view the dark lanes in the galaxy, but I still found it remarkable that this faint 12th magnitude galaxy was visible with such small telescopes.

And now, a note to small telescope users. Please don't get discouraged when you see talk about huge telescopes and faint objects. Your equipment is usually inexpensive, sets up quickly, won't give you much back trouble when moving it, and can still show you many things in deep space which some "conventional" wisdom says you can't possibly see. Get out into as dark an environment as you can, get dark adapted, learn the proper observing techniques, and forget about what some others might say. Limits to viewing do exist, but not everyone (or every instrument) has the same limits. ☆

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.

WWW PAGE

Computers inside the Ford network or on the Internet can access the F.A.A.C. web page at one of the following addresses:

Ford Intranet:	http://pt0106.pto.ford.com/faac/faac.html
Internet:	http://kode.net/~dougbock/faac

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

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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. Subscriptions are free to other astronomy clubs wishing to participate in a newsletter exchange.

DECEMBER 1996

SUN	MON	TUE	WED	THU	FRI	SAT
1	2	3	4	5 FAAC Meeting	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	31				

Dec 03 Last Quarter Moon (12:08 am).
Dec 06 Comet Wilson-Harrington Perihelion (1.000 AU)
Dec 07 Possible Mars Occultation of PPM 118840 (8.8 Magnitude Star)
Dec 09 Asteroid Kalliope at Opposition
Dec 10 New Moon (11:56 am)
Dec 13 Geminids Meteor Shower
Dec 15 Mercury At Its Greatest Eastern Elongation (20 Degrees)
Dec 17 First Quarter Moon (4:32 am)
Dec 17 Possible Mars Occultation of 86130 (9.0 Magnitude Star)
Dec 20 Comet Kojima Near-Jupiter Flyby (0.1440 AU)
Dec 21 Winter Solstice
Dec 22 Ursids Meteor Shower
Dec 24 Full Moon (3:41 pm)
Dec 25 Asteroid 1994 WR12 Near-Earth Flyby (0.0978 AU)
Dec 29 Jupiter Occults 188551 (7.5 Magnitude Star)
Dec 30 Comet 1996 J1 (Evans-Drinkwater) Perihelion (1.3 AU) ☆

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, January 23, at 5:00 pm.**

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. ☆

DECEMBER SPACE HISTORY

The following December events come from the 11/26/96 edition of "Space Calendar." This calendar is compiled and maintained by Ron Baalke (baalke@kelvin.jpl.nasa.gov).

Dec 02 25th anniversary (1971), Mars 2 orbit insertion/Mars landing
Dec 14 Tycho Brahe's 450th birthday (1546)
Dec 15 30th anniversary (1966), Dollfus' discovery of Saturn moon Janus
Dec 21 30th anniversary (1966), Luna 13 launch (Soviet Moon lander)
Dec 27 Johannes Kepler's 425th birthday (1571) ☆

DECEMBER 1996 SPACE EVENTS

The following December 1996 events come from the 11/26/96 edition of "Space Calendar." This calendar is compiled and maintained by Ron Baalke (baalke@kelvin.jpl.nasa.gov). Note that launch dates are subject to change.

Dec 02 Mars Pathfinder Delta 2 launch (Mars Lander/Rover)
Dec 15 Galileo, Orbital Trim Maneuver #16 (OTM-16)
Dec 19 Galileo, 1st Europa Flyby (Orbit 4)
Dec 22 Galileo, Orbital Trim Maneuver #17 (OTM-17) ☆

AN UNUSUAL WINTER NEBULA

By Stephen R. Waldee (toccata@ix.netcom.com) via sci.astro.amateur

This observer seldom searches the lower-declination constellations from the light-polluted viewing sites near the Santa Clara valley, preferring to observe near the zenith in order to maximize image contrast. On one of my rare forays into the lower declinations during the week after Thanksgiving in 1995, I first observed an object that will be familiar to deep-sky trollers in the darker regions of the country. I have been so struck by the outstanding brightness and detail of the object that I felt compelled to alert fellow observers who must struggle to see deep-sky objects amidst the bath of photons generated by our 'civilization'!

