Star Stuff

FORD AMATEUR ASTRONOMY CLUB
FAAC
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FERA
Ford Employees
Recreation Association
ASTRONOMICAL LEAGUE

THE FORD AMATEUR
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HUBBLE CATCHES UP WITH A BLUE STRAGGLER STAR

From HST Press Releases from the ST Scl Office of Public Outreach
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Astronomers have long been mystified by observations of a few hot, bright, apparently young stars residing in well-established neighborhoods where most of their neighbors are much older. It's like finding teen-agers hanging out in stellar retirement homes.

With the help of NASA's Hubble Space Telescope, astronomers now have evidence that may eventually help solve the 45-year-old mystery of how these enigmatic stars, called blue stragglers, were formed. For the first time, astronomers have confirmed that a blue straggler in the core of a globular cluster (a very dense community of stars) is a massive, rapidly rotating star that is spinning 75 times faster than the Sun. This finding provides proof that blue stragglers are created by collisions or other intimate encounters in an overcrowded cluster core.

Astronomers studied a blue straggler in the tumultuous heart of the nearby globular cluster 47 Tucanae (47 Tuc), located 15,000 light-years away in the southern constellation Tucana. The observation was made by astronomers Michael M. Shara of the Space Telescope Science Institute in Baltimore, Md.; Rex A. Saffer of Villanova University in Villanova, Pa.; and Mario Livio, also of the Institute. Their analysis will appear in the Nov. 1 issue of the Astrophysical Journal Letters. "This is an extremely exciting result," Saffer said, "because it may help distinguish between competing theories of blue straggler star formation and evolution."

"Allan Sandage (an astronomer with Carnegie Observatories in Pasadena, Calif.) discovered blue stragglers in the globular cluster M3 nearly 45 years ago. Since that time, they have been assumed to be stars much like the Sun, although their bluer color and larger brightness imply that they are more massive and much younger than normal globular cluster stars. Our analysis confirms that, but without having to make any assumptions about the state of blue straggler star evolution."

Using the Hubble telescope's Faint Object Spectrograph, which was removed during the Second Servicing Mission in February, the astronomers analyzed the spectrum of one blue straggler, measuring its temperature, radius, and rotation rate. The team then combined these measurements with the blue straggler's apparent brightness, taken from a Hubble telescope Wide Field and Planetary Camera archival image, to obtain the star's mass. The derived temperature and mass are consistent with the characteristics of a normal star with a mass about 1.7 times that of the Sun. However, the star is spinning at least two to three times faster than stars of its kind.

"Masses are among the most fundamental properties of stars," Saffer explained. "Yet, except for some stars in binary systems, they are difficult to measure directly. Measurements of the masses and rotation rates of blue stragglers in globular clusters are extremely important, since they allow us to trace the history of cluster formation and evolution. This is possible because different formation theories make different predictions about these characteristics."

"A direct mass measurement of a blue straggler is a kind of acid test of theory and observations," Shara added. "In this case, the mass theory has been tested and stands up well."

By analyzing a blue straggler's mass, temperature, and rotation velocity, astronomers can investigate how it formed. Astronomers now believe that blue stragglers are created by the merger of two low-mass stars. But they have two different views of how these stars interact to create blue stragglers. One merger theory proposes that a violent collision of two unrelated stars creates a blue straggler. Another hypothesizes that a slow coalescence of a gravitationally bound pair creates the straggler star.

Based on their analysis of the blue straggler in 47 Tuc, the team favors the slower, gentler merger scenario between binary stars. In double-star systems where the stars are close enough to touch each other, the more massive star can cannibalize its partner, producing a single, even more massive star. This process, astronomers believe, more likely results in a rapidly spinning merger product where the fast orbital motions of the binary star produces the rapid spin of the consolidated pair. "Our measurement of a rapid rotation rate for the blue straggler star in 47 Tuc tends to strongly favor this second mechanism," Saffer said, "at least for this one star."

The second merger scenario involves a collision between two unrelated stars, which run into each other by chance in the dense star cluster core. "It's a bit like a head-on wreck between two tractor trailers," Saffer explained, "where the enormous energy carried by the fast-moving stars is deposited in the debris from the collision." The merged star is tremendously heated and swells into a red giant star, where it can easily lose its spin through magnetic activity. The swollen star's distended magnetic field throws off mass at high speed, like mud flung off the rim of a rapidly rotating wheel. Eventually, when the star shrinks to normal size after radiating the heat generated by the collision, it spins itself down and becomes a slow rotator, Shara said.

Saffer credits the Hubble telescope's superior spatial resolution with being able to peer into a swirling mix of stars to capture a blue straggler in the cluster core. "While some blue stragglers are found in globular cluster outskirts, in 47 Tuc the blue stragglers are only found in the cluster core," Saffer said. "The crowding of the stars there is too severe for the current generation of ground-based telescopes to resolve them."

Globular clusters are massive systems of up to 1 million stars packed into a spheroid about 20 light-years in diameter. They also are among the oldest stellar systems in the Milky Way Galaxy. Stars speeding through the extremely crowded cluster core are far more likely to collide or experience other dynamic interactions with their neighbors than stars in the sparse neighborhood of the Sun. These processes can produce a zoo of stellar animals, such as X-ray binaries, pulsars, blue stragglers, and other exotic species, all of which have actually been observed in globular cluster cores.

47 Tuc (NGC 104) is one of the intrinsically largest and brightest globular clusters. A naked eye object, it is just west of the Small Magellanic Cloud. Blue stragglers were first discovered in its core by the Hubble telescope's Faint Object Camera in 1991.

The Space Telescope Science Institute is operated by the Association of Universities for Research in Astronomy, Inc. (AURA), for NASA, under contract with the Goddard Space Flight Center, Greenbelt, MD. The Hubble Space Telescope is a project of international cooperation between NASA and the European Space Agency. ☆

REMEMBER, 1998 F.A.A.C. MEMBERSHIP DUES MUST BE PAID TO RAY FOWLER (RFOWLER4) BY JANUARY 1ST.

A NIGHT ON BOON HILL

From Doug Bock

The drums rolled
and the trumpets played
We mounted our chariots
and were on our way

The sky was so blue
the trees all aflame
As twilight approached
the astronomers came

With big eyes and small
they hastened their pace
for nighttime was falling
as the stars beamed from space

They came from near
and also from afar
with great anticipation
to see distant stars

Much cheering and rejoicing
displayed through the night
As a precious few photons
Beamed into their sight

Galaxies far away
were captured in view
With keepsakes on film
for later review

The night pressed on
with a chill in the air
Magnificent splendors on display
for all of us to share

I found it very heartening
to be with this crew
To share the experience
and learn something new

So much to see
and so very clear
The sky beckoned on
as fatigue came, I fear

We fought the desire
to slip into sleep
With renewed excitement
at what Orion would reap

A nebula so fair
it dazzled the eye
mere words can't describe it
except... maybe a sigh

The wisps so intricate
the colors so cool
One felt enveloped
by this gaseous pool

Onward the sky beckoned
for galaxies to see
clusters and planetaries
set our spirits free

Distant galaxies and nebula
were captured by many
lusting for more, while
viewing this sky of plenty

Lest we forget
Jupiter, Saturn and the Moon still
Recall all the memories
at this place we call Boon Hill.

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STAR STUFF
Monthly Publication of the Ford Amateur Astronomy Club

Star Stuff Newsletter
P.O. Box 7527
Dearborn, Michigan 48121-7527

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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 in conference room 100 in the Ford Worldwide Web & Internet Applications (WWW&IA) building, at 555 Republic Drive in the Fairlane Business Park in Dearborn.

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://av7117.pd5.ford.com/faac/**
Internet: http://kode.net/~dougbock/faac/

New address!

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.

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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.

NOVEMBER 1997

SUN	MON	TUE	WED	THU	FRI	SAT
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	31					

Nov 01 Comet Johnson Perihelion (2.308 AU)
Nov 01 Comet Neujmin 2 Perihelion (1.274 AU)
Nov 03 Taurids Meteor Shower Peak
Nov 04 Asteroid 3757 (1982 XB) Near-Earth Flyby (0.390 AU)
Nov 06 Venus at Greatest Eastern Elongation (47 Degrees)
Nov 09 First Quarter Moon (4:44 pm)
Nov 10 Comet Helin-Roman-Alu 2 Perihelion (1.910 AU)
Nov 10 Mars Occults 186240 (7.3 Magnitude Star)
Nov 11 Triple Shadow Transit on Jupiter, 03:34 UT
Nov 11 Jupiter Occults PPM 722517 (9.8 Magnitude Star)
Nov 12 Moon Occults Saturn
Nov 12 Asteroid 1991 WA Near-Earth Flyby (0.362 AU)
Nov 13 Jupiter Occults SAO 104174 (8.9 Magnitude Star)
Nov 13 Jupiter Occults SAO 164156 (6.0 Magnitude Star)
Nov 14 Comet duToit-Hartley Perihelion (1.201 AU)
Nov 15 Full Moon (9:12 am)
Nov 15 Asteroid 89 Julia at Opposition (9.7 Magnitude)
Nov 15 Comet C/1997 A1 (NEAT) Closest Approach to Earth (2.714 AU)
Nov 16 Asteroid 1980 Tezcatlipoca Near-Earth Flyby (0.274 AU)
Nov 17 Leonids Meteor Shower Peak
Nov 19 Comet Russell 3 Perihelion (2.510 AU)
Nov 19 Possible Mercury Occultation of SAO 184890 (9.4 Magnitude Star)
Nov 20 Comet Shoemaker-Holt 1 Perihelion (3.05 AU)
Nov 21 Mars Occults PPM 268761 (7.9 Magnitude Star)
Nov 22 Comet Mueller 2 Perihelion (2.412 AU)
Nov 22 Comet Tsuchinshan 1 Closest Approach to Earth (1.223 AU)
Nov 23 Last Quarter Moon (7:00 pm)
Nov 24 Jupiter Occults PPM 722611 (9.9 Magnitude Star)
Nov 24 Asteroid 1993 WD Near-Earth Flyby (0.286 AU)
Nov 25 Asteroid (3753) 1986 TO Near-Earth Flyby (0.311 AU)
Nov 25 Possible Venus Occultation of 188069 (9.0 Magnitude Star)
Nov 26 Asteroid 2340 Hathor Near-Earth Flyby (0.2428 AU)
Nov 27 Comet Shoemaker-Holt 1 Closest Approach to Earth (2.0632 AU)
Nov 28 Mercury at Greatest Eastern Elongation (21 Degrees)
Nov 28 Possible Mercury Occultation of SAO 185854 (8.0 Magnitude Star)
Nov 29 Comet Biela (Lost Comet) Perihelion (0.803 AU)
Nov 29 Neptune Occults SAO 188797 (9.1 Magnitude Star)
Nov 31 New Moon (9:15 pm) ☆

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, December 4, at 5:00. **PLEASE NOTE THAT THERE IS NO MEETING IN NOVEMBER.**

The FAAC meets in conference room 100 in the Ford WorldWide Web & Internet Applications (WWW&IA) building, at 555 Republic Drive in the Fairlane Business Park in Dearborn. The find the building take the Southfield Freeway to Rotunda Drive. Go east on Rotunda and take the first right into the Fairlane Business Park (there is a sign). The WWW&IA building is the first building on the left. Park on the south or east side of the building and come to the south door (there is a big "425" over the door). The WWW&IA building is secured with a card entry system. If no one is at the door to let you in, then dial 18388 on the lobby phone and we will send someone. When you enter the building, turn left and follow along the windows to the conference room. ☆

IMPORTANT NOTE !!!

A NEW NEWSLETTER EDITOR IS NEEDED FOR THE STARSTUFF NEWSLETTER. THERE WILL BE NO NEW EDITIONS UNTIL SOMEBODY VOLUNTEERS.

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NOVEMBER SPACE HISTORY

The following November events come from the 09/27/97 edition of "Space Calendar." This calendar is compiled and maintained by Ron Baalke (baalke@kelvin.jpl.nasa.gov).

Nov 03 40th Anniversary (1957), Sputnik 2 Launch (Carried Laika the Dog)
Nov 07 30th Anniversary (1967), Surveyor 6 Launch (Moon Lander)
Nov 08 15th Anniversary (1982), Wethersfield Meteorite Fall (Hit House)
Nov 09 30th Anniversary (1967), Apollo 4 Launch (1st Saturn V Launch)
Nov 11 15th Anniversary (1982), STS-5 Launch (Columbia)
Nov 23 20th Anniversary (1977), Meteosat-1 Launch (1st ESA Launch)
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NOVEMBER 1997 SPACE EVENTS

The following November 1997 events come from the 09/27/97 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.

Nov ?? LMTI-1 Atlas 2 Launch
Nov ?? ARD/Telecom Ariane-503 Launch
Nov ?? US Air Force Titan 4 Launch
Nov 01 ETS-7/TRMM H-2 Launch (Japan)
Nov 03 Galileo,Orbital Trim Maneuver #35 (OTM-35)
Nov 03 STEX Taurus 3 Launch
Nov 05 GPS Delta 2 Launch
Nov 06 Galileo, 3rd Europa Flyby (Orbit 11)
Nov 08 Iridium-5 Launch
Nov 15 ORBCOMM-1 Pegasus XL Launch
Nov 17 NEAR, Trajectory Correction Maneuver #9 (TCM-9)
Nov 18 SERTS '97 Launch (Sounding Rocket)
Nov 19 STS-87 Launch, Columbia, USMP-4, Spartan-201
Nov 21 JSCAT 5/Equator S Ariane 4 Launch
Nov 23 Lunar Prospector LMLV-2 Launch (Moon Orbiter)
Nov 24 Galaxy-8i Atlas 2AS Launch ☆

1997 LEONID METEOR WATCH

From American Meteor Society, Geneseo, NY

Since the last Leonid meteor storm in 1966, meteor observers and scientists have been eagerly awaiting the next approach of Comet Temple-Tuttle, the parent body of the Leonid meteor stream, in hopes of witnessing another such event. In March of this year, University of Hawaii astronomers K. J. Meech, O. R. Hainaut and J. Bauer used the Keck II 10 meter reflector atop Mauna Kea to recover Comet Temple-Tuttle, now headed toward the inner solar system on its 33-year orbit, and the meteor science community is gearing up to study the November Leonid maximum.