NGC-2359 is a diffuse nebula in the constellation of Canis Major, located about 4.5 degrees northeast of M-47: the coordinates (2000.0 epoch) are: 7 hr 18.6 min RA; -13.12 DEC.

The object is not included in the list of 2500 William and John Herschel discoveries; nor is it in Messier's list, despite its conspicuity. The old J. L. E. Dreyer NGC description is "!!, vF, vvL, viF" which translates to: remarkable object, very faint, extremely large, very irregular figure", sounding reasonably accurate, except for its brightness when viewed using a Lumicon UHC or O-III filter (unavailable in 1888 when the NGC was compiled, of course!)

I had spent a few past winter evenings at a dark sky site in late 1995 sweeping through the Milky Way and the numerous star clusters in the lower declinations of Canis Major, but I had never sought the few galaxies and nebulae that are visible, despite the obscuration of the plane of our galaxy. David Eicher's excellent book "The Universe From Your Back Yard" included a rather unstimulating description of NGC-2359 (and its adjacent faint photographic nebula IC-468) as being "a dim and challenging region of emission nebulosity...shaped like a twisted comet and measuring 10' x 5', NGC-2359 appears as a faint streamer of pale grey light in an 8-inch scope. A 16-inch telescope shows irregular lighter and darker patches across its surface, but not much detail..." I thought I might give it a try, though expecting to struggle to locate yet another dim, unimpressive deep-sky object. Surprise!

While sweeping slightly northeast from M-47, I found an unmistakable misty patch at the coordinates for NGC-2359. Since the rated visual magnitude is around 10 according to the estimate in John Sanford's "Observing the Constellations", and because of the large diameter of the object, I expected the surface brightness to be low. However, a very distinct and discrete irregular outline was visible in a one-degree FOV using a 26-mm ocular in my scope; adding the Lumicon UHC filter dramatically enhanced the sharp contours and looping extensions. It did NOT look like a mis-shaped comet to this observer; rather like a cartoon crown.

My final test was to install the Lumicon O-III filter, which is a certain way to darken a light-polluted background. Despite the placement of NGC-2359 in a sky aglow from Santa Cruz streetligts in the distance, I now saw internal loops, much like the arc-like flow of a solar prominence. I traced the outline and then compared my visual impression with the isophote plotted on page 274 of the Tirion "Uranometria": my eyepiece view actually matched the schematic outline in the star-chart! It is a rare occurence for an eyepiece view of a deep-sky nebular object to resemble the detail in a sky atlas. IC-468, however, was only suspected in the field: it was not included on the "Uranometria" atlas, and immediate confirmation was not possible. Later I did conclude that I had indeed spotted at least some trace of it in the correct orientation near NGC-2359.

Burnham's "Celestial Handbook" contains only a data listing of NGC-2359, with no article or picture. The only other modern visual reference I could locate was the description by Skiff and Luginbuhl as "merged nebulae" that are "fairly large and bright" as seen in a 10" aperture scope (p. 58 of their "Observing Handbook and Catalogue of Deep-Sky Objects.")

Oddly enough, the usually-precise authors of that volume gave the wrong coordinates for NGC-2359! I consulted with my erudite colleague Richard Page, whose voluminous astronomical library soon turned up some interesting and exacting references of amateur sightings. According to the "Observer's Guide", the famous amateur astronomer Steve Coe has heard the object called "The Duck"; others at the 1995 Florida star-pary have described it as "Thor's Helmet", according to a report in the August 1995 SKY & TELESCOPE. Many dedicated observers in the southwestern USA have reported the kind of discrete shape and detail that I saw, surprisingly, under rather poor conditions with a lowly 8-inch aperture telescope; some have reported detecting it unmistakably in a 2-inch instrument! Yet the authoritative Tom Lorenzin

(continued on page 4)

(continued from page 3)
describes it as a "shapeless blob", while Alan MacRobert spied only "a definite, irregular glow" with his 6-inch scope in Cambridge, Massachusetts's light-polluted skies. I then loaded up our Waldee-Wood Astronomical Software computer program EYEPIECE 2.0, which includes NGC-2359 in its database of diffuse nebulae.