Though the comet will not reach perihelion until February 28, 1998, the Leonid meteor stream associated with this comet has already given meteor observers enhanced displays in 1994, 1995 and 1996. This year, despite the bright gibbous moon which will be present, professional and amateur meteor scientists in North America will be watching closely as the Leonids reach maximum, predicted for Monday morning, November 17, 1997, at 1335 UTC. This timing (5:45 am PST) favors visual observers in Western N. America and the Pacific. In addition to the "classical" peak, which is characteristically rich in bright, trained meteors, observations from the past two years have hinted at a newer, fainter concentration of particles occurring a few hours prior to the normal shower peak.

Professional astronomers in North America will observe the Leonids from widely separated geographic locations. From Waterloo, Canada and Edwards AFB, California, meteor scientists James Jones and Peter Brown (University of Western Ontario) will be conducting extensive back-scatter radar observations — including the testing of a mobile meteor radar. Video observations from Edwards and an airborne observatory will be coordinated by Robert Hawkes (Mt. Allison University). Collaborator Ray Russell will be attempting visual and infrared meteor spectroscopy from the airborne platform. Peter Jenniskens (NASA / Ames Research Center) and his associates will be organizing both visual and photographic campaigns at Edwards AFB, in addition to attempting to make telescopic meteor train observations from facilities in Chile.

In the Caribbean, John Mathews and David Meisel, along with a team of other scientists from Cornell, Penn State and SUNY-Geneseo will be using the Arecibo Radio Telescope in Puerto Rico to sample the faint component of the Leonid stream using a narrow-beam back-scatter technique. The Arecibo dish is fortunately situated such that the Leonid radiant will pass directly through the radar beam very close to the time of predicted shower maximum. An array of LIDAR and optical instruments will be monitoring the Leonids at Arecibo as well.

On the amateur side, the American Meteor Society will coordinate visual observations from diverse locations as far east as Halifax, Nova Scotia, and as far west as Oahu, Hawaii. Using the combined forces of observers from the Association of Lunar and Planetary Observers (ALPO), Meteor Group Hawaii (MGH), North American Meteor Network (NAMN), New Jersey Astronomical Association (NJAA), and our regular AMS observers, the Society will cover nearly a quarter of the northern hemisphere. The bright waning gibbous moon will be high in the sky at the time of radiant rise near local midnight, but Leonid rates should continuously improve through the night as the moon sets and the radiant rises. Visual observers are encouraged to utilize a building or other nearby object to make observations from the moon's shadow.

In addition to visual observations, the three operational stations of the AMS Radiometeor Project (Florida, California, and Maryland) will also be collecting forward-scatter data continuously throughout the Leonid period. Despite the irritating moonlight, all observers are encouraged to help us to keep a close watch on the Leonids this November 17th.

For future planning here are the predicted times of greatest Leonid meteor activity in 1998 and 1999:

1998: Peak date / time, November 17, 1945 UTC
Most favored area: Asia.
Moon phase: New Moon, 28 days

1999: Peak date / time, November 18, 0150 UTC
Most favored areas: Eastern Atlantic, Europe, Africa, Asia.
Moon phase: Waxing Gibbous Moon, 9 days ☆

1998 LEONID METEOR WATCH

From Royal Astronomical Society Press Notices, Ref. PN 97/12 (NAM)

The Leonid meteor shower is expected to produce a particularly spectacular display in November 1998 according to Professor Iwan Williams of Queen Mary and Westfield College, University of London, who has been studying what is known about the stream of meteoroids in space which is responsible for the shower. Professor Williams presents his findings at the UK's National Astronomy Meeting at Southampton University on Friday 11th April 1997. The Leonids produce grand displays about every 33 years. The last time was in 1966, but 1998 could be better than 1999, Professor Williams says.

Meteor streams are formed from the dust grains released by the nucleus of a comet when it gets near to the Sun and becomes active. If the Earth's orbit crosses through the meteor stream, we experience a meteor shower. Over time, the dust grains spread slowly round the comet's orbit. When they are distributed around the whole of the orbit, the same number of meteors are seen at about the same time each year. However, this is not the case with the Leonids.

The Leonids are dust from comet Temple-Tuttle, discovered in 1865, but that dust is still in a large clump close to the comet. It has not had enough time to spread all round the orbit. That means that the Leonids produce large numbers of meteors when Earth is near the comet — about every 33 years — and are rather sparse or non-existent at other times. Professor Williams says that his calculations suggest 'the display will be spectacular but not awesome, that is several thousand meteors per hour rather than tens or even hundreds of thousand as has been the case on some occasions in the past. He also thinks 1998 will possibly be the best year rather than 1999 since the comet's closest approach to Earth is between the two dates but closer to November 1998.

The start of the serious scientific study of meteors is generally attributed to the spectacular display produced by the Leonids in November 1833. It was studies of this shower that led to the observation that the meteors appeared to originate from a single point, or radiant, in the sky. This was correctly interpreted as signifying that the meteoroids move on essentially parallel tracks in the solar system, as a stream. In the case of the Leonids, the radiant is in the constellation Leo — hence the name of the shower.

The mathematician John Couch Adams (1819-1892) (who also predicted the existence of the planet Neptune) studied changes in the Leonid stream and concluded that the orbital period of the Leonid meteors was about 33.25 years. This was remarkably similar to that of the newly discovered Comet Temple-Tuttle. It was also soon realized that spectacular displays of the Leonid stream had occurred at the same interval. Good displays were seen in 1799, 1833 and 1866. Since then, spectacular displays occurred around 1900 and in 1966. ☆

OCTOBER 1996 METEORITE FALLS

Albuquerque, N.M. After a year of detective work involving scores of eyewitness reports from New Mexico and Texas, a group of scientists has concluded that the Earth collided with a swarm of cosmic debris on the night of Oct. 3-4, 1996.

The most widely-reported fireballs were ones over eastern New Mexico and the Texas panhandle, and another near Bakersfield, California, exactly 104 minutes later. The relationship among the times, locations, and trajectories of the meteors seemed too unlikely to be mere coincidence, and had initially led some scientists to believe that a single object skimmed through the atmosphere and re-entered after a single orbit.