The program calculated an estimated surface brightness of 13th magnitude per square arcminute of area, and using the value of my defined sky's naked-eye sky stellar limiting magnitude of 5.5, EYEPIECE calculated that my 8-inch scope would have a stellar visual limit of 12th magnitude: the same brightness of the four faint stars supposedly embedded in the north portion of the nebula, according to Lorenzin. These stars were not detected with my scope except at very high power; yet the nebula was clear as could be at 50X! I am pleased that our program gave a 'visibility prediction' of "GOOD" for NGC-2359 for my 8-inch telescope. Apparently our prediction algorithms are reasonably accurate (at least, for THIS object!) thanks to the careful mathematical contribution of Dr. Jack Marling to this part of our program.

"Why a duck?" as Grouch Marx queried in the movie "Animal Crackers". This viewer—with no preconceptions—found nary any mammalian resemblances. Now you are forewarned about what to expect when scrutinizing NGC-2359: be sure to take the challenge to 'bag' this creature, adornment, or whatever you care to call it, because this wonderful nebula may long be remembered as a prize winter catch!

SELECTED REFERENCES:

Magazines and Books

SKY & TELESCOPE: Backyard Astronomy - A Star-Hop From Sirius, February 1995, by Alan MacRobert. Report on Florida Star-Party, August, 1995.

OBSERVING THE CONSTELLATIONS: John Sanford

THE UNIVERSE FROM YOUR BACKYARD: David Eicher

OBSERVER'S GUIDE URANOMETRIA 2000.0: by Tirion, Rapparport, Lovi

Software

NGP: G. Dean Williams (free NGC database software)

HBASE: (Herschel database shareware program)

EYEPIECE 2.0: Waldee-Wood Astronomical Software, Shareware demo: at http:://www.rahul.net/resource/current/hiprograms/hiprograms.html

Filters

Ultra-High Contrast Filter, and Oxygen-III Nebular Line Filter, by Lumicon Co.

OBSERVING THE HORSEHEAD

By Stephen R. Waldee (toccata@ix.netcom.com) via sci.astro.amateur

Dear Observing Friends: It's the right time of the year for observations of the Horsehead nebula. Much has been written about this object in amateur astronomy magazines, and some of the historical information needs clarifying or correcting. Here are some interesting facts on its history, and a few suggestions for observing it, taken from the "Object Description" help file from my software programs REDSCOPE and EYEPIECE:

B 33: The "Horsehead" Dark Nebula of Interstellar Matter in ORION

J. L. B. Dreyer Summary: Not Detailed in either NGC or IC. Included in E. E. Barnard's "Catalog of 349 Dark Objects in the Sky" as No. 33. The author of EYEPIECE (Steve Waldee) has researched the Horsehead utilizing the resources of the UC/Lick Observatory Mary Lea Shane Archives, the Lick Observatory library and plate vault, and the collection of plates in the Harvard College Observatory. In all, hundreds of papers and publications were consulted, some dating back to Herschel in the late eighteenth century. We are grateful for the collaboration of Dr. Martha Hazen, Curator of HCO Historical Photographs, and Dr. Donald Osterbrock, retired Professor of Astronomy and Astrophysics at UC/Lick Observatory.

The Horsehead was discovered photographically on pictures taken as early as 1883, and confirmed with better images made in 1888. It was described and measured by its HCO observer, Mrs. Wilhelmina Fleming, who was then assistant to Professor E. C. Pickering, the Director. Mrs. Fleming's task was to categorize and catalog the discoveries of the observatory's recently-established photographic program, begun in 1882-3. Most of the significant photographic discoveries of nebulae at Harvard were made during her studies of these plates from the 1880s until the first decade of the 20th century.

Mrs. Fleming's own discovery description of the nebular region of IC 434 (including the dark "notch" we now call the Horsehead) was first printed by HCO as attributed to "Fleming," and it was thus sent to J. L. E. Dreyer in Britain for inclusion in his Index Catalog of 1895; yet the European astronomer listed IC 434 as having been contributed by "Pickering". He also omitted Harvard's details about the dark region. Thus we believe that Mrs. Fleming has been unfortunately denied her historical credit, along with William H. Pickering, as the object's first observer. The original exposures were taken by William Pickering and assistants, and very clearly and cleanly represent the Horsehead. The blue-sensitive plates contain images that are relatively comparable to typical modern pictures recorded by amateurs with similar 8-inch aperture telescopes. However, better and "faster" photographic equipment with red-sensitive film can capture much more of the bright, tenuous hydrogen nebulosity around Barnard 33, and make its dark protrusion more apparent.