After careful analysis of a videotape taken from El Paso, Texas, together with eyewitness reports, Mark Boslough of Sandia National Laboratories and Peter Brown of the University of Western Ontario found that the first meteor entered at too steep of an angle to skip off the atmosphere. They are now convinced that the two fireballs observed over New Mexico/Texas and over California were two different objects.

They also determined the most likely location in the Texas panhandle where meteorites might have fallen, and John Wasson (UCLA) has re-issued a reward for a sample. Brown and Boslough believe that any meteorites reaching the ground in the Southwest would most likely be found south of Amarillo, near the towns of Hereford and Canyon, where they were carried by winds to the east of the visible trajectory. The most likely place for small meteorites to have landed would be in an oblong area about 10 miles ESE if Hereford, but any larger meteorites would be in a strip that stretches as far as 10 miles east of Canyon.

(continued on page 5)

(continued from page 4)
This part of the Texas Panhandle is well-known for its abundance of meteorite finds because it is flat, with little vegetation and few natural rocks on the surface. The most famous area is southwest of Plainview, where over 900 meteorites were recovered after they fell in 1903, and were still being found as late as 1949.

Over the past year, two groups of scientists from Los Alamos National Laboratory and the National Oceanic and Atmospheric Administration have also reported low-frequency sound data showing that the Earth's atmosphere was hit by at least 60 objects within several hours of the two that were originally reported, two of which were also observed by Defense Department satellites. Most of the infrasound-producing meteors occurred during daylight hours and were not seen by witnesses, but the large number of collisions taking place that night helps explain why two bright ones with such similar trajectories would be seen so closely spaced in time. Although the scientists eliminated their hypothesis of a single object bouncing off the atmosphere and re-entering it later, they are still very interested in the events of one year ago because it means the Earth collided with a cluster of objects, perhaps pieces of a broken asteroid. A sample of one of these meteorites would help scientists determine what kind of asteroid spawned the fragments and better understand how they break apart and explode in the atmosphere, says Sandia's Mark Boslough.

Prof. John Wasson is seeking such samples and is offering a reward of $2,000 for the first confirmed sample as large as 4 ounces, and he urges persons living within the calculated fall area to look in their fields, on the roofs of buildings, in stock tanks and other locations where stones would not be expected. Meteorite hunters are reminded to get permission of land owners, and that any stones automatically belong to the owner of the property on which it is found. The stones are most likely to be black with a fresh matte texture. Samples should be sent to Prof. Wasson at the Institute of Geophysics, UCLA, Los Angeles, CA 90095. Each sample will be acknowledged, but those that are not meteorites will not be returned unless a return self-addressed envelope is provided. ☆

LARGE/BRIGHT METEOR DETECTED

From Los Alamos National Laboratory, Public Affairs Office (PAO)

LOS ALAMOS, N.M., Oct. 10, 1997 — Researchers at Los Alamos National Laboratory were able to use an array developed to listen for clandestine nuclear weapons tests to help locate a large meteor that flashed in the sky Thursday afternoon above Southern New Mexico. The object — presumably a large, bright meteor known as a bolide — was seen in the skies Thursday at about 12:47 p.m. Witnesses said the object was at least as bright as the full moon or as bright as the setting sun. "The meteor made a huge sonic signal," said Doug ReVelle, a meteorologist in Los Alamos' Atmospheric and Climate Sciences Group. "They heard it like a freight train in El Paso."

Using data from Los Alamos listening stations originally set up to monitor nuclear explosions, ReVelle and other researchers in Los Alamos' Atmospheric and Climate Sciences Group analyzed the infrasonic signature created when the meteor entered the atmosphere. When a meteor enters the atmosphere — or when a large explosion is detonated — it creates a sound or pressure wave that is below the range of human hearing. This infrasonic wave travels through the atmosphere and can be detected by special microphones that are set up in an array. By looking at the time of arrival of the sounds at different stations and the frequency of the infrasonic boom, researchers can pinpoint the location of the source and the determine the amount of energy that created it.

"The data from our array puts the meteor 441 kilometers due south of Los Alamos," said ReVelle. "We'll be looking for it in a location we've identified near El Paso." ReVelle will join researchers from Canada, the University of New Mexico and Sandia National Laboratory on a search this weekend for any meteor fragments that may have reached the ground. "The object's infrasonic signature was equivalent to the explosive yield of about 500 tons of TNT," ReVelle said. "That means the object was somewhere around one half to three-quarters of a meter in diameter." Thanks to the infrasound array at Los Alamos, researchers at the Laboratory were able to narrow down the location where it may have landed pretty well.

In addition to searching for remains of the meteor — which may have exploded into tiny bits in the sky — the researchers will interview witnesses about the object: how bright it was; what it sounded like. The object created a brilliant light as it streaked toward Earth. Witnesses in Santa Fe, Los Alamos, Albuquerque, El Paso and points in between saw the object in the sky. ReVelle and the others will search all weekend for the object and collect other data as well. "It could take weeks to find, but it could take a day or less, depending on how lucky we get," ReVelle said.

Infrasonic waves are very low frequency sounds that exist somewhere in the realm between hearing and meteorology, ReVelle said. The sounds are well below the range of human hearing, which ends at about 30 hertz, but actually can be detected as small changes in atmospheric pressure. If someone had a barometer that was sensitive enough, that person would be able to see fluctuations of several microbars when infrasonic waves arrive.

During the 1960s and early 1970s, before the rise of the satellite era, the United States Air Force operated a network of stations to listen for nuclear weapons tests. The listening stations were the nation's first line of detection for nuclear explosions worldwide. The four arrays of listening stations operated by Los Alamos are the only infrasonic network left in full-time operation in the world. They can detect meteors that are as small as a few centimeters in diameter. The stations are useful because they can help validate other non-proliferation and verification techniques, and they cost very little to operate and maintain.

The Los Alamos stations, around since 1983, have provided a way for scientists to detect bolides, larger-than-average space debris that slams into Earth's atmosphere and creates brilliant fireballs in the sky. Each year a number of large meteors enter the atmosphere and are detected by the Los Alamos array. Some meteors are tens of meters in diameter. ReVelle said each year about 10 meteors that are two meters in diameter — with an energy equivalent of a one-kiloton blast — enter the atmosphere. Most burn up or explode in brilliant flashes. Some hit the ground. ☆

TERRESTRIAL PLANET FINDER

From: Kevin Guerrero, Arizona Space Grant intern, News Services

Do planets like ours exist elsewhere in the universe? Do they sustain life? Have technological civilizations evolved on these extra-solar planets and have they survived? We'll probably know within the next 20 years, Neville J. Woolf said last week in Tucson in the first Steward Public Evening Lecture for 1997-98. Woolf, professor of astronomy at The University of Arizona in Tucson, is part of the Terrestrial Planet Finder project for the NASA Origins program. The focus of the project is detecting extra-solar planets which are hospitable to life.

There are several factors which make the detection of Earth-like planets a difficult enterprise. Perhaps the most obvious difficulty is the enormous distance between the Earth and planets well beyond our solar system: the further away a planet is, the fainter the image of it will be. Another difficulty results from the planet's proximity to its star. Because of its brightness, the host star far outshines the nearby planet. In our solar system, for instance, the planets are ten million times dimmer than the sun. A third difficulty lies in the detection of life on these planets: which gases provide evidence of life?

In association with other UA astronomers, including Roger Angel and James Burge of the Steward Observatory, Woolf has proposed the construction of a linear nulling interferometer for the detection of earth-like planets. A linear nulling interferometer is essentially a four-mirror device that determines planetary position, atmospheric emission spectrum and surface temperature. Two larger mirrors are aligned with two smaller, peripheral mirrors for the detection of radiation. The mirrors, because of their arrangement, block out, or "null," the light from a star in order to examine the surrounding space for earth-like planets. To map the positions of planets and determine the spectrum produced by their atmospheres, the device separates the bands of the spectrum and maps the sky in each band. It also measures surface temperature. In particular, the linear nulling interferometer will search for the presence of carbon dioxide, ozone and water in the planetary atmosphere. The substantial presence of all three on a planet of earth-like temperature is fairly good indication of the existence of microorganisms.

Woolf noted that the technology needed for this project is similar to the technology for the Next Generation Space Telescope, so the proposed date for construction of the Terrestrial Planet Finder project in 2005 is feasible and may even be earlier. Speedy development depends upon an efficient means of propulsion into space and an improvement in mirror technology, Woolf said. The focus has been on smaller, thinner mirrors which cost only a fraction of the Hubble Space Telescope mirror. Steward Observatory astronomers' recent attempts to produce small-scale models have been successful, he added.

The Terrestrial Planet Finder project is not important for astronomers only, Woolf emphasized. Biologists, for example, would have a keen interest in the project if life was discovered on an extra-solar planet. As NASA Administrator Dan Goldin said it, "No human endeavor and no human thought would be untouched by that discovery." ☆

USING TELESCOPE FINDERS

The Most Efficient Finder Method For Locating Deep-Sky Objects

By Stephen R. Waldee, Partner: Waldee-Wood Astronomical Software
E-Mail: toccata@ix.netcom.com, toccata-and-fugue@worldnet.att.net

FINDERSCOPE INADEQUACIES

"Ticked Off About Telescopes" was the title for the "Focal Point" column in the February, 1991 issue of SKY & TELESCOPE. Contributing editors Fienberg, Sinnott, and MacRobert provided their choices of the worst features or shortcomings of modern commercial telescope products. The bete noir of Richard Tresch Fieberg was the right-angle finder, a ubiquitous presence on premium Schmidt-Cassegrain instruments. Unable to correlate the sky view orientation through such an accessory with either star charts or main telescopic eyepiece fields, a frustrated Fienberg called the deviser of the mirror-image right angle finder a "sadist".

I too apparently suffer from Fienberg's uncertainty principle. The diverse finderscopes supplied with all of the commercial telescopes I have owned — from the utterly useless 6x30 peephole on my Meade f/11 refractor, to the blurry 8x50 upright but mirror-image Polaris-reticle finder provided by Celestron for their better-grade SCTs — have proved to be of value only for momentarily occupying the attention of small children at star parties, who often mistake them for the correct optical output of the telescope.

THE TELRAD(tm)

I suspect that the nonfunctionality of these finder designs has spurred the success of the famous Telrad (tm) reflex sight, designed and made by Steve Kufeld. Unlike its inferior competitors, the one and only original Telrad is a true astronomical tool in the tradition of Tycho Brahe. The helpful reticle, with its precise projected red circles of 4, 2, and 1/2 degrees angular diameter, make positioning the telescope a matter of ease and simplicity. When I purchased one and used it for the very first time years ago, I was astonished at the celerity I had achieved in locating objects in the eyepiece field by employing the Telrad to quickly gauge angular distance. It was taking only 10-15 seconds to find, say, M-51, not several minutes. Now, as a better observer (and with the help of such aids as Brent Watson's Telrad sky charts) it might require a scant 5 seconds!

The Telrad — in my experience — requires the ability to spot and hold with direct vision a star of at least 4.5 magnitude brightness as viewed through the 45-degree-angle plastic screen that reflects the image of the reticle. In order to function as required, that screen must be able to reflect the light of the reticle: thus it has no anti-reflective coatings and causes a considerable loss of starlight, at least a half-magnitude or perhaps slightly greater. In city observing sites in the SF Bay area, the Telrad is almost useless unless the target object is a planet or very bright star; in light-polluted skies, such as the venue at Grant Ranch Park on Mount Hamilton Road, it is often difficult to see even a 4th magnitude star through the Telrad, so the viewer must train herself to use both eyes, with one looking through the Telrad screen, and one staring at the sky directly. And it is essential to turn the brightness of the internal LED to a dim level just above invisibility. Some of my viewing companions have made the mistake of almost blinding themselves by cranking up the brilliance too high: even red light can cause a loss of dark adaptation. Used correctly, the Telrad is nearly as important as your telescope in obtaining a good view of a deep-sky object: do not be tempted by lesser imitators.

OPTICAL FINDERS

The erudite Dr. Roger N. Clark, professional astronomer and amateur skygazer, packs more detail and content in the short chapter on vision and optics in the opening of his monumental work, "VISUAL ASTRONOMY OF THE DEEP SKY", than any author of any other observing guide this writer has encountered. Clark calculates a desired 'Finder Magnification Ratio' or FMR for any telescope to be 1/10th the magnification of the main instrument: thus, no one single magnification for a finderscope is suitable for the varying powers of magnification used for observing diverse objects in the main telescope. His preference is for at least two finders, so that the desired object may be located within one full field of view, as well as closer than one-half the FOV. Clark posits using two finders as a solution, rather than one with exchangeable eyepieces. Many observers have opted to employ a Telrad as one (non-magnifying) finder, with the regular small optical finder as its companion. But if the deficiencies of the commercially-provided finderscope cause you Fienberg's uncertainty, you must replace it with a useful alternative.

I assembled my own finder from a high-quality f4.5 copier machine lens of 50mm clear aperture. Using our own computer program EYEPIECE to perform appropriate optical calculations, I determined that the operating parameters for this little instrument are as follows:

50mm clear aperture f4.5 objective with:

Eyepieces (dia./ap. field):	27mm / 35 deg.	30mm / 52 deg.
Magnification:	8.3x	7.5x
Power per Inch of Aperture:	4.2x/inch	3.8x/inch
Approximate True FOV:	4.2 degrees	6.9 degrees
Exit Pupil:	6 mm	6.7 mm
Stellar Magnitude Limit	10.5 mag	same
Mag. to achieve above:	50x	same
Dawes Limit:	2-1/2 arcsec.	same

The eyepieces I use in this finder are (1) a cheap 27 mm Kellner type ocular that originally came with a Coulter telescope, similar to the eyepieces on a binocular, and (2) a fine Orion "Ultrascopic" (tm) enhanced Ploessl design (similar to models from Parks and Celestron), used in the finder when I require a much wider field of view than provided by the Kellner (an appropriate TeleVue Ploessl would also be an ideal choice: a Nagler design is not absolutely essential, as one has a phenomenally wide FOV at 7x even with a Kellner!) The Ultrascopic is also handy for trying out my nebular line filters in the finder itself: a sure means of seeing such enormous-diameter faint objects as the "California" nebula (NGC-1499) or "Barnard's Loop" in the constellation of Orion, which are too wide for the main instrument FOV.