Most of the popular astronomy references have the details of the Horse-head story quite wrong. 19th- and early-20th century observers, including all well-known and skilled amateurs and professionals who widely published their accomplishments, reported no sightings of the object by eye. Edward Emerson Barnard himself saw it only on his own photographs, and failed to detect its outline even with the gigantic Yerkes 40-inch aperture refractor.

Early photographs taken in the 1890s were published by Max Wolf (who mistakenly believed he had discovered it 10 years after Pickering and Fleming!) and British amateur Isaac Roberts, but the name "Horsehead" came along many decades later. We surmise that John C. Duncan's spectacular 100-inch telescope plates (made with large scale in the winter of 1920) first revealed details that unmistakably resembled an equine object, and thus inspired the appellation, published by Duncan in his own 1926 astronomy textbook.

The earliest extant reference to the name "Horsehead" turned up by any of our group of investigators was in a 1923 letter to George Ellery Hale from the editor of Mt. Wilson publications. While researching the life of George Ritchey, Dr. Donald Osterbrock found the reference during a study of Hale's correspondence: we appreciate receiving permission from Ronald Brashear (Historical Curator of Observatories of the Carnegie Institution) permitting us to refer to Hale's private papers. Thanks to the efficiency of a hydrogen-beta-line filter, which transmits only a very narrow band of hydrogen-beta wavelength light and blocks other frequencies almost completely, the author (Waldee) and colleagues Ron and Ryan Wood and Richard Page have confirmed dozens of sightings of the Horsehead, our record accomplishment being a purported glimpse with 8 X 42 binoculars!

A 5-7 mm telescopic exit pupil is a virtual necessity; Barnard could use only a 2 mm exit pupil with the high-magnification Yerkes telescope. In apertures from 4 or 5 inches upward, the Horsehead can be seen by very practiced observers. In a 10-17 inch instrument, aided by the h-beta filter, the object can be a certainty if the sky reaches about a minimum 5.7-6.0 magnitude naked eye stellar limit; if the h-beta filter is employed and the object is near the meridian.

Take care to get the blinding Orion "belt" star Zeta (Alnitak) just outside the field of view, and follow the stream of IC 434 nebulosity toward the south. B 33 is a surprisingly-small, vague, dim region about a half-degree from Zeta, roughly dividing IC 434 in two along its major axis. The dark cloud seems scarcely more than a couple of arcminutes in length, despite its larger published dimensions. Its position is at the southeastern angle of a near-right triangle formed in conjunction with Zeta and the famous Orion multiple star system, Sigma. In very large scopes, some faint 12th magnitude field stars may be seen around the horse's "snout." It is helpful to make a chart by tracing a good large-scaled photograph that also includes Zeta, Sigma, and NGC 2023 (see p. 1307 of BURNHAM'S CELESTIAL HANDBOOK, Volume 3).

Only the most superb instruments and oculars (and not necessarily the largest apertures) can provide the image contrast that makes any shape appear. At best, the dark cloud seems merely uneven or oval, more like a blank region than a palpable physical presence. Thus, some early observers wondered if they were viewing "holes in the Heavens." Modern astrophysicists believe that Barnard 33 is a cloud of complex "PAH" molecules not dissimilar from the chemical contents of cigarette smoke! The object is now sufficiently popular to have adorned T-shirts sold to the general public.

There are truly few deep-sky objects that hold more fascination for the observer, and yet offer the challenge, frustration, and often disappointment that the Horsehead promises! We appreciate this opportunity, be it relatively brief, to clarify the erroneous and incomplete record of the early history of the object.

STATISTICALLY SPEAKING

Location (Dearborn, MI): 42°19'12" N, 83°10'48" W, 180 meters elevation
Local Time = Universal Time - 5 hours (Eastern Daylight 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 Decemober 1996

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1 SR: 7:43 SS: 17:01 MR: 23:16 MS: 12:07	2 SR: 7:44 SS: 17:01 MR: None MS: 12:37	3 SR: 7:45 SS: 17:01 MR: 0:13 MS: 13:06	4 SR: 7:46 SS: 17:00 MR: 1:10 MS: 13:35	5 SR: 7:47 SS: 17:00 MR: 2:09 MS: 14:04	6 SR: 7:48 SS: 17:00 MR: 3:10 MS: 14:36	7 SR: 7:49 SS: 17:00 MR: 4:13 MS: 15:11
8 SR: 7:49 SS: 17:00 MR: 5:17 MS: 15:51	9 SR: 7:50 SS: 17:00 MR: 6:22 MS: 16:37	10 SR: 7:51 SS: 17:00 MR: 7:27 MS: 17:30	11 SR: 7:52 SS: 17:00 MR: 8:28 MS: 18:30	12 SR: 7:53 SS: 17:00 MR: 9:24 MS: 19:36	13 SR: 7:54 SS: 17:01 MR: 10:14 MS: 20:45	14 SR: 7:54 SS: 17:01 MR: 10:58 MS: 21:56
15 SR: 7:55 SS: 17:01 MR: 11:37 MS: 23:06	16 SR: 7:56 SS: 17:01 MR: 12:13 MS: None	17 SR: 7:56 SS: 17:02 MR: 12:47 MS: 0:15	18 SR: 7:57 SS: 17:02 MR: 13:20 MS: 1:22	19 SR: 7:58 SS: 17:03 MR: 13:54 MS: 2:29	20 SR: 7:58 SS: 17:03 MR: 14:30 MS: 3:33	21 SR: 7:59 SS: 17:04 MR: 15:08 MS: 4:36
22 SR: 7:59 SS: 17:04 MR: 15:50 MS: 5:37	23 SR: 8:00 SS: 17:05 MR: 16:36 MS: 6:33	24 SR: 8:00 SS: 17:05 MR: 17:26 MS: 7:26	25 SR: 8:00 SS: 17:06 MR: 18:19 MS: 8:13	26 SR: 8:01 SS: 17:07 MR: 19:13 MS: 8:56	27 SR: 8:01 SS: 17:07 MR: 20:09 MS: 9:34	28 SR: 8:01 SS: 17:08 MR: 21:05 MS: 10:08
29 SR: 8:02 SS: 17:09 MR: 22:02 MS: 10:39	30 SR: 8:02 SS: 17:10 MR: 22:59 MS: 11:08	31 SR: 8:02 SS: 17:10 MR: 23:56 MS: 11:37		Lunar Events Dec 03 LQ: 0:08 Dec 10 NM: 11:56 Dec 17 LQ: 4:32 Dec 24 LQ: 15:41		