In examining the optical parameters calculated for the finderscope as listed above, one must take careful note of the value for visible stellar magnitude limit. Unless the finderscope is used at a magnification of about 1x per millimeter of aperture, the faintest stars may not be visually detected. So at a magnification of 7 or 8 power, you will not see stars as faint as 10.5 magnitude: their Airy disks will be too small for your retinas to resolve! Expect to see stars as faint as about 9 or 9.5 magnitude at the operating powers listed above, or dimmer as light pollution encroaches on the background field. Normally, I am capable of seeing all of the stars plotted in the Uranometria atlas, and most of the faintest stars in the finder charts of Astro-Cards. I find that it is not always desirable to use a finderscope exit pupil of 7 mm, since at that diameter, my eyes create flared star images. By restricting the exit pupil to about 6 mm, I personally see a much cleaner field of stellar points. Experiment with your own vision to determine the optimal magnification with respect to clarity.

IMAGE ORIENTATION

Unlike Richard Tresch Fienberg, I have never been happy with simply mounting the ocular for straight-through viewing: I like to position the finder eyepiece close to the main telescope focuser, so that I have to move my head very little to obtain both views. But simply placing the ocular at the focal point of the finder objective lens causes a reversed, inverted image of the eye, which adds to one's confusion and slows the process of correlating the sky view to an observing chart depiction.

Now to the final and most important aspect of using this finder: the UPRIGHT, CORRECTED PRISM! In order to provide an image orientation that is EXACTLY like a star chart, I employ a Porro prism image corrector, personally preferring a 90-degree model, though 45 degree and 60 degree angle units may occasionally be found. Using multi-faceted prisms to achieve the necessary reflective surfaces to correct the image rotation caused by the objective lens of the scope, these types of 'star diagonals' are much more expensive than the simple prism or mirror type of upright but reversed eyepiece diagonal. Yet the increased ease of comparing the finder FOV with a complicated star field chart will justify the added cost the very first time you use the device! However, be warned that the corrected star diagonal may require a closer position to the objective lens than the non-correcting upright type.

If one does not care to assemble a home-made finderscope, there are commercial options, such as the Super-Finder (tm) from Lumicon, or finders from Tuthill that permit attaching one's own diagonal and ocular: some models even have focusers. If cost is no object, one could do no better than to equip your telescope with a small refractor, such as a TeleVue Pronto (tm) or a Celestron SS-80. These fine instruments will also provide an alternative richest-field view of high contrast that may prove superior to the main telescope FOV for some types of objects. One colleague of mine mounts a trusty Edmund Astroscan on the mirror-box of his 17" f4.5 Dobsonian, but to my taste, the higher magnification than necessary (16x minimum) makes this combination less than optimal.

The use of a Telrad as well as my rather complicated home-made finder causes a bulky front-end on my scope, requiring a beefy mount as well as correctly-positioned counterweights on the tube assembly. Yet the enhancement of my ability to quickly find faint objects without the aid of setting circles has amply compensated for all of the fussing I went through to perfect my system. I suggest that you, too, upgrade and improve your own finder equipment, and your deep-sky sessions will become not only more efficient, but also vastly more rewarding! ☆

STATISTICALLY SPEAKING

Location (Dearborn, MI): 42°19'12" N, 83°10'48" W, 180 meters elevation
Local Time = Universal Time - 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 November 1997

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
2 SR: 7:07 SS: 17:25 MR: 9:04 MS: 19:17	3 SR: 7:09 SS: 17:23 MR: 10:01 MS: 20:03	4 SR: 7:10 SS: 17:22 MR: 10:57 MS: 20:55	5 SR: 7:11 SS: 17:21 MR: 11:48 MS: 21:53	6 SR: 7:12 SS: 17:20 MR: 12:36 MS: 22:55	7 SR: 7:14 SS: 17:19 MR: 13:19 MS: None	8 SR: 7:15 SS: 17:18 MR: 13:59 MS: 0:01
9 SR: 7:16 SS: 17:17 MR: 14:36 MS: 1:10	10 SR: 7:17 SS: 17:16 MR: 15:12 MS: 2:20	11 SR: 7:19 SS: 17:15 MR: 15:47 MS: 3:32	12 SR: 7:20 SS: 17:14 MR: 16:24 MS: 4:44	13 SR: 7:21 SS: 17:13 MR: 17:04 MS: 5:56	14 SR: 7:22 SS: 17:12 MR: 17:46 MS: 7:08	15 SR: 7:24 SS: 17:11 MR: 18:33 MS: 8:16
16 SR: 7:25 SS: 17:10 MR: 19:24 MS: 9:20	17 SR: 7:26 SS: 17:09 MR: 20:19 MS: 10:17	18 SR: 7:27 SS: 17:08 MR: 21:15 MS: 11:08	19 SR: 7:29 SS: 17:07 MR: 22:13 MS: 11:51	20 SR: 7:30 SS: 17:07 MR: 23:11 MS: 12:30	21 SR: 7:31 SS: 17:06 MR: None MS: 13:03	22 SR: 7:32 SS: 17:05 MR: 0:09 MS: 13:34
23 SR: 7:33 SS: 17:05 MR: 1:06 MS: 14:03	24 SR: 7:34 SS: 17:04 MR: 2:03 MS: 14:31	25 SR: 7:36 SS: 17:04 MR: 2:59 MS: 14:59	26 SR: 7:37 SS: 17:03 MR: 3:57 MS: 15:28	27 SR: 7:38 SS: 17:03 MR: 4:56 MS: 16:00	28 SR: 7:39 SS: 17:02 MR: 5:55 MS: 16:34	29 SR: 7:40 SS: 17:02 MR: 6:55 MS: 17:14
30 SR: 7:41 SS: 17:02 MR: 7:54 MS: 17:58					Lunar Events: Nov 07 FQ: 16:44 Nov 14 NM: 09:12 Nov 21 NM: 19:00 Nov 29 NM: 21:15	