Planet View Info Report for December 1996

Date	Rise	Set	RA	Dec	Elongation	Ill Fr	DIST(AU)
Mercury							
12/ 3/1996	9:16	17:56	17h49m54s	-25°44'39"	16°46'47"	0.871	1.25784
12/10/1996	9:30	18:13	18h33m26s	-25°29'50"	19°27'52"	0.766	1.13428
12/17/1996	9:30	18:26	19h08m50s	-24°09'21"	20°24'02"	0.578	0.97620
12/24/1996	9:05	18:18	19h23m18s	-22°12'02"	16°45'36"	0.280	0.80294
12/31/1996	8:07	17:31	19h01m32s	-20°36'32"	5°13'13"	0.021	0.68387
Venus							
12/ 3/1996	5:16	15:36	14h41m33s	-13°55'04"	28°50'55"	0.875	1.40405
12/10/1996	5:33	15:33	15h15m57s	-16°31'18"	27°15'12"	0.890	1.43786
12/17/1996	5:50	15:32	15h51m18s	-18°47'01"	25°38'46"	0.904	1.46978
12/24/1996	6:07	15:33	16h27m36s	-20°37'55"	24°01'41"	0.916	1.49987
12/31/1996	6:22	15:36	17h04m43s	-22°00'11"	22°24'05"	0.928	1.52816
Mars							
12/ 3/1996	0:32	13:28	11h16m58s	6°54'33"	83°42'09"	0.902	1.43571
12/10/1996	0:21	13:08	11h28m59s	5°45'54"	87°36'43"	0.902	1.37007
12/17/1996	0:09	12:47	11h40m15s	4°41'43"	91°43'45"	0.902	1.30356
12/24/1996	23:53	12:27	11h50m40s	3°42'55"	96°04'31"	0.904	1.23665
12/31/1996	23:38	12:05	12h00m09s	2°50'30"	100°40'52"	0.907	1.16974
Jupiter							
12/ 3/1996	10:28	19:38	19h21m30s	-22°24'45"	37°40'35"	0.997	5.88672
12/10/1996	10:06	19:18	19h27m52s	-22°12'25"	32°03'17"	0.997	5.94747
12/17/1996	9:44	18:58	19h34m25s	-21°58'44"	26°28'06"	0.998	5.99909
12/24/1996	9:22	18:38	19h41m07s	-21°43'43"	20°54'55"	0.999	6.04114
12/31/1996	9:00	18:19	19h47m55s	-21°27'25"	15°23'20"	0.999	6.07336
Saturn							
12/ 3/1996	13:51	1:43	0h04m44s	-2°10'29"	109°05'36"	0.998	9.12879
12/10/1996	13:23	1:16	0h04m51s	-2°07'58"	102°02'06"	0.997	9.24053
12/17/1996	12:56	0:49	0h05m17s	-2°03'20"	95°03'09"	0.997	9.35527
12/24/1996	12:29	0:23	0h06m03s	-1°56'38"	88°09'03"	0.997	9.47120
12/31/1996	12:02	23:53	0h07m07s	-1°47'58"	81°19'41"	0.997	9.58667
Uranus							
12/ 3/1996	11:14	20:42	20h16m55s	-20°18'22"	50°44'32"	1.000	20.40362
12/10/1996	10:47	20:16	20h18m12s	-20°14'06"	43°56'34"	1.000	20.49280
12/17/1996	10:21	19:50	20h19m35s	-20°09'28"	37°09'28"	1.000	20.57178
12/24/1996	9:55	19:25	20h21m04s	-20°04'29"	30°23'24"	1.000	20.63952
12/31/1996	9:28	18:59	20h22m38s	-19°59'13"	23°38'13"	1.000	20.69520
Neptune							
12/ 3/1996	10:49	20:15	19h51m04s	-20°32'28"	44°45'54"	1.000	30.84829
12/10/1996	10:22	19:49	19h51m57s	-20°30'15"	37°52'08"	1.000	30.92759
12/17/1996	9:56	19:22	19h52m55s	-20°27'48"	30°58'35"	1.000	30.99548
12/24/1996	9:29	18:56	19h53m56s	-20°25'11"	24°05'31"	1.000	31.05102
12/31/1996	9:02	18:30	19h54m59s	-20°22'25"	17°12'51"	1.000	31.09350
Pluto							
12/ 3/1996	6:26	17:27	16h14m37s	-8°40'25"	14°34'19"	1.000	30.89483
12/10/1996	6:00	17:00	16h15m40s	-8°43'16"	19°03'26"	1.000	30.87240
12/17/1996	5:33	16:33	16h16m43s	-8°45'42"	24°38'09"	1.000	30.83643
12/24/1996	5:07	16:07	16h17m43s	-8°47'41"	30°43'32"	1.000	30.78747
12/31/1996	4:40	15:40	16h18m41s	-8°49'13"	37°05'03"	1.000	30.72626

Planet/Moon Apsides Report for December 1996

12/ 1/1996	Moon @ Apogee	Hour: 05	Distance: 404673 km Diameter: 0.492°
12/12/1996	Moon @ Perigee	Hour: 23	Distance: 364234 km Diameter: 0.547°
12/28/1996	Mercury @ Perihelion		Distance from Sun: 0.31 AU
12/29/1996	Moon @ Apogee	Hour: 00	Distance: 405523 km Diameter: 0.491°