Planet View Info Report for November 1997

Date	Rise	Set	RA	Dec	Elongation	Ill Fr	DIST(AU)
Mercury							
11/ 5/1997	8:28	17:52	15h32m55s	-20∞37'42"	13∞22'57"	0.935	1.36959
11/12/1997	8:55	17:56	16h16m02s	-23∞21'49"	16∞44'48"	0.888	1.29977
11/19/1997	9:18	18:03	16h58m38s	-25∞08'20"	19∞35'21"	0.816	1.20167
11/26/1997	9:32	18:11	17h38m03s	-25∞49'26"	21∞26'02"	0.697	1.07298
Venus							
11/ 5/1997	11:21	19:48	17h58m21s	-26∞59'17"	47∞07'20"	0.501	0.67622
11/12/1997	11:23	19:52	18h29m17s	-26∞52'39"	47∞00'21"	0.464	0.62301
11/19/1997	11:22	19:56	18h58m16s	-26∞17'56"	46∞28'09"	0.424	0.57026
11/26/1997	11:15	20:00	19h24m34s	-25∞18'39"	45∞23'31"	0.379	0.51840
Mars							
11/ 5/1997	10:56	19:46	17h46m04s	-24∞37'53"	44∞14'12"	0.936	1.93815
11/12/1997	10:52	19:42	18h09m12s	-24∞40'03"	42∞27'53"	0.940	1.96450
11/19/1997	10:47	19:38	18h32m30s	-24∞29'01"	40∞43'10"	0.944	1.99015
11/26/1997	10:41	19:36	18h55m54s	-24∞04'39"	38∞59'45"	0.948	2.01523
Jupiter							
11/ 5/1997	13:42	23:32	21h04m43s	-17∞40'45"	90∞49'13"	0.990	4.91914
11/12/1997	13:16	23:08	21h07m28s	-17∞28'13"	84∞28'53"	0.990	5.02779
11/19/1997	12:51	22:45	21h10m45s	-17∞13'15"	78∞15'17"	0.991	5.13530
11/26/1997	12:26	22:23	21h14m31s	-16∞55'54"	72∞07'44"	0.991	5.24052
Saturn							
11/ 5/1997	16:15	4:47	0h57m51s	3∞13'04"	151∞49'04"	0.999	8.50819
11/12/1997	15:47	4:17	0h56m16s	3∞04'21"	144∞23'58"	0.999	8.56925
11/19/1997	15:18	3:48	0h54m54s	2∞57'17"	137∞00'50"	0.999	8.64250
11/26/1997	14:50	3:19	0h53m48s	2∞52'04"	129∞40'18"	0.998	8.72671
Uranus							
11/ 5/1997	13:15	22:49	20h29m47s	-19∞37'45"	82∞19'35"	0.999	19.94612
11/12/1997	12:48	22:22	20h30m23s	-19∞35'26"	75∞26'47"	0.999	20.06452
11/19/1997	12:21	21:55	20h31m09s	-19∞32'32"	68∞35'03"	0.999	20.17931
11/26/1997	11:54	21:29	20h32m04s	-19∞29'06"	61∞44'09"	1.000	20.28897
Neptune							
11/ 5/1997	12:46	22:13	19h57m30s	-20∞18'15"	74∞46'36"	1.000	30.39179
11/19/1997	11:51	21:20	19h58m35s	-20∞15'30"	60∞57'31"	1.000	30.61355
11/26/1997	11:24	20:53	19h59m16s	-20∞13'42"	54∞03'05"	1.000	30.71478
Pluto							
11/ 5/1997	8:24	19:20	16h19m18s	-9∞18'35"	24∞52'22"	1.000	30.91273
11/26/1997	7:05	18:00	16h22m26s	-9∞29'57"	11∞59'21"	1.000	30.98571

Planet/Moon Event Report for November 1997

11/ 1/1997	Mercury @ Aphelion	Distance from Sun: 0.47 AU		
11/12/1997	Moon @ Perigee	Hour: 03	Dist.: 363384 km	Dia.: 0.5481°∞
11/23/1997	Moon @ Apogee	Hour: 21	Dist.: 404676 km	Dia.: 0.4921°∞
11/27/1997	Pluto @ Conjunction	Hour: 18		

Meteor Showers Report for November 1997

Date	Meteor Shower	ZHR	RA	DEC	Illum. Frac.	Longitude
11/ 2/1997	Taurids	8	3h44m	14∞	0.06	221∞
11/17/1997	Leonids	10	10h08m	22∞	0.87	236∞

Twilight Report for November 1997

	Sun		Astronomical		Nautical		Civil	
Date	Rise	Set	Begin	End	Begin	End	Begin	End
11/ 5/1997	7:11	17:21	5:31	19:01	6:04	18:29	6:37	17:55
11/12/1997	7:20	17:14	5:38	18:55	6:11	18:22	6:45	17:48
11/19/1997	7:29	17:07	5:46	18:50	6:19	18:17	6:53	17:43
11/26/1997	7:37	17:03	5:53	18:47	6:26	18:14	7:01	17:39

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SKY & TELESCOPE NEWS BULLETINS

From the editors of Sky & Telescope magazine

HUBBLE SPIES NEUTRON STAR

While not one of the Hubble Space Telescope's more stunning images, the Space Telescope Science Institute released the first direct image in visible light of a neutron star this week. Hubble's observations set the size of the 25th-magnitude object at no more than 28 kilometers across and with a surface temperature of 670,000 degrees Celsius (1.2 million degrees Fahrenheit). Nothing else other than a neutron star could fit such attributes. Fred Walter (State University of New York at Stony Brook) used Hubble to look for the visible counterpart of an X-ray source in Corona Australis detected in 1992 by the Rosat spacecraft. The pin-point image of the neutron star, captured by Hubble's Wide Field Planetary Camera 2, was only 2 arcseconds from the X-ray position. The collapsed stellar core is believed to lie less than 400 light-years away.

NEAR LOOKS FAR

While en route to asteroid 433 Eros, the Near Earth Asteroid Rendezvous (NEAR) spacecraft has become an astrophysical observatory. Mission engineers reprogrammed the spacecraft to monitor readings from its gamma-ray spectrometer, an instrument intended to probe the surface composition of Eros when the craft reaches it in February 1999. NASA announced this past week that the instrument has detected seven gamma-ray bursts from deep space. These mysterious eruptions of high-energy radiation pop off about once a day at random points on the sky. NEAR has now been added to an interplanetary network of gamma-ray-sensing spacecraft, which include those in Earth orbit — such as the Compton Gamma Ray Observatory — and the Ulysses and Wind spacecraft.

MOST LUMINOUS STAR

There's apparently a new stellar heavyweight champion in the galaxy. It lies 25,000 light-years away in Sagittarius, and is hidden from view by dense clouds of dust. The star was first spotted in infrared observations several years ago, but in 1995, astronomer Don Figer suggested that the star also created the surrounding cloud of glowing gas, which has been dubbed the Pistol Nebula. Figer has followed up with observations using the Hubble Space Telescope's recently installed Near-Infrared Camera and Multi-Object Spectrometer. The star — which currently emits 10 million times as much energy as the Sun — may be only 1 to 3 million years old, and will live for only another 1 to 3 million years before exploding in a supernova. While it initially may have been some 200 times the mass of the Sun, it is actively throwing off tremendous amounts of matter. The UCLA researcher and his team presented Hubble's view of the region this week, clearly showing material that Figer estimates was ejected 4,000 and 6,000 years ago.