Meteor Showers Report for December 1996

Date	Meteor Shower	ZHR	RA	DEC	Illum. Frac.	Longitude
12/ 8/1996	Puppids-Velids	15	9h00m	-48°	0.05	257°
12/13/1996	Geminids	75	7h28m	32°	0.13	262°
12/22/1996	Ursids	5	14h28m	78°	0.96	272°
12/24/1996	Puppids-Velids	15	9h20m	-65°	1.00	274°

Twilight Report for December 1996

Date	Sun Rise	Sun Set	Astronomical Begin	Astronomical End	Nautical Begin	Nautical End	Civil Begin	Civil End
12/ 3/1996	7:45	17:01	5:59	18:46	6:33	18:12	7:08	17:37
12/10/1996	7:51	17:00	6:05	18:46	6:39	18:12	7:14	17:37
12/17/1996	7:56	17:02	6:10	18:48	6:44	18:14	7:19	17:39
12/24/1996	8:00	17:05	6:13	18:52	6:48	18:18	7:23	17:42
12/31/1996	8:02	17:10	6:16	18:57	6:50	18:23	7:25	17:47

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SKY & TELESCOPE NEWS BULLETINS

from the editors of Sky & Telescope magazine

PLANET IN A MULTIPLE STAR SYSTEM

Researchers at McDonald and Lick observatories have independently discovered a planet orbiting the star 16 Cygni B, which is part of a triple-star system about 100 light-years from Earth. The teams have not actually seen the planet itself, but rather the wobbling motion it induces in the star. The teams have been monitoring this star system since the late 1980s, and they combined their data for this joint announcement. No large planets have been detected yet around the other two stars. 16 Cygni B is considered a close match to our Sun in brightness and temperature.

The detection of a planet in a multiple-star system would be unusual enough, but this planet has some interesting quirks of its own. First, it is much less massive than most of the other extrasolar planets found to date, with a mass that could be as little as 1.6 times that of Jupiter. Thus it is probably a true planet rather than a brown dwarf. Also, it circles the star every 2.2 years in a highly eccentric orbit (e = 0.67), which means its distance from the star ranges between 84 and 425 million km, averaging about 250. How a planet can be so big yet in such an eccentric orbit is a puzzling challenge to theorists.

SUNSPOT DROUGHT ENDS

We've now learned that the long string of days without seeing any spots on the Sun was briefly broken on October 19 and 20, but only for a few hours. So the final official tally is that the Sun remained completely spotless for 36 days — from September 13th to October 18th. It hasn't done that since 1944. Such a protracted drought is something of a mystery to solar physicist Patrick McIntosh, who notes that other types of solar activity ticked upward months ago. "It's nearing a time," McIntosh says, "when the new solar cycle should display itself with more vigor."

WHERE QUASARS LIVE

Quasars have long been thought to be the unusually brilliant nuclei of otherwise recognizable galaxies billions of light-years away. But testing that notion has been hampered by the overwhelming brightness of these beacons. Ground-based images have revealed tantalizing hints of matter surrounding them, and a first Hubble Space Telescope study somehow failed to find anything around several apparently "naked" quasars. Now, however, John Bahcall (Institute for Advanced Study), Mike Disney (University of Wales), and their collaborators have successfully probed those quasars' surroundings. New Hubble images show two quasars residing within two traditional galaxies, one spiral, one elliptical. Others appear in galaxies that have been bent out of shape by tides from interacting companions. Since galaxy collisions can dump extra "fuel" onto a central black hole in a galaxy's nucleus, it only seems natural to find quasars in such settings.

LEONID METEORS

The Leonid meteor shower put on a noteworthy display — not in the numbers of meteors, but in their brightness. Those who watched before dawn on November 17th typically counted 15 to 40 meteors per hour — substantially more than the Leonids usually produce. And for many observers the arrivals were predominantly very bright. "Every Leonid that I saw was brighter than magnitude +1," says Joe Rao. One fireball left a 5-minute glowing train. Sky & Telescope columnist John Bortle likens this year's event to the 1961 Leonid fireball shower. "There just weren't any faint meteors," he says.