NEW GIANT EYE IN TEXAS

On October 8th, the William P. Hobby-Robert E. Eberly was dedicated at McDonald Observatory near Fort Davis, Texas. The primary mirror of this giant eye of Texas is composed of 91 separate one-meter hexagonal mirrors. Computers control the mirrors' alignment so they work in concert as a single 11-meter mirror. Because of the way the Hobby-Eberly Telescope will be used, only 9.2 meters of its surface will be accessible at any given time. Thus, while its primary mirror is larger than the twin 10-meter Keck telescopes in Hawaii, the Hobby-Eberly Telescope is effectively the third-largest telescope in the world.

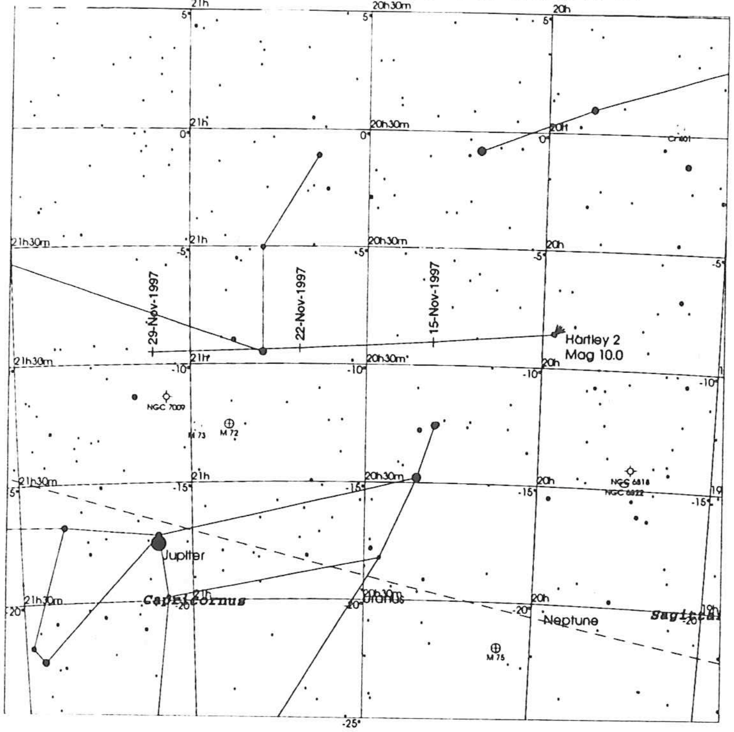
CASSINI ON ITS WAY

After a two day delay due to high winds at Cape Canaveral and a later-detected software error, the Cassini Saturn orbiter lifted off at 4:43 a.m. Eastern Daylight Time on Wednesday, October 15th. Cassini and the Huygens Titan probe, supplied by the European Space Agency, are operating normally and have begun their six-year journey to the ringed planet. Along the way, they will make three planetary gravity-assist flybys, two by Venus and one by the Earth.

GLOBAL SURVEYOR ON HOLD

Engineers at the Jet Propulsion Laboratory raised the orbit of the Mars Global Surveyor orbiter on October 12th because one of its solar panels seems to be in an unusual position. Global Surveyor has been repeatedly brushing the Martian atmosphere to slow the spacecraft and lower its orbit. Apparently, on a recent passage, a solar panel was pushed beyond its "locked" position. Aerobraking maneuvers have been suspended until flight controllers can determine why this occurred and what can be done to prevent further motion. A contributing factor to the panel's shift may have been the unanticipated two-fold thickening of Mars's air during the previous week. According to project manager Glenn E. Cunningham, the interruption in aerobraking will result in a slightly different mapping orbit but should not significantly affect the science results. ☆

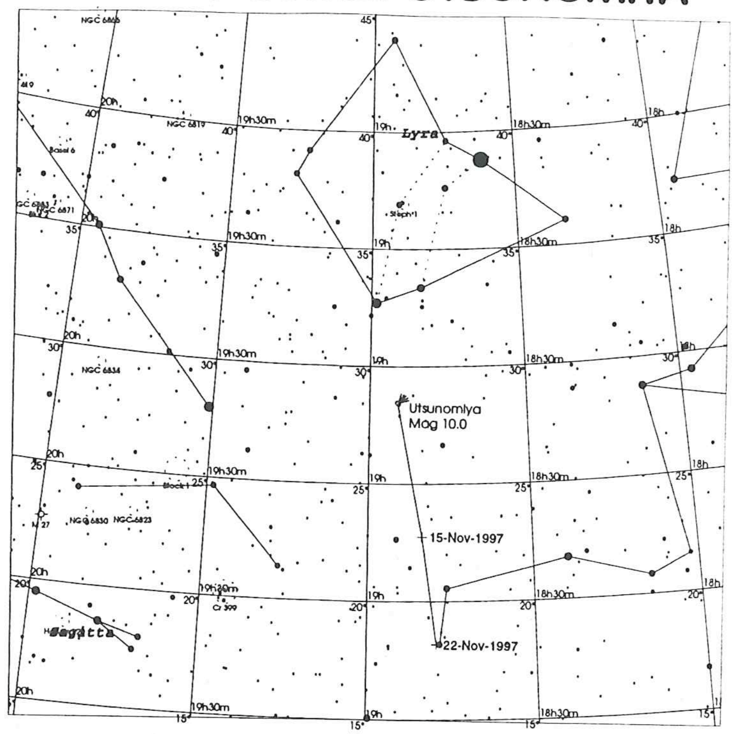
FINDING COMET HARLEY2



STARS	SYMBOLS	
<1 · >6 2 3 4 5	Comet · Globular Cluster Asteroid · Planetary Nebula Galaxy · Quasar Open Cluster · Other Object Bright Nebula	*Created with SkyMap software version 3.0.3 by Chris Marriott (www.skymap.com)* *Map reprinted with permission.*

Local Time: 18:00:00 8-Nov-1997 UTC: 23:00:00 8-Nov-1997 Sidereal Time: 20:39:56
Location: 42° 19' 12" N 83° 10' 48" W RA: 20h30m00s Dec: -10° 00' Field: 30.0° Julian Day: 2450761.4583

FINDING COMET UTSUNOMIYA



STARS	SYMBOLS	
<1 · >6 2 3 4 5	Comet · Globular Cluster Asteroid · Planetary Nebula Galaxy · Quasar Open Cluster · Other Object Bright Nebula	*Created with SkyMap software version 3.0.3 by Chris Marriott (www.skymap.com)* *Map reprinted with permission.*

Local Time: 18:00:00 8-Nov-1997 UTC: 23:00:00 8-Nov-1997 Sidereal Time: 20:39:56
Location: 42° 19' 12" N 83° 10' 48" W RA: 19h00m00s Dec: +30° 00' Field: 30.0° Julian Day: 2450761.4583

Ford Amateur Astronomy Club
Star Stuff Newsletter
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