(continued on back)

(continued from page 5)

MARS 96 FAILS

Russia's instrument-laden Mars 96 probe has crashed into the Pacific Ocean. Liftoff came on schedule at 20:49 Universal Time on November 16th, and Moscow's Space Research Institute initially reported that the "Proton rocket performed perfectly." But a short while later the Proton's upper stage misfired. But a short while later the Proton's upper stage misfired. Instead of boosting Mars 96 out of Earth orbit and on its way to the red planet, it sent the probe tumbling out of control. Australia had a scare when it looked like the rocket's final stage might reenter the atmosphere over that continent and scatter debris over populated areas, but both it and the 6-ton probe burned up harmlessly over the South Pacific Ocean. Mars 96 was the second of three robotic missions targeted at the red planet during this year's launch opportunity. NASA's Mars Global Surveyor got off OK on November 7th, and its Mars Pathfinder, which includes a tiny rover called Sojourner, is slated for liftoff on December 2nd.

NEPTUNE's TEMPESTUOUS WEATHER

Hubble Space Telescope observations have allowed astronomers Heidi Hammel (MIT) and G. Wesley Lockwood (Lowell Observatory) to examine Neptune's weather over an unprecedented three-year period. Images captured in 1994 indicate that the Great Dark Spot (GDS), the dominant feature seen by Voyager 2 cameras in 1989, had disappeared. In 1995 another spot (GDS- 94), never seen before, was detected in the planet's northern hemisphere, accompanied by a pattern of bright clouds. Further imaging in 1996 showed that Neptune's atmosphere was remarkably stable; its banded structure was the same as in 1994, and there were hints of activity in the northern hemisphere, but the presence of the GDS could not be confirmed. In a parallel study, a team led by Lawrence Sromovsky (University of Wisconsin, Madison) combined images from HST and the Infrared Telescope Facility in Hawaii into a time-lapse movie showing a full 16.11-hour rotation of Neptune. Both programs were announced at the October Division of Planetary Sciences meeting in Tucson. ☆

COMET COMMENTS FOR 12/96

by Don Machholz (DonM353259@aol.com)

Comet Hale-Bopp continues to brighten as it passes north of the sun and into the morning sky as 1996 draws to a close. Northern Hemisphere observers will have difficulty seeing it for a few weeks, while Southern Hemisphere observers won't see it until May 1997. While Comet Hale-Bopp has developed jets near the nucleus and a tail a few degrees long, Comet Tabur began to fade rapidly in late October. This was unexpected and it is unusual behavior for a comet. It may now be fainter than the adjusted magnitude estimates listed in the ephemerides below.

Several comets should be easily visible to us in 1997. Comet Hale-Bopp will likely be the brightest, reaching perihelion in late March. Between January and June, Periodic Comet Wild 2 will reach magnitude ten in the northern evening sky. At nearly the same time Periodic Comet Wirtanen will be of similar brightness. Periodic Comet Encke is visible to the Southern Hemisphere in mid-summer. Toward the end of the year Periodic Comet Hartley 2 may reach binocular visibility in the evening sky, while Periodic Comet Tempel-Tuttle crosses through the north polar region at magnitude nine. In addition to these returning periodic comets, one never knows when and where new comets will be discovered. ☆

OBSERVATIONS

by Greg Burnett

Sit down in your favorite coffee shop. Take a look at the table. Assuming it's made of wood, examine closely the layers of grain. Alternating light and dark bands result from the lumberman's saw buzzing through annual growth rings laid down by the tree that grew the wood. If lumberman and furniture maker have done their jobs well, the result is the unique beauty and warm appeal of natural wood grain.

Each time a tree drops its leaves in the Fall and sprouts new buds in the Spring, it makes an astronomical observation. In its own way, it notes the inclination of the ecliptic, and patiently records the altitude of the Sun. Methodical and persistent in making these observations, they are carefully logged in the fibers of the wood. (Why do you think they're called "logs" ?? ;-)) We are reading these recorded observations whenever we enjoy wood grain patterns in furniture, woodwork, paneling, anything made of this ubiquitous and remarkable product of nature. The repeating bands of light and dark capture Earth whirling around and around the Sun, many years displayed in dizzying fast-forward revolutions, unwound and displayed to our delight—the inexorable progress of the seasons. ☆

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